CHAPTER 4: THE DEEPWATER HORIZON OIL SPILL NATURAL RESOURCE INJURY ASSESSMENT

The Trustees are in the process of assessing injuries caused by the Spill to natural resources and the services provided by these resources. This assessment extends from the deep ocean to the highly productive coastal habitats and estuaries along the five Gulf States, and includes a broad array of fish and shellfish species, rare deep sea corals, plankton and invertebrates that serve as prey for larger organisms, coastal vegetation, birds, sea turtles, and marine mammals. Additionally, impacts to recreational use of these resources and habitats, such as recreational fishing, boating, and other shoreline activities are also being assessed.

The Trustees have developed and implemented hundreds of scientific assessment studies focused in areas ranging from deep sea sediments, through the water column, to the nearshore and shoreline. In so doing, the Trustees have worked with technical teams including scientists from state and federal agencies, academic institutions, and BP. This cooperative approach to injury assessment is strongly encouraged by the OPA NRDA regulations, with the goal of creating a common set of data for quantifying injury in the future.

The Trustees have established websites to provide the public with access to work plans and data related to the injury assessment.[1] In addition, in April 2012 the Trustees published an NRDA status update to provide the public with an overview of the potential impacts to resources in the Gulf of Mexico ecosystem caused by the spill; it also outlined the activities undertaken by Trustees to assess the injury.[2]

While many of the NRDA data collection efforts have been completed, some investigations continue, many aspects of the injury determination phase are ongoing and the full extent and duration of impacts on the Gulf of Mexico resources and habitats are still being evaluated. This chapter provides an update on the injury assessment as context for the Early Restoration plans presented and proposed in later chapters of this document.

4.1 The Injury Assessment Process: Assessing Injuries in a Complex, Interconnected Ecosystem

Oil from the Spill spread over a large area of the Gulf of Mexico environment, through a variety of different pathways. Oil and gas released from the wellhead rose from the wellhead to the surface of the water and was volatized to the atmosphere, moved with surface waters, or transported at depth (Camilli et al. 2010). Some of the oil and gas dissolved into the water, some oil was dispersed into tiny oil droplets, and some adsorbed onto particles in the water. Surface oil was transported by natural processes such as wind and waves, eventually reaching Gulf shorelines (Benton et al. 2011). An array of habitats and associated biological communities and organisms were exposed to the oil and/or gas,

[1] As NRDA work plans and data are made public, they are posted to www.doi.gov/deepwaterhorizon/adminrecord, www.gulfspillrestoration.noaa.gov, www.fws.gov/home/dhoilspill, and http://losco-dwh.com. Data that are made public also are available on www.geoplatform.gov/gulfresponse/

[2] Natural Resource Damage Assessment April 2012 Status Update for the Deepwater Horizon Oil Spill, http://www.gulfspillrestoration.noaa.gov/wp-content/uploads/FINAL_NRDA_StatusUpdate_April2012.pdf

including, deep sea habitats such as deep water soft bottom sediments, deep water coral reefs, and mesophotic coral reefs; the offshore and nearshore water column, including nearshore habitats such as unvegetated (unconsolidated) nearshore sediment, submerged aquatic vegetation (SAV), oyster reefs, and coastal waters; and shoreline habitats such as marshes, beaches, barrier islands, and mangroves (OSAT 2010 and White et al. 2012). Oil and dispersant vapors also were present in the atmosphere in some areas (Middlebrook et al. 2012 and OHSA 2014).

The Gulf of Mexico ecosystem includes a complex and interconnected web of organisms (species, populations, and communities), habitats, and natural processes and functions. Consequently, natural resources may be adversely affected by oil by direct exposure or indirectly – for example, through loss of spawning and nesting habitat or reductions in prey availability caused by lost primary and secondary productivity. When natural resources are injured, cascading indirect ecological effects can also occur, including changes in ecological structure (such as increasing rates of shoreline erosion) and ecological functions (such as habitat suitability for foraging).

In designing the injury assessment, the Trustees have undertaken studies to evaluate potential Spill-related impacts on species and habitats of particular legal, management and/or ecological concern. However, because of the diversity and complexity of the Gulf of Mexico ecosystem, the vast area of the northern Gulf of Mexico that was affected by the Spill, and the practical challenges of performing scientific studies in some habitats such as the deep ocean, it is impossible to study every species, habitat, location, and ecological process that was potentially affected. Therefore, the Trustees have focused the injury assessment on representative species, habitats, and locations. In this way, the Trustees can then use the results of individual studies to make reasonable scientific inferences about natural resources that were not explicitly studied, based on an understanding of ecological relationships and processes.

Oil and/or dispersants can adversely impact natural resources and natural resource services through a variety of pathways and modes of action. Several examples are provided in the following sections of this chapter. In addition, while efforts to protect biota and habitats from oiling and/or to remove oil from the environment are necessary and critical, such cleanup or response actions can themselves cause natural resource injuries. For example, adverse impacts to habitats and/or biota can be caused by:

- Installation, maintenance, and removal of a wide range of types of physical barriers constructed to prevent oil from entering shoreline habitats;
- Manual and mechanical activities required to remove oil from shoreline and nearshore habitats, including staging areas, access areas, vehicular traffic, and other types of disturbances, in addition to cleaning and removal of oiled substrate and debris; and/or
- The release of freshwater from diversion structures to keep oil from moving into nearshore habitats.

In their assessment of natural resource injuries from oil and/or dispersants and other response related injuries, the Trustees are applying a combination of field, laboratory, and numerical modeling approaches. Field studies have been performed to document environmental conditions, evaluate exposure, and assess the condition of biological resources. In some circumstances, field-based enumeration of affected biota (e.g., oiled birds) can be undertaken and used to inform estimation of the magnitude and severity of certain types of spill impacts. However, because of the enormous spatial scale affected by the Spill, detecting changes in some natural resources by observing or counting organisms in the field can be difficult and/or impractical. The Trustees are increasing the interpretive power of their assessment by combining field studies with controlled laboratory studies designed to study the effects of oil on Gulf of Mexico biota. As appropriate, field and laboratory data are combined in mathematical computer models to enable interpretation and quantification of injuries at the broad spatial and ecological scale necessary for the NRDA.

4.2 Injuries to Natural Resources

The following subsections of this chapter provide an update for several areas of the Trustees' ongoing natural resource damage assessment, including:

- Laboratory toxicity testing;
- Deep benthic environments;
- Offshore water column fish and invertebrates;
- Sea turtles;
- Marine mammals;
- Marsh and mangrove habitat;
- Beach habitat;
- Unvegetated nearshore sediment;
- Submerged aquatic vegetation;
- Oyster reefs;
- Birds; and
- Recreational use.

The information provided in this chapter is not intended to provide a comprehensive review of the status of all assessment activities. Rather, it provides an appropriate level of background and context for consideration of the proposed Early Restoration programmatic alternatives and proposed Phase III Early Restoration projects that are the subject of the remaining chapters in this document.

4.2.1 Laboratory Toxicity Testing Program

The Trustees are undertaking a comprehensive laboratory toxicity testing program to evaluate the adverse effects of oil and dispersant on marine organisms of the Gulf of Mexico. The testing program is designed to determine the nature of toxic effects that occurred to different organisms in different habitats, the concentrations of oil and dispersant at which such effects occur, and how exposure to oil in a range of weathering states can adversely affect the viability of organisms in various stages of their life histories. Laboratory toxicity test results are being published as they are completed. Some examples include: Brette et al., 2014; Incardona et al., 2014; and Mager et al., 2014. Additionally, Trustees are mindful that the scientific community has undertaken extensive testing and research regarding the Spill. Trustees continue to stay abreast of current research, which may impact the understanding of ecological injury in the northern Gulf of Mexico.

The Trustees' aquatic toxicity tests involve exposing test organisms to samples of the released oil in various states of weathering (fresh to very weathered), with and without the presence of dispersant. This process was applied to samples of contaminated sediment as well. A wide variety of representative marine and estuarine species, including fish, shellfish, and invertebrates, are being tested as part of the program. Scientists typically conduct these laboratory toxicity tests by exposing test organisms to a range of oil concentrations under controlled conditions. By conducting the tests in this way, scientists are able to calculate the adverse effects that would be expected to occur at various oil concentrations in specific exposure conditions.

The Trustees' aquatic toxicity testing program includes studies both of the lethal effects of oil and dispersant, to determine the concentrations of oil that kill organisms, and the "sub-lethal" impacts of oil, to determine concentrations of oil that can cause significant adverse effects on the health, growth, reproduction, or general viability of organisms. For example, some of the sub-lethal effects of oil that have been documented in the Trustees' aquatic toxicity tests to date include:

- Disruptions in growth, development, and reproduction;
- Tissue damage;
- Altered cardiac development and function;
- Disruptions to the immune system;
- Biochemical and cellular alterations; and
- Changes in swimming ability and other behaviors that can adversely affect an organism's viability in the environment.

Overall, the results of the Trustees' ongoing aquatic toxicity testing program will provide a means for the Trustees to reach conclusions regarding the nature and extent of different types of adverse impacts to aquatic organisms based on observed, measured, and modeled concentrations of oil and dispersant on and in the water column, as well as in bottom sediments.

Similar to the efforts to assess the adverse effects of oil on marine and estuarine organisms, efforts are ongoing to assess the adverse effects of oil on avian species that inhabit the Gulf of Mexico. Millions of birds utilize the northern Gulf including, but not limited to, sea birds, colonial nesting birds, shorebirds, waterfowl and passerines. The Trustees are conducting laboratory toxicity tests to determine the potential adverse effects of oil from the Spill on avian species.

4.2.2 Deep Benthic Environments

Deep sea habitats are important reservoirs of biodiversity and also serve vital roles in the recycling of carbon and other building blocks for life in the sea, enabling productivity from the near bottom to surface waters of the ocean. New species and ecological relationships are regularly discovered with our increased exploration of these remote regions of the sea. This zone is characterized by little or limited light penetration and is populated by organisms adapted to cold, high-pressure, and dark conditions (Fisher et al. 2007, MacDonald and Fisher 1996). Much of the energy reaching the sea floor is provided in the form of "marine snow", which is a mixture of sediment and biological detritus that, in general, falls from the upper photic zone, through the water column, to the bottom (Grassle 1991). The deep environments under investigation pursuant to the NRDA fall into several major habitat types. These include soft bottom sediments, which make up the majority of the ocean floor in the northern Gulf of Mexico; hard bottom rocky patches that can support deep sea coral communities in depths of greater than 650 feet (200 m); and mesophotic coral reefs found at depths of about 160 – 650 feet (50 – 200 m), the deepest zone where light can penetrate.

Studying the deep ocean environment is challenging, and relatively little is known about the ecology of the organisms using these habitats. The Trustees have been working to quantify the nature and magnitude of injuries to these unique and sensitive deep water habitats using remotely operated vehicles, autonomous underwater vehicles, and complex water and sediment sampling devices. Data and analyses available to date have documented injuries to these habitats attributable to the Spill, including but not limited to: loss and/or degradation of coral colonies in deep sea coral habitats; reduced numbers of planktivorous fish species and increased prevalence of injured corals at mesophotic reefs in the affected area compared to reference reefs that were outside the influence of the Spill; and adverse impacts to sediment-dwelling animals near the wellhead and in the direction of oil flow.

4.2.3 Offshore Water Column Fish and Invertebrates

The offshore water column of the Gulf of Mexico supports a wide variety of organisms, including numerous species of fish at different life stages (from fertilized eggs, to larvae, juveniles, and adults), as well as many species of phytoplankton, zooplankton, and bacteria (Mann and Lazier 2006 and Lyczkowski-Schultz et al. 2004). All of these organisms play an important ecological role, including serving as prey for fish, invertebrates, birds, sea turtles, and marine mammals as well as cycling and transporting nutrients between nearshore and offshore areas and between the surface and the deep sea (Felder and Camp 2009). Many fish and invertebrate species support robust commercial and recreational fisheries.

Oil and gas released from the wellhead rose to the atmosphere and the surface of the water, and was transported at depth. Some of the oil volatilized to the atmosphere, dissolved in the water, dispersed into tiny oil droplets, and adsorbed onto particles in the water. Animals exposed in the water column include small and large pelagic fish, demersal fish that live near the bottom of the ocean, invertebrates, and planktonic organisms.

To help understand the fate, chemical weathering, transport, and toxicity of the oil, the Trustees have collected data to document physical and chemical water conditions in and around the spill area. These data include currents and physical properties of the water column in the vicinity of the wellhead; dissolved oxygen data to help assess the effect of microbial degradation of the oil and to track the fate of the oil; and data on suspended sediments, chlorophyll concentrations, and other physical measurements. Trustees are accounting for temporally variable surface water oiling in calculations of exposure and injury. Concentrations of oil components are calculated for multiple depth intervals. To help evaluate impacts to water column organisms, the Trustees have gathered and analyzed information on the density and abundance of organisms that live in the water column, including variations in their distribution over space and time. Preliminary Trustee analysis suggests that tens of thousands of square miles of surface waters were affected by oiling and that hundreds of cubic miles of surface water may have contained petroleum compounds at concentrations associated with mortality to sensitive aquatic organisms. This indicates that injuries to offshore water column organisms were widespread, both spatially and in terms of the diversity of organisms and life stages that were affected.

4.2.4 Sea Turtles

There are five species of sea turtles living in the Gulf of Mexico that are listed as threatened or endangered under the Endangered Species Act: Kemp's ridley (*Lepidochelys kempii*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*) and hawksbill (*Eretmochelys* *imbricata*). Sea turtles nest along beaches throughout the Gulf. Sea turtles were exposed to oil in open water, and in *Sargassum* habitat, through consuming oil, by direct contact, and by inhaling volatile oil and dispersant-related compounds. In addition, response activities, such as collecting and burning oil at sea, skimmer operations, boom deployment, berm construction, increased lighting at night near nesting beaches, beach cleanup operations and boat traffic may have injured sea turtles directly or by blocking access to turtle nesting beaches and changing their reproductive behavior.

More than 1,000 sea turtles (of all life stages) were found dead in the northern Gulf of Mexico between April 26, 2010 and December 2011, and hundreds of those were oiled. The Trustees are using a variety of information to evaluate injuries to sea turtles, including stranding records, response recovery operations, aerial surveys from aircraft, analysis of the intersection of convergence zones, *sargassum* habitat, and baseline turtle densities, the toxicological effects of oil, veterinary examination of oiled turtles, and analysis of hatching success. Preliminary findings include:

- More than 500 live or dead oceanic turtles were recovered or collected during attempts to rescue sea turtles from oiled *Sargassum* in the summer of 2010. Oil was often found within the mouth, pharynx, and esophagus in oral exams of live turtles and necropsies of dead turtles that were visibly, externally oiled upon recovery;
- Broad-scale aerial surveys conducted in 2010 indicate that there were tens of thousands of neritic turtles (life-stages found in coastal waters) exposed to oil within the footprint of surface oiling; and
- 14,700 hatchling turtles were relocated from the Gulf to the Atlantic coast of Florida to protect them from potential oil exposure. Although sea turtles typically return to their natal beaches to reproduce, uncertainty about the timing and location of the imprinting process makes it difficult to predict whether surviving relocated turtles will return to Atlantic or Gulf beaches to reproduce.

Sea turtles live for many years (decades) and the full extent of impacts to the five affected species of sea turtles may not be apparent for many years. The evaluation of impacts to nesting, oceanic, and neritic turtles is ongoing.

4.2.5 Marine Mammals

Marine mammals that reside in the Gulf of Mexico include 21 species of cetacean (whales and dolphins) and one sirenian (manatee) (Waring et al. 2010). All are protected under the Marine Mammal Protection Act, 16 U.S.C. §§ 1361 *et seq* (MMPA). Sperm whales (*Physeter macrocephalus*) and the West Indian manatee (*Trichechus manatus*) are listed as endangered under the Endangered Species Act. In addition, several other species of baleen whales, notably North Atlantic right whales (*Eubalaena glacialis*), fin whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeingliae*), and minke whales (*Balaenoptera acutorostrata*) may occur in the Gulf of Mexico. Based on life histories and habitat preferences of these species, and on observations of oil within marine mammal habitats, Trustees divided marine mammals into three functional groups for the purposes of injury assessment: oceanic marine mammals (targeting primarily sperm whale, Bryde's whale, striped dolphin and Risso's dolphin), coastal dolphins, and estuarine bottlenose dolphins.

Currently available information suggests that thousands of marine mammals were exposed to oil from the Spill. Preliminary data also indicate the presence of adverse health outcomes resulting from this exposure. Dolphin health assessments have been conducted in parts of the northern Gulf of Mexico. In 2011, data indicated that bottlenose dolphins in Barataria Bay (which suffered heavy and prolonged exposure to oil) demonstrated signs of severe ill health, with many dolphins sampled in Barataria Bay given a 'guarded', 'poor' or 'grave' prognosis. Symptoms included low body weight, anemia, low blood sugar, and/or symptoms of liver and lung disease (Schwacke et al. 2013). Data analysis continues for the marine mammal assessment in the Mississippi Sound and in other areas of the Gulf of Mexico. Collection and evaluation of data relevant to the assessment of the type and magnitude of injury to marine mammals attributable to the Spill is continuing.

4.2.6 Marsh and Mangrove Habitat

The high productivity of coastal marsh vegetation provides an ideal nursery ground that supports a wide variety of finfish, shrimp, and shellfish (Mitsch and Gosselink 2007, Daily et al. 1997, Minello and Webb 1997). Many bird species are dependent on marshes for foraging, roosting and nesting, and marshes are also critical to both migratory and wintering waterfowl (Mitsch and Gosselink 2007). The marsh edge also serves as a critical transition between the emergent marsh vegetation and open water. This area serves as the gateway for the movement of organisms and nutrients between intertidal and subtidal estuarine environments. Additionally, marsh edge has been found to be the most productive area of the marsh for many organisms (English et al. 2009).

The highly productive black mangrove (*Avicennia germinans)* occurs in association with smooth cordgrass (*Spartina alterniflora*) in many locations of the northern Gulf of Mexico and is important for maintaining shoreline protection and stabilization (Carlton 1974 and Massel et al. 1999). It is an essential feeding and nursery habitat for juvenile fish such as snapper (Coleman et al. 2000 and Mumby et al. 2004). The roots of mangroves that emerge from the water and soil provide excellent habitat for small organisms. Some species of colonial waterbirds, such as herons, egrets, and pelicans, build nests in mangroves and forage in the mangroves or nearby (Davis et al. 2005).

Declines in marsh vegetative health have been observed in oiled herbaceous mainland marshes relative to reference marshes. Key measurements illustrating adverse effects of oil on marsh vegetation included reductions in live plant cover, total vegetation cover, and vegetative condition. These effects generally are more pronounced along the highly productive marsh edge. Moreover, shorelines with more significant oiling tended to experience greater adverse effects.

In addition to vegetation impacts, impacts on animals that live in the marsh have been demonstrated. For example, researchers have documented a lower abundance of *Littorina* snails (a typically abundant marsh organism that is an important source of prey in intertidal habitats) in heavily oiled areas relative to un-oiled areas more than a year after the Spill began.

4.2.7 Beach Habitat

Beaches are vital both ecologically and economically (Schlacher et al. 2008 and United Nations Millennium Assessment 2005). Ecologically, beaches provide food sources for numerous shoreline and migratory birds, invertebrates, and nesting sea turtles and shorebirds. Organic material such as sea grass that is cast up onto the beach by the surf, tides, and wind provides foraging opportunities and shelter for breeding and wintering shorebirds (Dugan et al. 2003). Colonial nesting gulls, terns, and skimmers nest on open beaches. The sand beaches of the northern Gulf Coast, including various state and federal parks, are also important recreational destinations and tourist attractions that support local and regional economies (e.g., Parsons et al. 2009, Mobile Area Chamber of Commerce 2010, Gulf Coast Business Council Research Foundation 2012, Houston 2013).

Preliminary estimates indicate that about 600 linear miles of sand beach habitat were oiled as a result of the Spill. At the peak of the Spill, beaches were oiled from eastern Texas to the Florida Panhandle. Many of these beaches were oiled repeatedly over an extended time period. A significant effort to remove oil from beaches was launched across the northern Gulf of Mexico. Oiling of beaches can have a variety of effects on the physical and biological communities of the beach and near shore habitats. Shoreline protection and clean up related to the Spill clearly affected biological communities as well. At least 400 miles of oiled beaches also experienced some level of impairment due to response activities.

4.2.8 Unvegetated Nearshore Sediment

The unvegetated nearshore benthic sediments and tidal flats of the Gulf of Mexico serve as an important and diverse habitat for many species. Crabs, shrimp, fish, shorebirds, and terrestrial wildlife feed on the rich populations of organisms living on and in the nearshore sediments (e.g., McTigue and Zimmerman 1998, Perry and McIlwain 1986, Fox et al. 2002, Gabbard et al. 2001). This sediment-based system notably includes the major shrimp species in the Gulf of Mexico, including white and brown shrimp (Muncy 1984, Bielsa et al. 1983, Lassuy 1983, also see www.fishwatch.gov). Three key commercial species of crabs in the Gulf of Mexico region also are supported by sediment-based ecosystems: blue crab, Gulf stone crab, and stone crab (Lindberg and Marshall 1984, Perry and McIlwain 1986, also see www.fishwatch.gov). Gulf sturgeons (classified as threatened under the ESA) also forage on the bottom of the bays and estuaries of Florida, Alabama, Mississippi, and Louisiana, eating invertebrates such as mollusks, worms and crustaceans (Fox et al. 2002, USFWS and NMFS 2009).

As part of the evaluation of the magnitude and extent of oil that stranded and persisted in the shoreline and nearshore environment, nearshore sediment was sampled within one kilometer of the shoreline in 2010 and 2011. These sediment samples have been analyzed for polycyclic aromatic hydrocarbons (PAHs) and other parameters to evaluate the potential for injury to nearshore species. Analysis of over 2500 sediment samples has revealed the presence of PAHs in many nearshore sediments. Field and laboratory toxicity studies are being conducted to evaluate the implications of this contamination for nearshore fish and invertebrates.

Overall, the Trustees' ongoing assessment of injury to nearshore sediment habitat indicates that shallow water sediments were contaminated with oil following the Spill and that the degree of contamination was sufficient to cause a range of adverse effects on survival, reproduction, health of organisms and overall ecosystem productivity within this important habitat.

4.2.9 Submerged Aquatic Vegetation

Submerged aquatic vegetation (SAV) refers collectively to a group of rooted plants that grows up to the water surface. Various seagrasses grow in marine water, and other species live in fresh and brackish habitats of the Gulf of Mexico. SAV is a highly productive habitat in the northern Gulf of Mexico which provides food and shelter for fish, shellfish, crustaceans, and other invertebrates (Gulf of Mexico Program 2004). It also is an important foraging habitat for sea turtles and resident and migrating birds (USFWS 2012 and Gulf of Mexico Program 2004). It serves as nursery habitat for many species, produces oxygen in the water column as part of the photosynthetic process and enhances water quality by filtering water and removing excess nutrients. SAV also stabilizes sediment and is vital to keeping barrier islands intact (Fonseca et al. 1998, Poirrier 2007).

Sampling was performed to evaluate oil exposure at a number of sites in the northern Gulf of Mexico. Oil was detected in samples at several SAV sites, and preliminary information suggests that at least 10 square miles of SAV beds were oiled and/or adversely affected by a variety of response activities.

4.2.10 Oyster Reefs

The eastern oyster (*Crassostrea virginica*) forms an integral component of nearshore coastal ecosystems and local economies along the Gulf of Mexico (Eastern Oyster Biological Review Team 2007). Oyster reefs provide numerous ecological services to estuarine systems, including production of biomass, filtering water to remove organic and inorganic particles, and improving water quality and clarity. Oyster reefs provide habitat for numerous other shellfish, crabs, and finfish. Oysters are also a valuable commercial and recreational fishery resource (Eastern Oyster Biological Review Team 2007). Oysters in the Gulf of Mexico are present in both intertidal and sub-tidal areas (Eastern Oyster Biological Review Team 2007). Commercial oysters are harvested from sub-tidal areas, but intertidal oysters may be important as a source of larvae to maintain populations of both intertidal and sub-tidal oysters.

In response to the Spill, large volumes of freshwater from Mississippi River diversion structures in Louisiana were released as part of a set of response actions designed to reduce the movement of oil into sensitive marsh and shoreline areas. The volume and duration of the low salinity water from these response actions adversely affected oysters. Preliminary analyses in 2010 suggest oysters in areas affected by lowest salinity water experienced substantial mortality in Louisiana. Oyster abundance and biomass in 2010 was low in many areas.

Oyster gametes and larvae float to the surface after spawning and remain at the surface for the early part of their planktonic period. They can travel up to 40 miles in surface waters. Oyster eggs, sperm, and larvae were exposed to oil and potentially dispersants through direct contact with water. PAHs are toxic to oyster gametes, embryos, larvae, juveniles and adults and result in lethal and sub-lethal effects (e.g., impaired reproductive success). Intertidal adult oysters were also likely exposed to oil droplets and oil on suspended sediment and detritus.

Fall 2010 sample results suggest oyster larvae were rare or absent in many of the samples collected across the northern Gulf of Mexico. Oyster spat recruitment was also extremely low or zero in 2010 over large areas of subtidal oyster habitat along the northern Gulf coast. There was also low spat recruitment through the spring and fall of 2011 and the fall of 2012. Trustees are continuing to evaluate effects of 2010 oiling and associated response activities on Gulf oyster populations.

4.2.11 Birds

The northern Gulf Coast is important to a variety of birds that nest on beaches, mudflats, dunes, bars, barrier islands, and other nearshore habitats including marshes and mangroves. Breeding species of regional importance include American oystercatcher, snowy plover and Wilson's plover. The Breton National Wildlife Refuge off the Louisiana coast supports one of the world's largest colonies of sandwich terns. The northern Gulf Coast also supports nearly half of the southeastern population of brown pelican. The northern Gulf of Mexico is critically important wintering habitat for a variety of migratory birds. In addition, Gulf Coast marshes are important to many marsh birds, including but not limited to black rail, clapper rail, king rail, Virginia rail, sora, least bittern, and American bittern. The Gulf Coast also supports protected bird species, such as the piping plover, which is federally listed under the ESA. At least 70 percent of all piping plovers winter on the shores of the Gulf of Mexico.

Oiled birds can lose the ability to fly, dive for food, or float on the water, which can lead to drowning. Oil and dispersants interfere with the water repellency of feathers and can lead to problems of thermoregulation (e.g., hyper- or hypothermia). In addition, birds may ingest or inhale oil while cleaning (preening) their feathers, by consuming contaminated vegetation or prey, or by incidental ingestion of contaminated sediment. This exposure can kill the bird, leave it susceptible to predation or lead to long-term physiological, metabolic, developmental, and/or behavioral effects, which can in turn lead to reduced survival and/or reproduction. Exposure to oil also can reduce the hatching of eggs and survival of hatchlings. Examples of direct and indirect avian injury can include, but are not limited to, mortality, productivity loss, decline in reproductive success, sub-lethal effects, and loss of prey resources (including food and habitat for nest building).

The Spill injured avian resources throughout the Gulf through a variety of mechanisms, including but not necessarily limited to exposure to oil, disturbance from response activities, cleaning in rehabilitation settings, and degradation of habitat. Approximately 8,500 live impaired and dead birds were collected in the northern Gulf of Mexico as part of wildlife rescue and NRDA operations during and following the Spill. These birds represent over 100 species collected in all five Gulf Coast states. Due to the inability to search all areas and recover all affected birds, collected birds represent a fraction of the total number of birds that were killed or impaired as a result of the Spill. Additionally thousands of photographs were taken of birds that showed external exposure of oil on feathers. This exposure could have potential short-term and long-term effects on individual and offspring survivorship.

The Trustees are conducting a broad spectrum of studies to fully evaluate the impact of the spill on avian species, including incident-specific avian toxicity studies and evaluations of potential impacts experienced by oiled birds collected from the Gulf. This approach allows for controlled laboratory testing of the oil to specifically identify adverse effects and for confirmation that these effects are observed in oiled, wild birds.

4.2.12 Recreational Use

The Gulf of Mexico provides a wide range of recreational opportunities to local residents and visitors from across the nation. These include recreational fishing, boating, visiting beaches, and other activities. The Spill resulted in closures of beaches, fishing areas and waterways, preventing access to these areas by both local and more distant recreational users. In addition to these direct closures, the Spill also caused some recreational users to change the type of recreational activities they would otherwise engage in. Other users cancelled their planned recreational visits or traveled to alternate locations because of the threat of oiling (or because of actual oiling that did not result in beach closures), or visited oiled beaches and therefore suffered from degraded, lower quality trips. Other coastal recreational activities would likely have been disrupted as a result of the Spill.

For each broad type of injury (shoreline use, boating/boat based fishing trips, and shore-based fishing), Trustee experts developed a sampling and analysis plan to estimate the change in recreational use in the assessment area resulting from the Spill. Each of these approaches is described in more detail below. These assessment activities provide estimates of recreation use including counts of recreational users over time and information on the type of activities in which users engaged. By comparing recreation use during the spill period with the counts during a baseline period, and adjusting for other non-spill related differences between the two periods, the Trustees can estimate the number of lost recreation user days in the assessment area. In addition, the Trustees are evaluating recreational use data from a variety of sources and surveys for determining potential impacts in other coastal areas where the data described above is unavailable.

One major category of injury is shoreline use, which includes any recreational visitation to beach sites in the assessment area, such as sunbathing, swimming, birding or other wildlife viewing, walking, and running. Aerial over-flights and on-the-ground fieldwork on beaches that began in the weeks following the Spill provide a measure of recreational use along the Gulf Coast shoreline.

Another major category of injury is boating and boat-based fishing trips, which includes any recreational users who would have engaged in recreational fishing or pleasure boating in the assessment area during and after the Spill period. This assessment does not include those fishing for commercial purposes since losses to commercial enterprises are not part of an NRDA claim. Assessment teams started counting departures at public boat ramps in the assessment area shortly after the Spill at publically accessible sites. As boating and boat-based fishing also occurs from non-public locations, such as backyards, private marinas, and other sites, Trustees also conducted surveys to assess impacts upon this recreational user group. Together these data collection efforts provide measures of the level and types of boating and boat-based fishing along the coastal waters of the Gulf of Mexico.

Another major category of injury that required a significant assessment effort is shore-based fishing, which includes fishing from beach locations as well as fishing from piers and jetties or other similar structures. Assessment teams conducted field counts of users engaged in this activity type beginning shortly after the Spill.

While analysis of recreational use data is ongoing, preliminary Trustee review indicates that over ten million recreational user days were lost or otherwise adversely affected by the Spill.

4.3 Use of Assessment Data to Inform Early Restoration Project Selection

Throughout the Early Restoration process, the Trustees have used preliminary results from the Assessment to inform and guide the selection of Early Restoration projects. As noted above, the Assessment work to date clearly demonstrates areas of extensive oiling of marsh and beach shorelines from Texas to the Florida Panhandle. Preliminary results also make clear that the oiling has had significant adverse impacts on coastal and nearshore habitats and their biological communities. In addition, initial results from the Trustees' Assessment clearly show that oiling caused very large reductions in coastal recreation from Texas to Florida. Analysis of recreational data assembled by the Trustees indicates that more than 10 million user-days of beach, fishing and boating activity were lost due to the spill.

Proposed Phase III ecological projects include measures to protect shorelines and enhance nearshore productivity in a variety of habitats. These projects include restoration of barrier islands and construction of living shorelines, as well as measures to restore oysters, SAVs, and dunes. The ecological projects represent approximately 63 percent of the Phase III program spending. The remaining 37 percent of the Phase III budget is devoted to restoration projects aimed at increasing and enhancing recreational activity in all five affected Gulf States.

Early Restoration reflects the Trustees' proposal to focus on those injury categories for which the nature of the adverse impacts are reasonably well understood. Once the Trustees' Assessment is complete, a final damage assessment and restoration plan will be developed to address injuries not fully addressed by the Early Restoration program.

4.4 References

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CHAPTER 5: PROPOSED EARLY RESTORATION PROGRAMMATIC PLAN: DEVELOPMENT AND EVALUATION OF ALTERNATIVES

This chapter provides information relevant to the programmatic alternatives proposed to address Early Restoration. More specifically, this chapter provides information relevant to development of a reasonable range of programmatic alternatives proposed for continued pursuit of Early Restoration of injured natural resources and their services under the Oil Pollution Act (OPA) and in accordance with the Framework Agreement. Under each alternative, the Trustees identify a suite of appropriate Early Restoration project types. This chapter includes:

1. A discussion of the criteria used by the Trustees to develop and evaluate programmatic alternatives, referred to here as "programmatic criteria";
2. Descriptions of Early Restoration programmatic alternatives considered by the Trustees, including a "No Action" alternative; and
3. Identification of the Trustees' preferred alternative for continued Early Restoration.

As required by NRDA regulations (15 C.F.R. § 990.53(a)(2)), the Trustees consider a reasonable range of restoration alternatives before identifying their preferred alternative. Those alternatives must be designed so that, as a package of one or more actions, each restoration alternative would make the environment and the public whole. Early Restoration for the Spill, however, is only the beginning of the process to restore natural resources and their services, and therefore is intended to contribute to, but not fully meet, the goal of making the public whole.

The Council on Environmental Quality's (CEQ's) regulations implementing NEPA also direct agencies to rigorously explore and objectively evaluate all reasonable alternatives (40 C.F.R. § 1502.14(a)). An alternative is reasonable if it will achieve the stated purpose and need, restore or enhance the quality of the human environment, and avoid or minimize any possible adverse effects of the agency's actions upon the quality of the human environment (40 C.F.R § 1500.1(e)–(f)). Alternatives are developed consistent with a range of requirements designed to meet the purpose and need of the proposed action.

For Early Restoration, the Trustees considered both the OPA regulations and the Framework Agreement in developing requirements to meet the stated purpose and need for the Early Restoration program. These requirements, referred to as "programmatic criteria" in this chapter, are appropriate for the development and evaluation of programmatic alternatives. Programmatic criteria are used by the Trustees to narrow what could be a boundless list of options into a reasonable range of alternatives.

The remainder of this chapter provides information about the Trustees' process for identifying programmatic alternatives and their associated project types for continuing Early Restoration, culminating with the identification of four programmatic alternatives considered by the Trustees.

5.1 Criteria for Developing Programmatic Alternatives

This section describes the suite of programmatic criteria used by the Trustees to develop and evaluate Early Restoration programmatic alternatives that meet the purpose and need described in Chapter 1. First, the Trustees considered the following criteria found in the OPA regulations at 15 C.F.R. § 990.53(a)(2):

- Whether each alternative is comprised of primary and/or compensatory restoration components that address one or more specific injury(ies) associated with the incident;
- Whether each alternative is designed so that, as a package of one or more actions, the alternative would make the environment and public whole;[1]
- Whether each alternative is technically feasible; and
- Whether each alternative is in accordance with applicable laws, regulations, or permits.

In addition to the criteria identified above, the Trustees found three of the OPA regulation's evaluation standards (15 C.F.R. § 990.54(a) (2)-(4)) particularly suited to serving as programmatic criteria for evaluating Early Restoration programmatic alternatives:

- The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses;
- The likelihood of success of each alternative; and
- The extent to which each alternative will avoid collateral injury as a result of implementing the alternative.[2]

The Framework Agreement and its criteria are important components of the Trustees' objectives for Early Restoration, and along with the OPA regulations, were considered in developing programmatic criteria. Although the Framework Agreement primarily contemplates project specific evaluation, the concepts can be applied to the development of programmatic alternatives. Thus, when evaluating programmatic alternatives for consistency with framework criteria, the Trustees specifically considered whether the alternative:

- Addresses one or more specific injuries to natural resources or services associated with the incident; and
- Contributes to making the environment and the public whole by restoring, rehabilitating, replacing, or acquiring the equivalent of natural resources or services injured as a result of the Spill, or compensating for interim losses resulting from the incident.

[1] Because Early Restoration will not, by itself, make the environment and the public whole, in Early Restoration planning, the Trustees consider whether each alternative will *contribute to* making the environment and public whole.

[2] This criterion is adapted from the regulatory language, which includes consideration of "the extent to which each alternative will prevent future injury as a result of the incident." This adaptation reflects the fact that Early Restoration takes place concurrently with, rather than after completion of, NRDA activities for this Spill.

The remainder of this chapter focuses on application of the programmatic criteria for development of the proposed programmatic alternatives, which serve as both the OPA and NEPA reasonable range of alternatives.

5.2 Programmatic Alternatives and Project Types Development Process

As part of the alternatives development process, the Trustees considered potential project types with a clear nexus to the injuries established by injury assessment efforts to date. As noted throughout this document (and in Chapter 4 in particular), the injury assessment process is ongoing. Currently available information indicates the presence of several types of injuries, and in some cases provides a preliminary indication of the potential severity and/or magnitude of impact. The Trustees identified Early Restoration project types suited to address injuries and losses that are currently indicated while the full assessment process continues to move forward.

In this document, the term "project type" refers to a category that includes restoration approaches with a comparable objective, which use appropriate, established restoration techniques to meet that objective. As an example, the project type "Create and Improve Wetlands" includes restoration techniques that improve wetlands by establishing or reestablishing conditions conducive to wetland vegetative growth and/or by restoring hydrologic function within wetland habitats. Project types are not associated with a specific geographic location, nor are they limited to projects of a certain size or cost. Each of the project types has a relationship to one or more of the injury categories discussed in Chapter 4. Based on that continuing injury assessment, and in consideration of public scoping input, the Trustees developed the potential restoration project types described in this chapter.

Consistent with the programmatic criteria identified above, for potential project types, the Trustees considered the extent to which there exist restoration techniques that are (1) commonly applied, (2) are well understood, (3) have demonstrated benefits, (4) have a high likelihood of successful implementation, and (5) are otherwise feasible and effective. Under the programmatic criteria, use of established restoration methods likely to meet the goal of accelerating meaningful restoration of injured natural resources and their services resulting from the Spill would be favored. Therefore, while a particular project may have innovative components, programmatic alternatives identified in this chapter reflect project types with established restoration methods.

Development of proposed project types draws on the Trustees' restoration experience and incorporates public input. The Trustee agencies have previously developed and engaged in significant regional planning efforts for restoration in the Gulf of Mexico, which included extensive public involvement. Development of proposed project types builds from the Trustees' restoration experience and from public input. Significant regional planning efforts previously have been undertaken for restoration in the Gulf of Mexico, many of which were developed by the Trustee agencies and included extensive public involvement. The Trustee agencies bring decades of experience and knowledge of the Gulf ecosystem to the *Deepwater Horizon* Early Restoration planning effort. Supplementing this internal expertise, the Trustees are familiar with restoration input from the public, academic, non-governmental and private sectors, including restoration plans developed by several non-governmental organizations following the Spill. Development of potential Early Restoration project types identified in the June 4, 2013 Notice of Intent incorporated experience from these prior and ongoing restoration efforts to develop potential project types available for public consideration and input during the scoping period.

Specifically, beginning with the NOI, the Trustees sought input and involvement from the public to help define the issues and alternatives that should be examined in this document. Through the scoping process, which included both meetings and opportunities for written comment, the public commented on the potential project types and provided general comment on the level of emphasis between ecological projects and recreational use projects. This input helped in the further development of the Early Restoration project types proposed here, as well as informed the structure of the programmatic alternatives.

Within the construct identified above, the Trustees developed a set of project types for inclusion in Early Restoration programmatic alternatives that were consistent with the desire to seek a diverse set of projects, which provide benefits to a broad array of potentially injured resources.[3] Ultimately, this process resulted in the inclusion of twelve project types in programmatic alternatives evaluated for Early Restoration in this document, including:

1. Create and Improve Wetlands
2. Protect Shorelines and Reduce Erosion
3. Restore Barrier Islands and Beaches
4. Restore and Protect Submerged Aquatic Vegetation
5. Conserve Habitat
6. Restore Oysters
7. Restore and Protect Finfish and Shellfish
8. Restore and Protect Birds
9. Restore and Protect Sea Turtles
10. Enhance Public Access to Natural Resources for Recreational Use
11. Enhance Recreational Experiences
12. Promote Environmental and Cultural Stewardship, Education and Outreach

The Trustees will continue to evaluate the appropriateness of other potential project types for Early Restoration using new data and/or analysis, public input, Early Restoration experience, and other relevant information. If any additional project types are proposed by the Trustees for inclusion in the Early Restoration process in the future, those project types would be subject to Trustee OPA and NEPA review, public review and comment on related documentation, Trustee consideration of public comments and, if applicable, finalization.

After identifying project types that 1) fit the purpose and need of Early Restoration, 2) were compatible with the evaluation criteria, and 3) addressed identified injuries, the Trustees organized the resulting 12 project types identified above into the Early Restoration programmatic alternatives identified below. The Trustees are considering and evaluating the following four programmatic alternatives and their associated project types in this document:

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[3] The discussion of project type names, descriptions, and resources benefitted for purposes of developing and evaluating these programmatic alternatives are not necessarily indicative of NRD offsets agreed upon with BP for any particular project pursuant to the Framework Agreement. Offset types and their relationship to the specific projects proposed in this Final Phase III ERP/PEIS are described in Chapters 7-12 of this document. Future proposed projects, even if similar to those proposed herein or within the same project type, may bear different proposed NRD offsets.

1. No Action (i.e., no additional Early Restoration at this time);
2. Contribute to Restoring Habitats and Living Coastal and Marine Resources (project types 1-9 above);
3. Contribute to Providing and Enhancing Recreational Opportunities (project types 10-12 above); and
4. Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Contribute to Providing and Enhancing Recreational Opportunities (project types 1-12 above).

Each programmatic alternative has a different grouping of project types that fit within its description. The Trustees believe that these alternatives are consistent with relevant programmatic criteria and provide a reasonable range for consideration and evaluation that is inclusive of all twelve project types. These alternatives are responsive to a theme that emerged during scoping. Numerous comments during scoping requested that Trustees focus on only ecological project types, e.g., habitat and living coastal and marine resources, for the remainder of Early Restoration. Some commenters requested focus only on recreational use project types; others requested that Trustees focus across both ecological and recreational use project types.

5.2.1 Alternatives and Project Types Considered but Not Evaluated Further at This Time

Additional project types were considered by the Trustees for inclusion in programmatic alternatives, but are not evaluated in detail in this Final Phase III ERP/PEIS because the Trustees do not consider them appropriate for inclusion in Early Restoration at this time. For example, while the Trustees are concerned about and continue to evaluate potential Spill-related injuries to marine mammals and to components of the deep benthic environment (e.g., deep sea corals, mesophotic reefs and deep soft bottom sediment habitat), additional time and effort is needed to identify appropriate, reliable restoration methods. In response to public comments, the Trustees also considered whether restoration of water quality would be appropriate to consider for early restoration, and determined that more time and effort is needed to evaluate water quality restoration methods. These approaches are consistent with the Trustees' focus on types of projects that address injuries that are reasonably well understood, with which the Trustees have significant experience, and which allow the Trustees to predict costs and likely success with a relatively high degree of confidence.

There was also interest from some of the public to see an increased focus in Early Restoration on additional marine and avian resources. The Trustees considered these comments and determined that many of the additional marine resources suggested by commenters, particularly crabs, shrimp, and pelagic seabirds, are within the scope of the finfish/shellfish and bird restoration project types already proposed. Additionally, since the restoration techniques evaluated in this document are exemplary, other marine resource restoration techniques suggested by commenters (i.e., removal of invasive species; fisheries management) are not excluded from consideration for the early restoration program, provided any particular future project meets the project screening described in Chapters 2 and 7.

5.2.2 Relationship Between Programmatic Alternatives and Proposed Projects

Of the four alternatives, the three programmatic action alternatives represent three different ranges of project types for continuing Early Restoration, and reflect whether Early Restoration would focus, within the available funding, on ecological project types (Alternative 2), recreational use project types (Alternative 3), or allow for consideration of both ecological and recreational use project types

(Alternative 4). The ultimately selected programmatic alternative will guide the types of projects that align with the Early Restoration program and are therefore appropriate to consider for potential implementation.

Specific to Phase III of Early Restoration, the selected programmatic alternative will define which of the 44 projects described in this document would be considered for individual selection. If Alternative 2 or 3 became preferred then 9 or 35 projects, respectively, would be appropriate to consider for Phase III (see Table 7-1 in Chapter 7). If Alternative 4 remains preferred, each of the 44 individual projects would be considered for implementation in Phase III. Future phases of Early Restoration would likewise identify and propose projects pursuant to the selected programmatic alternative. Under any programmatic alternative, a given project is individually evaluated under both OPA and NEPA, and the Trustees' decision of whether to proceed (action) or not proceed (no action) for that individual project is independent of the other projects. The number of projects ultimately selected for action in Phase III does not affect the Trustees' construct of a programmatic alternative.

5.3 Proposed Alternatives

5.3.1 Alternative 1: No Action (No Additional Early Restoration)

Both OPA and NEPA require the evaluation of the considered actions against a No Action alternative. For Early Restoration, the No Action alternative means that the Trustees would not pursue any additional Early Restoration actions at this time. Choosing this alternative would not preclude continued development of the Damage Assessment and Restoration Plan (DARP) and supporting PEIS, but no further implementation of Early Restoration would occur. The OPA regulations call for the evaluation of a natural recovery alternative in which no human intervention would be taken to directly restore injured natural resources and services to baseline (15 C.F.R. § 990.53(b)(2)). Early Restoration Offsets will be applied to the final injury claim, and it is not within the scope of this action to evaluate the long-term appropriateness of natural recovery for any particular injury category. Analysis of each injury category and determination of whether to allow natural recovery or to undertake restoration will be presented in the DARP and supporting PEIS.

5.3.2 Alternative 1: Consistency with Programmatic Evaluation Criteria

The No Action Alternative is the only alternative that must be analyzed in an EIS that does not respond to the purpose and need for the action (National Environmental Policy Act Handbook, Handbook H-1790-1, U.S. Department of the Interior, Bureau of Land Management). This alternative is not consistent with the programmatic criteria, as no additional Early Restoration would be conducted at this time.

5.3.3 Alternative 2: Contribute to Restoring Habitats and Living Coastal and Marine Resources

Under Alternative 2, the Trustees would focus on pursuing Early Restoration project types and associated specific projects that contribute to initial restoration and protection of certain habitats and living coastal and marine resources. Nine project types are included in this alternative. A short description of each project type is provided, including examples of restoration techniques appropriate for each project type. These examples do not represent the full suite of techniques available to perform a given project, as numerous variables can affect project logistics.

In discussing project types and specific techniques, the Trustees recognize that appropriate factors should be incorporated into project engineering and design to facilitate the realization of project goals and minimize the possibility of undesired outcomes. As part of project design and implementation, the Trustees will monitor the success of the applied restoration techniques.

5.3.3.1 Create and Improve Wetlands

This project type involves creating or improving wetlands by establishing or reestablishing conditions conducive to wetland vegetative growth and by restoring hydrologic function within wetland habitats. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace natural resource services comparable to those lost are described below and include, but are not limited to:

1. Create or enhance wetlands through placement of dredged material in shallow water bodies
2. Replant vegetation via propagation and/or transplanting
3. Restore hydrologic connections to enhance coastal habitats
4. Backfill canals including drainage canals, access canals established for petrochemical development and canals constructed for other purposes (i.e., recreational and residential uses)

Create or enhance wetlands through placement of dredged material in shallow water bodies. Wetland enhancement using sediment placement can be accomplished in several ways. For example, sediment can be deposited in thin layers to increase the elevation of degraded wetlands to within the intertidal range. Sediment placement can be used to stabilize eroding natural wetland shorelines, including in combination with engineered breakwaters, or to nourish subsiding wetlands. Dewatered sediment can also be used to construct erosion barriers that reduce loss of wetland acreage and aid in restoring a degraded wetland. Appropriate borrow sources would be evaluated on a project specific level.

Replant vegetation via propagation and/or transplanting. In addition to placing sediment, restoration can include re-vegetation. Wetland plants can establish naturally or can be planted. Planting vegetation in marsh and mangrove habitat can reestablish the native plant community and stabilize marsh sediments to maintain the integrity of the marsh platform. Vegetation can be planted in areas to help new restoration become functional faster, or help degrading areas recover from disturbances.

Restore hydrologic connections to enhance coastal habitats. Wetland restoration can include restoring or enhancing natural tidal and freshwater flow regimes in estuarine and coastal transitional landscapes and adjacent watersheds (including the restoration or maintenance of salinity gradients across freshwater, intermediate, brackish, marine, and hypersaline systems). Techniques could include the following: filling, reshaping and re-contouring drainageways to restore hydrology, wetland and/or sedimentary functions; removing blockages, breaching dikes, levees, and spoil banks; and constructing, enlarging, or repairing malfunctioning conveyances (e.g., culverts, bridges, etc.). These modifications can support the restoration of native wetland vegetation composition and cover, and improve connectivity between habitats.

Backfill canals including drainage canals, access canals established for petrochemical development and canals constructed for other purposes (i.e. recreational and residential uses). Wetlands can also be created or restored by filling in abandoned canals and other channelized waterways with dredged or spoil sediments and replanting with appropriate material. Access canals from abandoned oil and gas exploration and residential sites as well as other channelized waterways have become conduits for the introduction of salt water into previously freshwater or brackish-water marshes. Dead-end canals often result in degraded water quality due to a lack of tidal flushing, and the canals expose formerly protected marshes and transitional coastal wetlands to erosive wind, wave and boat wake energy. A potential cost-effective source of material for backfilling access canals would be existing spoil banks adjacent to these canals. Reducing the number and extent of artificial spoil banks may also provide the added benefit of restoring hydrology, for example, in circumstances where spoil banks have altered natural sheet flow.

5.3.3.2 Protect Shorelines and Reduce Erosion

This project type involves developing shore protection systems to slow or prevent erosion. Shorelines maintain the integrity of natural coastal systems by provak or buffer to wave and current energy and are important transitional habitats. Shore protection systems are designed to protect and retain shorelines and landward areas. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Construct breakwaters on/or adjacent to shoreline
2. Construct living shorelines

Construct breakwaters on/or adjacent to shoreline. When used for shore protection, breakwaters are usually built either on or adjacent to the shoreline and are typically oriented parallel to the shore. Breakwaters are designed to break waves or reduce wave action landward of the structure. Depending on their design, breakwaters attenuate wave energy by dissipating, reflecting, or changing the refraction and diffraction patterns of incoming waves. The resulting reduction in wave energy arriving at the shoreline tends to decrease the ability of waves to entrain and transport sediment, thereby decreasing erosion at the shoreline. Breakwaters can extend above the water or be submerged, fully or partially, where they function as reefs or sills. Breakwaters can be solid or porous, and have vertical or sloping faces, and can be continuous or segmented.

Construct living shorelines. Living shoreline projects involve a variety of shoreline stabilization and habitat restoration techniques that span several habitat zones and utilize a variety of structural and organic materials. Living shorelines can provide erosion control benefits; protect, restore, or enhance natural shoreline habitat; and re-establish land and water ecological connections. This technique may include living shoreline features such as the incorporation of oyster shell in the construction of breakwaters. Oyster shell can be used as a substitute for or in addition to stone rip-rap to create hybrid structures that increase habitat diversity and increase secondary benthic productivity. Subtidal and/or intertidal reef restoration and oyster escarpments may also be appropriate depending on shoreline conditions and water depths. In addition, created wetlands can be constructed on the shoreline side of breakwaters.

5.3.3.3 Restore Barrier Islands and Beaches

This project type involves restoring barrier islands and beaches which provide important coastal habitat. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Re-nourish beaches through sediment addition
2. Restore dune and beach systems through the use of passive techniques to trap sand
3. Restore barrier islands via placement of dredged sediments
4. Plant vegetation on dunes and back-barrier marsh
5. Construction of groins, breakwaters, or sediment by-pass structures

Re-nourish beaches through sediment addition. Beach re-nourishment or replenishment involves the placement of suitable material from sources outside the natural sources of sediment for the eroding beach. Sediment is typically taken from a borrow site where the physical and chemical sediment characteristics closely match those at the restoration site. Identification of suitable borrow material is crucial, including consideration of sediment color, grain size, and other characteristics. These factors are important because introducing different sediment characteristics could negatively impact aesthetics, erosion potential and general use by shoreline fauna as well as decrease the lifespan of the re-nourished beach.

Restore dune and beach systems through the use of passive techniques to trap sand. Passive techniques can be used to trap sand transported by winds and waves to restore dune and beach systems. Passive restoration techniques could include, but are not limited to, placement of sand fencing, hay bales, and recycled Christmas trees, or planting native dune vegetation to capture sand.

Restore barrier islands via placement of dredged sediments. Restoration involving the placement of dredged sediments can stabilize, maintain and restore degraded beach, dune, and back-barrier marsh habitats on existing barrier islands. Sediments used for restoration can be obtained by beneficially using dredged material from navigation channels or by accessing material from approved borrow areas. Dredged material should closely match the chemical and physical characteristics of sediment at the restoration site and target borrow areas should be within reasonable proximity to suitable sites for sediment placement. Among other factors, local hydrodynamics and sediment deposition processes should be carefully monitored and modeled prior to implementation of this technique.

Plant vegetation on dunes and back-barrier marsh. Planting vegetation on dunes and in back-barrier marshes can restore the plant community and provide additional habitat and foraging area for shoreline organisms. Vegetative root structure can stabilize marsh and beach sediments, and contribute to the stability of the shoreline by helping to reduce erosion and encouraging sediment deposition. Planting vegetation can also contribute to the ecosystem function of dunes and back-barrier marshes, providing habitat for fish and invertebrates, birds, and other shoreline wildlife.

Construction of groins, breakwaters, or sediment by-pass structures. In addition to beach re-nourishment, construction of engineered structures such as breakwaters, groins and sediment by-pass methods can be used to decrease erosion of engineered beaches. These structures can increase the life span of re-nourished beaches near passes, inlets, or in areas where erosion rates are high and where sediment supply is limited.

5.3.3.4 Restore and Protect Submerged Aquatic Vegetation

This project type involves restoring submerged aquatic vegetation (SAV) beds using one or more techniques including re-vegetation and protection of SAV with buoys, signage, and/or other protective measures. These techniques are often used in combination. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Backfill scars with sediment
2. Re-vegetate SAV beds via propagation and/or transplanting
3. Enhance SAV beds through nutrient addition
4. Protect SAV beds with buoys, signage, and/or other protective measures

Backfill scars with sediment. SAV beds are often injured by motorized boat propellers, with the two primary means of damage observed as linear scars and blowholes. Scar injuries are formed by the dredging effect of the turning propeller, or occasionally the vessel's hull, as the boat travels over a shallow bank. Blowholes are depressions formed from the concentrated force of propeller wash as a vessel attempts to power off a shallow SAV bed. Once injury occurs, rising and falling tides, wind, waves, vessel wakes or currents can expand scars and blowholes into adjacent, intact SAV. Backfilling blowholes or propeller scars with native fill (i.e., local sediment) is a rapid way of returning the seafloor to its original elevation and grade. The focus of this restoration action is to stabilize the substrate as soon as possible to prevent further deterioration of the SAV bed as a result of erosion, and prepare the area for re-colonization by neighboring or transplanted SAV.

Re-vegetate SAV beds via propagation and/or transplanting. SAV beds can be re-vegetated through transplanting whole plants or plugs. Transplanting whole plants (either cultivated or taken from donor beds) requires each plant to be planted by hand. Planting with plugs (uses tubes to secure plants with surrounding sediment and rhizomes intact) helps anchor the new transplant to the sediment until the roots take hold.

Enhance SAV beds through nutrient addition. Nutrients can be added to SAV beds via the use of "bird stakes" or fertilizer spikes to enhance regrowth in SAV bed blowholes or in smaller areas in need of restoration or enhancement. While many coastal areas suffer from high levels of nitrogen loading from nonpoint sources, these diffuse nutrients are not as effective in fostering SAV recovery as nutrient input from "bird stakes". This method of fertilization utilizes the nutrient composition of bird feces deposited from birds resting on stakes and is effective in facilitating the colonization of SAV in some areas and/or promoting faster growth of transplants. This technique has been tested and found to be effective for areas in Florida where nutrient limitation is impairing seagrass growth.

Protect SAV beds with buoys, signage, and/or other protective measures. Using protective measures can help ensure that existing or restored SAV beds are not damaged through boating or other activities that take place around SAV beds. Protective measures could include buoys and signage or other educational campaign efforts.

5.3.3.5 Conserve Habitat

This project type involves identifying, protecting, managing, and restoring habitat areas or land parcels to complement and advance the goals of coastal management, habitat conservation, and ecosystem restoration. Areas could be nominated for conservation based on their potential for loss or degradation, their ability to protect or buffer wetlands, their contributions to restoring ecosystems and other significant coastal habitats, their ability to connect other protected areas, and/or their ability to reduce coastal water pollution. Appropriate restoration techniques for this project that would restore, rehabilitate or replace comparable natural resource services type are described below and include, but are not limited to:

1. Conserve habitat through fee title acquisition
2. Conserve habitat through property use restrictions and/or management
3. Conserve, manage and restore habitat that is being acquired or is currently under protection.

Conserve habitat through fee title acquisition. The Department of the Interior has the authority to use Eminent Domain to acquire lands and interests for the public good. However, the Department will not exercise this authority to implement Early Restoration projects in relation to the Spill. Acquisition of a land parcel would be accomplished through voluntary participation by landowners who were willing to sell their land. Successful negotiations would result in land acquisition by the appropriate State or Federal land management agency, accredited land trust, land protection organization or other qualified non-government organization. Once areas are acquired, management plans are often developed and implemented to enhance their conservation value.

Conserve habitat through property use restrictions and/or management. In addition to acquisition through fee title, habitat can be protected through the acquisition of lesser property interests and the enactment of voluntary use restrictions. For example, a conservation easement is a legally enforceable agreement between a property owner and a land trust (or other land protection organization) or government agency for the purposes of land preservation and conservation. Land subject to a conservation easement may remain in private ownership; however, a conservation easement would restrict development and certain uses on the property. Regardless of the vehicle used to conserve, acquire, restore, or manage land, the benefits and potential impacts are site and project-specific depending on the type of habitat and resources present.

Conserve, manage, and restore habitat that is being acquired or is currently under protection. Management plans are often developed and implemented to enhance the conservation value of acquired parcels or parcels under protection. Management plans could provide for habitat management or restoration activities in conservation areas to maintain or enhance habitat quality or ecosystem condition; they could also include public access or amenities, or controls on public access. Such plans would identify system modifications that could enhance habitat quality or ecosystem condition, and could consider how multiple protected land parcels can be jointly managed to support multiple life stages of a species or improve the overall condition of a receiving water body.

Conservation, restoration and management approaches identified in plans might include altering land cover or land management, such as reforestation, fire management, removing invasive plant species or eliminating artificial water diversions or use of water diversions to establish the restored hydrologic condition.

5.3.3.6 Restore Oysters

This project type involves restoring or creating oyster reefs to enhance or expand available intertidal or subtidal oyster reef habitat. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Restore or create oyster reefs through placement of natural or other appropriate materials
2. Enhance oyster production through cultch placement, relay, or cultivation

Restore or create oyster reefs through placement of natural or other appropriate materials. Oyster reef restoration has been demonstrated to be successful; however, careful project siting is crucial. Projects need to consider basic factors such as suitable substrate, remains of previous oyster reefs, adequate spat set, fouling organisms, currents, predation rates, disease prevalence and intensity, salinity ranges, and tidal elevation. In addition, substrate should be at an appropriate depth to allow for optimal oyster growth and development. The reef location should also have sufficient tidal flushing to provide ample food for oysters. Reefs constructed with natural material (e.g., oyster or other bivalve shells) provide the texture and chemical cues that attract oyster larvae and increase recruitment. However, oyster shell is often expensive and is not always available in large enough quantities to be economically feasible. In this case other material, such as limestone, concrete, and engineered structures can also be used to create or enhance reefs.

Commercial oysters are harvested from sub-tidal areas, but intertidal oysters are believed to be important as a source of larvae to maintain populations of both intertidal and sub-tidal oysters. Not all oyster reef creation projects are for the purpose of harvest. Oyster restoration may include placement of oyster cultch material near or on exposed shorelines to establish or reestablish intertidal oyster reef and enhance or increase secondary productivity.

Enhance oyster production through cultch placement, relay, or cultivation. Oyster production can be enhanced through placement of cultch materials, relay/relocation, or cultivation. Cultch material consists of limestone rock, crushed concrete, oyster shell and other similar material that, when placed in oyster spawning areas, provides a substrate on which free floating oyster larvae can attach and grow into oysters. In the case of projects to relocate reefs, cultch material including live oysters would be harvested from areas with unsuitable or poor habitat conditions and placed in other areas with more optimal conditions for growth. Suitable areas generally have strong bottom currents in bay bottoms and intertidal and subtidal areas. In the case of projects intended to expose suitable substrate for oyster recruitment, existing oyster reef substrate would be “turned over” using bagless oyster dredges to expose suitable surfaces and enhance spat set.

5.3.3.7 Restore and Protect Finfish and Shellfish

This project type would restore and protect finfish by encouraging changes in fisheries efforts and gear, and removing fishing-related debris from aquatic environments. For example, gear modifications that reduce direct and bycatch-related fishing mortality can be effective and practical approaches to restoring populations of recreational, commercial and non-target species. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Provide incentives for a voluntary, temporary reduction in commercial fishing effort
2. Provide incentives for voluntary use of technological innovations
3. Remove debris from freshwater, estuarine, marine, and/or critical habitats

Two of these techniques provide incentives to temporarily reduce fishing effort and modify fishing gear. The approaches to reducing fishing mortality described are similar to those used in fisheries management. They differ in that they could be implemented by means of (1) remunerative contracts with commercial fishers to voluntarily reduce fishing effort or the catch of specific species, at least temporarily; and (2) incentives and training for commercial fishers to adopt tools and methods to reduce release mortality. There are several different fisheries that would be appropriate for these techniques, such as the pelagic longline fishery.

Provide incentives for voluntary, temporary reduction in commercial fishing effort. One technique involves voluntarily setting aside some fraction of the catch, catch limit, or individual fishing quota for conservation. The reduction in fishing effort would be for a specified period of time and would compensate fishers at fair market value for leaving fish in the water. Compensation details (price, allocation, etc.) and assurance methods would need to be determined, but this type of technique would result in a reduction in fishing mortality, allowing the population that the fishery targets, as well as bycatch species, to be restored more rapidly.

Provide incentives for voluntary use of technological innovations. This restoration approach could involve providing incentives for fishing vessel owners and operators to voluntarily modify fishing gear or practices to reduce fishing and bycatch mortality. Gear modifications can help target specific size classes of fish for harvest in an effort to protect adults or juveniles and increase survival of non-targeted bycatch returned to the water.

Remove debris from freshwater, estuarine, marine, and/or critical habitats. Finfish and shellfish restoration could also include the removal of debris from marine, estuarine, and freshwater environments that may trap, hook and entangle species. There are multiple sources of marine debris, including fishing gear lost from commercial fishing vessels, recreational boats, and shore-fishing activities. Removal of derelict fishing gear consisting of nets, lines, crab pots, shrimp nets, and other recreational or commercial fishing equipment that has been lost, abandoned, or discarded in the aquatic environment helps prevent unintentional mortalities.

5.3.3.8 Restore and Protect Birds

This project type involves protecting bird populations by reducing mortality and directly restoring habitat. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Protect bird nests and nesting habitat, and control predators
2. Prevent and control invasive species
3. Create/enhance bird nesting and/or foraging habitat

Protect bird nests and nesting habitat, and control predators. Protecting bird habitats including nests and nesting habitat can be accomplished through the use of exclusion devices, vegetated buffers, or distance buffers. One of the most common methods for minimizing disturbance to birds is to create buffer zones between human activities and bird areas. Buffer areas minimize visual and auditory impacts associated with human activities near nest sites. Buffer distances would be determined for a particular species or activity relative to the type of activity occurring such as intensity of activity, time of year, and sensitivity of the species. Seasonal restrictions could be implemented to decrease stress on the birds from the courtship period through fledging of young.

Protecting bird habitats including nests and nesting habitat is important for ensuring the viability of bird populations. Loss of a breeding season and the recruitment of young into the population can result in the gradual decline of a population and can contribute to the decline of a species over the long-term, particularly for range or habitat-restricted species or subspecies. Ground-nesting birds, their eggs, and nestlings are especially vulnerable.

Predation can be a substantial factor when nest sites or colonies are located in habitat that does not afford adequate protection. There are several options for removing or excluding predator threats to nesting birds. Predator control by non-lethal (e.g., exclusionary fencing or live-trapping) and lethal methods consistent with current management practices could be implemented at the discretion of the land-managing agencies based on their evaluation of necessity and feasibility. Non-lethal management of predators on ground-nesting or colonial wading bird species could use techniques that exclude predators from a single nest or from the entire area surrounding a colony. Methods also include baiting, trapping, or hunting, and exclusionary fencing to lessen numbers of undesired wildlife species. These methods help to minimize disturbances associated with human activities and predators that can result in reduced mortality. In addition to predator exclusion or removal, there are other options for minimizing disturbances to nesting birds.

Prevent and control invasive species. Restoration can also focus on removing invasive species that negatively impact bird habitat. There are several methods used to manage land-based or terrestrial invasive species. For plants, these methods include cutting, application of pesticides or herbicides, and biological control to manage plant species.

Create/enhance bird nesting and/or foraging habitat. Restoration can also focus on creating or enhancing habitat. Creation of habitat can include physical construction of new nesting and/or foraging habitat such as barrier islands and beaches or herbaceous wetlands. Enhancement of habitat can include physical changes to improve nesting and/or foraging habitat such as replanting shoreline vegetation or rotovating (plowing) to remove vegetation for a limited time for certain species.

5.3.3.9 Restore and Protect Sea Turtles

This project type involves restoring and protecting sea turtles through activities that enhance sea turtle habitat, increase the survival of sea turtles at various life stages, or both. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below, include those restoration actions outlined in the Recovery Plans[4] for each of the impacted Gulf sea turtle species and may include, but are not limited to the following restoration examples:

1. Improve nesting beaches
2. Protect and conserve nesting beaches
3. Expand existing stranding networks and rehabilitation capabilities
4. Enhance compliance monitoring through gear monitoring team coordination and enhanced observer monitoring

[4] http://www.nmfs.noaa.gov/pr/recovery/plans.htm#turtles

5. Enhance training and outreach for enforcement personnel to improve expertise in compliance requirements and increased enforcement activities

Improve nesting beaches. The nesting success of sea turtles can be improved by identifying and reducing ongoing threats at nesting sites and protecting and enhancing those nesting sites through threat reduction. Restoration actions that may reduce threats from anthropogenic or natural causes may include ecologically-based predator control or nest relocation where threats cannot be mitigated by other measures. Potential enhancements of nesting sites include, use of turtle-friendly lighting, monitoring, outreach, and education. Education and outreach along with turtle-friendly lighting projects would reduce human light sources, minimizing the potential for hatchlings to become disoriented and increasing the number of hatchlings reaching the water. Nest protection measures that enhance nesting beaches, include identifying, marking and monitoring nesting. Nest detection and enhancement would reduce the potential for predation of eggs, and protect nest sites from human use that could cause harm or destruction of nests. Greater monitoring of nests could improve hatchling survival and result in a higher number of sea turtles surviving to adulthood and reproductive life stages.

Protect and conserve nesting beaches. Many nesting beaches are under threat of development. The protection and conservation of nesting beaches could include purchasing beach-front properties. As sea-levels rise, nesting habitats will become pinched between upland development and the sea. Land purchases could extend the life of nesting beaches by giving the beach/dune system room to migrate landward in response to erosion and sea-level rise.

Expand existing stranding networks and rehabilitation capabilities. Sea turtle restoration could also focus on improving the ability of experts and trained personnel to respond to strandings of sea turtles by expanding stranding networks and rehabilitation capabilities.

Reducing response times to live and dead stranded turtles, increasing assessment efforts to determine mortality sources, and expanding capacity to respond to unusual stranding events would all potentially help turtles. Funding for additional training and responders, as well as for supplies, equipment, data management needs, necropsies, and facilities would increase programmatic capabilities and ultimately increase the number of successfully rehabilitated turtles returned to the Gulf. Achieving this goal could also require additional facilities for stranding and rehabilitation operations and equipment storage as well as providing support for mobile response units to triage and stabilize turtles. Mobile units increase the changes of survivorship and are one of the most often called for resources in cold-stunning events.

Enhance compliance monitoring through gear monitoring team coordination and enhanced observer monitoring. Increases in coordination of gear monitoring teams with other State and Federal agencies in order to avoid duplication of effort, and to allow teams to identify and target areas that are not presently receiving adequate monitoring, could also be part of sea turtle restoration. Courtesy dockside and at-sea inspections by gear specialists would be implemented to provide information on gear requirements and best-use methods. This technique would also provide the training for and increase the number of observers and observer coverage dedicated to specifically designed sea turtle bycatch monitoring. At-sea and dockside inspections by NOAA Fisheries Service gear specialists and marine law enforcement personnel continue to be the most effective means of sustaining compliance with turtle excluder device regulations. Observers and gear monitoring teams provide important information on protected species interactions with fishing activities, which helps to improve management decisions for protecting and recovering populations. This effort has been shown to be the most effective method of reaching the fishing industry with information on regulated gear requirements and best-use methods (DOC et al. 2011)[5].

Enhance training and outreach for enforcement personnel to improve expertise in compliance requirements and increased enforcement activities. Training and education could include developing and implementing a State-led Gulf-wide program for enforcement officers to enhance their knowledge and compliance with existing requirements. This technique could include additional money for gas and maintenance of boats to support appropriate increased enforcement activities as well as hiring additional State enforcement personnel. This would support efforts to reduce the sea turtle bycatch mortality in the shrimp trawl or other fisheries across the Gulf. In addition, this could support efforts by local governments to enforce lighting ordinances in beachfront areas.

5.3.4 Alternative 2: Consistency with Programmatic Evaluation Criteria

Alternative 2 is consistent with the programmatic criteria identified in this chapter (Section 5.2), for reasons summarized below:

- The alternative addresses several injuries associated with the incident by incorporating nine restoration project types that contribute to restoration and/or protection of certain habitats and living coastal and marine resources injured due to the Spill;
- Although natural resource damage assessment activities are ongoing, information available to date indicates that projects within identified categories would help offset injuries to habitats and living coastal and marine resources injured due to the Spill, thereby contributing to the Trustee goal of making the environment and the public whole;
- As described throughout the preceding section of this document, there are multiple, well-established, commonly utilized techniques available for undertaking projects within Alternative 2 (i.e., project types that are technically feasible, have a high likelihood of success and can be implemented in conformance with applicable laws, regulations and permits are available); and
- As described in Chapter 6 of this document, the Trustees have carefully considered the potential beneficial and adverse impacts of Alternative 2 project types. The analyses under NEPA were considered to inform the Trustees' NRDA evaluation of the programmatic alternatives' potential for collateral injury, including consideration of the potential for collateral injury associated with the ecological project types in Alternative 2 (and Alternative 4). Based on that evaluation and through consideration of mitigation measures (as appropriate), the Trustees find that implementation of this Alternative would reasonably limit the potential for collateral injury(ies).
- This alternative meets the purpose and need for Early Restoration described in Chapter 1. This programmatic alternative allows the Trustees to consider 9 of the 44 projects described in Chapters 7-12 as the projects proposed for implementation in Phase III. All projects are subject to individual review under OPA, NEPA and other statutes and ultimately to individual decision by the Trustees whether to proceed or not proceed with selection of a given project. If this

[5] United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. 2011. Annual Report to Congress on the Bycatch Reduction Engineering Program. Website accessed on January 3, 2012: http://www.nmfs.noaa.gov/by_catch/docs/brep_final_2011.pdf.

alternative were selected, projects proposed in any specific restoration planning phases (inclusive of Phase III) would focus on, and be limited to, projects that restore habitats and living and coastal marine resources. Correspondingly, if all of the available Early Restoration funding is expended, relatively more Offsets for habitat and living and coastal marine resources would be established by Early Restoration, when compared to alternatives 3 and 4. All accounting for Early Restoration Offsets as credits for injury would be conducted in the final natural resources damage claim.

5.3.5 Alternative 3: Contribute to Providing and Enhancing Recreational Opportunities

Under Alternative 3, the Trustees would focus on pursuing Early Restoration project types and associated specific projects that contribute to providing and enhancing recreational uses lost as a result of the *S*pill. Three project types are included in this alternative. A short description is provided of each project type, including examples of restoration techniques appropriate for each project type.

5.3.5.1 Enhance Public Access to Natural Resources for Recreational Use

This project type involves creating new or improved access to natural resources for recreational purposes. Despite the popularity of coastal recreation, the public's ability to take advantage of such opportunities can be limited by a lack of access points and/or access infrastructure. Moreover, well-planned public access may help protect natural areas that would otherwise be used as informal access points. Enhanced public access will provide more opportunities for the public to engage in coastal recreational activities such as swimming, boating, fishing, bird watching, beach walking, and photography. Appropriate restoration techniques for this project type that would restore, rehabilitate or replace comparable natural resource services are described below and include, but are not limited to:

1. Improve access to natural resources for recreational use through the construction or enhancement of infrastructure; and
2. Purchase of access rights, easements, and/or property to increase access to resources for recreational purposes.

Improve access to natural resources for recreational use through the construction or enhancement of infrastructure. Access to recreational areas can be improved by enhancing or constructing infrastructure (e.g., boat ramps, piers, boardwalks, dune crossovers, camp sites or other lodging, educational/interpretive spaces, navigational channel improvements/dredging, safe harbors, navigational aids, ferry services, rebuilding of previously lost facilities, promenades, trails, roads and bridges to access natural resources, and marina pump out stations). Improved public access could also be accomplished by providing or improving water access in publicly owned areas (e.g., parks and marinas), which might also increase boating safety. The construction and operation of boat ramps, piers, or other infrastructure could occur on publicly-owned lands. Larger-scale infrastructure improvements like a ferry service or the construction or improvement of roads and bridges could also serve to improve access to natural resources.

Purchase of access rights, easements, and/or property to increase access to resources for recreational purposes. In some parts of the Gulf, access to shoreline and/or water-based recreational opportunities is limited by the availability of public access points. The targeted purchase of easements, access rights and/or fee simple ownership of property from willing sellers, can provide new access points for public recreational use.

The Department of the Interior has the authority to use Eminent Domain to acquire lands and interests for the public good. However, the Department will not exercise this authority to implement Early Restoration projects in relation to the Spill. Preservation of habitats through acquisition of land or easements will only be from willing sellers or participants. Landowners will be under no obligation to sell to any of the governments associated with the Trustees. Neighbors adjacent to land purchased to gain access to resources under this restoration plan will retain all of their current rights to their land. The government agencies are required to pay fair market value for land purchased. Fair market value will be determined through established appraisal procedures. Where land is occupied, relocation assistance may be available.

5.3.5.2 Enhance Recreational Experiences

This project type involves enhancing the public's recreational experiences. The experience of recreational activities like swimming, boating, diving, bird watching, beach going and fishing can vary depending on the appearance and functional condition of the surrounding environment in which they occur. Appropriate restoration techniques for this project type that would restore, rehabilitate, or replace comparable natural resource services are described below and include, but are not limited to:

1. Re-nourish beaches through sediment addition
2. Place stone, concrete, or permissible materials to create artificial reef structures
3. Construction to enhance recreational experiences.
4. Enhance recreational fishing opportunities through aquaculture
5. Reduce and remove land-based debris

Re-nourish beaches through sediment addition. Recreational activities on beaches can be enhanced when beach conditions are improved through the addition of appropriate sediment. Beach re-nourishment or replenishment involves the placement of suitable material from sources outside the natural sources of sediment for the eroding beach. The increased sediment allows for more available area for recreational use which can improve the experience. Identification of suitable borrow material is crucial, including consideration of sediment color, grain size, and other characteristics. These factors are important because introducing different sediment characteristics could negatively impact aesthetics, erosion potential and general use by shoreline fauna as well as decrease the lifespan of the re-nourished beach.

Place stone, concrete, or permissible materials to create artificial reef structures. An artificial reef is defined as a submerged structure that is constructed or placed on the existing substrate in coastal or marine waters. Properly sited, constructed and managed reef sites can be attractive locations for recreation, including fishing, snorkeling, and scuba diving. An artificial reef can be constructed from a variety of different materials including, but not limited to, stone, concrete blocks, decontaminated vessels, or engineered reef unit structures. The site considerations could include locations that enhance or create habitat, support a diversity of fishery resources, and do not impede or interfere with navigation. Artificial reefs enhance recreational opportunities for users such as anglers, snorkelers, and divers.

Construction to enhance recreational experiences. Besides providing access, new construction can benefit the recreational experience by providing for wildlife viewing platforms and fish cleaning shelters for example. New construction could also provide meeting spaces for resource-based education and other programs.

Enhance recreational fishing opportunities through aquaculture. This technique can include the breeding, rearing, and release of finfish and shellfish species into the Gulf of Mexico and adjacent coastal bays to increase densities of target species so that recreational fishing opportunities are enhanced.

In the context of Early Restoration, stock enhancement programs could have one or more goals that include providing additional catch for anglers, providing information to fishery managers, and/or helping to mitigate losses suffered from anthropogenic effects. This could include the expansion of existing hatchery operations, the construction of new facilities, and the release and monitoring of finfish and shellfish species reared in those facilities. Projects implemented under this technique can also be used to inform fishery management decision-making, with the potential to enhance recreational experiences. For example, techniques for bait and sport fish hatchery production and holding systems can be developed and refined. Fish produced in hatcheries can be marked, released, and monitored for the purpose of informing fishery managers about the recruitment, survival, and population health of recreationally significant marine fish species.

Each stock enhancement project will be evaluated on a project-specific basis that identifies its goals and objectives and ensures quantification of those parameters that enable measurement of project success. Any stock enhancement project must utilize the 'Responsible Approach' techniques that have been outlined by Blankenship and Leber (1995) and Lorenzen et al., 2010)[6].

Reduce and Remove Land-Based Debris. Land-based debris can enter the ocean as a result of storms or through the intentional or unintentional disposal of domestic or industrial wastes. Land-based debris can be disturbing and disruptive to recreational activities like hiking, beach going, and boating. Removal of marine debris not only restores the beauty of coastal environments but removes potentially harmful debris for humans and wildlife.

Efforts to reduce land-based debris could incorporate public education and awareness, as well as physical removal of debris. Specific techniques for removing land-based debris are varied and will depend in large part on the characteristics of the relevant habitat and debris. In general, techniques can be categorized into two types: 1) manual methods (e.g., workers using hand tools); and 2) mechanized

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[6] Such 'Responsible Approach' techniques include, but are not limited to: structuring the project around the specific restoration goal(s); evaluating habitat needs and conditions (abundance of prey and predators) to ensure adequate habitat availability and suitability for stocked individuals; managing and assessing ecological impacts through a well-designed hatchery/broodstock and release program (e.g., ecosystem, genetic, and disease management); assessing the economic and social benefits and costs; incorporating post-release monitoring protocols (i.e., identification of stocked individuals, contribution and potential substitution rates); and utilizing adaptive management (e.g., modify or cease stocking program depending on monitoring and evaluation results).

Lorenzen, K., K. M. Leber, H. L . Blankenship, 2010. Responsible approach to marine stock enhancement: An update. Reviews in Fisheries Science, 18:189-210.

Blankenship, H.L. and Leber, K.M. 1995. A responsible approach to marine stock enhancement. American Fisheries Society Symposium, 15:167-175.

methods (e.g., utilizing ATV or tractors with sifters, backhoes, roll-off dumpsters and/or similar machinery).

5.3.5.3 Promote Environmental and Cultural Stewardship, Education, and Outreach

This project type involves providing and enhancing recreational opportunities through environmental and cultural stewardship, education, and outreach activities. Educational activities would provide additional recreational opportunities that improve the connectedness of the public to the environment and develop an awareness and appreciation for natural and cultural resources of the Gulf of Mexico. Appropriate restoration techniques that would restore, rehabilitate or replace comparable natural resource services for this project type are described below and include, but are not limited to:

1. Create or enhance natural resource related education facilities
2. Create or enhance natural resource related education programs

Create or enhance natural resource related education facilities. Facilities established to educate visitors about injured resources resulting from the Spill and/or the recovery of those resources could include, but are not limited to, museums, aquariums, cultural centers, interpretive centers, natural laboratories for researchers and students, research and teaching laboratories, and classrooms and offices for technical and support personnel. The aim of these facilities is to provide a location in which environmental and cultural education and outreach can occur through a variety of different mediums. These facilities could vary in form, content, and even function but would concentrate on the coastal resources of the Gulf of Mexico.

Create or enhance natural resource related education programs. The focus on coastal resources could stimulate the general public's interest and understanding of the natural science, environment, and cultural history of the Gulf coastal region. This interest would be enhanced by providing educational features for both the public and students through coastal exhibits and collections, hands-on activities, educational outreach programs related to coastal resources, and other interactive activities. The public would learn about the complexity and importance of coastal ecosystems and come away with a better understanding of the surrounding marine ecosystems of the Gulf and the impact humans are having on these environments. These programs could link recreational activities such as bird watching, hiking, and fishing with educational components. For example, a bird specialist could accompany a bird watching group, or a youth fishing pond could be paired with educational information on the management of recreational fishing in the Gulf of Mexico.

5.3.6 Alternative 3: Consistency with Programmatic Evaluation Criteria

Alternative 3 is consistent with the programmatic criteria identified in this chapter (Section 5.2), for reasons summarized below:

- The alternative incorporates multiple project types to address a different and important type of injury caused by the Spill and not captured in Alternative 2: lost and degraded recreational use of Gulf resources;
- Although natural resource damage assessment activities are ongoing, information available to date indicates that recreational use impacts caused by the Spill are substantial, and this alternative contributes to the Trustees' goal of making the environment and the public whole in a complementary, albeit different manner than Alternative 2;

- As described throughout the preceding section of this document, there are multiple, well-established, commonly utilized techniques available for undertaking projects within Alternative 3 (i.e., project types that are technically feasible, have a high likelihood of success and can be implemented in conformance with applicable laws, regulations and permits are available); and
- As described in Chapter 6 of this document, the Trustees have carefully considered the potential beneficial and adverse impacts of Alternative 3 project types. The analyses under NEPA were considered to inform the Trustees' NRDA evaluation of the programmatic alternatives' potential for collateral injury, including consideration of the potential for collateral injury associated with recreational use project types in Alternative 3 (and Alternative 4). The discussion of collateral impacts of recreational projects has been expanded in this Final Phase III ERP/PEIS in response to public comment in Chapter 6. Based on that evaluation and through consideration of mitigation measures (as appropriate), the Trustees find that implementation of this Alternative may result in more collateral injury than Alternative 2, but would reasonably limit the potential for collateral injury(ies).

This alternative meets the purpose and need for Early Restoration described in Chapter 1. This programmatic alternative allows the Trustees to consider 35 of the 44 projects described in Chapters 7-12 as the projects proposed for implementation in Phase III. All projects are subject to individual review under OPA, NEPA and other statutes and ultimately to individual decision by the Trustees whether to proceed or not proceed with selection of a given project. If this alternative were selected, projects proposed in any specific restoration planning phases (inclusive of Phase III) would focus on, and be limited to, projects addressing lost recreational use. Correspondingly, if all of the available Early Restoration funding is expended, relatively more Offsets for recreational use loss would be established by Early Restoration, when compared to alternatives 2 and 4. All accounting for Early Restoration Offsets as credits for injury would be conducted in the final natural resources damage claim.

5.3.7 Alternative 4: (Preferred Alternative) Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities

Alternative 4 is the Trustees' preferred alternative. Under Alternative 4, the Trustees would focus on pursuing Early Restoration project types and associated specific projects that contribute to restoring habitats and living coastal and marine resources as well as lost recreational uses. This alternative combines project types described in both Alternatives 2 and 3 and allows for the consideration of all specific projects described in Chapters 7-12 as appropriate for Early Restoration.

5.3.8 Alternative 4: (Preferred Alternative) Consistency with Programmatic Evaluation Criteria

Alternative 4 is consistent with the programmatic criteria identified in this chapter (Section 5.2). As described above, Alternative 4 is a combination of Alternatives 2 and 3, each of which are consistent with programmatic evaluation criteria individually. Combining the two alternatives would allow the Trustees to address a larger number of injuries caused by the Spill than addressed by Alternatives 2 or 3 individually, and contributes more broadly to the Trustees' goal of making the environment and the public whole, using techniques that are commonly utilized, feasible, highly likely to succeed. As described in Chapter 6 of this document, the Trustees have carefully considered the potential beneficial and adverse impacts of the combination of ecological and recreational use project types proposed in Alternative 4. The analyses under NEPA were considered to inform the Trustees' NRDA evaluation of the programmatic alternatives' potential for collateral injury, including consideration of the potential for collateral injury associated with the project types in Alternative 4. Based on that evaluation and through consideration of mitigation measures (as appropriate), the Trustees find that implementation of this Alternative may result in more collateral injury than Alternative 2, but would reasonably limit the potential for collateral injury(ies).

This alternative meets the purpose and need for Early Restoration described in Chapter 1. This programmatic alternative allows the Trustees to consider all 44 projects described in Chapters 7-12 for implementation in Phase III of Early Restoration. All projects are subject to individual review under OPA, NEPA and other statutes and ultimately subject to individual decision by the Trustees whether to proceed or not proceed with selection of a given project. If the Trustees select the preferred alternative, projects proposed in any specific restoration planning phases (inclusive of Phase III) would focus on projects that restore habitats and living and coastal marine resources as well as projects that address lost recreational use. Correspondingly, if all of the available Early Restoration funding is expended, a more diverse set of projects might be expected under Early Restoration when compared to alternatives 2 and 3. The Trustees prefer this alternative since it allows a wider range of restoration project types to be considered to address injured resources. All accounting for Early Restoration Offsets as credits for injury would be conducted in the final natural resources damage claim.

CHAPTER 6: ENVIRONMENTAL CONSEQUENCES

This Chapter describes the predicted consequences, or effects, of implementing Early Restoration Programmatic Plan alternatives proposed in Chapter 5 on the physical, biological, and human environment described in Chapter 3. This Chapter is organized as follows:

- Section 6.1 provides a brief description of the Early Restoration project area and description of the scope of the analysis for which environmental consequences have been determined.
- Section 6.2 provides definitions of impact determinations and their significance, using resource-specific criteria for the determinations.
- Sections 6.3 through 6.7 present the analysis of the environmental consequences of alternatives by resource. Impacts on the physical and biological environments are further disaggregated by each of the 12 project types (organized by alternative) identified in Chapter 5. For each project type, potential restoration techniques are noted. Impacts on the human use[1] and socioeconomic environment are presented in consideration of project types in their aggregate for each alternative.
- Section 6.8 summarizes the range of impact findings for each alternative.
- Section 6.9 provides an analysis of cumulative impacts of proposed alternatives by resource.
- Section 6.10 provides a discussion of other required findings under NEPA, including unavoidable adverse impacts, the relationship between short-term uses of the human environment and the maintenance and enhancement of long-term productivity, irreversible and irretrievable commitment of resources. The section also includes a discussion of climate change.
- Appendix 6-A provides examples of potential mitigation measures and Best Management Practices (BMPs) that could be implemented to further reduce potential effects to various resources on a project-specific basis.
- Appendix 6-B presents examples of cumulative actions that are ongoing in the Gulf of Mexico.

6.1 Project Area and Scope of Analysis

Although the NRDA regulations do not constrain the geographic location of restoration projects, an area must be defined as the affected environment in order to complete a PEIS which is part of the NEPA process. The area considered as the affected environment for purposes of this PEIS includes the northern Gulf of Mexico and its coastal environment. The ecosystem is comprised of a complex biological community of interacting organisms, including humans, and their physical environment(s). The scope of the analysis is limited to those activities and potential effects from those activities that are reasonably foreseeable from the Early Restoration program alternatives (as described in Chapter 5) proposed herein. As discussed above, the analysis is organized by programmatic alternative and project types within the alternatives, as summarized in Table 6-1.

[1] The term "human use" in this chapter, and in Chapters 8 through 12, is specific to the evaluation under NEPA of the potential impacts on those aspects of the human environment not addressed in the assessment of the physical and biological environments. The term 'human use' here is not intended to address or substitute for an evaluation of human use in the context of OPA or the OPA implementing regulations.

Table 6-1. Summary of Early Restoration Programmatic Plan Project Types by Action Alternatives 2, 3 and 4

ALTERNATIVE 4	
ALTERNATIVE 2	**ALTERNATIVE 3**
• Create and improve wetlands • Protect shorelines and reduce erosion • Restore barrier islands and beaches • Restore and protect submerged aquatic vegetation • Conserve habitat • Restore oysters • Restore and protect finfish and shellfish • Restore and protect birds • Restore and protect sea turtles	• Enhance public access to natural resources for recreational use • Enhance recreational experiences • Promote environmental and cultural stewardship, education, and outreach

It should be noted that the beneficial environmental effects described in this Chapter's NEPA analyses, as well as in the environmental impacts portions of Chapters 8 through 12, consider potential direct, indirect impacts of the alternatives and their associated project types. In addition, the analyses also include the cumulative impacts of the alternatives when combined with other past, present, and reasonably foreseeable actions, as required under NEPA. The NEPA concept of "reasonably foreseeable" differs from the NRDA evaluation of actions to benefit specific injured resources. Chapter 7 provides information on the NRDA component of the project-specific analysis for Phase III and the development of Offsets.

Determining the Level of Impact

Under NEPA, federal agencies must consider the environmental effects of their actions. These effects may include, among others, impacts to social, cultural, and economic resources, as well as natural resources. To identify those resources that could be significantly impacted by the proposed alternatives and actions, appropriate definitions of *impacts* must first be identified. Table 6-2 provides guidelines for resource-specific definitions for determining effects of programmatic alternatives as well as for individual planned actions.

As defined in NEPA, evaluations should include direct and indirect effects. Effects are defined in the Council for Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [C.F.R.] § 1508.8 and 1508.7) as follows:

- Direct effects, which are caused by the action and occur simultaneous to the activity and at the same place.
- Indirect effects, which are caused by the action and occur later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.
- Cumulative effects are the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other

actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

In this analysis, effects are described by both the expected duration (short-term, long-term) and the expected intensity (in this analysis, impacts are defined as minor, moderate, or major). The intensity definitions used here are described in terms of adverse impacts (other than for cultural resources, which also include a definition of beneficial impacts). For resource areas where there is no expected effect from project activities, a "no impact" conclusion is made. The analysis of beneficial impacts focuses on the duration (short- or long-term), without attempting to specify the intensity of the benefit. As described further in Section 6.3, a "no impact" conclusion is made for the No Action alternative because the No Action alternative would largely result in a continuation of the conditions as described in Chapters 3 and 4, without the benefits to resources intended as a result of Early Restoration.

This chapter evaluates the potential environmental effects by project type, acknowledging that the selection of a programmatic alternative and associated project types do not in themselves result in environmental effects; effects would occur as a result of projects ultimately identified and selected in Phase III and future phases of early restoration. All projects conducted as part of Early Restoration would secure all necessary state and federal permits, authorizations, consultations or other regulatory processes related to sensitive habitats (e.g. wetlands or Essential Fish Habitat) and protected species (e.g. marine mammals such as dolphins, or federally listed species such as sea turtles, etc.), and other applicable requirements. These compliance measures and consultations are already in progress or completed for proposed Phase III projects. Chapter 7 provides an overview of key applicable Federal laws and regulations. For projects proposed in Phase III, specific analysis and compliance status under Federal laws and regulations is provided in greater detail in Chapters 8 through 12. For example, if projects proposed for Early Restoration have the potential to affect an ESA-listed species or designated critical habitat, consultation with NMFS or USFWS would occur and, if necessary, a biological opinion would be prepared. Avoidance of identified locations for threatened and endangered species would be implemented on a site-specific basis. It is important to note that some restoration techniques are intended to benefit listed species and their habitats and would intentionally be targeted to occur in locations where species are or may be present. The analysis in this chapter also assumes that restoration projects would be implemented in appropriate locations and with proper design criteria.

Appendix 6-A provides a listing of example BMPs and mitigation measures that could be included as appropriate on a project-specific basis to avoid, minimize, or reduce potential adverse effects to the resources. Additional BMPs and mitigation measures are discussed in Chapters 8 through 12. The potential programmatic environmental consequences described in this Chapter are presented largely without factoring in the types of specific project actions and requirements (BMPs) that could avoid or minimize the potential adverse effects at a project-specific level in planning and implementation. An exception is the analysis of impacts to protected biological resources and their habitats. For these resources, project types were specifically analyzed with the incorporation of BMPs that would be typically required by trust resource agencies, as these projects would generally not be able to move forward through agency review without incorporation of BMPs. Standard restoration approaches and practices would be considered as individual projects are proposed. These include but are not limited to steps taken through site selection, engineering and design, use of proven restoration techniques and best management practices, and other conditions or activities required for project-specific regulatory compliance. As part of the project-specific environmental review, appropriate BMPs and mitigation measures would be selected prior to project implementation. For example, projects that require use of a borrow source for material to use in upland or submerged habitats (i.e. beach re-nourishment, wetland or marsh creation, etc.) would use appropriate sources that were chemically and physically suitable to the placement site. Another example would be avoiding or minimizing activities in sensitive habitats during critical periods, such as sea turtle nesting beaches during the nesting season.

In this Chapter, the Trustees describe the direct, indirect, and cumulative impacts that could occur, recognizing that they could be mitigated to some extent as noted above. This approach assists the Trustees in identifying specific projects that effectively avoid or minimize collateral injuries. For the proposed Phase III Early Restoration projects, project-level actions and requirements anticipated to avoid or minimize adverse effects are considered in the proposed project evaluations in Chapters 8 through 12. Appendix 6-A identifies examples of BMPs and mitigation measures that could be employed, depending on site-specific considerations, for each resource. Additional or alternative measures may be developed and implemented as necessary.

Table 6-2. Guidelines for NEPA Impact Determinations in the Programmatic ERP/PEIS.[2]

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
Geology and Substrates	Short-term: During construction period. Long-term: Over the life of the project or longer.	Disturbance to geologic features or soils could be detectable, but could be small and localized. There could be no changes to local geologic features or soil characteristics. Erosion and/or compaction could occur in localized areas.	Disturbance could occur over local and immediately adjacent areas. Impacts to geology or soils could be readily apparent and result in changes to the soil character or local geologic characteristics. Erosion and compaction impacts could occur over local and immediately adjacent areas.	Disturbance could occur over a wide-spread area. Impacts to geology or soils could be readily apparent and could result in changes to the character of the geology or soils over a wide-spread area. Erosion and compaction could occur over a wide-spread area. Disruptions to substrates or soils may be permanent.
Hydrology and Water Quality	Short-term: During construction period. Long-term: Over the life of the project or longer.	Hydrology: The effect on hydrology could be measurable, but it could be small and localized. The effect could only temporarily alter the area's hydrology, including surface and groundwater flows. Water Quality: Impacts could result in a detectable change to water quality, but the change could be expected to be small and localized. Impacts could quickly become undetectable. State water quality standards as required by the Clean Water Act could not be exceeded. Floodplains: Impacts may result in a detectable change to natural and beneficial floodplain values, but the change could be expected to be small, and localized. There could be no appreciable increased risk of flood loss including impacts on human safety, health, and welfare. Wetlands: The effect on wetlands	Hydrology: The effect on hydrology could be measurable, but small and limited to local and adjacent areas. The effect could permanently alter the areas hydrology including surface and groundwater flows. Water Quality: Effects to water quality could be observable over a relatively large area. Impacts could result in a change to water quality that could be readily detectable and limited to local and adjacent areas. Change in water quality could persist; however, could likely not exceed state water quality standards as required by the Clean Water Act. Floodplains: Impacts could result in a change to natural and beneficial floodplain values and could be readily detectable, but limited to local and adjacent areas. Location of operations in floodplains could increase risk of flood loss including impacts on human safety, health, and welfare.	Hydrology: The effect on hydrology could be measurable and wide-spread. The effect could permanently alter hydrologic patterns including surface and groundwater flows. Water Quality: Impacts could likely result in a change to water quality that could be readily detectable and wide-spread. Impacts could likely result in exceedance of state water quality standards and/or could impair designated uses of a water body. Floodplains: Impacts could result in a change to natural and beneficial floodplain values that could have substantial consequences over a wide-spread area. Location of operations could increase risk of flood loss including impacts on human safety, health, and welfare. Wetlands: The action could cause a permanent loss of wetlands across a wide-spread area. The character of the wetlands could be changed so that the functions typically provided by the wetland could be

[2] Note that while this chapter only evaluates programmatic alternatives, the same determinations are applied in the Phase III project level analyses in Chapters 8 through 12.

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
		could be measurable, but small in terms of area and the nature of the impact. A small impact on the size, integrity, or connectivity could occur; however, wetland function could not be affected and natural restoration could occur if left alone.	Wetlands: The action could cause a measurable effect on wetlands indicators (size, integrity, connectivity) or could result in a permanent loss of wetland acreage across local and adjacent areas. However, wetland functions could only be permanently altered in limited areas.	permanently lost.
Air Quality and Greenhouse Gas Emissions	Short-term: During construction period. Long-term: Over the life of the project or longer.	The impact on air quality may be measurable, but could be localized and temporary, such that the emissions do not exceed the Environmental Protection Agency's (EPA's) de minimis criteria for a general conformity determination under the Clean Air Act (40 C.F.R. 93.153). The contributions to GHGs may be measurable, but below 25,000 metric ton/year of carbon dioxide (CO_2) or its equivalent. [3]	The impact on air quality could be measurable and limited to local and adjacent areas. Emissions of criteria pollutants could be at the EPA's de minimis criteria levels for general conformity determination. The contribution to GHG emissions could exceed 25,000 metric tons of CO_2 or its equivalent annually. [4] Although the level of emissions could be similar to a large source (i.e. natural gas and petroleum users, landfills, agriculture, etc.), the levels could not be a dominant contributor to GHGs in the area.	The impact on air quality could be measurable over a wide-spread area. Emissions are high, such that they could exceed the EPA's de minimis criteria for a general conformity determination. The contribution to GHGs could exceed 25,000 metric tons of CO_2 or its equivalent annually. The source could be a dominant contributor in terms of GHG in the area.
Noise	Short-term: During construction period. Long-term: Over the life of the project.	Increased noise could attract attention, but its contribution to the soundscape would be localized and unlikely to affect current user activities.	Increased noise could attract attention, and contribute to the soundscape including in local areas and those adjacent to the action, but could not dominate. User activities could be affected.	Increased noise could attract attention, and dominate the soundscape over wide-spread areas. Noise levels could eliminate or discourage user activities.

[3] "The reference point of 25,000 metric tons of direct CO2-equivalent GHG emissions may provide agencies with a useful indicator – rather than an absolute standard of insignificant effects -- for agencies' action-specific evaluation of GHG emissions and disclosure of that analysis in their NEPA documents. CEQ does not propose this reference point as an indicator of a level of GHG emissions that may significantly affect the quality of the human environment, as that term is used by NEPA, but notes that it serves as a minimum standard for reporting emissions under the Clean Air Act." CEQ, "Draft NEPA guidance on consideration of the effects of climate change and GHG emissions." 2010.

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
Habitats	Short-term: Lasting less than two growing seasons. Long-term: Lasting longer than two growing seasons.	Impacts on native vegetation may be detectable, but could not alter natural conditions and be limited to localized areas. Infrequent disturbance to individual plants could be expected, but without affecting local or range-wide population stability. Infrequent or insignificant one-time disturbance to locally suitable habitat could occur, but sufficient habitat could remain functional at both the local and regional scales to maintain the viability of the species. Opportunity for increased spread of non-native species could be detectable but temporary and localized and could not displace native species populations and distributions.	Impacts on native vegetation could be measureable but limited to local and adjacent areas. Occasional disturbance to individual plants could be expected. These disturbances could affect local populations negatively, but could not be expected to affect regional population stability. Some impacts might occur in key habitats, but sufficient local habitat could retain functional to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas, but could only result in temporary changes to native species population and distributions.	Impacts on native vegetation could be measurable and wide-spread. Frequent disturbances of individual plants could be expected, with negative impacts to both local and regional population levels. These disturbances could negatively affect range-wide population stability. Some impacts might occur in key habitats, and habitat impacts could negatively affect the viability of the species both locally and throughout its range. Actions could result in the wide-spread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.
***Living Coastal and Marine Resources*:** Wildlife Species (including birds)	Short-term: Lasting up to two breeding seasons, depending on length of breeding season. Long-term: Lasting more than two breeding seasons.	Impacts to native species, their habitats, or the natural processes sustaining them could be detectable, but localized and could not measurably alter natural conditions. Infrequent responses to disturbance by some individuals could be expected, but without interference to feeding, reproduction, resting, migrating, or other factors affecting population levels. Small changes to local population numbers, population structure, and other demographic factors could occur. Sufficient habitat could remain functional at both the local and range-wide scales to maintain the viability of the species.	Impacts on native species, their habitats, or the natural processes sustaining them could be measureable but limited to local and adjacent areas. Occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local population levels. Some impacts might occur in key habitats. However, sufficient population numbers or habitat could retain function to maintain the viability of the species both locally and throughout its range. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas, but could only result in temporary	Impacts on native species, their habitats, or the natural processes sustaining them could be detectable, and wide-spread. Frequent responses to disturbance by some individuals could be expected, with negative impacts to feeding, reproduction, migrating, or other factors resulting in a decrease in both local and range-wide population levels and habitat type. Impacts could occur during critical periods of reproduction or in key habitats and could result in direct mortality or loss of habitat that might affect the viability of a species. Local population numbers, population structure, and other demographic factors might experience large changes or declines. Actions could result in the wide-spread increase of non-native species resulting in broad and permanent changes to native

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
		Opportunity for increased spread of non-native species could be detectable but temporary and localized and could not displace native species populations and distributions.	changes to native species population and distributions.	species populations and distributions.
Living Coastal and Marine Resources: Marine and Estuarine Fauna, (fish, shellfish benthic organisms)	Short-term: Lasting up to two spawning seasons, depending on length of season. Long-term: Lasting more than two spawning seasons.	Impacts could be detectable and localized but small. Disturbance of individual species could occur; however, there could be no change in the diversity or local populations of marine and estuarine species. Any disturbance could not interfere with key behaviors such feeding and spawning. There could be no restriction of movements daily or seasonally. Opportunity for increased spread of non-native species could be detectable but temporary and localized and could not displace native species populations and distributions.	Impacts could be readily apparent and result in a change in marine and estuarine species populations in local and adjacent areas. Areas being disturbed may display a change in species diversity; however, overall populations could not be altered. Some key behaviors could be affected but not to the extent that species viability is affected. Some movements could be restricted seasonally. Opportunity for increased spread of non-native species could be detectable and limited to local and adjacent areas, but could only result in temporary changes to native species population and distributions.	Impacts could be readily apparent and could substantially change marine and estuarine species populations over a wide-scale area, possibly river-basin wide. Disturbances could result in a decrease in fish species diversity and populations. The viability of some species could be affected. Species movements could be seasonally constrained or eliminated. Actions could result in the wide-spread increase of non-native species resulting in broad and permanent changes to native species populations and distributions.
Living Coastal and Marine Resources: Protected Species	Short-term: Lasting up to one breeding/growing season. Long-term: Lasting more than one breeding/growing season.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, but small, localized, and could not measurably alter natural conditions. Impacts could likely result in a "may affect, not likely to adversely affect" determination for at least one listed species.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable and some alteration in the numbers of protected species, or occasional responses to disturbance by some individuals could be expected, with some negative impacts to feeding, reproduction, resting, migrating, or other factors affecting local and adjacent population levels. Impacts could occur in key habitats, but sufficient population numbers or habitat could remain functional to maintain the viability of the species both locally and throughout its range.	Impacts on protected species, their habitats, or the natural processes sustaining them could be detectable, wide-spread, and permanent. Substantial impacts to the population numbers of protected species, or interference with their survival, growth, or reproduction could be expected. There could be impacts to key habitat, resulting in substantial reductions in species numbers. Results in an "Is likely to jeopardize proposed or listed species / adversely modify proposed or designated critical habitat (impairment)" determination for at least one listed species.

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
			Some disturbance to individuals or impacts to potential or designated critical habitat could occur. Impacts could likely result in a "may affect, likely to adversely affect" determination for at least one listed species. No adverse modification of critical habitat could be expected.	
Socioeconomics and Environmental Justice	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties or institutions could be impacted. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions. Actions could not disproportionately affect minority populations and low-income populations.	Many individuals, groups, businesses, properties or institutions could be impacted. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions Actions could disproportionately affect minority populations and low-income populations. However, the impact could be temporary and localized.	A large number of individuals, groups, businesses, properties or institutions could be impacted. Impacts could be readily detectable and observed, extend over a wide-spread area, and could have a substantial influence on social and/or economic conditions. Actions could disproportionately affect minority populations and low-income populations. However, the impact could be permanent and widespread.
Cultural Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	Adverse impact: The disturbance of a site(s), building, structure or object could be confined to a small area with little, if any, loss of important cultural information potential.	Adverse impact: Disturbance of a site(s), building, structure or object not expected to result in a substantial loss of important cultural information.	Adverse impact: Disturbance of a site(s), building, structure or object could be substantial and may result in the loss of most or all its potential to yield important cultural information.
Infrastructure	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could affect public services or utilities but the impact could be localized and within operational capacities. There could be negligible increases in local daily traffic volumes resulting in perceived inconvenience to drivers but no actual disruptions to traffic.	The action could affect public services or utilities in local and adjacent areas and the impact could require the acquisition of additional service providers or capacity. Detectable increase in daily traffic volumes (with slightly reduced speed of travel) resulting in slowing down traffic and delays, but no change in level of service (LOS). Short service interruptions (temporary closure for a few hours) to roadway and railroad traffic.	The action could affect public services utilities over a wide-spread area resulting in the loss of certain services or necessary utilities. Extensive increase in daily traffic volumes (with reduced speed of travel) resulting in an adverse change in LOS to worsened conditions. Extensive service disruptions (temporary closure of one day or more) to roadways or railroad traffic.

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
Land and Marine Management	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could require a variance, zoning change or amendment to a land use or area comprehensive or management plan, but could not affect overall use and management beyond the local area.	The action could require a variance, zoning change or amendment to a land use or area comprehensive or management plan, and could affect overall land use and management in local and adjacent areas.	The action could cause permanent changes to and conflict with land uses or management plans over a wide-spread area.
Tourism and Recreational Use	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be partial developed recreational site closures to protect public safety. The same site capacity and visitor experience could remain unchanged after construction. The impact could be detectable and/or could only affect some recreationalists. Users could likely be aware of the action but changes in use could be slight. There could be partial closures to protect public safety. Impacts could be local. There could be a change in local recreational opportunities; however it could affect relatively few visitors, or could not affect any related recreational activities.	There could be complete site closures to protect public safety. However, the sites could be reopened after activities occur. There could be slightly reduced site capacity. The visitor experience could be slightly changed but could still be available. The impact could be readily apparent and/or could affect many recreationalists locally and in adjacent areas. Users could be aware of the action. There could be complete closures to protect public safety. However, the areas could be reopened after activities occur. Some users could choose to pursue activities in other available local or regional areas.	All developed site capacity could be eliminated because developed facilities could be closed and removed. Visitors could be displaced to facilities over a wide-spread area and visitor experiences could no longer be available in many locations. The impact could affect the most recreationalists over a wide-spread area. Users could be highly aware of the action. Users could choose to pursue activities in other available regional areas.
Fisheries and Aquaculture	Short-term: During construction period. Long-term: Over the life of the project or longer.	A few individuals, groups, businesses, properties or institutions could be impacted. Impacts could be small and localized. These impacts are not expected to substantively alter social and/or economic conditions.	Many individuals, groups, businesses, properties or institutions could be impacted. Impacts could be readily apparent and detectable in local and adjacent areas and could have a noticeable effect on social and/or economic conditions.	A large number of individuals, groups, businesses, properties or institutions could be impacted. Impacts could be readily detectable and observed, extend over a wide-spread area, and could have a substantial influence on social and/or economic conditions.
Marine Transportation	Short-term: During construction period. Long-term: Over the life of the project or longer.	The action could affect public services or utilities but the impact could be localized and within operational capacities. There could be negligible increases in local daily marine traffic volumes	The action could affect public services or utilities in local and adjacent areas and the impact could require the acquisition of additional service providers or capacity. Detectable increase in daily marine	The action could affect public services utilities over a wide-spread area resulting in the loss of certain services or necessary utilities. Extensive increase in daily marine traffic volumes (with reduced speed of travel) resulting in an extensive service disruptions

		IMPACT INTENSITY DEFINITIONS		
RESOURCE AREA	**IMPACT DURATION**	**MINOR**	**MODERATE**	**MAJOR**
		resulting in perceived inconvenience to operators but no actual disruptions to transportation.	traffic volumes (with slightly reduced speed of travel) resulting in slowing down traffic and delays. Short service interruptions (temporary delays for a few hours).	(temporary closure of one day or more).
Aesthetics and Visual Resources	Short-term: During construction period. Long-term: Over the life of the project or longer.	There could be a change in the view shed that was readily apparent but could not attract attention, dominate the view, or detract from current user activities or experiences.	There could be a change in the view shed that was readily apparent and attract attention. Changes could not dominate the viewscape, though they could detract from the current user activities or experiences.	Changes to the characteristic views could dominate and detract from current user activities or experiences.
Public Health and Safety , Including Flood and Shoreline Protection	Short-term: During construction period. Long-term: Over the life of the project or longer.	Actions could not result in 1) soil, groundwater, and/or surface water contamination, 2) exposure of contaminated media to construction workers or transmission line operations personnel, and/or 3) mobilization and migration of contaminants currently in the soil, groundwater, or surface water at levels that could harm the workers or general public. Increased risk of potential hazards (e.g., increase likelihood of storm surge) to visitors, residents, and workers from decreased shoreline integrity could be temporary and localized.	Project construction and operation could result in 1) exposure, mobilization and/or migration of existing contaminated soil, groundwater or surface water to an extent that requires mitigation and/or 2) could introduce detectable levels of contaminants to soil, groundwater and/or surface water in localized areas within the project boundaries such that mitigation/remediation is required to restore the affected area to the preconstruction conditions. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be sufficient to cause a permanent change in use patterns and area avoidance in local and adjacent areas.	Actions could result in soil, groundwater and/or surface water contamination, at levels exceeding federal, state, or local hazardous waste criteria including those established by 40 C.F.R. Part 261; 2) mobilization of contaminants currently in the soil, groundwater or surface water resulting in exposure of humans or other sensitive receptors such as plants and wildlife to contaminant levels that could result in health effects; and 3) result in the presence of contaminated soil, groundwater or surface water within the project area exposing workers and/or the public to contaminated or hazardous materials at levels exceeding those permitted by Federal Occupational Safety and Health Administration (OSHA) in 29 C.F.R. Part 1910. Increased risk of potential hazards to visitors, residents, and workers from decreased shoreline integrity could be substantial and could cause permanent changes in use patterns and area avoidance over a wide-spread area.

6.2 Programmatic Alternative 1: No Action

Both OPA and NEPA require the evaluation of the considered actions against a No Action alternative. For Early Restoration, the No Action alternative means that the Trustees would not pursue any additional Early Restoration actions at this time. The No Action alternative does not preclude continued development of the Damage Assessment and Restoration Plan (DARP) and supporting PEIS, but no new Early Restoration would be undertaken at this time.

Current management, restoration and stewardship programs and activities are described in Appendix 6-B. There would be no change in these programs and activities anticipated under the No Action alternative, and therefore no change anticipated in the effects of these activities on resources. Similarly, other stressors affecting Gulf resources (described in Chapters 3 and 4) would also be expected to continue. This section does not re-analyze the existing conditions described in Chapters 3 and 4. The No Action alternative would largely result in a continuation of the conditions as described in Chapters 3 and 4, without the benefits to resources intended as a result of Early Restoration.

Descriptions of effects to specific resources under the No Action Alternative are described below.

6.2.1 Geology and Substrates

Under the No Action alternative, Early Restoration Programmatic Plan actions that would increase stability and function of upland and near-shore coastal substrates would not be initiated at this time. The types of projects that would utilize sediment borrow resources for restoration would not be pursued at this time and those borrow resources could potentially be available for use by others. Correspondingly, potential adverse effects, ranging from minor to moderate and including both short-term (e.g., turbidity) and long-term (use of the materials) impacts would not occur, and benefits to substrates achieved through the use of these materials for restoration would not be realized at this time.

Geomorphic processes are dynamic. Under the No Action alternative, some coastal areas may stabilize over time, while erosion may increase in other areas. As stated in Chapter 3, sediment resources in the Gulf of Mexico are used for many man-made construction and restoration projects. The Gulf of Mexico Alliance (GOMA) has developed a Gulf Regional Sediment Management Master Plan aimed at improving sediment management practices (GOMA 2009). In addition, State master plans for beneficial use of dredged materials have been developed. These plans would be unaffected by the No Action Alternative.

6.2.2 Water Quality and Hydrology

Adverse localized effects to hydrology and water quality may occur associated with the action alternatives; these are expected to be minor and may include both short and long-term effects related to new facility development and operation. These impacts would not occur under the No Action alternative. Similarly, benefits of the action alternatives, particularly Alternatives 2 and 4, to localized water quality and hydrology, range from short to long-term, and these benefits would not be realized under the No Action alternative. Existing hydrologic and water quality conditions and contributing stressors, as described in Chapters 3 and 4, would in large part persist under the No Action alternative.

6.2.3 Air Quality and Greenhouse Gases

Adverse effects to air quality and changes in the emission of greenhouse gases associated with the action alternatives, which range from minor to moderate and include primarily short-term effects associated with construction-related activities, as well as long-term effects related to operation of new facilities such as boat ramps, would not occur under the No Action alternative. Similarly, the short to long-term benefits of the action alternatives, particularly Alternatives 2 and 4, to air quality and greenhouse gas emissions, also would not be realized under the No Action alternative.

6.2.4 Noise

As stated in Chapter 3, there are natural and anthropogenic sources of noise in the coastal environment. Primary sources of terrestrial noise in the coastal environment are transportation and construction-related activities. Adverse noise effects associated with the action alternatives, which range from minor to major and which are primarily short-term in nature, would not occur under the No Action alternative.

6.2.5 Habitats

Adverse effects to habitats associated with the action alternatives would not occur under the No Action alternative. Action alternative impacts include minor to moderate short-term effects and minor and moderate long-term effects. In addition, short to long-term benefits of the action alternatives, particularly Alternatives 2 and 4, to habitats would not be realized under the No Action alternative.

Under the No Action alternative, habitats including wetlands, barrier islands and beaches that are subject to ongoing degradation would continue to be subject to existing stressors. The Trustees are implementing Phase I and Phase II Early Restoration projects that benefit wetlands, sea turtle habitat, dune habitat, and bird habitat. As stated above, these efforts would not be affected by the No Action alternative.

6.2.6 Living Coastal and Marine Resources

Living coastal and marine resources encompass a broad range of species that utilize the Gulf Coast and Gulf waters for some or all life stages (e.g., larval, juvenile, adult) or activities (e.g., breeding, foraging, or migration). While some species utilize this area for only one life stage or activity, such as certain migratory birds that use the area as a stopover, others spend their entire life cycle in the Gulf Coast, such as Gulf sturgeon. Adverse effects to living coastal and marine resources associated with the action alternatives, which could include minor to moderate short-term effects and minor to moderate adverse long-term impacts, would not occur under the No Action alternative. In addition, short to long-term benefits of the action alternatives, particularly Alternatives 2 and 4, to living coastal and marine resources would not be realized under the No Action alternative. The Trustees are implementing Early Restoration projects, identified earlier, that benefit oysters and benthic organisms, and these efforts would not be affected by the No Action alternative.

6.2.7 Socioeconomics and Environmental Justice

Adverse effects to socioeconomics associated with the action alternatives, which could include minor to moderate short-term effects and minor adverse long-term impacts, would not occur under the No Action alternative. Similarly, benefits of the action alternatives, to human use and socioeconomics, including the creation of both temporary and permanent jobs, would not be realized under the No Action alternative. Since no actions would be pursued, there is no potential for disproportionately high and adverse impacts to minority and low income populations, therefore no environmental justice concerns are raised by pursuit of the No Action alternative.

6.2.8 Cultural Resources

Under the No Action alternative, some cultural resources that may be affected by the Action Alternatives would be preserved in their natural condition. Adverse effects to cultural resources associated with the action alternatives, which could include minor to moderate short-term and long-term adverse effects, would not occur under the No Action alternative.

6.2.9 Infrastructure

Adverse effects to infrastructure associated with the action alternatives, which could include minor to major short-term effects and long-term adverse impacts, would not occur under the No Action alternative. Similarly, benefits of the action alternatives, to infrastructure, such as the creation and improvement of boat ramps and potential benefits associated with shoreline stabilization, would not be realized under the No Action alternative.

6.2.10 Land and Marine Management

Potential effects to land and marine management associated with the action alternatives, including minor to moderate short-term adverse impacts, primarily associated with temporary closures related to construction activities would not be realized under the No Action alternative. Long-term benefits associated with improvements to land and marine areas managed as well as benefits through enhanced environmental education, would not be realized under the No Action Alternative.

6.2.11 Tourism and Recreational Use

Tourism and recreational use in the Gulf Coast region includes a broad range of activities, ranging from beach visitation and boating to hunting and fishing. Effects to tourism associated with the action alternatives, including minor to moderate short-term adverse impacts as well as long-term benefits, would not be realized under the No Action alternative.

6.2.12 Fisheries and Aquaculture

Effects to commercial fisheries and aquaculture associated with the action alternatives, including moderate short-term adverse impacts as well as long-term benefits (e.g., from protection of shorelines and SAV protection and restoration), would not be realized under the No Action alternative.

6.2.13 Marine Transportation

Under the No Action alternative, marine infrastructure would continue to provide important transportation, services, and other important functions. Effects to marine transportation associated with the action alternatives, including short-term and long-term minor adverse impacts and long-term benefits, would not be realized.

6.2.14 Aesthetics and Visual Resources

Aesthetic and visual resource elements include natural features, vistas, or views including shorelines, natural and maintained beaches, mangroves and other wetlands. These can also include urban or community visual elements such as architecture, skylines, or other man made characteristics (see Chapter 3). Effects to aesthetics and visual resources associated with the action alternatives, including short-term moderate and long-term minor adverse effects and long-term benefits, would not be realized under the No Action alternative.

6.2.15 Public Health and Safety, including Flood and Shoreline Protection

As stated in Chapter 3, delivery of public health and safety to Gulf Coast communities has been complicated by large storm events that have historically caused extensive damage to shorelines as well as infrastructure such as roadways, bridges and buildings. Under the No Action alternative, existing programs that provide public health and safety would continue. Effects to public health and safety associated with the action alternatives, including short-term and long-term minor adverse effects and long-term benefits, would not be realized under the No Action alternative.

Flood risk management refers to methods used to reduce or prevent the detrimental effects of flood waters, including the construction of floodways (man-made channels to divert floodwater), levees, lakes, dams, reservoirs, or gates to hold extra water during times of flooding. Shoreline protection consists of engineered structures or other solutions meant to slow erosion due to rising sea levels and storm wave action. Effects to flood risk management and shoreline protection associated with the action alternatives, including short-term and long-term minor adverse effects and long-term benefits, would not be realized under the No Action alternative.

6.3 Alternatives 2 (and 4): Physical and Biological Environments

This section describes the environmental consequences of Alternative 2 for physical and biological environments. Impacts for physical and biological resources are disaggregated by each of the nine project types identified in Chapter 5 under this Alternative. For each project type, potential restoration techniques are noted. Because Alternative 4 is inclusive of Alternative 2, the analysis of environmental consequences for these project types is the same for Alternative 4 as Alternative 2.

6.3.1 Project Type 1: Create and Improve Wetlands

This project type involves creating or improving wetlands to establish or reestablish conditions conducive to wetland vegetative growth and to restore hydrologic function within wetland habitats. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

1. Create or enhance wetlands through placement of dredged material in shallow water bodies
2. Replant vegetation via propagation and/or transplanting
3. Restore hydrologic connections to enhance coastal habitats
4. Backfill canals including drainage canals, access canals established for petrochemical development and canals constructed for other purposes (i.e., recreational and residential uses)

6.3.1.1 Geology and Substrates

Restoration activities undertaken to create and improve wetlands could benefit nearshore geology and substrates by allowing normal geomorphic processes to resume. This, as well as the planting of vegetation and restoring hydrologic connections, would help prevent further erosional loss of natural geological substrates. This would be a long-term beneficial effect to geology and substrates because effects would extend beyond the construction period. Short-term adverse effects to nearshore geology and substrates are expected to be minor to moderate and associated with disturbance during the construction phase.

Use of equipment in submerged substrates to excavate material for wetland creation can disturb sediments. This adverse effect would be minor and short-term because actions would be localized and generally would not extend beyond the construction period. Substrates at borrow areas could be disturbed or altered during excavation and construction. These adverse effects would be minor to moderate and long-term because they could affect a localized area, or larger area, and extend beyond the construction period.

Staging and equipment used for re-vegetation, canal backfilling, or restoration of hydrologic connections could also result in impacts to geology and substrates, such as rutting or a temporary increase in local erosion. These adverse effects would be minor and short-term because they would be localized and generally would not extend beyond the construction period. However, compaction of soils by these construction activities would be a long-term, minor adverse effect that would extend beyond the construction period, if staging does not occur on an already paved or otherwise disturbed area.

6.3.1.2 Hydrology and Water Quality

Restoration activities could improve the filtering capacity of wetland recharge zones, improving long-term water quality and hydrologic function. Vegetation replanting could also help, through organic production, accumulation of sediment, reduction of storm surges and limitation of the shoreward extent of saltwater flow, thereby reducing the pace and extent of future surface derived saltwater intrusion and assisting in the maintenance of salinity regimes in brackish and freshwater systems. Removing blockages and improving conveyances would distribute flood water both temporally (to have a lower and longer peak) and spatially (over a larger floodplain area). These would be long-term beneficial effects because they would extend beyond the construction period.

Equipment usage and other construction activities in wetland recharge areas could result in short-term minor adverse impacts to surface water related to sediment compaction, disturbance, and erosion.

6.3.1.3 Air Quality and Greenhouse Gases

During restoration activities there could be short-term minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor increase in GHG emissions.

6.3.1.4 Noise

During the construction period, minor to moderate short-term adverse impacts of noise could occur from dredging, backfilling canals, and other noise-generating restoration activities, depending on the location and the equipment being used and the distance to sensitive receptors such as recreational users or wildlife. Over the short-term, these actions could result in a change in the soundscape which would attract attention. Although such changes would not dominate the soundscape, they could detract from the current user activities or experiences. However, upon completion of wetland restoration activities, no long-term noise-related impacts would be anticipated.

6.3.1.5 Habitats

The creation and restoration of wetlands (including the expansion of shoreline and marsh edge along barrier islands) would result in a long-term benefit to the health and stability of many important habitats including wetlands, barrier islands, beaches and dunes, areas of SAV and coastal transition zones. These activities could help reestablish native plant communities, stabilize substrates and support sediment deposition, strengthen shorelines, and reduce erosion.

Adverse effects could occur to these habitats from different restoration activities such as dredging, placement of sediment transport pipeline, placement of sediment, filling of canals, or in-water construction work.   Adverse impacts could include:

- increased soil erosion, vegetation trampling, vegetation removal, or other disturbance from human activity from project staging or construction, or;
- changes in water quality from turbidity and substrate disturbance from in-water work with heavy equipment, re-vegetation activities.
- introduction or opportunity for establishment of invasive species.

These impacts would be, for the most part, minor to moderate and would take place over the short-term, during the construction activity. Depletion of sand or sediment at a borrow site could also result in a localized long-term minor to moderate adverse effect to the borrow site habitat due to the disruption of existing conditions and exploitation of sand and sediments. Borrow sites near the shoreline could contain high nutrient levels which, when disturbed, could affect local water quality by decreasing dissolved oxygen levels. Therefore, the removal of material from these sites for purposes of wetland creation may result in hypoxic conditions in local wetland or coastal habitats. This could be a short- or long-term minor to moderate adverse effect.

BMPs and other mitigation measures that may be employed to further minimize or contain adverse impacts are detailed in Appendix 6-A.

Adverse impacts from wetland restoration actions would not be expected on regional habitat function and viability because these impacts would be short-term, limited to the restoration site, and would only occur during construction. There is a potential for inadvertent introduction of invasive exotic species during construction activities, e.g., through transport on construction equipment. However, the use of BMPs would help prevent the introduction of invasive species. Ultimately, creation of wetlands is expected to be a long-term benefit to wetlands.

6.3.1.6 Living Coastal and Marine Resources

Creating and improving wetlands and shallow water habitats could provide a long-term benefit to coastal and marine resources by reducing or preventing erosion and establishing more stable habitats. Restoring hydrologic connections could support salinity regimes that are conducive to oyster growth. In addition, the creation and restoration of wetlands could provide a long-term benefit by enhancing nesting and/or foraging habitat for birds as well as increasing habitat for terrestrial wildlife. Finfish could also benefit from wetlands restoration, which could provide habitat for foraging, spawning, and shelter. Stabilizing sediment from re-vegetation would indirectly result in a long-term benefit to pelagic microfaunal communities through improved water clarity and enhanced photosynthesis.

Some short-term minor adverse effects could occur if resources, including oysters, fish, sea turtles, marine mammals, benthic communities, and pelagic microfaunal communities are present in the construction area. Possible impacts could include increased turbidity, reduction of water quality, noise pollution, and disruption to the water column and habitat. In particular, dredging, replanting, or other construction activities could result in the following adverse impacts:

- Dredging sediment from borrow areas could have a short-term, minor effect to oyster populations near the borrow site from increased turbidity and siltation, which may increase mortality and inhibit spawning activities.
- Direct mortality of benthic organisms would likely occur in work areas. Other adverse effects to benthic organisms would include covering and destroying suitable habitat, increasing turbidity during construction, and changing soil and water chemistry (e.g., salinity).These effects would be long-term and minor because affected benthic organisms would be limited to the localized area where wetland restoration work occurred.
- Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal organisms. These impacts would be short-term and minor because, at the community level, pelagic microfaunal communities could move away to other readily available habitat areas.
- Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by equipment, construction activity, or sediment placement. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could also result in mortality of individual finfish. At the community and population level, these would be minor short-term adverse effects that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Sea turtle and marine mammal individuals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and could result in short-term, minor impacts. Dredging equipment can harm or kill sea turtles; however, with proper implementation of best management practices these impacts are not expected. If projects may incidentally harass marine mammals or adversely affect ESA-listed marine mammals or sea turtles, consultation or authorizations with appropriate agencies would be required prior to project implementation.
- Construction in upland habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, bird and terrestrial wildlife individuals that rest, roost, forage or nest in or near the work area could be temporarily disturbed or displaced. Changes in depths at marsh habitat could also displace some invertebrate species that are attracted to the former habitat. If projects have potential to adversely affect protected bird or terrestrial wildlife species, consultations with the appropriate agencies would be required prior to project implementation.
- Some minor long-term impacts could occur if restoration activities fill in existing wetlands and provide access for native and non-native terrestrial animals that could increase predation of local birds or terrestrial wildlife.

6.3.2 Project Type 2: Protect Shorelines and Reduce Erosion

This project type involves developing shore protection systems to slow or prevent erosion by stabilizing the shoreline through the use of engineered structures which can serve as breakwaters, reefs and platforms for vegetation. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

- Construct breakwaters on/or adjacent to shoreline; and
- Construct living shorelines.

6.3.2.1 Geology and Substrates

Placement of breakwaters and living shorelines could benefit geology and substrates by reducing erosion and increasing the lifespan of shorelines near passes, inlets, or in areas where erosion rates are high and sediment supply is limited. These beneficial effects would be long-term because they would last beyond the construction period.

Adverse effects could occur to geology and substrates from installation of shore protection systems. Use of equipment in submerged substrates would disturb sediments; these actions would result in short-term minor adverse effects limited to the area where construction activity occurred. Placement of structures such as living shorelines would permanently cover existing geology and substrates. Adverse effects from soil compaction and rutting of adjacent shoreline substrates during construction may also occur. These structures can change the natural process of sediment accretion and erosion, including preventing washover events[5] and cause erosion in off-site locations. These adverse effects would be minor to moderate and long-term, because they would affect substrate/geologic characteristics of the adjacent shoreline, and could extend beyond the construction period.

6.3.2.2 Hydrology and Water Quality

Shoreline protection and erosion reduction could generally help reduce storm surges on coastal wetlands, and limit the shoreward extent of saltwater flow. These actions could reduce the pace and extent of future saltwater intrusion to freshwater and brackish systems and reduce erosion and loss of the wetlands and channel networks. This could be a long-term beneficial effect because it would extend beyond the construction period.

Equipment usage and boating traffic in construction areas could pose a minor short-term adverse effect by increasing the risk of water quality contamination during the construction period. In addition, the installation of shore protection systems could increase turbidity. This would be a minor short-term adverse effect because it would be localized and would only occur during the construction period. Shoreline protection could result in minor long-term adverse effects by changing the current patterns in the localized area.

6.3.2.3 Air Quality and Greenhouse Gases

Project construction would require the use of equipment and vehicles, emissions from which could result in short-term minor to moderate adverse impacts to air quality in the project vicinity. There is a

[5] Washover events maintain bare sediments used by shorebirds for nesting and foraging and provide opportunity for sediment colonization by benthic invertebrates which are also used by shorebirds as forage items.

slight potential for fugitive dust creation from construction activities, resulting in minor adverse impacts. Examples of estimated project-specific emissions are described in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project.

6.3.2.4 Noise

During the construction period, adverse impacts to the environment due to an increase in the ambient noise level could occur, particularly along shorelines where construction activities would take place. The severity of impacts would depend to a large degree on the location of the project, the amount of noise that these activities would generate, and the distance to sensitive receptors such as recreational users or wildlife. Installation activities, equipment operation, and vehicle or boat traffic associated with the construction of breakwaters and living shorelines could result in short-term minor to moderate adverse impacts from noise. For example, during the use of motorized heavy equipment such as cranes and barges, noise would be created which could be readily apparent and attract attention. Although such changes would not dominate the soundscape and some sounds could be dampened or masked by ambient wave or ship noise, these actions could detract from the current user activities or experiences and create audible contrast for visitors in the project area.

Over the long-term these features placed along shorelines as a result of restoration activities would become part of the background noise and would not attract attention, dominate the soundscape, or detract from current user activities or experiences.

6.3.2.5 Habitats

Placement of breakwaters and other shore protection systems could protect wetlands, barrier islands, beaches, coastal transition zones, SAV and shallow water habitats by reducing erosion rates, increasing wetland sediment deposition, and prolonging habitat lifespans, which would provide a long-term benefit.

Adverse effects to wetlands could occur if existing wetlands or wetland vegetation were present in the project area where restoration-related construction activities would occur. Construction effects could include filling, disruption, or alteration of wetlands. These effects would be minor because they would be limited to the local area, and may range from short-term to long-term.

Construction activities related to placement of breakwaters or other shore protection systems could result in introduction of invasive species during construction activities, e.g., through transport on construction equipment. However, the use of BMPs would help prevent the introduction of invasive species.

Placement of certain types of breakwaters and living shorelines can create long-term adverse impacts due to the permanent nature of the hard structures. In some areas, hard shoreline protection near beaches may lead to accretion near the structure and accelerated erosion around the ends of the structure. Because hard structures may cause net beach erosion, construction of groins and breakwaters may cause long-term minor to moderate long-term adverse impacts in some areas.

Adverse effects to SAV and shallow water habitats could occur where in-water work with heavy equipment is used to place engineered structures. These effects would include covering existing SAV meadows or increasing turbidity during construction. Turbidity would dissipate quickly and effects from this water quality change would be minor and short-term. However, adverse effects from covering SAV would be minimized due to pre-construction surveys in specific project locations; impacts to SAV could be minor and would be avoided and minimized to the maximum extent practicable.

Short-term minor to moderate adverse effects to coastal transition zones could occur during construction from the use of heavy equipment. In addition, the introduction of breakwaters could have short-term to long-term and minor to moderate adverse effects on coastal transition zones from altered flood control or hydrology.

Breakwaters could change natural current patterns, sediment accretion and erosion rates, availability of invertebrate prey, cause erosion in off-site locations, and alter natural habitats of the dune-beach-nearshore system by the introduction of artificial features. This could result in minor to moderate long-term adverse impacts.

6.3.2.6 Living Coastal and Marine Resources

Placement of breakwaters and living shorelines could protect eroding wetlands and shallow water habitats and, in some cases, would allow for additional wetlands and shallow water habitat creation on the shore side of the constructed breakwaters. These actions would provide long-term benefits to benthic populations, pelagic microfaunal communities, and finfish, by increasing habitat and foraging areas.

Placement of breakwaters and living shorelines would require use of in-water heavy equipment and sediment placement, which would increase human activity, noise, vibration, and turbidity in the short-term. These activities could result in the following adverse impacts:

- Short-term minor impacts to local oyster populations or other benthic organisms may occur from increased turbidity, substrate disturbance, or siltation during construction.
- Short-term, minor disturbance or loss of pelagic microfaunal communities from increased turbidity, which decreases available light necessary for photosynthesis, and from disruption in the water column and surface water. These impacts would be short-term and minor because pelagic microfaunal communities would re-establish once turbidity dissipates;
- Short-term, minor displacement of finfish individuals or mortality of individual finfish, including adults, eggs, or larvae, could occur during construction, depending on timing and location of construction and affected species. However, it is anticipated that finfish would move away to other readily available aquatic habitats during the construction period. Fish present in the dredging or fill-placement area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could result in mortality of individual finfish. Overall, this would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. If projects have a potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Short-term, minor to moderate displacement of individual sea turtles and marine mammals from the work area due to increase in activity, noise, vibration, and turbidity during construction. These impacts would be short-term and minor and would affect localized areas.

Moderate adverse effects could occur to nesting turtles as well. Construction activities could result in destruction of eggs deposited within the boundaries of the proposed project, causing a loss of recruitment and a longer term effect. In addition, construction activities could result in harassment in the form of disturbing or interfering with female turtles attempting to nest within the construction area or on adjacent beaches as a result of construction activities (e.g., false crawls or use of marginal or unsuitable nesting areas).In addition, disorientation of hatchling turtles on beaches adjacent to the construction area as they emerge from the nest and crawl to the water as a result of project lighting may occur. BMPs are expected to avoid or minimize these impacts. If projects have potential for incidental harassment of marine mammals or adverse effects to ESA-listed marine mammals or sea turtles, authorizations and consultations with appropriate agencies would be required prior to project implementation.

- Short-term minor displacement of local birds and terrestrial species or mortality of intertidal invertebrates could occur during construction, although most wildlife would be expected to move away to forage in other readily available foraging habitat during this activity. If construction occurs during the nesting season, nests could be destroyed, and chicks or fledglings could be harmed, causing a loss of recruitment and a longer term effect. BMPs are expected to avoid or minimize these impacts. Structures that extend above the water surface could also potentially improve predator access to nesting birds, resulting in a minor long-term adverse impact limited to the localized area of breakwater placement. If projects have potential to adversely affect protected bird species or other terrestrial wildlife, consultations with the appropriate agencies would be required prior to project implementation.

In particular, the following long-term impacts may occur:

- Long-term, moderate displacement of sea turtles can occur during the construction of breakwaters like groins and jetties. Sea turtles can be adversely affected through the presence of groins or jetties could affect the movement of sand by altering the natural coastal processes and could affect the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest and crawl to the ocean. The physical presence of the groin or jetty creates a physical obstacle to nesting sea turtles. As a result, the groin or jetty is anticipated to result in decreased nesting and loss of nests that do get laid within the nearby area for all subsequent nesting seasons following the completion of the groin or jetty.
- Long-term moderate displacement of shorebirds can occur due to habitat loss from functioning breakwaters. Dredging of inlets as this action can affect spit formation adjacent to inlets, as well as ebb and flood tidal shoal formation. Jetties stabilize inlets and cause island widening and subsequent vegetation growth on the updrift inlet shores; they also cause island narrowing and/or erosion on the downdrift inlet shores. Seawalls and revetments restrict natural island movement and exacerbate erosion. Although dredge and fill projects that place sand on beaches and dunes may restore lost or degraded habitat in some areas, in other areas these projects may degrade habitat quality by altering the natural sediment composition, depressing the invertebrate prey base, hindering habitat migration with sea level rise, and replacing the natural habitats of the dune-beach-nearshore system with artificial geomorphology. These threats are exacerbated by accelerating sea level rise, which increases erosion and habitat loss

where existing development and hardened stabilization structures prevent the natural migration of the beach and/or barrier island.

6.3.3 Project Type 3: Restore Barrier Islands and Beaches

This project type involves restoring barrier islands and beaches which provide important coastal habitat. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

- Re-nourish beaches through sediment addition
- Restore dune and beach systems through the use of passive techniques to trap sand
- Restore barrier islands via placement of dredged sediments
- Plant vegetation on dunes and back-barrier marsh
- Construction of groins, breakwaters, or sediment by-pass structures

6.3.3.1 Geology and Substrates

Placement of appropriate soils on eroding beaches and/or dune systems could benefit geology and substrates by helping stabilize eroding areas. In addition, passive or active efforts to capture sediments and reintroduce them to the system would also help to stabilize these areas. These effects would be long-term because they would last beyond the construction period.

Adverse effects from beach re-nourishment and barrier island restoration may occur to geology and substrates from construction activities. Use of equipment in submerged substrates to excavate material for beach re-nourishment can disturb sediments, which would be a short-term minor effect limited to the area where excavation occurred. Staging and heavy equipment use for beach re-nourishment could result in minor short-term impacts to upland geology and substrates. Borrow sources for beach re-nourishment may occur in upland or submerged areas, which would be disturbed during excavation and removal and the structure of existing soils and geology could be altered. These adverse effects would be minor and long-term because disturbance would be limited to the local area. Placement of structures such as groins or footings may permanently cover existing geology or substrates, effects of which would be minor and long-term because they are limited to the local area. In some areas, hard shoreline protection near beaches may lead to accretion near the structure and accelerated erosion around the ends of the structure. Because hard structures may cause net beach erosion, construction of groins and breakwaters may cause long-term minor to moderate long-term adverse impacts in some areas.

6.3.3.2 Hydrology and Water Quality

Beach re-nourishment and, particularly, barrier island restoration have the potential to reduce the effects of future storm surges on nearshore wetlands and associated brackish-water resources. These effects could include reduced erosion/loss of these wetlands and channel networks as well as reduced inland extent of saltwater encroachment during storms. These would be long-term beneficial effects because they would extend beyond the construction period.

The dredging of borrow sources could locally degrade water quality at the borrow site through the disturbance of sediment and increased turbidity. This would be a minor short-term adverse effect because it would be localized and would only occur during the construction period. Placement of sediment in the nearshore environment to re-nourish beaches could cause sedimentation and turbidity in the immediate vicinity of the work area. These effects would be minor and short-term as turbidity would dissipate shortly after placement activities are completed.

6.3.3.3 Air Quality and Greenhouse Gases

During dredging, excavation or placement of materials on barrier islands and beaches, there could be minor to moderate adverse impacts to air quality associated with the use of heavy equipment and vehicles. There is a slight potential for fugitive dust creation from construction activities, resulting in minor adverse impacts. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the duration and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to an increase in GHG emissions.

6.3.3.4 Noise

During the construction period, local noise levels would increase and minor to major short-term adverse impacts from noise may occur, particularly at barrier islands and beaches where beach re-nourishment activities would take place. The severity of impacts would depend to a large degree on the location of the project, the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. Typically, impacts are expected to range from minor to moderate. The construction or placement of passive techniques to trap sand could result in temporary changes to the soundscape, which would be only slightly apparent to visitors while this technique is being constructed, and would not attract attention, dominate the soundscape, or detract from current user activities or experiences. In these instances, impacts to ambient noise levels would be minor. Dredging activities associated with barrier island restoration and beach re-nourishment, by contrast, could result in short-term minor to moderate impacts due to noise. These activities could adversely impact the soundscape by introducing mechanical dredging, a readily observable audible contrast if occurring in areas where noise would detract from current user activities or experiences. In these instances, short-term impacts of noise would be minor to moderate.

Over the long-term, the restoration activities would not have a noticeable impact on noise levels. The placement of structures such as groins, breakwaters and sediment by-pass structures in natural areas where these elements did not previously occur would not present an audible contrast to natural surroundings. Any added noise from these elements would not be readily apparent and would not attract attention, dominate the soundscape, or detract from current user activities or experiences.

6.3.3.5 Habitats

The purpose of re-nourishing beaches or restoring barrier islands through sediment addition is to re-build and stabilize the area by providing clean sediment or replenishment of suitable materials from borrow sources compatible with the restoration site. The construction of engineered structures such as breakwaters and groins and sediment by-pass methods could decrease erosion of beaches and may increase the lifespan of beaches near passes, inlets, or in areas where erosion rates are high and sediment supply is limited. However, as described above, breakwaters and groins can cause long-term minor to moderate adverse effects due to changes in current patterns, sediment accretion and erosion, and washover frequency. Benefits would be anticipated from increasing stability and resilience of barrier islands and beaches in the long-term. Re-nourishment of beaches and barrier islands can enhance beach habitat and provide benefits to other habitats, such as wetlands through storm surge protection. These actions could also provide protection for back-bay SAV habitats and coastal and riparian areas by reducing erosion and scouring.

Back barrier marsh and beach stability could be achieved by planting vegetation to reduce erosion and encourage sediment deposition. Restoration of dune and beach systems by passive techniques to trap sand (i.e. placement of sand fencing, hay bales, and recycled Christmas trees and by replanting and re-vegetating) could also stabilize marsh and beach sediments. These actions could contribute to the stability of the shoreline of the barrier island or beach, resulting in a long-term benefit. Planting vegetation on dunes and in back-barrier marshes could also restore the plant community within wetlands, resulting in long-term beneficial effects. Vegetation planting and dune beach restoration could stabilize marsh and beach sediments contributing to the stability and protection of habitats that are critical to the coastal and riparian ecosystem and yield a long-term benefit to coastal transition zones.

Adverse effects to wetlands from beach re-nourishment through sediment addition would occur if existing wetlands or wetland vegetation were present where restoration associated activities such as dredging, placement of a sediment transport pipeline or in-water construction work take place. The effects could include filling, disruption, or alteration of wetlands. If they occur, these effects would be minor and short-term because they would be limited and localized.

Adverse effects to SAV and shallow water habitats from beach re-nourishment and barrier island restoration may result if sediment deposition occurs in shallow water habitats where SAV is present. Potential adverse impacts on SAV could include covering existing SAV or increasing turbidity during construction. These adverse impacts would be expected to be short-term and minor.

Short-term minor adverse effects to barrier islands or beaches could occur during construction from human activity and/or the use of equipment to place sand traps or plant vegetation on affected dunes, beaches, and marshes. However, hand placement is typically employed for this technique which is a minimally-invasive method. Turbidity effects that could result from construction would be minimized, short-term and minor. SAV population changes would not occur, however the degree of impact would depend on the site’s potential for redevelopment of similar habitat functions.

If material was placed over existing hard substrate for beach re-nourishment habitat could be converted long-term from hard substrate to soft bottom habitat. This would be a long-term minor effect as it would be limited to the local area where sandy material was placed over existing hard substrate.

Borrow sites near the shoreline could contain high nutrient levels which, when disturbed, could affect local water quality by decreasing dissolved oxygen levels. Therefore, the removal of material from these sites for purposes of beach or barrier island enhancements may result in hypoxic conditions in local wetland or coastal habitats. This could be a short- or long-term minor to moderate adverse effect.
In some areas, hard shoreline protection near beaches may lead to accretion near the structure and accelerated erosion around the ends of the structure. Because hard structures may cause net beach erosion, construction of groins and breakwaters may cause long-term minor to moderate long-term adverse impacts in some areas.

Adverse effects to wetlands could occur if existing wetlands or wetland vegetation were present in the project area and would be affected by filling, disruption, or alteration of wetlands during construction. These effects could be short or long-term, but would be limited to the local area and therefore considered minor.

Construction activities related restoring barrier islands and beaches could result in inadvertent introduction of invasive species through transport on construction equipment. However, if invasive species became established in or adjacent to restored or enhanced areas, this adverse effect would be short- to long-term, would be limited to the local area and may range from minor to moderate. Use of BMPs would help prevent the introduction of invasive species.

Short-term minor to moderate adverse effects to beaches, dunes and barrier islands could occur during construction from the use of heavy equipment and from construction activities on the beach area, dunes, barrier islands, and to coastal transition zones. In some areas, hard shoreline protection near beaches may lead to accretion near the structure and accelerated erosion around the ends of the structure. Because hard structures may cause net beach erosion, construction of groins and breakwaters may cause long-term minor to moderate long-term adverse impacts in some areas.

Adverse effects to SAV could occur in areas where in-water work with heavy equipment is used to place engineered structures. These effects would include covering existing SAV populations or increasing turbidity during construction. However, turbidity would dissipate quickly and be minor and short-term. However, adverse effects from covering SAV would be minimized due to pre-construction surveys in specific project locations; impacts to SAV could be minor and would be avoided and minimized to the maximum extent practicable.

6.3.3.6 Living Coastal and Marine Resources

There are several long-term beneficial effects to finfish expected from enhancing barrier island systems. Beaches contribute to the quantity and quality of adjacent shallow water soft-bottom habitats that serve as nurseries and foraging areas for some finfish. A larger beach area also enables improved food and nutrient exchange to aquatic habitats.

Re-nourishment of beaches could provide a long-term benefit to terrestrial wildlife by protecting valuable beach and dune habitat. Such benefits include:

- Protecting habitat for endangered beach mice, protected sea turtles, and other protected species.
- Providing a long-term benefit to birds by providing crucial habitat for shorebirds. Some species that nest or winter on barrier islands or sandy beaches could benefit long-term due to the restoration of habitat that has been disappearing from development along the coasts. These beaches are essential stopover areas for migratory birds to rest and feed during migration.
- Protecting and supplementing existing terrestrial species habitat.
- Sediment deposition on beaches could reduce erosion rates and thereby provide protection for back-bay habitats where pelagic microfaunal communities may be present. Overall, this could result in a long-term benefit to pelagic microfaunal communities and an indirect, long-term benefit to the food chain to which pelagic microfaunal communities are a fundamental part.

- Placement of sand fencing, hay bales, and recycled Christmas trees, or planting native dune vegetation can restore the plant community and provide additional habitat and foraging area for shoreline organisms and terrestrial wildlife, and stabilize and restore existing dune systems.
- Planting vegetation on dunes and in back barrier marshes would restore plant communities and could provide additional habitat and foraging area for other shoreline organisms. Native shoreline grasses and other plants tolerant of a dune environment could be used to stabilize dunes. Replanting dune and back-barrier marsh areas could create suitable habitat for birds, benthic communities, finfish, and pelagic microfaunal communities. Shoreline habitats landward of the beach could benefit from beach, dune, and back-barrier marsh restoration because restoring these areas could provide protection from storm surge and erosion. This technique could provide long-term indirect benefits to migratory birds or other terrestrial wildlife by expanding or stabilizing habitat. Additionally, reducing erosion could benefit oyster populations that can be adversely affected by excessive sediment in nearshore waters.
- Restoration of beach, dune, and back-barrier marsh could provide protection from storm surge to nesting and breeding terrestrial species.

To facilitate creation and/or restoration of beaches and barrier islands, sediments would be dredged from borrow sources which could result in the following adverse impacts:

- Sediment removed from nearshore waters could impact local oyster populations or other benthic communities near the borrow site from increased turbidity, substrate disturbances or siltation, which could locally increase mortality and inhibit spawning activities in the short-term until silt dissipated.
- Increased turbidity might limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities in the immediate vicinity. These impacts would be short-term and minor because pelagic microfaunal communities .would re-establish once turbidity dissipates
- Fish present in the dredging or fill-placement area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could result in mortality of individual finfish. This would be a minor adverse effect that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Sea turtle and marine mammal individuals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of habitats. If projects have potential to incidentally harass marine mammals or may adversely affect sea turtles, consultations with appropriate agencies would be conducted prior to project implementation.
- Birds that forage in or near the dredge site could be temporarily affected. However, these effects would be short-term and minor as birds would be expected to move away to forage in other readily available foraging habitat during the dredging. If projects may adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation.

Short-term minor adverse effects to sea turtle nesting habitat could occur from human activity or equipment operation used during installation of passive means to trap sand such as sand fencing, hay bales, and recycled Christmas trees. These materials can become lodged in shallow water habitats near beach placement sites. However, these materials would degrade or wash out with tidal fluctuations and would not be expected to result in adverse effects to terrestrial or marine species that may be in the area. Beach nourishment can have long-term minor adverse effects on nesting and hatchling sea turtles and sea turtle nests. Placement of sand on a beach in and of itself may not provide suitable nesting habitat for sea turtles. Beach nourishment may result in changes in sand density (compaction), beach shear resistance (hardness), beach moisture content, beach slope, sand color, sand grain size, sand grain shape, and sand grain mineral content if the placed sand is dissimilar from the original beach sand. These changes could result in long-term minor adverse impacts on nest site selection, digging behavior, clutch viability, and hatchling emergence. Although sand placement activities may increase the potential nesting area, significant negative impacts from sand placement and other associated activities (equipment and vehicle use, artificial lighting) to sea turtles may result if protective measures are not incorporated during project construction. These activities during the nesting season, particularly on or near high density nesting beaches, can create barriers for nesting turtles (from equipment left on the beach or tire ruts), increased loss of eggs and hatchlings (through nest destruction, sand compaction, or females not nesting), and, along with other mortality sources, these sources may significantly impact the long-term survival of the species.

Some minor short-term displacement of local birds or wildlife could occur during vegetation planting operations. However, increased vegetation in dune and marsh areas could improve habitats that are important for migratory birds and terrestrial species. Additionally, planting marsh habitats could result in short-term adverse effects to pelagic microfaunal communities due to turbidity and temporary reduction of light availability. Any finfish or other animal species present in the marsh planting areas may also be temporarily disturbed from turbidity or other in-water activities that would cause species to disperse to other areas. These effects would be minor short-term during planting activities only.

Beach nourishment activities can result in short-term and minor to moderate impacts (such as disturbance and reduced foraging efficiency) to shorebirds if the birds are roosting and feeding in the area during a migration stopover or could result in harm or mortality if birds are nesting in the area. For example, the deposition of sand will temporarily deplete the intertidal food base during construction and between 6 months to 2 years later depending on invertebrate faunal recovery rates. If disturbance or reduced foraging efficiency is sustained, the birds may be temporarily displaced resulting in valuable energy reserve expenditures to seek available habitat elsewhere. Expending energy reserves can result in reduced fitness of an individual. These impacts to shorebirds are not only at the site of the nourishment, but may extend along the beach depending on sediment transport at the site. The tilling to loosen compaction of the sand required to minimize sea turtle impacts may affect any wrack that has accumulated on the "new" beach. Impacts to wrack affects feeding and roosting habitat for shorebirds, since they often use wrack for foraging and shelter. Nesting shorebirds, eggs, chicks, or fledglings could be harmed or killed during use of heavy equipment or actual sand placement. Best management practices would be implemented to avoid harm and mortality and minimize other effects.

The geomorphic characteristics of barrier islands, peninsulas, beaches, dunes, overwash fans, and inlets are critical to a variety of natural resources and influence a beach's ability to respond to wave action, including storm overwash and sediment transport. However, the protection or persistence of these important natural land forms, processes, and wildlife resources is often in conflict with long-term, large-scale beach stabilization projects and their indirect effects, i.e., increases in residential development, infrastructure, and public recreational uses, and preclusion of overwash, especially into coastal dune lakes and creation of spit formations which are preferred by many shorebirds. The construction of berms, dunes, and nourishment activities can indirectly affect shorebirds by reducing potential for the formation of these optimal habitats, especially along shorelines that are susceptible to overwash, posing concern for their long-term survival and recovery and resulting in long-term minor to moderate adverse impacts.

Construction in upland habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. These effects would be minor and short-term. If engineered structures were constructed in areas where protected species may be present, consultations with appropriate agencies would occur prior to project implementation.

If heavy equipment is used to place, modify or replace engineered structures in the aquatic environment minor short-term impacts could include increased sedimentation, increased turbidity, and potential leaking of construction fluids which could affect finfish, marine mammals, benthic organisms or sea turtles that may be present. However, these would be short-term minor effects because species would be expected to move away to other readily available aquatic areas. Long-term impacts to local oyster populations may occur from sediments or other materials placed directly on top of an existing oyster reef/substrate or from removal of existing hard substrate habitats (such as groins or reefs).

6.3.4 Project Type 4: Restore and Protect Submerged Aquatic Vegetation

This project type involves restoring submerged aquatic vegetation (SAV) beds using one or more techniques including re-vegetation and protection of SAV with buoys, signage, and/or other protective measures. These techniques are often used in combination. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

1. Backfill scars with sediment
2. Re-vegetate SAV beds via propagation and/or transplanting
3. Enhance SAV beds through nutrient addition
4. Protect SAV beds with buoys, signage, and/or other protective measures

6.3.4.1 Geology and Substrates

Implementation of restoration activities would provide a long-term benefit to geology and substrates by backfilling blowholes or propeller scars (which result from boat traffic in shallow water areas) with native fill (i.e., local sediment), which could return the seafloor to its original elevation and grade. Stabilizing the substrate with vegetation could also prevent further disturbance of the substrate from tides, wind, waves, vessel wakes, or currents, which can expand scars and blowholes into adjacent areas.

For all implemented techniques, affected areas would be localized and typically small. Backfilling, re-vegetation, bird stakes or fertilizer spikes, and buoys or signage would have only minor, short or long-term local adverse effects on nearshore sediments due to temporary increase in turbidity during construction or installation.

6.3.4.2 Hydrology and Water Quality

SAV helps stabilize shorelines, diffuse the energy of storms, and trap sediment. As such, restoring SAV could help protect shorelines. SAV restoration activities could also improve wetland filter function, slow water velocities and reduce turbidity, and prevent erosion and sedimentation. These would be long-term beneficial effects because they would extend beyond the construction period.

Equipment usage and other construction activities in wetland recharge areas could result in short-term minor adverse impacts to surface water related to sediment compaction, disturbance, and erosion. There would be negligible local disturbance from placement of signs or buoys. Fertilization and bird stakes would increase the long-term risk of adding more nutrients than could be used by plants on-site, resulting in increased nutrient concentration in adjacent or downstream areas. However, given the small scale of fertilizer use, this effect would be minor.

6.3.4.3 Air Quality and Greenhouse Gases

During restoration activities, there could be short-term minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor increase in GHG emissions.

6.3.4.4 Noise

During the construction period, temporary impacts to ambient noise levels would result from SAV restoration activities. The severity of impacts would depend to a large degree on the location of the project and the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. For example, the placement and use of barges and associated equipment for backfilling scars with sediment would temporarily emit noise, which may detract from current user activities or experiences. These short-term construction-related adverse impacts to ambient noise levels would be minor to moderate in nature.

Over the long-term, the SAV restoration activities would not have a noticeable impact on noise. For example, the placement of signage posted to warn boat traffic of the submerged vegetation would not present an audible contrast to natural surroundings. As a result, noise from these elements would not be apparent and would not attract attention, dominate the soundscape, or detract from current user activities or experiences.

6.3.4.5 Habitats

Backfilling scars and re-vegetating the areas as part of restoration activities would be expected to enhance adjacent wetland, barrier island, beach, or other coastal habitats. Restoring SAV resources could, over the long-term, also improve water quality by providing areas of slower moving water that can reduce shoreline erosion rates. These would be long-term benefits to local habitats, because effects would persist beyond the construction period.

Temporary adverse effects could occur to local habitats affected by SAV restoration activities. There could be minor short-term increases in sediment disturbance and turbidity associated with in-water activities such as SAV planting and fertilization, but this would be expected to settle quickly and be limited to the localized area where restoration activities occurred. Short-term minor to moderate adverse effects to barrier islands, beaches, coastal transition zones, or other habitats could also occur from the temporary introduction or staging of construction equipment to remediate, replant, and backfill scars to prepare for re-colonization and transplantation of SAV.

Activities related restoring SAV could result in introduction of invasive species. Use of BMPs would help prevent the introduction of invasive species. However, if invasive species became established in or adjacent to restored SAV areas, this adverse effect would be short to long-term, would be limited to the local area and may range from minor to moderate.

6.3.4.6 Living Coastal and Marine Resources

Increasing SAV ecosystem function and area would expand the amount of available habitat creating a long-term beneficial effect to coastal and marine resources that use those areas.

Adverse effects could occur if resources, including oysters, fish, sea turtles, marine mammals, benthic communities, and pelagic microfaunal communities, are present where restoration activities occur. Mortality of benthic organisms could occur in areas identified for borrow source material dredging and in-water construction work, where planting of SAV is taking place, or where staking or placement of signs occurs. These effects would be short-term and minor because they would occur only during in-water activities would be limited to small areas.

SAV restoration actions would result in short-term minor impacts to pelagic microfaunal communities due to substrate disturbance and increased turbidity which, when suspended in the water column, could reduce the ability for some pelagic microfaunal species to photosynthesize. Turbidity from replanting efforts would be temporary and would dissipate quickly, and pelagic microfaunal should be able to re-establish readily available habitats.

Restoration activities that involved the use of in-water equipment and sediment disturbance could affect sea turtles, manatees, and other marine mammals through a temporary increase in activity, noise, vibration, turbidity, and alteration or loss of foraging habitat. This could result in temporary displacement of individuals from the work area. Construction activities will vary depending on the type and size of the project but are generally anticipated to be short-term. If projects may incidentally harass marine mammals or may adversely affect ESA-listed marine mammals or sea turtles, authorizations or consultations with appropriate agencies would be required prior to project implementation.

Fish present in the work area could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.

Birds that forage in or near the restoration site could be temporarily disturbed or displaced. However, these effects would be short-term and minor as birds would be expected to move away to forage in other readily available habitat. If projects have potential to adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation.

6.3.5 Project Type 5: Conserve Habitat

This project type involves land acquisition and management actions to conserve Gulf Coast habitats. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include, but are not limited to:

1. Conserve habitat through fee title acquisition
2. Conserve Habitat Though Use Restrictions and/or Management
3. Conserve, manage, and restore habitat that is being acquired or is currently under protection

6.3.5.1 Geology and Substrates

Fee title land acquisition or use of a conservation easement could reduce disturbance of geology and substrates by protecting lands from development pressure. This would be a long-term beneficial effect that will extend the life of the project.

Specific restoration activities identified as part of land management plans could result in short-term minor to moderate adverse effects to affected substrates and/or geology. The intensity of impacts would be highly dependent on the management goals for the acquired land and the location of the project. For example, land acquisition could permit public access for recreational use. This public use, which would depend on management stipulations developed as part of the land acquisition, could result in short-term minor to moderate adverse effects through increased soil compaction, rutting, or erosion from human presence and activity within island marshes, flats, dunes, and beaches. For example, invasive plant species are initially removed from a property, short-term disturbance to geological resources would occur, but the replanting or recolonizing of native vegetation would enhance the acquired land over the long-term.

6.3.5.2 Hydrology and Water Quality

Where easements and protected lands overlap groundwater recharge zones, surface water, or brackish-water resources, water sources and quality could be further protected from future degradation by helping to reduce runoff. Similarly, where protected land overlaps wetlands or shorelines, the protection of natural hydrologic processes could indirectly help limit development and associated effects on water quality, including via saltwater intrusion. These would be long-term beneficial effects that would occur over the life of the project.

Specific restoration activities identified as part of land management plans could result in short-term minor effects to affected water resources. The severity of impacts would be highly dependent on the management goals for the acquired land and the location of the project. For example, land acquisition could permit public access for recreational use. This public use, depending on management stipulations, could result in short-term minor effects through increased sedimentation and turbidity from human presence and activity within wetland/shallow water habitat.

6.3.5.3 Air Quality and Greenhouse Gases

No change from status quo to air quality or GHG impacts would be anticipated over the short or long-term from the identification, nomination and fee title acquisition of specific habitat areas or the addition of conservation easements to such lands.

During implementation of land management plans, there could be short-term minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles.

Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor increase in GHG emissions.

6.3.5.4 Noise

No change in status quo to noise would be anticipated over the short-term from the identification, nomination and fee title acquisition of specific habitat areas or the addition of conservation easements to such lands. Depending on the land use, some changes in noise levels could occur, however, these would need to be evaluated on a project specific basis (e.g., public access might result in minor increases to noise levels from recreational users, or preservation of lands may assist in maintaining natural quiet over a longer-term).

During implementation of the land management plan, minor short- and long-term adverse impacts to ambient noise levels could occur. The severity of impacts would depend to a large degree on the location of the project and the amount of noise that these activities would generate and the proximity of sensitive noise receptors including wildlife to these activities. Noise impacts associated with specific land management and restoration techniques, such as beach re-nourishment, are discussed under the Project Types associated with those techniques

6.3.5.5 Habitats

Conservation of habitat through fee title acquisition or use restrictions could have a long-term benefit to any habitat on the property acquired or protected. Depending on the restoration site and project goals, barrier islands, beaches, coastal transition zones, or other habitats could experience a long-term benefit from being protected and conserved through acquisition and proper management. Conservation would also allow for upland migration of beach, wetland, or other habitats as the sea levels rises and could limit development encroachment.

Specific restoration activities identified as part of land management plans could result in short-term minor to moderate adverse effects to barrier island, coastal transition zone, beach and dune, or other habitats. The severity of impacts would be highly dependent on the management goals for the acquired land and the location of the project.

Construction activities that may occur on conserved lands may result in introduction of invasive species. Use of BMPs would help prevent the introduction of invasive species. However, if invasive species became established in or adjacent to restored or enhanced habitats areas, this adverse effect would be short to long-term, would be limited to the local area and may range from minor to moderate

6.3.5.6 Living Coastal and Marine Resources

Conservation of habitat through fee title acquisition or conservation easements could have a long-term benefit to pelagic microfaunal communities, finfish, sea turtles, marine mammals, birds, and terrestrial wildlife through the protection of barrier island, beach, wetland/shallow water habitat (marshes, estuaries, mangrove swamps, etc.), or other habitat, depending on project specific goals and the location of acquired land. These habitats can be important for food supply and various life stages of some species. Land acquisitions with stipulations that limit human activities that could adversely affect coastal and marine resources would result in long-term benefits to species that utilize the acquired habitats.

Implementation of land management plans, located within or near restoration activities could result in disturbed, removed, or altered habitats, which could cause minor to moderate, short- and long-term adverse effects to species that use those habitats for forage or nesting purposes. The severity of impacts would be highly dependent on the management goals for the acquired land and the location of the project. For example, land acquisition could permit public access for recreational use. This public use, depending on management stipulations, could result in long-term minor to moderate adverse effects to area species through increased human presence and activity on acquired habitats.

6.3.6 Project Type 6: Restore Oysters

This project type involves the use of cultch or other suitable material for creating reef structures and enhancing oyster populations. Appropriate restoration/protection techniques (described in more detail in Chapter 5) for this project type include, but are not limited to:

- Enhance oyster production through cultch placement, relay, or cultivation
- Use of natural or permissible materials to create oyster reef structure

6.3.6.1 Geology and Substrates

Creating or enhancing nearshore oyster reefs can help protect eroding shorelines on the landward side of the reef structure. In addition, the placement of cultch to establish oyster reefs could reduce wave energy reaching shorelines. This would provide a long-term beneficial effect by reducing shoreline erosion because it would extend beyond the construction period. Depending on where the material was placed, the creation of oyster reefs would reduce the amount of soft bottom habitat resulting in a long-term minor adverse impact to existing soft bottom habitat. If cultch relay or a similar technique is used, there could be a long-term, minor adverse impact on geology and substrate from the removal of oysters from the original site. However, there would be a long-term beneficial impact on substrate in the project area through the increase in hard bottom and elevation as a result of the placement of oyster shell or other suitable substrate for oyster to establish a reef.

6.3.6.2 Hydrology and Water Quality

Creating and enhancing nearshore oyster reefs could help protect eroding wetlands and shallow water areas. Placement of cultch and other materials to establish oyster reefs can reduce wave energy reaching shorelines. This could provide beneficial effects by reducing wave energy of storm surges and thus indirectly reducing saltwater incursion inland. Once established, oyster beds could benefit local water clarity because oysters feed by filtering the water column. The reef could also reduce wave energy reaching the shoreline, minimizing erosion, and decreasing sediment suspended in the water column from erosion. Long-term this method could result in minor improvements to water quality. The benefits would be long-term because they would extend beyond the construction period.

Creation of oyster beds involves the placement of materials using offshore equipment and boats. Oyster reef creation can result in a short-term minor adverse impact to water quality due to the disturbance associated with the placement of materials.

6.3.6.3 Air Quality and Greenhouse Gases

During construction of reefs and placement of materials, short-term impacts to air quality and GHGs would occur from the use of gasoline and diesel powered construction vehicles and equipment, including barges, and exhaust produced by the use of this equipment. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. There is a slight potential for fugitive dust creation from construction activities, resulting in minor adverse impacts. No long-term impacts to air quality are anticipated and no long-term emissions of GHG would occur.

6.3.6.4 Noise

During construction or restoration of oyster reefs, the use of heavy motorized equipment would result in short-term minor adverse effects to ambient noise levels. The noise generated from the operation of large barges and other equipment would attract attention and contribute to the soundscape in local areas, resulting in short-term minor impacts. However, the severity of impacts would depend to a large degree on the actual project site, distance to sensitive receptors such as recreational users or wildlife and the level of ambient noise. In areas with low ambient noise, adverse impacts would be greater because the contrast created by barges and other construction equipment. Conversely, in areas where commercial and recreational water vessel traffic is commonplace there are higher ambient noise levels and impacts to ambient noise levels would be less. No adverse impacts to ambient noise levels are expected over the long-term.

6.3.6.5 Habitats

Depending on design and location, creating and enhancing oyster habitat could reduce the intensity of wave action and protect eroding shorelines, which would provide long-term benefits to these habitats. Similarly, restoration or creation of nearshore oyster reefs can help protect shallow water areas that could provide habitat for SAV. Enhancing existing reefs near SAV areas can also encourage more bird activity, which could fertilize SAV beds.

Placement of reefs near shallow water areas would require the use of in-water heavy equipment, which could produce turbidity and adversely affect the immediate area; therefore, these impacts would be short-term and minor.

6.3.6.6 Living Coastal and Marine Resources

Restoration and creation of nearshore oyster reefs can help protect eroding wetlands and shallow water areas that provide habitat for coastal and marine resources. In addition, the reef structure can also provide foraging and shelter areas for these resources such as fish and invertebrates. Creating nearshore oyster reef habitat would result in a long-term beneficial impact on birds because these structures can provide foraging and roosting areas for birds depending on the project design.

Restoration and creation of oyster reefs using natural and permissible materials may cause the short-term and minor loss or displacement of benthic organisms. Placement of these materials on soft bottom habitat would have an adverse impact to benthic organisms. Placement of breakwaters or living shorelines on hard substrate could impact existing oyster populations, resulting in short-term minor effects. Transport of oyster shell may result in the transport of invasive organisms that can have a minor short-term effect on oysters and other reef organisms.

Reef placement and relocation of cultch enhancement activities could require use of in-water heavy equipment that would adversely impact any pelagic microfaunal communities present in the proposed work area. Some smaller projects may not use in-water heavy equipment, but would shoot cultch from cannons off of a boat to the desired location. Adverse impacts would occur from increased turbidity, which decreases available light necessary for photosynthesis, and the degree of impacts would depend on the method used to place the cultch. Disruption in the water column and surface water would disturb or kill some pelagic microfaunal communities. Adverse impacts from in-water work would be short-term and minor because pelagic microfaunal communities would re-establish once turbidity dissipates. Placement of reefs near shallow water areas would involve use of in-water heavy equipment and create turbidity and habitat disturbance, which could have a short-term minor impact on finfish. The noise and disturbance could also have a short-term impact on birds, sea turtles, terrestrial wildlife, and marine mammals that would avoid the area during construction. Minor long-term impacts to birds and terrestrial wildlife could occur from disturbance associated with the potential for increased human activity around the oyster reef. If projects may incidentally harass marine mammals or may adversely affect ESA-listed marine mammals, sea turtles or fish species, authorizations or consultations with appropriate agencies would be required prior to project implementation. Creation of breakwaters, reefs, and living shorelines provides oyster habitat that would have a long-term benefit for oysters.

Oyster cultch placement (including limestone rock, crushed concrete, oyster shell, and other similar material) placed in oyster spawning areas would provide a substrate for oyster larvae to attach and grow, providing a long-term benefit to oysters. Relocating reefs and cultch material from unsuitable or poor habitat conditions to more suitable areas (with strong bottom currents in bay bottoms and intertidal and subtidal areas) could result in a long-term increase in oyster populations. Exposing suitable substrate would also encourage oyster recruitment in those areas. Oyster cultch material placed over existing hard substrate currently occupied by oysters could have a minor short-term impact on local populations as would bagless dredging to “turn over” existing oyster reefs. Long-term beneficial effects to oyster populations would result from cultch placement.

6.3.7 Project Type 7: Restore and Protect Finfish and Shellfish

The purpose of this project type is to reduce direct and bycatch-related mortality of fish and other non-target species. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

- Voluntary, temporary reduction in fishing effort
- Remove debris from freshwater, estuarine, marine, and/or critical habitats
- Provide incentives for voluntary use of technological innovations

6.3.7.1 Geology and Substrates

Equipment that may be employed for the removal of debris from marine environments could include motorized vehicles such as boats to deploy equipment or divers engaged in collection activities. Removal of this debris could temporarily displace substrates within the immediate vicinity as debris is removed and boats/equipment are used. Displaced sediment would be expected to naturally refill in a short-period as a result of the relatively small size of debris. These effects would be short-term and minor because they would likely be small and localized.

6.3.7.2 Hydrology and Water Quality

Temporary reductions in fishing effort and implementation of methods to reduce bycatch mortality could have minor short-term beneficial effects on water quality by temporarily reducing the number of boats on the water. This reduction could reduce the contaminant loadings to surface waters typical of those vessels, assuming that a temporary repose would not lead to an increase in fishing effort in fisheries that were not part of the repose. This is also assuming that vessels were not being used for purposes other than fishing. These effects would be minor and short-term because they would be small, localized, and only occur when boats are not being used for fishing.

The use of equipment to remove debris could pose a minor short-term adverse effect to water quality by increasing the risk of water quality contamination from equipment and vessels used during the removal period. During removal sediment disturbance would increase turbidity within the immediate vicinity of the removal site. This would be a minor short-term adverse effect because it would be localized and would only occur during the debris removal period. Removal of any debris that may leach or otherwise adversely affect water quality would have a long-term beneficial effect because it would remove a potential source of contamination.

6.3.7.3 Air Quality and Greenhouse Gases

Temporary reductions in fishing effort and implementation of methods to reduce bycatch mortality could have minor short-term beneficial effects on air quality by temporarily reducing the number of boats on the water. This reduction could reduce the GHG emission in the local area produced by those vessels, assuming that a temporary repose would not lead to an increase in fishing effort in fisheries that were not affected. This is also assuming that vessels were not being used for purposes other than fishing. These effects would be minor and short-term because they would be small, localized, and only occur when boats are not being used for fishing.

Removal of debris would require the use of equipment and vehicles, emission from which could result in minor adverse impacts to air quality in the project vicinity. The use of gasoline and diesel-powered equipment would contribute to an increase in GHG emissions. Based on the small scale of projects and the short timeframe, impacts would be short-term and minor. No long-term impacts are anticipated.

6.3.7.4 Noise

Temporary reductions in fishing effort could have minor short-term beneficial effects on noise by temporarily reducing the number of boats on the water and reducing the ambient noise level in the area. This reduction in ambient noise levels assumes that those vessels would not increase their fishing effort in areas that were not part of the repose or be used for purposes other than fishing. These effects would be minor and short-term because they would be small, localized, and only occur when boats are not being used for fishing.

The removal of debris could require the use of equipment, which would result in short-term minor to moderate impacts to ambient noise levels. The severity of impacts would depend to a large degree on the location of the project and the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. The effects from noise levels produced by equipment use would be minor and short-term because the noise levels would be localized and only occur when equipment was in use.

6.3.7.5 Habitats

Removal of debris from marine, estuarine, and freshwater environments could result in minor short-term adverse effects to these habitats as a result of the use equipment, displacement of substrate, and increase in turbidity in the removal area. These effects would be minor and short-term because they would be limited to the local area. There would be long-term beneficial impacts to these habitats from the removal of debris. Removal of any debris that may leach or otherwise adversely affect water quality or sediments within these habitats would also result in a long-term beneficial effect because it would remove a potential source of contamination.

6.3.7.6 Living Coastal and Marine Resources

Direct impacts on living coastal and marine resources from a voluntary and temporary reduction in fishing effort or the use of technological innovations would be based on project-specific considerations to determine the magnitude and duration. A voluntary reduction in fishing effort and/or the use of technological innovations could result in the following beneficial impacts:

- Increased finfish population levels of both commercial and recreational fisheries resources by reducing fishing and bycatch mortality;
- Reduced bycatch mortality of sea turtle, marine mammal and bird species as a result of reduced fishing pressure effort and use of technological innovations;

Minor long-term adverse impacts could result from removing a food source for certain gulls, terns, and pelicans that have adapted to following fishing boats in order to forage on the discarded bycatch. A voluntary reduction in fishing effort could also result in adverse effects to biological resources if fishing effort is displaced to another location. Debris such as derelict fishing gear may result in adverse effects to finfish, invertebrates (such as crabs), sea turtles, marine mammals, and birds that are caught, stranded, and killed in this equipment. Removal of this equipment could result in long-term moderate beneficial effects to these species that are susceptible to entanglement and mortality by derelict fishing gear by reducing incidental entanglement and mortality. The beneficial effect to these species would depend on the amount and areas of removal of derelict fishing gear.

Removal efforts may also result in short-term minor adverse effects to living coastal and marine resources present in the removal area due to temporary increases in activity, noise, vibration, and turbidity. Activities are anticipated to be short-term based on the type and size of the project. This could result in temporary displacement of individuals from the work area or mortality of individual species. The equipment that would be used to remove debris would not be anticipated to produce sound levels that would adversely affect fish or marine mammals. Temporary increases in turbidity and alteration of water quality in the work area may result in short-term minor adverse impacts. If eggs and larvae are present in the project area, they are more likely to be negatively impacted and killed by debris removal activities. Minor and short-term disturbances may impact pelagic microfaunal communities in the area from increased turbidity near in-water work, which decreases available light necessary for photosynthesis. Also, disruption in the water column and surface water would disturb or kill some pelagic microfaunal individuals. These impacts could be reduced by avoiding activities during critical spawning and rearing periods for sensitive species. BMPs and other mitigation measures that may be employed to further minimize or contain adverse impacts are detailed in Appendix 6-A. Overall, living coastal and marine resources would have a long-term beneficial effect from removal of derelict fishing gear and other types of debris from fishery habitats.

6.3.8 Project Type 8: Restore and Protect Birds

This project type involves restoring habitat that would support bird populations and implementing measures that would protect bird habitat or reduce direct impacts to nesting populations. Appropriate restoration/protection techniques for this project type (described in more detail in Chapter 5) include but are not limited to:

- Create or enhance bird nesting and/or foraging habitat;
- Protect bird foraging and nesting habitat, including the use of predator control;
- Control existing encroachment of invasive species and prevent further spread.

6.3.8.1 Geology and Substrates

Creating or enhancing bird habitat by constructing new nesting or foraging habitat such as barrier islands, beaches or wetlands could benefit geology and substrates by adding sediments into the system. Re-planting of shoreline vegetation could result in long-term benefits to soils because native plants could help stabilize shorelines and reduce erosion. These effects would be long-term because they would last beyond the construction period.

Protecting bird habitat from development would benefit geology and substrates by preventing disturbance, loss of soil, and reducing erosion. No adverse effects from protecting bird habitat on geology and substrates would occur.

Efforts to remove and limit the further spread of invasive species could have a long-term benefit to soil substrates since some invasive plant species displace native vegetation that are better suited to prevent erosion. Some invasive plants prevent the colonization of native understory plants with root systems that have evolved to prevent beach sand and soil erosion. No adverse impacts to geology or substrate would occur by limiting invasive species introduction or spread. Controlling invasive plant species entails physical cutting/removal, application of herbicides, and biological control. These techniques would have no impact on geology, but the use of equipment to remove existing vegetation could leave soils vulnerable to erosion until replacement vegetative cover is provided. This would be a short-term minor adverse effect. Herbicides or biological control methods can have a similar effect but the physical presence of dead vegetation may provide short-term erosion control.

6.3.8.2 Hydrology and Water Quality

Creating and enhancing bird nesting and foraging habitat through construction of barrier islands, beaches, and wetlands could result in shoreline stabilization that reduces erosion and reduces adverse impacts to water quality. These would be long-term beneficial effects because they would extend beyond the construction period. Some short-term adverse impacts due to turbidity could occur in the immediate vicinity of the work area. These effects would be minor and short-term as turbidity would dissipate shortly after placement activities are completed. Development of herbaceous wetlands would produce long-term benefits to hydrology and remove nutrients and other impurities from the water which improve water quality. If creation of wetlands requires excavation, short-term adverse impacts could occur, but would be expected to be local and temporary.

Protecting nesting and foraging habitat for birds would have long-term benefits by preventing development and disturbances, which can reduce runoff and benefit water quality.

Preventing the invasion of exotic species could have a long-term benefit to hydrology, since many non-native plant species have higher water requirements and can deplete soil moisture more rapidly than native species. The use of pesticides or herbicides could have an adverse minor short-term impact on water quality if they are applied where they can enter the aquatic ecosystem. Application would be expected to be in compliance with Federal labeling requirements that should limit impacts. Equipment usage and other construction activities in wetland recharge areas could result in short-term adverse impacts to surface water related to sediment compaction, disturbance, and erosion.

The use of heavy equipment to remove existing vegetation could leave soils vulnerable to erosion if replacement vegetative cover is not provided. This could result in a short-term adverse, but local impact on water quality.

6.3.8.3 Air Quality and Greenhouse Gases

During dredging, excavation or placement of materials to restore or enhance beaches, barrier islands and wetlands for bird habitat there could be short-term minor to moderate adverse impacts to air quality from the use of heavy equipment and vehicles. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor increase in GHG emissions.

6.3.8.4 Noise

During the construction period to create or enhance bird habitat, minor to major short-term adverse impacts to ambient noise levels may occur, particularly at barrier islands and beaches where beach re-nourishment activities would take place. The severity of impacts would depend to a large degree on the location of the project, type of equipment, the amount of noise that these activities would generate, and the distance to sensitive receptors such as recreational users or wildlife. Impacts on noise would be short-term during the construction period.

Predator control would have no discernible benefit or adverse impact to noise. To the extent that bird habitat is protected through land acquisition, development or potential activities which could in turn cause noise impacts may be limited.

6.3.8.5 Habitats

Creating and enhancing bird habitat would create long-term benefits from increasing stability and resiliency of barrier islands and beaches. Re-nourishment of beaches and barrier islands can enhance beach habitat and provide benefits to other habitats such as wetlands through storm surge protection. Adverse effects to wetlands could occur if existing wetland vegetation were present in the project area and would be disturbed. Short-term adverse impacts to beaches, dunes and barrier islands could occur during construction from the use of heavy equipment and from construction activities on the beach area, dunes, barrier islands, and to coastal transition zones.

Bird habitat restoration activities such as creation of wetlands, beach enhancements or re-nourishment and dune planting could have short-term to long-term minor adverse impacts on habitats from:

- Filling, disruption, or alteration of wetlands;
- Increased soil erosion, vegetation trampling, vegetation removal, or other human activity from project staging or construction, or implementation of restoration activities on adjacent uplands, coastal transition zones, barrier flats, dunes and beaches;
- Limited cover or loss of SAV populations in areas where in-water construction work, dredging, or placement of an underwater pipeline occurs (noting that pre-construction SAV surveys would be conducted) ; and
- Changes in water quality from turbidity and substrate disturbance from in-water work with construction activities or re-vegetation activities.

Protecting bird habitat from disturbance or development provides long-term benefits for habitat. Restrictions on seasonal or overall human use reduce stress on habitat and reduce habitat degradation. Some predator control could have a long-term benefit to habitat; for example, if fencing eliminates disturbance and protects sensitive habitat. Adverse short-term impacts to local habitat could occur from the disturbance associated with the construction barriers such as fencing.

Long-term benefits to habitat could occur from the prevention and control of invasive plants that contribute to the loss of habitat quality. Use of heavy equipment and herbicides could have a short-term adverse impact on habitat since some species use habitat colonized by non-native vegetation. Replacement of non-native with endemic species would have a long-term benefit to habitat. Use of herbicides and pesticides could have a short-term adverse impact to aquatic habitat if they are applied where they can enter wetlands or water bodies, and impacts to non-target vegetation or species also could occur.

Construction of islands and beaches could have an adverse impact if materials covered existing SAV populations. These impacts would be considered minor and short-term because they would occur in discrete areas. SAV habitat could be avoided through proper survey and selection of project sites. Herbicides used to control invasive plants could also enter the waterway through air dispersion, by leaching into groundwater sources, or by stormwater runoff, which would result in a moderate, short-term impact to local SAV populations.

6.3.8.6 Living Coastal and Marine Resources

Sediment deposition on beaches to create or enhance bird habitat could provide erosion protection for back-bay habitats where pelagic microfaunal communities may be present. Overall, this could result in a long-term benefit to pelagic microfaunal communities and a long-term benefit to the food chain to which pelagic microfaunal communities contribute. Beaches contribute to the quantity and quality of adjacent shallow water soft-bottom habitats that serve as nurseries or forage areas for some finfish. A larger beach area also enables improved food and nutrient exchange to aquatic habitats. Re-nourishment of beaches could be a long-term benefit to terrestrial wildlife by protecting valuable beach and dune habitat. These beaches are essential for a number of endangered beach mice, protected sea turtles and other protected species. This project type targets the improvement for bird habitat, therefore long-term benefits to birds would occur including enhanced habitat for shorebirds. Some species that nest or winter on barrier islands or sandy beaches could benefit long-term due to the restoration of habitat that has been disappearing from development along the coasts. These beaches are essential stopover areas for migratory birds to rest and feed during migration. Re-nourishment of beaches through sediment addition and restoration of barrier islands could be a long-term benefit to wildlife populations, and could be a long-term benefit by creating new habitat suitable for beach mice and other terrestrial species that utilize beach habitats.

Some short-term adverse impacts could occur from dredging and other borrowing techniques which result in suspended sediments and increased near-site turbidity. Adverse effects from dredging may include:

- Sediment removed from nearshore waters could impact local oyster populations or other benthic communities near the borrow site from increased turbidity, substrate disturbances or siltation, which could locally increase mortality and inhibit spawning activities in the short-term until silt dissipated.
- Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities. These impacts would be short-term and minor because pelagic microfaunal communities would re-establish once the turbidity dissipates.
- Fish present in the dredging area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Sea turtle and marine mammal individuals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and could result in short-term, minor impacts. If projects could incidentally harass marine mammals or adversely affect ESA-listed marine mammals or sea turtles, consultation or authorizations with appropriate agencies would be required prior to project implementation.
- Birds that forage in or near the dredge site could be temporarily affected. However, these effects would be short-term and minor as birds would be expected to move away to forage in other readily available foraging habitat during the dredging. If projects have potential to adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation.

Creating herbaceous wetlands could have long-term benefits to terrestrial and aquatic wildlife by increasing habitat quantity and quality. Planting marsh habitats could result in short-term adverse effects to pelagic microfaunal communities due to turbidity and temporary reduction of light availability. Any finfish or other animal species present in the marsh planting areas may also be temporarily disturbed by turbidity or other in-water activities that would cause species to disperse to other areas. These effects would be short-term during planting activities only and limited to the localized construction area only.

Planting native vegetation on dunes and in back barrier marshes would restore plant communities and could provide additional habitat and foraging area for other shoreline organisms. Shoreline grasses and other plants tolerant of a dune environment could be used to stabilize dunes. Replanting dune and back-barrier marsh areas could create suitable habitat for birds, benthic communities, finfish, pelagic microfaunal communities, manatees and sea turtles and also stabilize the dune or marsh area. Shoreline habitats landward of the beach could benefit from beach, dune, and back-barrier marsh restoration because restoring these areas could provide protection from storm surge and reduce erosion. This technique could provide long-term indirect benefits to migratory and resident birds as well as nesting sea turtles and beach mice or other terrestrial wildlife by expanding or stabilizing habitat. Additionally, reducing erosion could benefit oyster populations that can be adversely affected by excessive sediment in nearshore waters. Some minor short-term displacement of local birds or wildlife could occur during planting operations. However, increased vegetation in dune and marsh areas could improve habitats that are essential for migratory birds and terrestrial species and provide a long-term benefit.

Protecting bird habitat would have long-term benefits to living coastal and marine resources. No adverse impacts to living coastal and marine resources would be expected from protecting bird habitat. Predator control could have an adverse impact to some species, since these efforts such as constructing barriers could also exclude other non-target species that utilize those areas. Exclusion fencing may be buried in wetlands or shallow water habitat, which could result in short-term adverse effects from turbidity and substrate disturbance.

Use of pesticides, herbicides and other chemicals to control invasive species could result in the contamination of habitat through air dispersion, by leaching into adjacent waters, or by stormwater runoff. Use of pesticides and herbicides can have a minor short-term direct effect if wildlife is exposed. For example, removal of rats and other potential predators could have a long-term benefit to many birds and a long-term benefit to rare or sensitive species where predation limits increases in population. Contamination by ingesting treated seeds or insects could cause stress and even mortality for birds and some small mammals. Coastal and marine resources such as finfish, sea turtles, and marine mammals are likely to avoid an area of contamination. If potential for adverse effects to protected finfish, sea turtles or marine mammals from pesticide use existed, consultation with appropriate agencies would occur prior to project implementation.

Use of herbicides to control invasive vegetation could result in a minor long-term benefit to local bird populations if accompanied by efforts to restore native plant communities. Some species may have adapted to using invasive plant communities for nesting, and therefore treatment or removal of this vegetation may have a short-term minor impact.

Non-lethal management methods include fencing, providing artificial nest structures, protecting isolated peninsulas, or constructing islands that exclude predators from a single bird nest or from the entire area surrounding a colony. Predator control could result in long-term benefits to many species, including sensitive or rare bird species whose populations could increase with reduced predation.

6.3.9 Project Type 9: Restore and Protect Sea Turtles

This project type involves restoring and protecting sea turtles through activities that enhance sea turtle habitat, increase the survival of sea turtles, or both. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

- Improve nesting beaches;
- Protect and conserve nesting beaches;
- Expand existing stranding networks and rehabilitation capabilities;
- Enhance compliance monitoring through gear monitoring team coordination and enhanced observer monitoring;
- Enhance training and outreach for enforcement personnel to improve expertise in compliance requirements and increased enforcement activities.

6.3.9.1 Geology and Substrates

Nesting beaches could be conserved and protected by purchasing beach-front properties. This could allow beach and dune migration and sediment migration in response to future climate and weather, which would have long-term beneficial effects on geology and substrates over the life of the project. Nest relocations could have a short-term minor impact to affected substrates but excavated sites would be backfilled immediately after the removal of turtle eggs. No impact on geology and substrate would occur from expanding stranding networks, enhancing compliance monitoring, or enhancing training and outreach. However, if new facilities are constructed, there could be effects on geology and substrate during the construction period which will be evaluated on a site-specific basis.

6.3.9.2 Hydrology and Water Quality

Beach-front properties could be purchased to conserve and protect nesting sea turtle habitat and to allow future upland migration of the beach (i.e. nesting habitat) as sea-levels rise. Land acquisition could also help limit coastal development's effects on water quality, depending on land acquisition goals. Beach re-nourishment activities to improve sea turtle nesting habitat could also benefit hydrology and water quality by stabilizing sediments, and reducing storm surges. These beneficial effects would be long-term because they would occur over the life of the project. No impact on hydrology and water quality would occur from expanding stranding networks, enhancing compliance monitoring, or enhancing training and outreach. However, if new facilities are constructed, there could be minor effects on geology and substrate during the construction period which will be evaluated on a site-specific basis.

6.3.9.3 Air Quality and Greenhouse Gases

During restoration activities, there could be short-term minor to moderate adverse impacts to air quality from emissions generated by construction equipment and vehicles. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor increase in GHG emissions.

6.3.9.4 Noise

Minor to major short-term adverse impacts to ambient noise levels could occur during implementation of restoration activities, particularly at beaches where sea turtle improvement and conservation activities would take place. The severity of impacts would depend to a large degree on the location of the project, the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. The manual implementation of predator controls, lighting, and other nesting site enhancements could result in temporary changes to the soundscape, which would be only slightly apparent to visitors while this technique is being constructed, and would not attract attention, dominate the soundscape, or detract from current user activities or experiences. In these instances, impacts to noise would be minor. Any use of construction equipment, by contrast, could result in short-term moderate to major impacts to noise.

6.3.9.5 Habitats

Restoration efforts to protect and conserve sea turtle nesting beaches and populations could provide numerous long-term benefits to beach and barrier island habitats, as described below:

- Depending on the restoration site and project goals, barrier islands, beaches, coastal transition zones, or other habitats could experience a long-term benefit from being protected and conserved through acquisition and proper management. Conservation could also allow for upland migration as sea level rises and could limit development encroachment.
- Shoreline habitats landward of the beach (e.g., wetlands) could benefit from adjacent beach and dune area protection because these areas provide protection from storm surge and reduce erosion.

Human activity and/or the use of equipment during installation of predator control and turtle-friendly lighting, mobilization of stranding and response efforts, and monitoring could result in short-term minor to moderate adverse effects to beaches. Long-term minor to moderate adverse effects to beaches could also occur if any permanent structures were erected for equipment storage.

6.3.9.6 Living Coastal and Marine Resources

Protection and conservation of sea turtle nesting beaches would minimize development encroachment on nesting and foraging habitat, which would be a long-term benefit to birds, sea turtles, terrestrial wildlife, and other species that use the beach habitat. For rare wildlife species such as beach mice that depend on beach or dune habitat, protection and conservation of habitat could have a long-term benefit.

Restoration efforts to protect and conserve nesting beaches could also benefit pelagic microfaunal communities and finfish populations. Beach habitats contribute to the quantity and quality of adjacent shallow water habitats that serve as nurseries or forage areas for some finfish species. The beach-shallow water interface also provides nutrient exchange to aquatic habitats. Protecting and restoring these habitats could result in a long-term benefit to these species and indirectly benefit the food chain that relies on the health of adjacent shallow water areas.

Nesting beach improvement via predator control and use of turtle-friendly lighting, as well as nest detection, monitoring, and protection, such as nest marking or relocation, could provide a long-term benefit to sea turtles by increasing nesting success and hatchling survivorship, resulting in a higher number of sea turtles surviving to adulthood and reproductive life stages. For example, turtle-friendly lighting would reduce artificial light sources to minimize the potential for both nesting females and hatchlings to become disoriented or misoriented. Predator control on the beaches could also have a long-term benefit for nesting birds by reducing predation, while increased hatchling survivorship would improve food sources for bird species that prey on hatchlings.

Expansion of existing stranding networks and rehabilitation capabilities would include monitoring and improved response time, particularly in underserved areas, and also benefit stranded marine mammals. Other restoration actions could include additional funding, responder training, or construction of equipment and rehabilitation facilities. Depending on the location of facility construction, the latter action could result in adverse effects to sea turtles from associated noise, human activity, and habitat disturbance or removal. However, improved stranding response would provide a long-term benefit to sea turtle and marine mammal populations. Increased stranding monitoring and expanded rehabilitation capabilities could help sea turtle and marine mammal populations improve as sick and injured individuals are rehabilitated and released to the wild. Faster response times and more rehabilitation facilities could also result in quicker responses that would reduce the number of dead or euthanized animals and also provide important data necessary to identify causes of mortality and inform future management decisions. If potential for adverse effects to protected species may occur as a result of proposed activities, consultations with the appropriate agencies would occur prior to project implementation.

Increased coordination of NOAA's monitoring teams with other state and federal agencies, providing additional trained observers dedicated for bycatch monitoring, and increased at-sea and dockside inspections by NMFS gear specialists and marine law enforcement personnel could result in a long-term benefit to sea turtle and marine mammal populations across the Gulf Coast. Enhanced training, funding, staffing, and outreach for enforcement personnel to reduce bycatch mortality in shrimp trawl or other fisheries and to ensure compliance with existing state and federal regulations could also provide a long-term benefit to sea turtle and marine mammal populations throughout the Gulf Coast.

Adverse effects to sea turtles or other present species could result from restoration activities requiring human activity and vehicle traffic on nesting beaches. Nest relocation, if necessary, could result in a variety of short-term to long-term adverse effects, including survey errors that inadvertently miss or misidentify nests; egg loss due to handling mortality; lower hatching and emerging success; and increased predation of concentrated nests. Any such efforts would be subject to consultation under ESA to assess the level of effect.

However, conservation measures (such as those in the Appendix to Chapter 6 and others developed through the ESA section 7 consultations) and standard practices for nest relocation would avoid or minimize most adverse effects to sea turtles.

Adverse effects from implementation of exclusion fencing or predator control could occur to species that use the affected area. Poison baits could enter the waterway through air dispersion, leaching into adjacent waters, or by stormwater runoff causing a potential short-term minor adverse impact, but these effects would be minimized through proper use following any required permits. Predator control on the beaches could also have a long-term minor impact on terrestrial wildlife by eliminating a potential prey source and directly causing mortality to some species.

6.4 Alternatives 2 (and 4): Human Uses and Socioeconomics

This section describes the environmental consequences of Alternative 2 for human uses and socioeconomics.[6] These impacts consider the nine relevant project types that are identified in Chapter 5 together by resource area. Because Alternative 4 is inclusive of Alternative 2, the analysis of environmental consequences for these project types is the same for Alternative 4 as Alternative 2.

6.4.1 Socioeconomics and Environmental Justice

The environmental setting of a project area can be viewed from both a geographic perspective and a human perspective. The physical environment provides a geographical context for the populations to be evaluated in this Environmental Impact Statement. The human perspective encompasses race, ethnic origin, and economic status of affected groups.

The intent of an environmental justice evaluation under Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority and Low Income Populations" (1994), is to identify communities and groups that meet environmental justice criteria, and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of Executive Order 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies.

According to CEQ and U.S. Environmental Protection Agency guidelines established to assist Federal and State agencies, a minority population is present in a project area if (1) the minority population of the affected area exceeds 50 percent, or (2) the minority-population percentage of the affected area is meaningfully greater than the minority-population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area consists of 50 percent or more people living below the poverty threshold, as defined by the U.S. Census Bureau, or is meaningfully greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The CEQ guidance indicates that when agencies determine whether environmental effects are disproportionately high and adverse, they are to consider whether there is or would be an impact on the natural or physical environment (as defined by NEPA) that would adversely affect a minority population or low-income population.

None of the published guidelines define the term "disproportionately high and adverse," but CEQ includes a nonquantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population (CEQ 1997).

[6] The term "human use" in this chapter, and in chapters 8-12, is specific to the evaluation under NEPA of the potential impacts on those aspects of the human environment not addressed in the assessment of the physical and biological environments. The term 'human use' here is not intended to address or substitute for an evaluation of human use in the context of OPA or the OPA implementing regulations.

The project types proposed under Alternatives 2 and 4 are not, in general, expected to create a disproportionately high and adverse effect on a minority or low-income population; however, population characteristics, including race and ethnicity and per-capita income as it relates to the poverty level as well as effect determinations are considered for the environmental justice analyses in Chapters 8 through 12 and would be considered in future phases of Early Restoration.

Under Alternatives 2 and 4, project spending associated with the implementation and construction of a number of the project types would benefit regional economies. Project construction or implementation spending is likely to occur under project types to create and restore wetlands; protect shorelines and reduce erosion; restore barrier islands and beaches; restore and protect SAV; restore oysters; and restore and protect finfish, birds, and turtles. Project spending would include and contribute to support of the workforce needed to design, engineer, manage, and carry out the projects. Additionally, locally purchased (or rented) equipment and materials would also benefit regional economies.

The duration of project construction and implementation would vary by project. Generally, the higher the project cost and associated project spending, the greater the economic benefits to the region. However, the distribution of economic benefits within the region would also depend on the locations or sourcing of labor, supplies, materials, and equipment. The extent to which labor, equipment, supplies, and materials can be sourced locally or from within the region would increase the economic benefits within the region. These regional economic benefits would include jobs, income, sales, and tax receipts.

Various industries would benefit from the projects, depending on the types of activities occurring. Construction, dredging, vegetation management, and marine and ecosystem planning and science consulting industries are likely to benefit from many of the Alternative 2 project types, including wetland restoration, protecting shorelines, restoring barrier islands and beaches, among others.

Short-term beneficial impacts to the local and regional economies would occur from increases in construction jobs and demand for workforce to support the restoration projects. These jobs would provide income, sales, and downstream economic activity in the region. The level of benefit would be related to the size, duration, and level of effort necessary for each project, as well as the size of the economy in which the project is located. The degree of beneficial impact would also depend on the extent to which the workers and other project materials and equipment are supplied from the region. Non-local workers, brought in for a short period of time, would bring in additional spending as workers stay in local hotels and eat in local eating and drinking establishments, although they typically spend most of their non-per diem income in their home location. In more remote communities, these workers may bring proportionally more benefits in terms of jobs and income to the economy than in large urban areas.

There could be other factors that relate to socioeconomic characteristics that could impact residents and property owners. These could include changes to land use that could affect property taxes or otherwise affect property associated with conserving habitat projects and changes in access to natural resources associated with protecting finfish, birds, and turtles (see 6.6.5, Tourism and Recreational Use). Depending on the type and location of the project, these implications could have a beneficial or at most a minor adverse impact on socioeconomic characteristics. For example, acquisition of lands for conservation or protection purposes could reduce the tax base for property tax collections; however, improvements in habitat associated with this project may draw additional visitors to the area with associated visitor spending, increasing sales and tax receipts on retail purchases. Adverse impacts to property taxes would vary by the property involved and would depend on the assessed value of the property, which would vary depending on its location. The relative importance of the taxes to the county would also affect the level of impact. It is anticipated that only a few properties would be impacted.

Long-term job creation could also occur under Alternatives 2 and 4. This type of benefit would be associated with project types that have the potential to increase tourism and visitation to an area, such as restoring beaches or islands and protecting shorelines. Additionally, projects that require additional staffing, specialists, and others in the support of new programs, such as turtle monitoring and responders to restore and protect turtles, would have beneficial impacts to the regional economy.

6.4.2 Cultural Resources

All projects conducted as part of Early Restoration would secure all necessary state and federal permits, authorizations, consultations or other regulatory processes related to sensitive habitats (e.g. wetlands or Essential Fish Habitat) and protected species (e.g. marine mammals such as manatee, federal or listed species such as sea turtles, etc.), and other applicable requirements. In particular, a complete review of proposed projects under Section 106 of the NHPA will be completed as environmental review continues. Tribal Consultations would be initiated with all interested federally recognized tribes. Projects will be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. Project-specific analyses of potential impacts to cultural resources are presented in Chapters 8 through 12 and would be for future phases of Early Restoration.

While the potential for impacts to cultural resources should be mitigated through BMPs and the Section 106 process, some projects have the potential to adversely impact cultural resources. In particular, under Alternatives 2 and 4, project types involving the removal and placement of dredged materials, and ground or substrate disturbing construction activities have the potential to lead to short and long-term minor to moderate impacts to cultural resources stemming from the potential for inadvertent damage to unknown sites, buildings, structures, or objects. In addition, the use of oyster shells to construct reefs raises the possibility of inadvertent site destruction, because some shell deposits along the coast have accumulated due to prehistoric human activity. Potential source areas of oyster shell would have to be assessed for human or natural accumulations before they are used for construction. Similarly, projects requiring the filling of canals would need to consider whether the canals qualify as historic properties under Section 106.

If not properly conducted, activities conducted under Alternatives 2 and 4 have the potential to compromise a site's integrity and cause a loss of cultural information. BMPs and other mitigation measures that may be employed, depending on site-specific considerations, to further minimize or contain adverse impacts to cultural resources are detailed in Appendix 6-A.

These same project types under Alternatives 2 and 4 could also lead to long-term beneficial impacts through the identification of cultural resources. Cultural or historical sites that may otherwise have been unknown or unprotected may benefit from the NHPA Section 106 review process that could require it be avoided and preserved in its natural state. In this manner, some information may be retrieved and future impacts could be avoided.

6.4.3 Infrastructure

Under Alternatives 2 and 4, project types involving the removal and placement of dredged materials, such as wetland restoration, barrier island restoration, and beach nourishment, and projects involving ground- or substrate-disturbing construction activities, such as the placement of engineered shoreline protection structures, could lead to short and long-term minor to major adverse impacts to infrastructure. These impacts would result if there were inadvertent damage to unknown submerged offshore pipeline infrastructure or buried onshore utility infrastructure. An analysis describing the probability and severity of such potential incidents has not been conducted at the programmatic level for this document. As appropriate on a project-specific basis, surveys would be conducted to locate and aid in avoiding or minimizing potential impacts to buried and submerged infrastructure as a result of specific project activities.

Projects requiring land-based construction activities and associated movement of construction materials and equipment by road could lead to short and long-term minor to major adverse impacts to infrastructure. Project types that enhance public access to natural resources for recreational use, enhance recreational experiences, and/or promote environmental and cultural stewardship, education, and outreach, may include construction activities such as backfilling of canals and shallow water bodies to create wetlands; removal of bulkheads, rip rap and other structures to restore hydrologic connectivity; dune restoration; or the placement of breakwaters or other engineered erosion control structures on the shoreline. Impacts would result from increases in construction traffic; temporary or permanent closure of roads or parking lots; or damage to roadways. These would range in intensity based on the duration of road or parking lot closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of roadway damage.

Similarly, projects requiring the permanent removal or relocation of infrastructure, such as the alteration of land cover for habitat conservation or the removal of piers or other coastal fixtures that are affecting SAV beds targeted for restoration, could lead to short and long-term minor to major adverse impacts on infrastructure.

Projects that stabilize and protect shorelines, reduce erosion, or reduce the effects of wave activity, such as the construction of groins or breakwaters; beach re-nourishment; oyster reef placement; and restoration of SAV beds would have potential long-term beneficial impacts for infrastructure. These would result from the protection of roadways, parking lots, utilities, and other nearshore infrastructure from the effects of storm waves and associated shoreline erosion.

Project types discussed under Alternative 2 that do not involve physical construction activities, including voluntary reductions in fishing effort and voluntary use of improved fishing technology, would have no impact to infrastructure.

6.4.4 Land and Marine Management

Project types implemented under Alternative 2 would have varying impacts on land and marine management depending on the type of management or land ownership applicable to the project site. Most of the project types that would be implemented under Alternative 2 would have no impact to land and marine management, since projects would generally be consistent with the prevailing management plans and direction governing the use of the land and marine areas where the projects would take place.

Projects implemented at national, state and local parks, wildlife refuges, and wildlife management areas could have short-term minor to moderate adverse impacts to land and marine management. These impacts would be temporary, and would occur if activities such as creation or restoration of wetlands; beach re-nourishment; placement of erosion control and shoreline protection; or other projects requiring construction activities result in partial or full closure of these areas during construction. Impacts could include the interruption of park operations; furlough of park staff; assignment of staff to duties not normally associated with their jobs; interruption of interpretive programs; and similar impacts. In the long-term, projects implemented under Alternative 2 would have beneficial impacts on land and marine management at parks, wildlife refuges wildlife management areas because these restoration activities would help park management and staff fulfill their obligations to manage these properties for the benefit of the environment and human enjoyment.

Projects that result in changes in ownership and/or permitted uses, such as the fee acquisition of a parcel or conservation easement held by a land trust, could have long-term impacts to land management. For restoration activities that involve the fee acquisition of land to create wetlands, restore wildlife habitat, protect shorelines, or other types of activities included under Alternative 2, land ownership and potentially zoning would change. Deed restrictions would permanently limit the amount and type of development that would be permitted on these lands and the management and the intensity of use on these properties would likely change. The transfer of fee title to lands and creation of conservation easements, however, are transactions negotiated or arranged between willing parties and as such would not give rise to adverse impacts to land and marine management.

Projects implemented within marine protected areas under Alternative 2 would be designed to restore habitat and conserve living coastal and marine resources and would therefore align with the management goals of these areas. Restoration of SAV, construction of oyster reefs, finfish restoration efforts, and efforts to protect bird and turtle nesting, among other efforts, could have some short-term minor to moderate adverse impacts if these activities require temporary closure of areas that are managed for fishing or recreational use. In the long-term, because projects aimed at habitat restoration and conservation of living resources would align with and further the management goals of marine protected areas, these projects are expected to have beneficial impacts on marine management.

6.4.5 Tourism and Recreational Use

Under Alternatives 2 and 4, project types involving the removal and placement of dredged materials, ground or substrate disturbing construction activities as well as restoration activities could result in some short-term minor to moderate adverse impacts to wildlife viewing, short-term minor to moderate adverse impacts to hunting, beach and waterfront visitors, and tourism and short-term minor to moderate adverse impacts to fishing. Impacts to these different resource areas stem from (1) temporary site closures enacted to protect public safety; and (2) construction activities and associated wildlife disturbances. These activities may result in limits tourism and recreational uses accessibility and opportunities. Degrees of impacts to the various aspects of tourism and recreation are highly dependent on the proximity of projects to the proposed recreation and tourism resources, with impacts likely being highly localized to specific project areas. Impacts as a result of these project types are experienced at greater levels in areas with limited tourist and recreation options, including barrier islands and less populated and/or rural areas leading to short-term minor to moderate adverse impacts in these types of locations. Impacts as a result of these project types could be particularly perceptible to hunting, fishing, tourism and beach and waterfront visitation as a result of the temporary fish and wildlife (particularly waterfowl) displacement due to disturbances from construction and the loss of tourism and visitors to beach and waterfront areas. If these closures occur in areas with high levels of hunting, fishing, and tourist activity such as beach and waterfront visitation occurs, adverse impacts would be readily apparent to resource users, who may choose to pursue these recreational activities in different locations.

Alternative 2 project types could also result in long-term beneficial impacts to wildlife viewing, hunting, beach and waterfront visitors, tourism and fishing. Long-term beneficial impacts to tourism and wildlife viewing from these restoration projects would occur as a result of the improvement of wildlife and aquatic species habitat and associated increases in wildlife and aquatic species populations, diversity and viewing opportunities. In addition, benefits to beach and waterfront recreation could occur from increased opportunities for swimming, snorkeling, and sightseeing. Similarly, long-term beneficial impacts to hunting and recreational fishing could occur as a result of increases in the wildlife and aquatic species populations. Overall, improvements to habitat quantity and quality could occur over time under such project types and could result in long-term beneficial impacts to the above-mentioned resources through increased opportunities to view more abundant wildlife and enhanced recreational experiences.

6.4.6 Fisheries and Aquaculture

Construction or implementation of project types under Alternative 2 have the potential to adversely impact commercial fisheries through activities that involve the use of in-water equipment, dredging, construction of groins and breakwaters, transplanting and vegetating SAV beds, installation of water signage, and reef placement activities. The potential for turbid waters; displacement of sand and sediment during construction, dredging, and placement; as well as potential for spills and leaks from equipment used in these activities could affect water quality and adversely impact fish and shellfish habitat, resulting in temporary adverse impacts to commercial fisheries in areas where these activities occur. Therefore any impacts would be localized and short-term, and construction activities would only result in disruptions to fishing operations if operations were in close proximity to the restoration projects. Depending on the location of project activities and their proximity to commercially important fisheries, short-term impacts could range from none to moderate.

No long-term impacts to commercial fisheries are anticipated with projects to conserve habitat. Project types intended to further sea turtle conservation may result in additional on-board observers and monitoring of commercial fishery by-catch that could affect commercial fishing operations. The development and implementation of projects to restore and protect finfish would require project-specific considerations of their economic effects on commercial fisheries.

Additionally, the restoration of bird or sea turtle nesting habitat would not result in any foreseeable impacts to commercial fisheries, but could result in short-term minor to moderate effects during any in-water construction (turbidity, disruption of foraging or other uses, etc.).

In the long-term, projects to restore and protect wetlands, protect shorelines and reduce erosion, restore and protect SAV, and restore oysters could provide forage, shelter areas, or improved habitat for commercially important fish and shellfish species. This could potentially benefit certain commercial fisheries that land, harvest, sell, and process these resources.

There are no anticipated short- or long-term impacts on land-based aquaculture operations associated with the project types under Alternative 2; some in-water operations located in proximity to planned projects may experience short-term disruptions related to construction activities resulting in short-term minor adverse impacts.

6.4.7 Marine Transportation

Under Alternative 2, impacts could occur from increases in marine traffic if there were sufficient numbers of barges involved and utilizing a congested shipping route. This could result in minor adverse impacts occurring in highly localized areas. Shipping routes would need to be properly identified prior to the selection of borrow sites for dredge and fill material.

Projects including wetlands, beaches, and barrier islands restoration and shoreline would reduce erosion and provide wave attenuation which would provide a long-term benefit for marine transportation infrastructure such as the Gulf Intracoastal Waterway, ports, and harbors. Long-term beneficial impacts could also result from proper planning and coordination of dredging activities in ways that allow for the dredging of fill material from borrow sites that provide opportunities to improve navigational channels.

6.4.8 Aesthetics and Visual Resources

Under Alternative 2, project types involving the use of construction equipment, including equipment used for the movement and placement of materials (i.e. barges) and barriers enacted to protect public safety would result in some minor to moderate short-term adverse impacts on aesthetics and visual quality. These impacts result from the presence of equipment, barriers and construction-related dust and emissions. During the construction period, visible impedances would detract from the natural landscape and create visual contrast for observers visiting the project areas. Over the short-term, there would be a change in the viewshed that would be readily apparent and that would attract attention. Although such changes would not dominate the viewscape, they would detract from current user activities or experiences. The severity of impacts would depend to a large degree on the location of the proposed projects, the degree to which these activities would be visible, the duration of the construction activities and how commonplace these activities and equipment are in certain areas. Impacts would likely be greatest in areas frequented by large groups of visitors and in areas where more natural viewsheds exist (i.e. barrier islands). In the event that construction and ground disturbing projects result in the long-term placement of structures and signage, long-term minor adverse impacts to aesthetics would occur, though these types of objects are often commonplace and would become less intrusive over time.

Project types involving dredging activities associated with projects centered on beach re-nourishment, by contrast, could result in restricted access to scenic viewsheds within the area where such activity was occurring. These activities would adversely impact the scenic character of natural areas by introducing mechanical dredging, a readily observable visual contrast into the natural setting which would dominate and detract from current user activities or experiences. In these instances, short-term impacts to aesthetics could rise to major. More typically, impacts would be expected to range from minor to moderate.

Restoration, improvement and wetland and habitat creation project types would lead to long-term beneficial impacts from the increased visual character of the landscape occurring from the projects restoring or enhancing areas to their natural conditions and over-time increasing the scenic quality of the project area.

Project types involving the identification and nomination of specific habitat areas for fee title acquisition or conservation easement would lead to long-term beneficial impacts to aesthetics and visual quality as over time as these restoration techniques would lead to the acquisition and enhancement of natural areas.

6.4.9 Public Health and Safety, Including Flood and Shoreline Protection

Under Alternative 2, project types involving construction and construction activities could result in short-term minor adverse impacts to public health and safety as a result of the operation of heavy equipment and construction materials. In addition, if hazardous chemicals or other materials are unintentionally released into the environment, soils, groundwater, and surface waters would be adversely impacted. Similarly, construction projects involving the use of boats and barges, and associated equipment, for the placement of materials to create habitat could impact the public through construction activities and the potential to contaminate surface waters, resulting in short-term minor adverse impacts. During implementation of land management plans, fire management activities could cause minor health and safety impacts. Measures to avoid risk to public health and safety would include, but not be limited to, approved burn plans/permits; assistance from local fire departments; and monitoring of weather conditions. BMPs and other mitigation measures that may be employed to further minimize or contain adverse impacts are listed in Appendix 6-A.

Long-term beneficial impacts from restoration and rehabilitation projects could reduce the risk of potential hazards, such as storm surges, to visitors, residents, and workers from improved shoreline integrity and additional buffer and flood storage from storms. Project types that include restoring wetlands and submerged aquatic vegetation could reduce water contamination currently present in the localized areas and help to alleviate potential future water contamination, also resulting in long-term beneficial impacts.

6.5 Alternatives 3 (and 4): Physical and Biological Environments

This section describes the environmental consequences of Alternative 3 for physical and biological environments. Impacts for physical and biological environments are disaggregated by each of the three project types identified in Chapter 5 under this Alternative. For each project type, potential restoration techniques are noted. Because Alternative 4 is inclusive of Alternative 3, the analysis of environmental consequences for these project types is the same for Alternative 4 as Alternative 3.

6.5.1 Project Type 10: Enhance Public Access to Natural Resources for Recreational Use

This project type would involve enhancing recreational users' experiences by creating new or improved access to natural resources. Access to recreational areas can be improved by enhancing or constructing infrastructure and by providing or improving access to natural resources in publicly owned areas (parks, marinas, etc.). Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

1. Improving access to natural resources for recreational use through the construction or enhancement of infrastructure

2. Purchase of access rights, easements, and/or property in areas to increase access to resources for recreational purposes

6.5.1.1 Geology and Substrates

Recreational enhancement projects could provide long-term beneficial effects on geology and substrate where existing degraded infrastructure (such as damaged piers or dilapidated public facilities) was improved or enhanced. These types of projects would result in long-term beneficial effects because they would extend beyond the construction period.

Enhancing or constructing infrastructure could require work with heavy equipment in construction or staging areas that would temporarily disturb soils and sediments in upland, shallow water areas or nearshore habitats. These construction activities could result in the local removal, compaction, and erosion of upland, shallow-water, and nearshore substrates in construction/development areas. These would be minor to moderate short- to long-term adverse effects because they would be localized and could have readily apparent effects on local soils, substrates and/or geologic features, with some effects lasting only during the construction period (heavy equipment use) and others extending beyond the construction period (compaction and displacement resulting from infrastructure).

6.5.1.2 Hydrology and Water Quality

Recreational enhancement projects have the potential to have minor to moderate long-term beneficial effects on water quality depending on the proposed activity. If recreational enhancements occurred at an existing site where ongoing degradation is occurring (e.g. unimproved or failing parking areas with poor stormwater management near coastal waters), there could be long-term benefits to water quality. Other projects may have beneficial effects by improving access to marine pump-out stations and reducing marine discharges of waste. Navigational aids would also tend to reduce the risk of boating accidents and associated fluid releases and spills. Projects that reduced degradation of water quality would result in long-term beneficial effects because they would extend beyond the construction period.

Equipment usage and other construction activities in wetland recharge areas could result in short-term minor to moderate adverse impacts to surface water related to sediment compaction, disturbance, and erosion. Conversion of natural areas to impervious surfaces could increase, which could increase stormwater runoff and pollutants to the receiving water body and cause minor long-term adverse effects. Long-term decreases in surface water quality could occur from increased use and presence of boats and equipment within the project area, which would be minor and long-term because the effects would be localized and would extend beyond the construction period. Equipment usage and other construction activities in wetland recharge areas could result in short-term adverse impacts to surface water related to sediment compaction, disturbance, and erosion.

6.5.1.3 Air Quality and Greenhouse Gases

During construction activities, short-term impacts to air quality and GHGs would occur from the use of gasoline and diesel powered construction vehicles and equipment, including barges, and exhaust produced by the use of this equipment. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. There is a slight potential for fugitive dust creation from construction activities, resulting in minor to moderate adverse impacts. Long-term minor adverse effects from these enhancements due to increased recreational use and associated vehicle traffic may occur.

6.5.1.4 Noise

During the construction period, adverse impacts to ambient noise levels could occur, particularly along shorelines where construction activities would take place. The severity of impacts would depend to a large degree on the location of the project and the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. Installation activities, equipment operation, and vehicle or boat traffic associated with the construction activities could result in short-term minor to major adverse impacts to noise, especially if they occurred in natural areas. For example, during the use of motorized heavy equipment such as cranes and barges, noise would be created which would be readily apparent and attract attention. Although such changes would not dominate the soundscape and some sounds could be dampened or masked by ambient wave or ship noise, these actions could detract from the current user activities or experiences and create audible contrast for visitors in the project area.

Over the long-term, the addition of infrastructure into the existing setting would present some amount of increase in ambient noise levels. For example, a new boat ramp would result in increased noise associated with boat launching. Long-term adverse effects of these enhancements could range from minor to moderate depending on the existing noise level of the surrounding landscape, the location and distance to sensitive receptors, and the anticipated increase in use.

6.5.1.5 Habitats

Not all public access projects necessarily result in benefits to habitats. While some of these projects do result in benefits, benefit from Alternative 3 to these resources is not specifically tied to this project type in Table 6-3 and 6-4. Some recreational enhancement projects may have long-term beneficial effects on wetlands, barrier islands, beaches, coastal transition zones, SAV and shallow water habitats. For example, enhancement projects could reduce degradation and recreation use in habitats in settings where recreation usage that is currently diffuse is redirected to a site that is more appropriate and conducive to recreational activities. Enhancing or constructing infrastructure could require in-water work with heavy equipment and long-term operation and maintenance of these facilities. These activities could result in the following short and long-term minor to moderate adverse impacts:

- Filling, disruption, or alteration of wetlands;
- Soil erosion, vegetation trampling, vegetation removal, or other human activity from project staging or construction, or implementation of recreational enhancements;
- Permanent shading of SAV or other habitats from placement of structures;
- Filling of shallow water areas, and the conversion of upland pervious areas to impervious surfaces (parking areas, buildings, etc.) related to the placement of piers, foundations, or other permanent structures;
- Localized plant species displacement or loss, introduction of invasive species, and degradation of habitats including potential habitat fragmentation as a result of an increased recreational activity and human encroachment in habitats, such as beaches or wetlands;
- Increased human-related disturbances of fish, birds or marine mammals in the long-term that may be present in the waterway related to facilities that include in-water activities;

- Cover or loss of SAV populations in areas where in-water construction work occurs. However, turbidity would dissipate quickly and effects from this water quality change would be minor and short-term. Adverse effects from covering SAV would be minimized due to pre-construction surveys in specific project locations; impacts to SAV could be minor and would be avoided and minimized to the maximum extent practicable.

These effects would depend on the size and scale as well as the location of facilities. Effects would also vary depending on presence of sensitive habitats and availability of other similar sensitive habitats in the project vicinity.

6.5.1.6 Living Coastal and Marine Resources

Some public access projects might have long-term beneficial effects on living coastal and marine resources (e.g., by reducing degradation and recreation use in habitats or on populations in settings where recreation usage that is currently diffuse is redirected to sites that are more appropriate and conducive to recreational activities). In some cases, degradation and recreational use that may have been wide spread, thus affecting a larger geographic region, could be focused on areas that can be managed for the recreational impact and that are not sensitive or important habitats for living coastal and marine resources. These projects could subsequently result in a long-term benefit through the stabilization and protection of sensitive habitats and biological resources. However, not all public access projects necessarily result in these types of benefits to living coastal and marine resources, and the summary tables, Table 6-3 and 6-4, assignment of benefit from Alternative 3 to these resources are not specifically tied to this project type. Enhancing or constructing infrastructure could require in-water work with heavy equipment and long-term operation and maintenance of these facilities. These activities could result in the following adverse impacts:

- Short-term, minor disturbance or loss of pelagic microfaunal and benthic communities from increased turbidity, which decreases available light necessary for photosynthesis, and disruption in the water column and surface water. These impacts would be short-term and minor because pelagic microfaunal communities would re-establish once turbidity dissipates;
- Short-term, minor displacement of finfish individuals or mortality of individual finfish, including adults, eggs, or larvae, could occur during construction, depending on timing and location of construction and affected species. However, it is anticipated that finfish would move away to other readily available aquatic habitats during the construction period. Fish present in the dredging or fill-placement area could be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sound pressure level increases or entrainment could result in mortality of individual finfish. This would be a minor short-term adverse effect that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Short-term, minor to moderate displacement of sea turtle and marine mammal individuals from the work area due to increase in activity, noise, vibration, and turbidity during construction. Removal or cover of existing foraging habitat (SAV) by suspended sediments during in-water activities could present another potential adverse effect to sea turtles or manatees. However the extent of covered SAV would be limited to the local area and sediments would be expected

to settle quickly once constriction was completed. Therefore, these impacts would be short-term and minor. If projects may incidentally harass marine mammals or adversely affect ESA-listed marine mammals or sea turtles, consultation or authorizations with appropriate agencies would be required prior to project implementation.

- Long-term, minor to moderate displacement, fragmentation or loss of nesting/rearing and foraging habitat for sea turtles, birds, or terrestrial wildlife as a result of recreational activity and encroachment on beaches and shallow waters used by these species.
- Short-term minor displacement of local birds and terrestrial species or mortality of intertidal invertebrates could occur during construction, although most wildlife would be expected to move away to forage in other readily available foraging habitat during this activity. Structures that extend above the water surface could also potentially improve predator access to nesting birds, resulting in a minor long-term adverse impact. If projects have potential to adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation;
- Short-term to long-term, minor displacement or loss of oyster populations or other benthic organisms from increased turbidity, substrate disturbance, or siltation of any hard substrate areas that house oyster populations during construction, loss of habitat from placement of permanent structures on soft sediments or hard substrates, damage to habitats from contact with vessels or from biofouling from leaked or otherwise discharged fluids (oil, gas, and diesel).

6.5.2 Project Type 11: Enhance Recreational Experiences

This project type involves a variety of techniques that could be implemented to enhance recreational experiences. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

- Re-nourish beaches through sediment addition;
- Place stone, concrete, or permissible materials to create artificial reefs;
- Construction to enhance recreational experiences;
- Enhance recreational fishing opportunities through aquaculture techniques; and
- Reduce and remove land-based debris.

6.5.2.1 Geology and Substrates

Sediment deposition on beaches or creation of shallow and/or inshore artificial reefs could result in a benefit to local geology and substrates by reducing erosion, as well as reducing wave action and inducing sediment deposition. These beneficial effects would be long-term because they would extend beyond the construction period. However, these actions also carry the long-term minor to moderate risk of interrupting geomorphic processes. This could include erosion or deposition outside the targeted area to be protected. Beach re-nourishment would require heavy equipment and construction activity that could result in increased sedimentation, compaction, or rutting. These adverse effects would be minor to moderate and short- to long-term because they could occur during the construction period and beyond the construction period. The construction and use of temporary pipelines to deliver sediment could also disturb substrates along the pipeline corridor and increase erosion temporarily. This adverse effect would be minor and short-term because it would be localized and generally would not extend beyond the construction period. Sediment deposition could require periodic maintenance on beaches that have degraded due to ongoing conditions (such as lack of sand deposition due to breakwaters or jetties and limitation of beach/dune migration due to development) which could result in minor, short-term adverse effects to local substrates through equipment operation and human activity.

Creation of artificial reefs could result in long-term benefits on geology and substrate. Placement of an artificial structure would create more substrate in an area which may or may not be hard-bottom habitat limited. Adverse effects could occur to geology and substrates from installation of artificial reefs. The creation of artificial reefs could cause short-term minor adverse impacts on geology and substrate due to initial placement of the vessel or other man made structure materials. Placement could cause loosening of sediments and may negatively impact any seafloor features; however, these impacts are anticipated to be temporary in nature. Placement of an artificial reef structure could also cause a loss in soft-bottom habitat. Placement of structures would permanently cover existing geology and substrates, which would be a long-term minor effect.

Constructing facilities such as wildlife viewing platforms or dune walkovers adjacent to Gulf waters could result in work with heavy equipment in construction or staging areas; this work could temporarily or permanently affect geology and substrates. These activities would result in removal, displacement, and compaction of geology and substrates, causing minor to moderate short- to long-term adverse effects.

The effects that removal of land-based debris during construction would have on geology and substrates would need to be considered in project-specific analyses. For example, if new recycling facilities are constructed, then minor short-term adverse effects on substrates could occur during construction activities. These effects would be minor and short-term because they would be localized and would occur during the construction period. However, other components of this technique (e.g., developing marine debris reduction programs, encouraging local businesses to recycle) would not likely have any effects on geology and substrates.

6.5.2.2 Hydrology and Water Quality

Beach re-nourishment (depending on design) could help reduce storm surges on coastal wetlands and associated surface water resources, and limit the shoreward extent of saltwater flow. This could provide short-term beneficial effect to hydrology and water quality because it would extend beyond the construction period. Since not all techniques and project types within Alternative 3 would be capable of providing this same benefit to hydrology and water quality, Tables 6-3 and 6-4 do not reflect a benefit to hydrology and water quality for this alternative.

Artificial reef construction could result in short-term minor adverse impacts on water resources, as placement of the material could cause short-term suspension of sediments at the restoration site. These impacts are expected to be temporary in nature, and have no significant impact on water quality. Any structure used for this technique should be properly cleaned of any contaminants. However, minor adverse impacts to water resources could occur if contaminants are released during the ship cleaning process. Indirect impacts would be determined based on site-specific and project-specific considerations.

Turbidity curtains could be utilized to decrease turbidity associated with placement of structures. Turbidity curtains are floating impermeable barriers that are constructed of flexible material with an upper hem containing floatation material and a lower hem that is weighted. They effectively minimize sediment transport from the area of disturbance by allowing suspended sediment to settle out of the water column in a controlled area (Southeast Florida Coral Reef Initiative 2008).

Equipment usage and other construction activities in wetland recharge areas could result in short-term minor to moderate adverse impacts to surface water related to sediment compaction, disturbance, and erosion. Construction of recreational or aquaculture facilities could result in additional impervious surface, which could increase runoff and reduce infiltration. These would likely be minor long-term effects because they would be small, localized, and extend beyond the construction period. Other adverse facility construction-related effects could include short to long-term minor to moderate decreases in water quality from disruption of sediments, increased turbidity, and increased fluid spill risk from equipment. Additionally, aquaculture facilities or research and development laboratories along the Gulf Coast could adversely affect water quality through the discharge of fish hatchery effluent. This would be a minor long-term adverse effect because effects would be localized and extend beyond the construction period. Increased human activity or vehicle traffic as a result of improved recreation facilities could also result in minor, long-term adverse effects to water quality.

The effects that removal of land-based debris during construction would have on hydrology and water quality would need to be considered in project-specific analyses. For example, if new recycling facilities are constructed, then minor short-term adverse effects on groundwater could occur during construction activities. These effects would be minor and short-term because they would be localized and would occur during the construction period. However, other components of this technique (e.g., developing marine debris reduction programs, encouraging local businesses to recycle) would not likely have any effects on groundwater. In some cases removal of debris could result in a long-term benefit to water quality and hydrology. For example, if debris was disrupting or otherwise affecting surface flow in a small waterway, removal could result in beneficial effects to hydrology.

6.5.2.3 Air Quality and Greenhouse Gases

During construction activities, short-term impacts to air quality and GHGs would occur from the use of gasoline and diesel powered construction vehicles and equipment, including barges, and exhaust produced by the use of this equipment. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. There is a slight potential for fugitive dust creation from construction activities, resulting in minor adverse impacts. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to a short-term and minor to moderate increase in GHG emissions. Long-term minor adverse effects from these enhancements due to increased recreational use and associated vehicle traffic may occur.

6.5.2.4 Noise

During implementation of restoration actions, adverse impacts to the environment due to an increase in the ambient noise level could occur. The severity of impacts would depend to a large degree on the location of the project and the amount of noise that these activities would generate and the distance to sensitive receptors such as recreational users or wildlife. Installation activities, equipment operation, and vehicle or boat traffic associated with the construction of artificial reefs, beach re-nourishment, or facility construction could result in short-term minor to major adverse impacts to noise, especially if they occurred in natural areas. For example, during the use of motorized heavy equipment such as cranes and barges, noise would be created which could be readily apparent and attract attention. Although such changes would not dominate the soundscape and some sounds could be dampened or masked by ambient wave or ship noise, these actions could detract from the current user activities or experiences and create audible contrast for visitors in the project area.

For projects that would increase motorized use or result in operational noise, long-term adverse changes to the ambient noise levels would be minor to moderate. For projects that would not create an increase in motorized use or operational sound, such as beach re-nourishment, long-term impacts to the ambient noise levels would be unlikely.

6.5.2.5 Habitats

The creation and restoration of beaches could result in a long-term benefit to habitats including wetlands, barrier islands, beaches and dunes, SAV, and coastal transition zones. These activities could help stabilize substrates, support sediment deposition, and reduce erosion. Since not all techniques and project types within Alternative 3 would be capable of providing this same benefit to habitats, the assignment of Alternative 3 benefits to habitats is not specifically associated with this project type.

Adverse effects could occur to these habitats from different restoration activities such as dredging, placement of sediment transport pipeline, placement of sediment, or facility construction. Adverse impacts from these activities could include:

- Filling, disruption, or alteration of adjacent habitats;
- Increased soil erosion, vegetation trampling, vegetation removal, or other human activity from project staging or construction, or implementation of restoration activities on adjacent uplands, coastal transition zones, barrier flats, dunes and beaches;
- Cover or loss of SAV populations in areas where in-water construction work, dredging, or placement of an underwater pipeline occurs; turbidity would dissipate quickly and effects from this water quality change would be minor and short-term. However, adverse effects from covering SAV would be minimized due to pre-construction surveys in specific project locations; impacts to SAV could be minor and would be avoided and minimized to the maximum extent practicable; and
- Change in water quality from turbidity and substrate disturbance from in-water work with heavy equipment or leaching of construction fluids.

These impacts would be, for the most part, minor to moderate and would take place over the short-term, during the construction activity.

The creation of artificial reefs could benefit sessile and benthic encrusting organisms and forage fish by providing substrate and interstitial spaces for use as habitat and forage areas. The benefits from artificial reefs depend on site-specific and project-specific considerations.

Minor to moderate adverse effects such as habitat trade-offs could result from placement of artificial hard substrate on soft bottom habitat as a transition from naturally occurring soft bottom benthic communities and the managed species that utilize these areas could occur. Placement of artificial reef can also modify water circulation patterns and cause accretion or erosion of the adjacent habitats. Proper siting of artificial structures will minimize these potential impacts.

Construction of wildlife viewing platforms, dune walkovers or other features for recreational users could result in adverse short-term and long-term minor to moderate adverse impacts, including:

- Increases in sedimentation and turbidity during construction;
- Fluid spills (e.g. oil, diesel, gasoline, etc.) in or near wetlands or shallow water areas from equipment usage and other construction activities;
- Soil erosion, vegetation trampling, vegetation removal, or other human activity from project staging or construction, or implementation of recreational enhancements on uplands, coastal transition zones, barrier flats, dunes and beaches;
- Permanent conversion of pervious areas to impervious surfaces (parking areas, buildings, etc.) related to the placement of piers, foundations, or other permanent structures, fill of shallow water areas;
- Conversion of upland habitats from placement of structures or facilities;
- Degradation or fragmentation of habitats and/or introduction of invasive or exotic species as a result of increased recreational activity and human encroachment in habitats, such as beaches or wetlands;
- Facilities that included in-water activities could increase long-term human-related disturbances of fish, birds or marine mammals that may be present in the waterway.

These effects would depend on the size, scale, and placement of facilities, presence of sensitive habitats and availability of other similar sensitive habitats in the project vicinity. Placement of structures could also cause permanent shading of SAV or other habitats. There could be short-term adverse disruption of habitats during construction from use of heavy equipment and staging of construction activities.

The effects of removal of land-based debris on Gulf Coast habitats would need to be considered in project-specific analyses. For example, if new recycling facilities are constructed, adverse effects could occur as a result of vegetation clearing, grading, or other actions. These effects would be minor and short-term because they would be localized and would occur during the construction period. However, other components of this technique (e.g., developing marine debris reduction programs, encouraging local businesses to recycle) would not likely have any effects.

6.5.2.6 Living Coastal and Marine Resources

Beach re-nourishment could protect eroding beaches and shallow water habitats. These actions would provide long-term benefits to benthic populations, pelagic microfaunal communities, and finfish, by providing forage areas and habitat. Restored beaches are intended for public use, potential benefits of restored beaches to birds, terrestrial wildlife and other species are not assumed here, but could be an outcome depending on location and level of use.

Some short-term minor adverse effects could occur if resources, including oysters, fish, sea turtles, marine mammals, benthic communities, and pelagic microfaunal communities, were present in the construction area. Possible impacts could include increased turbidity, reduction of water quality, noise pollution, vibration, and disruption to the water column and habitat. In particular, in-water dredging, reef construction, and recreation or aquaculture facility construction activities could result in the following adverse impacts:

- Short-term to long-term, minor displacement or loss of oyster populations or other benthic organisms from increased turbidity, substrate disturbance, leaching of equipment fluids or siltation of any hard substrate areas that house oyster populations during construction;
- Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities. These impacts would be short-term and minor because pelagic microfaunal communities would re-establish once the turbidity dissipates;
- Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by equipment, human activity, or sediment. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and alteration or removal of habitat. Sound pressure level increases or entrainment could also result in mortality of individual finfish. These would be minor short-term adverse effects that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation;
- Sea turtle and marine mammal individuals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and result in short-term, minor impacts. Sea turtle and marine mammals may be present in project areas where use of explosives may be used to sink a vessel for creation of an artificial reef. Underwater explosions may affect marine life by causing death, injury, or behavioral reactions; depending on the distance an animal is located from a blast. This could result in short to long-term impacts to individuals and may result in minor to moderate impacts. If projects have potential for adverse effects to marine mammals or sea turtles, consultations or incidental harassment authorizations with appropriate agencies would be required prior to project implementation;
- Construction in upland habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, bird and terrestrial wildlife individuals that forage or nest in or near the work area could be temporarily disturbed or displaced. Effects could vary from minor and short-term to major and long-term depending on the effect of the action. If projects have potential to adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation;
- Stormwater runoff from impervious surfaces could enter waterways and increase turbidity as well as carry pollutants that could affect benthic organisms, fish or foraging bird species; and
- Increase in visitation could result in noise and other disturbances as well as degradation or fragmentation of habitats and upland areas used by wildlife in the vicinity.

The creation of artificial reefs could result in short-term minor adverse impacts on biological resources as the initial placement of the reef could disturb fauna at the site. While the reduction of the available soft bottom habitat would be a long-term impact it is expected to be minimal in relation to the amount of that habitat available in the Gulf. If a vessel is being placed as an artificial reef, a higher disturbance of benthic fauna could be likely, as it would cover a larger area of the seafloor. There could be long-term benefits to benthic encrusting, sessile, and mobile epifauna, and small forage fishes.

The creation of artificial reefs could provide indirect benefits to marine fish, marine mammals, sea turtles, and potentially oysters and shallow water coral. A created artificial reef provides benefit to marine fish, marine mammals, and sea turtles, all of which would utilize a well-colonized reef for food, shelter, or spawning areas. If the reef is placed in shallow enough water, oysters or shallow water coral would also potentially colonize the structure. Long-term minor to moderate benefits could occur if artificial reefs provide habitat for larger resident fishes and temporary foraging sites for larger migratory fishes. When overfishing is a problem, however, artificial reefs may aggravate the overfishing problem by concentrating remaining fishes and making them more vulnerable to fishing pressure, which could be an adverse impact. Whether the availability of new habitat will serve to increase fish and/or invertebrate biomass or will only serve to concentrate organisms at the site, is likely dependent on where the reef is sited and how it is designed.

Sea turtle and marine mammal individuals present in project areas where use of explosives to sink a vessel for creation of an artificial reef could be subject to temporary increased noise, turbidity, and water quality changes, all of which could temporarily displace individuals or prey during construction and could result in short-term, minor impacts. If projects have potential for adverse effects to marine mammals or sea turtles, consultations with appropriate agencies would be required prior to project implementation.

Adverse minor long-term impacts could occur if restoration activities 1) placed materials or sediment directly on top of resources (e.g. existing oyster reef/substrates); 2) removed foraging or nesting habitat, such as replacing vegetation with a permanent structure; 3) provided access for native and non-native terrestrial animals that could increase predation of local nesting birds; or 4) increased recreational use and access of habitats that were previously undisturbed. Some hatcheries/aquaculture operations could result in a long-term minor adverse effect to marine mammals or fish through unintentional exposure of wild organisms to disease through release of contaminated effluent or infected animals. Stocking of hatchery-reared finfish could also, long-term, negatively impact the genetic diversity of the wild stock. Development and implementation of a genetics management plan or release of only sterile individuals may decrease the chance of long-term negative impacts on native populations. Stocked fish could also affect the balance of the fish community, competing for food and habitat resources with finfish species present in the receiving waters. Implementation of stocking management plans with consideration of the location of sensitive finfish species could prevent disruption to the native finfish populations through competition or predation. BMPs and other mitigation measures that may be employed, depending on site-specific considerations, to further minimize or contain adverse impacts to cultural resources are detailed in Appendix 6-A.

The effects of removal of land-based debris on living coastal and marine species would need to be considered in project-specific analyses. For example, if new recycling facilities are constructed, then adverse effects to some species' foraging or nesting habitat could occur as a result of vegetation clearing, grading, or other actions. These effects would be minor and short-term because they would be localized and would occur during the construction period. However, other components of this technique (e.g., developing marine debris reduction programs, encouraging local businesses to recycle) would not likely have any effects.

6.5.3 Project Type 12: Promote Environmental and Cultural Stewardship, Education, and Outreach

This project type would facilitate environmental and cultural stewardship, education, and outreach through a variety of different mediums that concentrate on the coastal resources of the Gulf of Mexico. Appropriate restoration techniques (described in more detail in Chapter 5) for this project type include but are not limited to:

1. Create or enhance natural resource-related education facilities
2. Create or enhance natural resource-related education programs

6.5.3.1 Geology and Substrates

Construction of new or improved educational facilities could result in local removal, displacement, and compaction of geology and substrates. These effects would be minor to moderate and short to long-term because they would be localized and could have readily apparent effects on local substrates/geologic characteristics, with some effects lasting only during the construction period and others extending beyond the construction period (i.e. compaction and displacement resulting from infrastructure).

6.5.3.2 Hydrology and Water Quality

Construction of educational facilities in, or directly upstream of, freshwater or brackish water could result in short-term decreases in water quality from disruption of sediments, and/or increased turbidity. Equipment usage and other construction activities in wetland recharge areas could result in short-term minor to moderate adverse impacts to surface water related to sediment compaction, disturbance, and erosion. Conversion of pervious areas to impervious surfaces could reduce infiltration while increasing stormwater runoff and pollutants to the receiving surface water body. These effects would be minor and long-term because they would be localized and extend beyond the construction period.

6.5.3.3 Air Quality and Greenhouse Gases

During construction activities, short-term impacts to air quality and GHGs would occur from the use of gasoline and diesel powered construction vehicles and equipment, including barges, and exhaust produced by the use of this equipment. Examples of project-specific projected emissions are located in Chapters 8 through 12. The severity of impacts would be highly dependent on the length and type of construction required and the location of the project. There is a slight potential for fugitive dust creation from construction activities, resulting in minor adverse impacts. The use of gasoline and diesel-powered construction vehicles and equipment could contribute to short-term minor to moderate increase in GHG emissions. Long-term minor adverse effects from these enhancements due to increased recreational use and associated vehicle traffic may occur.

6.5.3.4 Noise

Adverse impacts to the ambient environment during the construction of education facilities would be short-term and minor to moderate from noise disturbances such as the operation of bulldozers, front-loaders and other large earth moving equipment required for construction of new or improved recreational facilities. Depending on the surrounding environment, distance to sensitive receptors and ambient noise conditions, these construction sounds could potentially dominate the soundscape and detract from current user activities or experiences.

An increase in education programs could also have long-term minor to moderate adverse noise effects due to increases in motorized use or human activity, if resulting activity occurred in areas of previously undisturbed, quiet settings.

6.5.3.5 Habitats

Providing educational features for both the public and students through coastal exhibits and collections, hands-on activities, educational outreach programs related to coastal resources, and other interactive activities could increase public awareness of wetlands, barrier islands, beaches, and other habitats, as well as highlight their value to the overall ecosystem. The facilitation of educational outreach and interactive activities would be a long-term benefit to the environment by increasing public knowledge of, and support for, preservation and conservation of these habitats, as well as potentially resulting in behavioral changes during future public encounters with sensitive habitats. However, increased visitation to barrier islands, dune areas, or other habitats as a result of educational programs could have long-term minor to moderate adverse effects to previously minimally used or visited habitats.

Enhancing or constructing educational infrastructure could require work with heavy equipment and long-term operation and maintenance of these facilities. Adverse construction and operational habitat effects could include short to long-term minor to moderate adverse effects including:

- Short-term minor to moderate increases in sedimentation and turbidity during construction;
- Filling, disruption, or alteration of wetlands;
- Soil erosion, vegetation trampling, vegetation removal, or other human activity from project staging or construction or implementation of recreational enhancements on uplands, coastal transition zones, barrier flats, dunes and beaches;
- Permanent shading of SAV or other habitats from placement of structures;
- Filling of shallow water areas, and the conversion of upland pervious areas to impervious surfaces (parking areas, buildings, etc.) related to the placement of piers, foundations, or other permanent structures;
- Localized plant species displacement or loss, introduction of invasive species, and degradation or fragmentation of habitats as a result of an increase recreational activity and human encroachment in habitats, such as beaches or wetlands;
- Increased human-related disturbances of fish, birds or marine mammals in the long-term that may be present in the waterway related to facilities that include in-water activities;
- Cover or loss of SAV populations in areas where in-water construction work occurs. However, turbidity would dissipate quickly and effects from this water quality change would be minor and short-term. Adverse effects from covering SAV would be minimized due to pre-construction surveys in specific project locations; impacts to SAV could be minor and would be avoided and minimized to the maximum extent practicable.

6.5.3.6 Living Coastal and Marine Resources

Providing educational features for both the public and students through coastal exhibits and collections, hands-on activities, educational outreach programs related to coastal resources, and other interactive activities could increase public awareness of marine resources and of their value to the ecosystem, potentially leading to greater support for resource management and conservation. This could result in a long-term benefit to nearshore benthic communities, oysters, marine mammals and other species beyond the lifespan of the project. However, increased visitation to barrier islands, beaches, or other habitats as a result of educational programs could have long-term minor to moderate adverse effects to local marine resources via localized species displacement or loss and degradation of habitats.

Enhancing or constructing infrastructure to promote environmental and cultural features could require work with heavy equipment or operations and maintenance in areas where nearshore benthic communities, finfish, oysters, sea turtles, or other species are present. Adverse construction effects to these species could include short to minor to moderate effects, including:

- Displacement or loss of oyster populations or other benthic organisms from increased turbidity, substrate disturbance, leaching of equipment fluids or siltation of any hard substrate areas that house oyster populations during construction.
- Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities. These impacts would be short-term and minor because pelagic microfaunal communities would re-establish once the turbidity dissipates.
- Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by equipment, human activity, or sediment. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and alteration or removal of habitat. Sound pressure level increases or entrainment could also result in mortality of individual finfish. These would be minor short-term adverse effects that would not be expected to reduce local fish populations or designated EFH. If projects have potential to adversely affect protected fish species, consultations with the appropriate agencies would be required prior to project implementation.
- Sea turtle and marine mammal individuals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and result in short-term, minor impacts. If projects have potential for adverse effects to marine mammals or sea turtles, consultations or incidental harassment authorizations with appropriate agencies would be required prior to project implementation.
- Construction in upland habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, bird and terrestrial wildlife individuals that forage or nest in or near the work area could be temporarily disturbed or displaced. Effects could vary from minor and short-term to major and long-term depending on the effect of the action. If projects have potential to adversely affect protected bird species, consultations with the appropriate agencies would be required prior to project implementation.

Additional long-term minor to moderate adverse effects to species could result from the placement of piers, foundations, or other permanent structures; fill of shallow water areas; increased human traffic, and the conversion of pervious areas to impervious surfaces (parking areas, buildings, etc.). These actions could result in disturbance or displacement of local species. Construction of educational or cultural facilities could result in operational effects that could affect living coastal and marine resources, including:

- Stormwater runoff from impervious surfaces could enter waterways and increase situation and turbidity as well as carry pollutants that could affect benthic organisms, fish or foraging bird species;
- Increase in visitation could result in noise and other disturbances as well as degradation or fragmentation of habitats or upland areas used by wildlife in the vicinity;
- Potential for introduction of exotic or invasive species may increase;
- Facilities that included in-water educational activities could increase human-related disturbances of fish, birds or marine mammals that may be present in the waterway.
- If projects have potential to adversely affect protected species, consultations with the appropriate agencies would be required prior to project implementation.

6.6 Alternatives 3 (and 4): Human Uses and Socioeconomics

This section describes the environmental consequences of Alternative 3 for human uses and socioeconomics.[7] These impacts consider the three relevant project types that are identified in Chapter 5 together by resource area. Because Alternative 4 is inclusive of Alternative 3, the analysis of environmental consequences for these project types is the same for Alternative 4 as Alternative 3.

6.6.1 Socioeconomics and Environmental Justice

The environmental setting of a project area can be viewed from both a geographic perspective and a human perspective. The physical environment provides a geographical context for the populations to be evaluated in this Environmental Impact Statement. The human perspective encompasses race, ethnic origin, and economic status of affected groups.

The intent of an environmental justice evaluation under Executive Order 12898,"Federal Actions to Address Environmental Justice in Minority and Low Income Populations" (1994), is to identify communities and groups that meet environmental justice criteria, and suggest strategies to reduce potential adverse impacts of projects on affected groups. The purpose of Executive Order 12898 is to identify and address the disproportionate placement of adverse environmental, economic, social, or health impacts from Federal actions and policies on minority and/or low-income communities. This order requires lead agencies to evaluate impacts on minority or low-income populations during preparation of environmental and socioeconomic analyses of projects or programs that are proposed, funded, or licensed by Federal agencies.

According to CEQ and U.S. Environmental Protection Agency guidelines established to assist Federal and State agencies, a minority population is present in a project area if (1) the minority population of the affected area exceeds 50 percent, or (2) the minority-population percentage of the affected area is meaningfully greater than the minority-population percentage in the general population or other appropriate unit of geographic analysis. By the same rule, a low-income population exists if the project area consists of 50 percent or more people living below the poverty threshold, as defined by the U.S.

[7] The term "human use" in this chapter, and in chapters 8-12, is specific to the evaluation under NEPA of the potential impacts on those aspects of the human environment not addressed in the assessment of the physical and biological environments. The term 'human use' here is not intended to address or substitute for an evaluation of human use in the context of OPA or the OPA implementing regulations.

Census Bureau, or is meaningfully greater than the poverty percentage of the general population or other appropriate unit of geographic analysis.

The CEQ guidance indicates that when agencies determine whether environmental effects are disproportionately high and adverse, they are to consider whether there is or would be an impact on the natural or physical environment (as defined by NEPA) that would adversely affect a minority population or low-income population.

None of the published guidelines define the term “disproportionately high and adverse,” but CEQ includes a nonquantitative definition stating that an effect is disproportionate if it appreciably exceeds the risk or rate to the general population (CEQ 1997).

The project types proposed under Alternatives 3 and 4 are not, in general, expected to create a disproportionately high and adverse effect on a minority or low-income population; however, population characteristics, including race and ethnicity and per-capita income as it relates to the poverty level as well as effect determinations are considered for the environmental justice analyses in Chapters 8 through 12 and would be considered in future phases of Early Restoration.

Project spending under Alternative 3 (and 4) would also benefit regional economies. Project construction or implementation spending is likely to occur under projects to enhance public access to natural resources for recreational use and to enhance recreational experiences, including creating new and improved infrastructure for public access, improvements to parks and marinas, renourishing beaches, placing materials to create reef structures, construction of new facilities (bathrooms, lodging, piers, ramps), and removing land-based debris. Project spending would support workforce to design, engineer, manage, and carry out the projects. Additionally, locally purchased (or rented) equipment and materials would also benefit the regional economy.

A number of industries would benefit from the Alternative 3 (and 4) project types, including construction, dredging, recreation service providers, and natural resources educational and outreach consultants.

Short-term beneficial impacts to the local and regional economy would occur from construction jobs and workforce for Alternative 3. These jobs would support income, sales, and downstream economic activity in the regional economy. The level of regional benefit would vary by project and would depend on the magnitude and level of effort necessary for each project, the sourcing of labor and materials, and the size of the economy in which the project is located. In smaller or more remote communities, these project workers may bring proportionally more benefits in terms of jobs and income to the economy than in large urban areas.

Depending on the type and location of the project, these implications could have a beneficial or at most a minor adverse impact on socioeconomic characteristics. For example, acquisition of lands for conservation or protection purposes could reduce the tax base for property tax collections; however, improvements in habitat associated with this project may draw additional visitors to the area with associated visitor spending, increasing sales and tax receipts on retail purchases. Adverse impacts to property taxes would vary by the property involved and would depend on the assessed value of the property, which would vary depending on its location. The relative importance of the taxes to the county would also affect the level of impact. It is anticipated that only a few properties would be impacted.

Long-term job creation could also occur under Alternative 3. This type of benefit would be associated with project types and techniques that have the potential to increase tourism and visitation to an area, such as creating or improving new recreational facilities and infrastructure and renourishing beaches, and improving the quantity and quality or recreational opportunities such as the installation of artificial reefs. Long-term benefits to socioeconomic characteristics could be anticipated as a result of artificial reef creation from increased recreational opportunities such as fishing, diving, and snorkeling. Additionally, long-term job creation could also occur with project types that increase public access for recreational use and support facilities and programs for environmental and cultural stewardship, education, and outreach. These projects may require additional staffing, specialists, and others in the support of new programs or facilities, which would have beneficial impacts to the regional economy.

6.6.2 Cultural Resources

Project types under Alternative 3 that are centered on the enhancement of public access and recreational experiences could potentially have a minor to moderate long-term adverse impact on cultural resources from ground and substrate disturbing construction activities and dredging activities, as discussed for Alternative 2. In addition, the likely increase in visitor use, over time, could lead to the inadvertent discovery of newly exposed cultural resource sites and an increase in the frequency of unauthorized collection of artifacts and vandalism. Long-term beneficial impacts could occur if discoveries follow proper procedures leading to their protection.

All projects conducted as part of Early Restoration would secure all necessary state and federal permits, authorizations, consultations or other regulatory processes related to sensitive habitats (e.g. wetlands or Essential Fish Habitat)) and protected species (e.g. marine mammals such as manatee, federal or listed species such as sea turtles, etc.), and other applicable requirements. In particular, a complete review of proposed projects under Section 106 of the NHPA will be completed as environmental review continues. Tribal Consultations would be initiated with all interested federally recognized tribes. Projects will be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. Project-specific analyses of potential impacts to cultural resources are presented in Chapters 8 through 12 and would be for future phases of Early Restoration.

While the potential for impacts to cultural resources should be mitigated through BMPs and the Section 106 process, some projects have the potential to adversely impact cultural resources. In particular, under Alternatives 3 and 4, project types involving the removal and placement of dredged materials and ground or substrate disturbing construction activities have the potential to lead to short and long-term minor to moderate impacts to cultural resources stemming from the potential for inadvertent damage to unknown sites, buildings, structures, or objects. In addition, the use of oyster shells to construct reefs raises the possibility of inadvertent site destruction, because some shell deposits along the coast have accumulated due to prehistoric human activity. Potential source areas of oyster shell would have to be assessed for human or natural accumulations before they are used for construction. Similarly, projects requiring the filling of canals would need to consider whether the canals qualify as historic properties under Section 106.

If not properly conducted, activities conducted under Alternatives 3 and 4 have the potential to compromise a site's integrity and cause a loss of cultural information. BMPs and other mitigation measures that may be employed, depending on site-specific considerations, to further minimize or contain adverse impacts to cultural resources are detailed in Appendix 6-A.

These same project types under Alternatives 2 and 4 could lead to long-term beneficial impacts through the identification of cultural resources. Cultural or historical sites that may otherwise have been unknown or unprotected may benefit from the NHPA Section 106 review process that could require it be avoided and preserved in its natural state. In this manner, some information may be retrieved and future impacts could be avoided.

6.6.3 Infrastructure

Project types implemented under Alternative 3 (and 4) that involve ground- and substrate- disturbing construction activities could lead to short and long-term minor to major adverse impacts to infrastructure. These impacts would result if there were inadvertent damage to unknown submerged offshore pipeline infrastructure or buried onshore utility infrastructure resulting from dredging associated with navigational channel improvements or damage to buried onshore infrastructure associated with the construction boat ramps, piers, public bathrooms, camp sites, or other recreational and public access facilities. An analysis describing the probability and severity of such potential incidents has not been conducted at the programmatic level for this document. As appropriate on a project-specific basis, surveys would be conducted to locate and aid in avoiding or minimizing potential impacts to buried and submerged infrastructure as a result of specific project activities.

Many of the project types discussed under Alternative 3 would involve the transport of construction vehicles, equipment, and materials. These project types, which include techniques such as placement of artificial reef structures; construction of boardwalks, trails, roads, bridges and other types of public access; and the construction of boat ramps, piers, public bathrooms, lodging facilities and similar amenities, could lead to short and long-term minor to major impacts on infrastructure. The impacts associated with these projects would result from increases in construction traffic; temporary or permanent closure of roads, parking lots, or facilities; or damage to roadways or other infrastructure that provides access to the shoreline. The impacts to existing infrastructure, such as roadways, could also occur from increased vehicle use as a result of increased visitor use over time. These impacts would range in intensity based on the duration of road, parking lot or public access closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of damage to roadways, facilities or access points. Future infrastructure improvements or increased maintenance could be necessary to address impacts to infrastructure.

Projects that upgrade existing infrastructure or add new infrastructure, such as navigational improvements; construction of boat ramps, piers, public bathrooms, and lodging facilities; the construction of trails, boardwalks, and similar types of public access; and many of the other project types discussed above, would have long-term beneficial impacts to infrastructure.

In some cases, increased use of enhanced or created recreational facilities could result in indirect impacts to existing infrastructure such as roads, parking lots, bathrooms, or similar public facilities. These effects are anticipated to be minor and localized and would be long term.

Projects that enhance public access to natural resources for recreational use, enhance recreational experiences, and/or promote environmental and cultural stewardship, education, and outreach, that would not involve construction activities, such as the development of natural resource-related educational programs or research and development to enhance management of recreational fisheries, would have no impacts on infrastructure.

6.6.4 Land and Marine Management

Projects implemented under Alternative 3 would have varying impacts on land and marine management depending on the type of management or land ownership applicable to the project site. Projects would generally be consistent with the prevailing management plans and direction governing the use of the land and marine areas where the projects would take place; therefore, the project types that would be implemented under Alternative 3 are generally expected to have no adverse impacts to land and marine management.

Projects implemented at national, state and local parks, wildlife refuges, and wildlife management areas could have short-term minor to moderate adverse impacts to land and marine management. These impacts would be temporary, and would occur as a result of construction activities related to projects such as the construction of new roads, trails, boardwalks, and other public access improvements; or the construction of boat ramps, piers, lodging facilities, public restroom, campgrounds, and similar facilities. Impacts would be related to temporary, full or partial closures of parks and refuges. In the long-term, projects implemented under Alternative 3 would have beneficial impacts on land and marine management at parks and wildlife refuges, and wildlife management areas because these activities would improve public access and amenities, helping park management and staff fulfill their obligations to manage these properties for the benefit of the environment and human enjoyment.

Most land trusts in the northern Gulf of Mexico region are focused on conservation of critical natural habitat; some land trusts also promote educational and recreational opportunities. Therefore, it is unlikely that projects implemented under Alternative 3 would have impacts to land and marine management on trust lands. Short-term minor to moderate adverse impacts could occur during construction activities to the extent that those activities interfere with the trusts' abilities to fulfill their management obligations as set forth in the trusts' charters or in the deeds to the specific parcels of land. In the long-term, there would be beneficial impacts to land and marine management from projects aimed at providing and enhancing access and recreational opportunities.

Projects that may be implemented within marine protected areas under Alternative 3, such as the placement of artificial reef structures, could have some short-term minor to moderate adverse impacts if these activities require temporary closure of areas that are managed for fishing or other types of recreation. However, because those projects would need to conform to the management plans and direction governing where reef materials may be placed, the impacts to marine management in those cases would be beneficial.

6.6.5 Tourism and Recreational Use

Under Alternative 3, project types that involve the removal and placement of dredged materials and ground or substrate disturbing construction activities including access improvement projects would result in some short-term minor to moderate adverse impacts to wildlife viewing, hunting, beach and waterfront access, fishing and tourism. The intensities of impact to the various resources are highly dependent on the proximity of projects to the affected resources, with impacts being highly localized to specific project areas. Impacts such as site closures as a result of these project types would be experienced at greater levels in areas with fewer alternate tourism and recreation options, including barrier islands and less populated and/or rural areas leading to short-term minor to moderate adverse impacts in these types of locations. Impacts as a result of these project types could be particularly perceptible to people engaged in hunting, fishing, tourism and beach and waterfront visitation as a result of the temporary displacement of wildlife (particularly waterfowl) due to disturbances from construction. If these closures occur in areas with high levels of hunting, fishing, and tourist activity such as beach and waterfront visitation occurs, adverse impacts would be readily apparent to resource users, who may choose to pursue these recreational activities in different locations.

Project types that include techniques for improving public access would result in long-term beneficial impacts to tourism and recreational experiences by creating new or improved infrastructure and connectedness to these resource areas and amenities. However, increase recreational use could also result in some level of user conflict either for the same resource (e.g., higher recreational fishing pressures closer to infrastructure) or over different recreational activities (e.g. wildlife viewing or hiking and hunting).

Recreational enhancement project types that include techniques such as beach re-nourishment, placing materials to create reef structures, and enhancing recreational infrastructure could provide long-term benefits to tourist and recreational uses by improving wildlife habitat, and increasing recreational amenities (such as beach facilities). As a result, these types of projects would enhance wildlife viewing, hunting, beach and waterfront visitors, fishing and tourist experiences and provide additional areas in which to experience these opportunities.

Project types designed to promote environmental and cultural stewardship, education and outreach are not anticipated to have adverse effects on tourism, other than minor disruptions that could be associated with construction of new facilities. This Alternative is anticipated to lead to long-term beneficial impacts through the expansion of education and stewardship programs.

6.6.6 Fisheries and Aquaculture

Alternative 3 project types intended to enhance recreational experiences, such as those to re-nourish beaches and place stone and materials may result in short-term adverse impacts to nearshore fisheries from construction and restoration activities involving the use of in-water equipment, dredge and placement activities, or creating and placing reef structures. The potential for the displacement of sand and sediment causing increased turbidity and the potential for spills and leaks from equipment could affect water quality and aquatic habitat. The degree to which these effects would create tangible impacts to fisheries is dependent on the actual location of project activities and the proximity to fishery operations, ranging from no short-term impacts to moderate short-term adverse impacts.

Projects to enhance recreational experiences may include stock enhancement, which could result in additional catch for commercial fishing benefitting harvest, landings, sales, and processing industries. In addition, the use of aquaculture operations to rear finfish and shellfish for release could result in refinement and improvement of aquaculture techniques for future use, which would benefit future aquaculture operations.

6.6.7 Marine Transportation

Alternative 3 project types involving dredging, trenching, and ground or substrate disturbing construction activities and debris removal would have short-term minor adverse impacts to marine transportation in the event that shipping routes are blocked or obstructed by dredging equipment or barges or from increases in marine traffic. These impacts would occur in highly localized areas and would be within marine transportation operational capacities to withstand. Project types that enhance or increase public access or enhance recreational experiences could result in long-term minor adverse impacts to marine transit from increased recreational boat traffic and ferry traffic obstructing or slowing of commercial shipping traffic. However, given the low likelihood of recreational use of commercial shipping channels in general, it is anticipated that any such impacts would be minor. In addition, placement of signage, buoys, or other markers to alert recreational boaters to the location of commercial navigation channels would likely reduce these long-term impacts.

Although all of these project types are geared toward recreational rather than purely commercial uses, some could have long-term beneficial impacts to marine transportation if existing navigational infrastructure is improved. The construction of navigational aids, safe harbor improvements, and the dredging of navigational channels in particular would have long-term beneficial impacts on marine transportation.

6.6.8 Aesthetics and Visual Resources

All project types under Alternative 3 would have minor to moderate short-term adverse impacts from the temporary landscape during the construction period from the presence of bulldozers, front-loaders and other large earth moving equipment required for upgrades or new facilities. These impacts would constitute a change in the viewshed that is readily apparent and which would attract attention in the short-term. Although such changes would not dominate the viewscape, they could detract from the current user activities or experiences. Over the long-term, the addition of infrastructure and facilities into the existing setting would present some degree of visual contrast. Long-term adverse effects of these enhancements would range from minor to moderate, depending on the existing aesthetic character of the surrounding landscape. Where the addition of these facility enhancements into the existing setting would present a large degree of visual contrast, impacts would be moderate because they would detract from the current user activities or experiences. Where the additional infrastructure would be incorporated into landscapes that are already characterized by human-made features, impacts would be at most minor.

Projects that enhance public access and recreational experiences may have some long-term visual and aesthetic benefits (e.g., conducting beach renourishment; removal of land-based debris). However, as noted above, other projects may not have benefits to aesthetic resources, and may result in long-term minor to moderate adverse impacts (e.g, infrastructure enhancement such as improvement or expansions of boat ramps).

6.6.9 Public Health and Safety, Including Flood and Shoreline Protection

Project types under Alternative 3 involving construction and construction activities would result in short-term minor adverse impacts to public health and safety as a result of the operation of heavy equipment and construction materials as well as the potential of hazardous waste and materials contaminating soils, groundwater, and surface waters. Projects would be designed using similar safety-related BMPs to reduce hazards.

Projects centered on enhancing public access of areas would likely lead to long-term beneficial impacts to public safety by providing access to sites that currently lack infrastructure or require infrastructure improvements. However, projects that result in hardening of the shoreline, e.g., boat ramp improvements, would also lead to long-term minor adverse impacts related to flood and shoreline protection. Projects resulting in increased visitor use could cause visitor conflicts and associated safety issues (e.g., increase recreational boat traffic), which result in required additional law enforcement during certain high use times. However, impacts to public health and safety would likely be minor.

Long-term beneficial impacts to public health and safety could be experienced through the promotion environmental and cultural stewardship, education and outreach project types in the event that users of the sites are more knowledgeable about potential harms in the project areas.

6.7 Range of Direct and Indirect Impacts of Alternatives

Previous sections of Chapter 6 assessed the direct and indirect impacts associated with each proposed project type, organized by action alternative. Tables 6-3 and 6-4 provide an overview of the potential impacts to key resource areas for each alternative by project type. Because this PEIS identifies a number of types of potential projects that may occur, a range of impacts is anticipated for each resource. The range presented here represents the range of impacts estimated for each resource (e.g., minor to moderate) that is reported in each of the more specific project-type-level analyses. For example, if analyses for Project Types 1 through 4 report "minor" effects to a particular resource is likely under alternative 2, but Project Types 5 through 9 found that effects were likely to be moderate to major for that resources, Table 6-3 and 6-4 would report "minor to major" impacts for that resource. In a few cases, possible but rare or improbable impacts are described in the text, but are not shown in the table.[8] Specific impacts of Alternatives, when implemented, would depend on where individual projects may occur, the timing of proposed construction and other activities, and the scale of the proposed activities. This table provides a basis for comparing the ranges for the environmental impacts of the alternatives. Section 6.9 describes potential cumulative impacts of the alternatives by resource.

As shown in Table 6-3 and 6-4, most resources are expected to experience benefits across all alternatives. However, Table 6-3 and 6-4 do not capture the magnitude or duration of potential benefits. The Table also does not identify benefits relative to potential adverse impacts, i.e., it is not intended to represent "net" benefits attributed to individual project types or alternatives. As reported in the detailed text in above sections, benefits may include direct benefits, such as habitat improvements that are the focus of a particular restoration activity (e.g., wetland restoration), as well as indirect benefits to other resources that may occur as a result of the habitat improvement (e.g., improvements to water quality and aesthetics). Because of their defined focuses, Alternative 2, in general, has more direct benefits to physical and biological environments, while Alternative 3 has more direct benefits to

[8] In particular, refer to the Hydrology and Water Quality (Enhance Public Access to Natural Resources for Recreational Use), and the Living Coastal and Marine Resources and Habitats discussions for Project Types 10 (Enhance Public Access to Natural Resources for Recreational Use) and 11 (Enhance Recreational Experiences).

human use and socioeconomic environments. Indirect effects vary widely, and are described in more detail in above sections.

Adverse impacts for all Alternatives range from No Effect to Major impacts, depending on the resource. Impacts to habitats, hydrology and water quality, and noise are anticipated to be higher in Alternatives 3 and 4 than in Alternative 2. Adverse impacts that affect socioeconomics are expected to range from minor to moderate under Alternatives 3 and 4, as opposed to minor under Alternative 2. A summary of impacts by resource and alternative is provided below. The Trustees note that there are differences in environmental consequences that could result from recreational use project types as compared to ecological project types. Tables 6-3 and 6-4 present a range of potential impacts (e.g., minor to moderate) for each alternative, as, particularly for Alternative 4, the relative amount of recreational use restoration and ecological restoration that may ultimately occur are not known at this time. Project-specific analyses in Chapters 8 - 12 and in any future tiered analyses will describe the specific impacts associated with the specific proposed projects.

Table 6-3. Benefits and Adverse Impacts of Alternatives by Resource and Project Type

Benefit	No Effect	Minor Adverse Effect	Minor to Moderate Adverse Effect	Moderate Adverse Effect	Minor to Major Adverse Effect	Moderate to Major Adverse Effect	Major Adverse Effect
B	0	1	2	3	4	5	6

Alternative			**Alternative 4**											
			Alternative 2									**Alternative 3**		
Resources	**Sub-Resources**	**Short Term / Long Term**	**Create & Improve Wetlands**	**Protect Shorelines / Reduce Erosion**	**Restore Barrier Islands and Beaches**	**Restore & Protect SAV**	**Conserve Habitat**	**Restore Oysters**	**Restore & Protect Finfish & Shellfish**	**Restore & Protect Birds**	**Restore & Protect Sea Turtles**	**Enhance Public Access to Natural Resources for Recreational Use**	**Enhance Recreational Experiences**	**Promote Environmental and Cultural Stewardship, Education, and Outreach**
Geology and Substrates	Upland Geology and Soil; Nearshore Coastal Geology and Sediment	Short Term	2	1	1	1	2	1	1	1	1	2	2	2
		Long Term	2 B	2 B	2 B	1 B	B	1 B	0	B	B	2 B	2 B	2
Hydrology and Water Quality	Freshwater and Coastal Water Environments	Short Term	1	1	1	1	2	1	1	1	1	2	2	2
		Long Term	B	1 B	B	B	B	B	B	B	B	1 B	1	1
Air Quality	–	Short Term	2	2	2	2	2	1	1	2	2	2	2	2
		Long Term	0	0	0	0	0	0	0	0	0	1	1	1
Noise	–	Short Term	2	2	4	2	2	1	2	4	4	4	4	2
		Long Term	0	0	0	0	1	0	0	0	0	2	2	2
Habitats	Wetlands, Barrier Islands; Beaches and Dunes; Submerged Aquatic Vegetation; Other Habitats in the Coastal Environment of the Northern Gulf of Mexico	Short Term	2	2	2	2	2	1	1	2	2	2	2	2
		Long Term	2 B	2 B	2 B	2 B	2 B	B	B	1 B	2 B	2	2	2 B
Living Coastal and Marine Resources	Nearshore Benthic Communities; Oysters; Pelagic Microfaunal Communities; Sargassum; Finfish; Sea Turtles; Marine Mammals; Birds; Terrestrial Wildlife	Short Term	1	2	2	1	2	1	1	1	1	2	2	2
		Long Term	1 B	2 B	2 B	B	2 B	1 B	1 B	B	1 B	2	2	2 B
Socioeconomics and Environmental Justice*	–	Short Term	B	B	B	B	B	B	B	B	B	B	B	B
		Long Term	1 B	1 B	1 B	1 B	1 B	1 B	1 B	1 B	1 B	1 B	1 B	1 B
Cultural Resources **	–	**Short Term**	2	2	2	2	2	2	0	2	2	2	2	2
		Long Term	2 B	2 B	2 B	2 B	2 B	2 B	0	2 B	2 B	2 B	2 B	2 B
Infrastructure	–	**Short Term**	4	4	4	4	4	4	0	4	4	4	4	4
		Long Term	4 B	4 B	4 B	4 B	4 B	4 B	0	4 B	4	1 B	1 B	1 B
Land and Marine Management	National and State Parks; Refuges and WMAs; Land Trusts; Marine Protected Areas	**Short Term**	2	2	2	2	2	2	2	2	2	2	2	2
		Long Term	B	B	B	B	B	B	B	B	B	B	B	B
Tourism and Recreation Use	Wildlife Observation; Hunting; Beach and Waterfront (swimming, sightseeing, etc.); Boating; Recreational Fishing; Tourism; Museums, Cultural Resources, and Education Centers	**Short Term**	2	2	2	2	2	2	0	2	2	2	2	2
		Long Term	B	B	B	B	B	B	0	B	B	B	B	B

Alternative		Alternative 4												
		Alternative 2										Alternative 3		
Resources	Sub-Resources	Short Term / Long Term	Create & Improve Wetlands	Protect Shorelines / Reduce Erosion	Restore Barrier Islands and Beaches	Restore & Protect SAV	Conserve Habitat	Restore Oysters	Restore & Protect Finfish & Shellfish	Restore & Protect Birds	Restore & Protect Sea Turtles	Enhance Public Access to Natural Resources for Recreational Use	Enhance Recreational Experiences	Promote Environmental and Cultural Stewardship, Education, and Outreach
Fisheries and Aquaculture	Commercial Fishing; Shellfish Fishery; Seafood Processing and Sales; Aquaculture	Short Term	2	2	2	2	2	2	2	2	0	2	2	2
		Long Term	B	B	B	B	0	B	B	0	0	B	B	B
Marine Transportation	–	Short Term	1	1	1	1	0	1	0	1	0	1	1	0
		Long Term	B	B	B	0	0	0	0	B	0	B	B	B
Aesthetics and Visual Res.	–	Short Term	2	2	4	2	2	2	0	4	2	2	2	2
		Long Term	B	1 B	B	1 B	B	0	0	B	0	2 B	2 B	2 B
Public Health and Safety, including Flood and Shoreline	–	Short Term	1	1	1	1	0	1	0	1	1	1	1	1
		Long Term	B	B	B	B	B	B	0	B	B	1 B	1 B	B

Notes: The Trustees note that there are differences in environmental consequences that could result from recreational use project types as compared to ecological project types. Tables 6-3 and 6-4 present a range of potential impacts (e.g., minor to moderate) for each alternative, as, particularly for Alternative 4, the relative amount of recreational use restoration and ecological restoration that may ultimately occur are not known at this time. Project-specific analyses in Chapters 8 - 12 and in any future tiered analyses will describe the specific impacts associated with the specific proposed projects. The rating system reflects the range of impacts that could occur to each resource by project type. It is important to note that all techniques within a project type would not necessarily have the same level of impacts on resources. That is, some techniques could have no effect on the specific resource area. In a few cases, possible but rare or improbable impacts are described in the text, but are not shown in the Exhibit. In particular, refer to the Hydrology and Water Quality section for Project Type 10 (Enhance Public Access to Natural Resources for Recreational Use), and the Living Coastal and Marine Resources and Habitats discussions for Project Types 10 (Enhance Public Access to Natural Resources for Recreational Use) and 11 (Enhance Recreational Experiences). Specific impacts would depend on where individual projects may occur, the timing of proposed construction and other activities, and the scale of the proposed activities. Thus, the above summary describes generally the level and type of effects anticipated from project types to resources. Because this PEIS identifies a number of types of potential projects that may occur, a range of impacts is anticipated. More specific descriptions of impacts can be found in the text.

* Note that Socioeconomics and Environmental Justice are combined under a single heading in this table and the following analysis. However, consistent with EO 12898, benefits to Environmental Justice were not evaluated in this document; hence the findings summarized in this table reflect only socioeconomic considerations.

**Project types under all Alternatives could lead to long-term beneficial impacts through the identification of cultural resources. Cultural or historical sites that may otherwise have been unknown or unprotected may benefit from the NHPA Sectio106 review process that could require it be avoided and preserved in its natural state. In this manner, some information may be retrieved and future impacts could be avoided. Although minor to moderate adverse effects could occur if cultural resources are present at project sites involving dredge, fill or ground-disturbing activities, a Section 106 consultation would be completed prior to implementation of these activities and appropriate avoidance and mitigation measures would be implemented prior to commencement of ground disturbing activities

Table 6-4. Benefits and Adverse Impacts of Alternatives by Resource and Alternative

<table>
<tr><th>Resources</th><th>Sub-Resources</th><th>Duration</th><th>Alternative 1</th><th colspan="2">Alternative 2</th><th colspan="2">Alternative 3</th><th colspan="2">Alternative 4</th></tr>
<tr><td rowspan="2">Geology and Substrates</td><td rowspan="2">Upland Geology and Soil; Nearshore Coastal Geology and Sediment</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td>2</td><td>B</td><td>2</td><td>B</td><td>2</td><td>B</td></tr>
<tr><td rowspan="2">Hydrology and Water Quality</td><td rowspan="2">Freshwater and Coastal Water Environments</td><td>Short Term</td><td>0</td><td>2</td><td>B</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td>1</td><td>B</td><td colspan="2">1</td><td>1</td><td>B</td></tr>
<tr><td rowspan="2">Air Quality</td><td rowspan="2">-</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td colspan="2">0</td><td colspan="2">1</td><td colspan="2">1</td></tr>
<tr><td rowspan="2">Noise</td><td rowspan="2">-</td><td>Short Term</td><td>0</td><td colspan="2">4</td><td colspan="2">4</td><td colspan="2">4</td></tr>
<tr><td>Long Term</td><td>0</td><td colspan="2">0</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td rowspan="2">Habitats</td><td rowspan="2">Wetlands, Barrier Islands; Beaches and Dunes; Submerged Aquatic Vegetation; Other Habitats in the Coastal Environment of the Northern Gulf of Mexico</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td>2</td><td>B</td><td>2</td><td>B</td><td>2</td><td>B</td></tr>
<tr><td rowspan="2">Living Coastal and Marine Resources</td><td rowspan="2">Nearshore Benthic Communities; Oysters; Pelagic Microfaunal Communities; Sargassum; Finfish; Sea Turtles; Marine Mammals; Birds; Terrestrial Wildlife</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td>2</td><td>B</td><td>2</td><td>B</td><td>2</td><td>B</td></tr>
<tr><td rowspan="2">Socioeconomics and Environmental Justice*</td><td rowspan="2">-</td><td>Short Term</td><td>0</td><td colspan="2">B</td><td colspan="2">B</td><td colspan="2">B</td></tr>
<tr><td>Long Term</td><td>0</td><td colspan="2">B</td><td>1</td><td>B</td><td>1</td><td>B</td></tr>
<tr><td rowspan="2">Cultural Resources **</td><td rowspan="2">-</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td>2</td><td>B</td><td>2</td><td>B</td><td>2</td><td>B</td></tr>
<tr><td rowspan="2">Infrastructure</td><td rowspan="2">-</td><td>Short Term</td><td>0</td><td colspan="2">4</td><td colspan="2">4</td><td colspan="2">4</td></tr>
<tr><td>Long Term</td><td>0</td><td>4</td><td>B</td><td>1</td><td>B</td><td>4</td><td>B</td></tr>
<tr><td rowspan="2">Land and Marine Management</td><td rowspan="2">National and State Parks; Refuges and WMAs; Land Trusts; Marine Protected Areas</td><td>Short Term</td><td>0</td><td colspan="2">2</td><td colspan="2">2</td><td colspan="2">2</td></tr>
<tr><td>Long Term</td><td>0</td><td colspan="2">B</td><td colspan="2">B</td><td colspan="2">B</td></tr>
</table>

Resources	Sub-Resources	Duration	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Tourism and Recreation Use	Wildlife Observation; Hunting; Beach and Waterfront (swimming, sightseeing, etc.); Boating; Recreational Fishing; Tourism; Museums, Cultural Resources, and Education Centers	Short Term	**0**	2	2	2
		Long Term	**0**	B	B	B
Fisheries and Aquaculture	Commercial Fishing; Shellfish Fishery; Seafood Processing and Sales; Aquaculture	Short Term	**0**	2	2	2
		Long Term	**0**	B	B	B
Marine Transportation	-	Short Term	**0**	1	1	1
		Long Term	**0**	B	B	B
Aesthetics and Visual Res.	-	Short Term	**0**	4	2	4
		Long Term	**0**	2 B	2 B	2 B
Public Health and Safety, including Flood and Shoreline	-	Short Term	**0**	1	1	1
		Long Term	**0**	B	1 B	1 B

Notes: The Trustees note that there are differences in environmental consequences that could result from recreational use project types as compared to ecological project types. Tables 6-3 and 6-4 present a range of potential impacts (e.g., minor to moderate) for each alternative, as, particularly for Alternative 4, the relative amount of recreational use restoration and ecological restoration that may ultimately occur are not known at this time. Project-specific analyses in Chapters 8 - 12 and in any future tiered analyses will describe the specific impacts associated with the specific proposed projects. The rating system reflects the range of impacts that could occur to each resource by project type. It is important to note that all techniques within a project type would not necessarily have the same level of impacts on resources. That is, some techniques could have no effect on the specific resource area. In a few cases, possible but rare or improbable impacts are described in the text, but are not shown in the Exhibit. In particular, refer to the Hydrology and Water Quality section for Project Type 10 (Enhance Public Access to Natural Resources for Recreational Use), and the Living Coastal and Marine Resources and Habitats discussions for Project Types 10 (Enhance Public Access to Natural Resources for Recreational Use) and 11 (Enhance Recreational Experiences). Specific impacts would depend on where individual projects may occur, the timing of proposed construction and other activities, and the scale of the proposed activities. Thus, the above summary describes generally the level and type of effects anticipated from project types to resources. Because this PEIS identifies a number of types of potential projects that may occur, a range of impacts is anticipated. More specific descriptions of impacts can be found in the text.

* Note that Socioeconomics and Environmental Justice are combined under a single heading in this table and the following analysis. However, consistent with EO 12898, benefits to Environmental Justice were not evaluated in this document; hence the findings summarized in this table reflect only socioeconomic considerations.

**Project types under all Alternatives could lead to long-term beneficial impacts through the identification of cultural resources. Cultural or historical sites that may otherwise have been unknown or unprotected may benefit from the NHPA Sectio106 review process that could require it be avoided and preserved in its natural state. In this manner, some information may be retrieved and future impacts could be avoided. Although minor to moderate adverse effects could occur if cultural resources are present at project sites involving dredge, fill or ground-disturbing activities, a Section 106 consultation would be completed prior to implementation of these activities and appropriate avoidance and mitigation measures would be implemented prior to commencement of ground disturbing activities.

6.7.1 Geology and Substrates

6.7.1.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) include project types such as create wetlands, restore barrier islands and beaches and conserve habitats. These actions are expected to result in minor to moderate short-term construction-related adverse impacts, primarily related to equipment staging and use, and rutting. The placement of new structures such as breakwaters could result in minor to moderate long-term adverse effects by changing the natural processes of sediment accretion and erosion, preventing washover events, and causing erosion in offsite locations. Removal of borrow materials would cause long-term minor impacts to localized areas. Construction activities could also cause long-term soil compaction. However, long-term benefits to geology and substrates are also expected, including reduction in sediment runoff decreased soil disturbance, reduction in erosion/loss of wetlands, stabilization of substrates, backfilling of submerged propeller scars. The effects of Alternatives 2 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term beneficial impacts.

6.7.1.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in minor to moderate short-term construction-related adverse impacts to geology and substrates, primarily related to equipment staging and use, and rutting. The placement of new structures such as piers, dune walkovers, or viewing platforms could result in minor to moderate long-term adverse effects by changing the natural processes of sediment accretion and erosion, preventing washover events, and causing erosion in offsite locations. Removal of borrow materials would cause long-term minor impacts to localized areas. Construction activities could also cause long-term soil compaction. However, long-term benefits to geology and substrates are also expected related to sediment deposition on beaches and creation of artificial reefs. Additional benefits could accrue where projects improve existing outdated or degraded infrastructure that cause erosion. The effects of Alternatives 3 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale.

6.7.2 Hydrology and Water Resources

6.7.2.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts, primarily increases in turbidity. Shoreline protection could also result in minor long-term adverse effects by changing the ocean current patterns in the localized area. However, long-term benefits to hydrology and water quality are also expected, including improving wetland function, reduction in the inland flow of salt water, reduction in nutrient and sediment runoff, and reduction in erosion/loss of wetlands. The effects of Alternatives 2 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term beneficial impacts.

6.7.2.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term construction-related adverse impacts, including increases in turbidity and sedimentation. In addition, these actions may result in minor long-term increases in stormwater runoff and pollutants as a result of conversion of pervious to impervious surfaces, discharge of fish hatchery effluent, and increased presence of boats and equipment in waterways. To the extent that projects replace or improve outdated or failing systems, long-term benefits may also accrue. The effects of Alternatives 3 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale.

6.7.3 Air Quality and Greenhouse Gases

6.7.3.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts to air quality and GHG. The effects of Alternatives 2 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Project types that protect habitat or increase native vegetation would result in some level of CO_2 absorption; however, the benefits would be difficult to measure.

6.7.3.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term construction-related minor to moderate adverse impacts, including increases in air and greenhouse gas emissions. In addition, project types of Alternatives 3 (and 4) are expected to increase recreational use and visitation which would contribute to air quality and greenhouse gas emission rates in the long-term minor adverse impacts from the use of recreation equipment and vehicles (e.g., boats, cars, RVs) and from the operation and maintenance of certain facilities and services.

6.7.4 Noise

6.7.4.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) include project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term minor to major construction-related adverse impacts to noise. Long-term noise impacts would only be expected in a case where newly conserved land was opened to recreational use. These impacts would be minor. The effects of Alternatives 2 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Alternatives 2 (and 4) are expected to have little long-term impacts to ambient noise conditions.

6.7.4.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term minor to major construction-related adverse impacts to noise. Long-term noise impacts would be expected where additional recreational use, in terms of foot, car, or boat traffic, is expected. These impacts would range from minor to moderate. The effects of Alternatives 3 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale.

6.7.5 Habitats

6.7.5.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast habitats, including sensitive habitats, would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Most Alternatives 2 (and 4) project types would result in short-term minor to moderate adverse impacts to habitat as a result of construction activities. Adverse impacts could include: increased soil erosion, vegetation damage or removal, changes in water quality from turbidity and substrate disturbance from in-water work, and the potential introduction or opportunity for establishment of invasive species.

Long-term minor to moderate adverse impacts could occur to habitats adjacent to new breakwaters or other shoreline protection structures as they could change natural current patterns, sediment accretion and erosion rates; alter availability of invertebrate prey; and cause changes to erosion in off-site locations.

However, since many of these project types focus on restoring or protecting natural resources, Gulf Coast habitats would largely experience long-term beneficial impacts through improved health, stability and resiliency of habitats, including sensitive habitats such as wetlands, barrier islands, areas of SAV, and reefs. These project types could help reestablish native plant communities, stabilize substrates and support sediment deposition, strengthen shorelines, and reduce erosion.

6.7.5.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short- and long-term adverse impacts to habitats. The effects of Alternatives 3 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale.

Short-term adverse impacts would be related to construction or reconstruction activities such as those necessary for public access facilities, fish hatcheries, artificial reefs, campgrounds and education centers. Long-term adverse impacts include those that result from the operation, use and maintenance of facilities. These short- and long-term adverse impacts could include alteration of wetlands; covering, loss or shading of SAV or other habitats from placement of structures; filling of shallow water areas; localized plant species displacement or loss, introduction of invasive species, and degradation of habitats including potential habitat fragmentation as a result of an increased recreational activity and human use; increased soil erosion; changes in water quality from stormwater runoff associated with the conversion of upland pervious areas to impervious surfaces (parking areas, buildings, etc.) and increased turbidity and substrate disturbance from in-water work with heavy equipment or leaching of construction fluids.

Minor to moderate adverse effects such as habitat trade-offs could result from placement of artificial hard substrate on soft bottom habitat as a transition from naturally occurring soft bottom benthic communities and the managed species that utilize these areas could occur. Placement of artificial reef can also modify water circulation patterns and cause accretion or erosion of the adjacent habitats. Proper siting of artificial structures will minimize these potential impacts.

Some recreational enhancement projects may have long-term beneficial effects on habitats such as wetlands, barrier islands, beaches, coastal transition zones, SAV and shallow water habitats. For example, enhancement projects could reduce degradation and recreation use in habitats by redirecting use to a site that is more appropriate and conducive to recreational activities. These activities could also help stabilize substrates, support sediment deposition, and reduce erosion. In addition, the creation of artificial reefs could benefit sessile and benthic encrusting organisms by providing substrate and interstitial spaces for use as habitat and forage areas. Providing educational programs related to coastal resources could increase public awareness of Gulf Coast habitats by increasing public knowledge of, and support for, preservation and conservation of these habitats, as well as potentially resulting in behavioral changes during future public encounters with sensitive habitats.

6.7.6 Living Coastal and Marine Resources

6.7.6.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast habitats and restoring and protecting oysters and other shellfish, finfish, sea turtles, and birds would be undertaken. Most Alternatives 2 (and 4) project types would result in short-term minor to moderate adverse impacts to living coastal and marine resources as a result of restoration construction activities. Project types that include in-water work or dredging could affect oyster populations and other benthic organisms from increased turbidity and siltation, which may increase mortality and inhibit spawning activities. Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal organisms. Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by construction activity or sediment placement. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas.

Sensitive species such as sea turtle and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, which could temporarily displace individuals or prey. In addition, construction activities could result in the destruction of sea turtle eggs, or other ground nesters, deposited within the boundaries of the proposed project. Lighting from construction activities could disturb or interfere with female turtles nesting attempts (e.g., false crawls or use of marginal or unsuitable nesting areas) and could disorient hatchling turtles as they emerge from the nest and crawl to the water.

Short-term minor displacement of local birds and terrestrial species or mortality of intertidal invertebrates could occur during construction, although most wildlife would be expected to move away to forage in other readily available foraging habitat during this activity. If construction occurs during the nesting season, nests could be destroyed, and chicks or fledglings could be harmed, causing a loss of recruitment and a longer term effect. Construction in terrestrial habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, individual bird or terrestrial wildlife that rest, roost, forage or nest in or near the work area could be temporarily disturbed or displaced. Beach nourishment activities can result in short-term and minor to moderate impacts (such as disturbance and reduced foraging efficiency) to shorebirds if the birds are roosting and feeding in the area during a migration stopover or could result in harm or mortality if birds are nesting in the area. Predator control could have an adverse impact to some species, since these efforts such as constructing barriers could also exclude other non-target species that utilize those areas.

Some Alternatives 2 (and 4) project types could result in long-term minor to moderate adverse impacts to living coastal and marine resources. Long-term minor to moderate adverse impacts could occur to living coastal and marine resources inhabiting areas adjacent to new breakwaters or other shoreline protection structures as they could change natural current patterns, sediment accretion and erosion rates; alter availability of invertebrate prey; and cause changes to erosion in off-site locations. These structures could cause long term displacement of sea turtles as obstacles affecting the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest and crawl to the ocean. In addition, the change in sediment accretion could cause long term impacts to benthic communities including shellfish. Similar habitat impacts to beaches could result in the long term displacement of shorebirds or other animals that use different beach-related habitats.

Alternatives 2 (and 4) project types would result in long-term benefits to living coastal and marine resources. Project types that create or restore habitat, reduce erosion, improve water quality, and protect specific wildlife would have long term benefits for a variety of aquatic and terrestrial species. For example, the creation and restoration of wetlands could provide nesting and/or foraging habitat for birds as well as increasing habitat for terrestrial wildlife. Finfish could also benefit from wetlands restoration, which could provide habitat for foraging, spawning, and shelter. Restoring barrier islands and beaches could contribute to the quantity and quality of adjacent shallow water soft-bottom habitats that serve as nurseries and foraging areas for some finfish, while providing nesting habitat for birds.

6.7.6.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. The effects of Alternatives 3 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. These actions are expected to result in short-term construction-related adverse impacts. Enhancing or constructing infrastructure could require in-water work with heavy equipment and long-term operation and maintenance of these facilities. Some short-term minor adverse effects could occur if resources, including oysters, fish, sea turtles, marine mammals, benthic communities, and pelagic microfaunal communities, were present in the construction area. Possible impacts could include increased turbidity, reduction of water quality, noise pollution, vibration, and disruption to the water column and habitat. Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities. Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by equipment, human activity, or sediment. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and alteration or removal of habitat; however, effects would not be expected to reduce local fish populations.

Sensitive species such as sea turtles and marine mammals present in project areas where dredging, underwater use of equipment or reef placement could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and result in short-term, minor impacts. Sea turtle and marine mammals may be present in project areas where use of explosives may be used to sink a vessel for creation of an artificial reef. Underwater explosions may affect marine life by causing death, injury, or behavioral reactions; depending on the distance an animal is located from a blast. This could result in short to long-term impacts to individuals and may result in minor to moderate impacts.

Some hatcheries/aquaculture operations could result in long-term minor adverse effects to marine mammals or fish through unintentional exposure to disease through release of contaminated effluent or infected fish. Stocking of hatchery-reared finfish could also negatively impact the genetic diversity of the wild stock and affect the balance of the fish community, competing for food and habitat resources with finfish species present in the receiving waters.

Construction in terrestrial habitats could result in short-term minor to moderate adverse impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, bird and terrestrial wildlife individuals that forage or nest in or near the work area could be temporarily disturbed or displaced. Stormwater runoff from impervious surfaces could enter waterways and increase turbidity as well as carry pollutants that could affect benthic organisms, fish or foraging bird species. Long-term minor to moderate adverse effects to species could result from the placement of piers, foundations, or other permanent structures; fill of shallow water areas; increased human traffic, and the conversion of pervious areas to impervious surfaces (parking areas, buildings, etc.). These actions could result in disturbance or displacement of local species. Increase sin visitation could result in noise and other disturbances as well as degradation or fragmentation of habitats and upland areas used by wildlife in the vicinity.

The creation of artificial reefs could provide indirect benefits to marine fish, marine mammals, sea turtles, and potentially oysters and shallow water coral by providing food, shelter, or spawning areas. Whether the availability of new habitat will serve to increase fish and/or invertebrate biomass or will only serve to concentrate organisms at the site, is likely dependent on where the reef is sited and how it is designed. Providing educational features through coastal exhibits and collections, hands-on activities, educational outreach programs related to coastal resources could increase public awareness of marine resources and of their value to the ecosystem. This could result in a long-term benefit to nearshore benthic communities, oysters, marine mammals and other species beyond the lifespan of the project. To the extent that projects replace or improve outdated or failing systems, long-term benefits may also accrue.

6.7.7 Socioeconomics and Environmental Justice

6.7.7.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) include project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions could cause short-term benefits to local economies, depending on the types of activities occurring. Workforce employment in construction, dredging, and barge operation activities would benefit regional economies from projects occurring under Alternatives 2 (and 4). Locally purchased (or rented) equipment and materials would benefit the regional economy, including increased jobs, income, sales, and tax receipts. Increased recreational use associated with Alternatives 3 (and 4) would be expected to lead to long term beneficial economic effects. Short-term minor to moderate adverse impacts, primarily associated with temporary closures of areas to recreational uses could also occur. Long-term minor adverse impacts to socioeconomic conditions are anticipated.

6.7.7.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Similar to Alternatives 2 (and 4), workforce employment in infrastructure construction would benefit regional economies from projects occurring under Alternatives 3 (and 4). Locally purchased (or rented) equipment and materials would benefit the regional economy, including increased jobs, income, sales, and tax receipts. Additional recreational infrastructure and amenities, such as facilities, boat ramps, bathrooms, boardwalks, and amenities would increase access and improve recreational experiences.

6.7.8 Cultural Resources

6.7.8.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) include project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Projects implemented under Alternatives 2 (and 4) would be analyzed for potential effects to cultural resources prior to being implemented and most adverse effects to cultural resources would be avoided or minimized. However, inadvertent impacts to unknown sites, buildings, structures, or objects could occur, resulting in minor to moderate short-term and long-term impacts. The effects of Alternatives 2 (and 4) would vary depending on geographic location.

6.7.8.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Projects implemented under Alternatives 3 (and 4) would be analyzed for potential effects to cultural resources prior to being implemented and most adverse effects to cultural resources would be avoided or minimized. However, inadvertent impacts to unknown sites, buildings, structures, or objects could occur, resulting in minor to moderate short-term and long-term impacts. The effects of Alternatives 3 (and 4) would vary depending on geographic location.

6.7.9 Infrastructure

6.7.9.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) include project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Projects requiring land-based construction activities and associated movement of construction materials and equipment by road could lead to short and long-term minor to major adverse impacts to infrastructure. Project types that enhance public access to natural resources for recreational use, enhance recreational experiences, and/or promote environmental and cultural stewardship, education, and outreach, may include construction activities such as backfilling of canals and shallow water bodies to create wetlands; removal of bulkheads, rip rap and other structures to restore hydrologic connectivity; dune restoration; or the placement of breakwaters or other engineered erosion control structures on the shoreline. Impacts would result from increases in construction traffic; temporary or permanent closure of roads or parking lots; or damage to roadways. These would range in intensity based on the duration of road or parking lot closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of roadway damage.

6.7.9.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Many of the project types discussed under Alternatives 3 (and 4) would involve the transport of construction vehicles, equipment, and materials. These project types, which include techniques such as placement of artificial reef structures; construction of boardwalks, trails, roads, bridges and other types of public access; and the construction of boat ramps, piers, public bathrooms, lodging facilities and similar amenities, could lead to short and long-term minor to major impacts on infrastructure. The impacts associated with these projects would result from increases in construction traffic; temporary or permanent closure of roads, parking lots, or facilities; or damage to roadways or other infrastructure that provides access to the shoreline. The impacts to existing infrastructure, such as roadways, could also occur from increased vehicle use as a result of increased visitor use over time. These impacts would range in intensity based on the duration of road, parking lot or public access closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of damage to roadways, facilities or access points. Future infrastructure improvements or increased maintenance could be necessary to address impacts to infrastructure.

6.7.10 Land and Marine Management

6.7.10.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Actions that would result in the temporary or permanent partial or full closure of national, state and local parks, wildlife refuges, wildlife management areas and marine protected areas during construction would result in short-term minor to moderate adverse impacts, primarily from the interruption of operations and use and/or the furlough or reassignment of staff. In the long-term benefits to land and marine management are also expected as restoration activities would help align management goals and assist management and staff to best manage properties for the benefit of the environmental and human environment. Restoration projects resulting in changes to land ownership and/or permitted uses including the use of fee acquisition could have long-term impacts; however, as the transactions are negotiated or arranged between willing parties it is not anticipated that adverse impacts to land and marine management would occur. The effects of Alternatives 2 (and 4) would vary depending on location, type of activity and existing management but overall direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term beneficial impacts.

6.7.10.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected lead to short-term adverse impacts, stemming from construction and land transfer activities that would result in the temporary full or partial closure of parks and refuges, in the interruption of operations, in furloughs or staff layoffs, or that would interfere with land managers' ability to fulfill management obligations and responsibilities. To the extent that projects better align management goals and assist management and staff to best manage properties for the benefit of the environmental and human environment, long-term benefits may also accrue. The effects of Alternatives 3 (and 4) would vary depending on geographic location, land ownership and project scale.

6.7.11 Tourism and Recreational Use

6.7.11.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), early restoration projects may include creating wetlands, restoring SAV, restoring barrier islands and beaches, and conserving habitats. During the construction and implementation period for projects conducted under Alternatives 2 (and 4), there would be short-term adverse impacts to recreation and tourism from temporary recreational site closures and adverse impacts on recreational experiences associated with noise, wildlife disturbances, view sheds, and other adverse impacts on recreational experiences. The effects of restoration actions would vary depending on their location and the rate of usage by tourists or recreation users. However, Alternatives 2 (and 4) projects that result in higher quality habitats such as beach nourishment, living shorelines that that may be used for snorkeling, etc. would be expected to provide long-term benefits to tourism and recreational use. Some Alternatives 2 (and 4) projects may restrict some recreational uses such as boating or hiking in certain areas (e.g. SAV restoration sites or dune revegetation project areas). These restrictions would not be expected to substantially contribute to adverse effects to recreational uses because of the small geographic area likely to be restricted and the availability of other areas for those types of recreation. Other ongoing activities described in Appendix 6-B would be expected to continue.

6.7.11.2 Alternatives 3 (and 4)

Alternatives 3 (and 4) actions vary from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities specifically intended to provide educational awareness of Gulf Coast habitats (and associated species and cultural values). Cumulative effects associated with Alterative 3 would vary widely in both scope and severity depending on the location of specific actions. Alternatives 3 (and 4) projects may result in construction-related, short-term adverse impacts to recreation and tourism from temporary recreational site closures and adverse impacts on recreational experiences associ ated with noise, wildlife disturbances, visual impacts and other adverse impacts on recreational experiences. Impacts from ongoing and future actions would be similar to those described above for the No Action alternative. When combined there would likely be some short term adverse impacts to tourism and recreation during project construction, though timing of activities would likely avoid high visitation times if possible.

6.7.12 Fisheries and Aquaculture

6.7.12.1 Alternatives 2 (and 4)

Similar to the cumulative impacts described under Alternative 1, commercial fisheries would likely experience short-and long-term cumulative impacts depending on the particular species and harvest being impacted. Under Alternatives 2 (and 4), Early Restoration Programmatic Plan projects may include creating wetlands, restoring SAV, restoring barrier islands and beaches, and conserving habitats or protecting species. These actions could cause short-term adverse impacts to commercial fishing by limiting allowable catch. However, overall long-term benefits to commercial fisheries would be anticipated because of improved habitats that are important to a number of fish and shellfish species and potential for increased populations and species stability. These projects are unlikely to impact aquaculture. Other ongoing activities described in Appendix 6-B would be expected to continue.

6.7.12.2 Alternatives 3 (and 4)

Cumulative impacts to commercial fishing associated with Alternatives 3 (and 4), would be similar to Alternative 1. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities specifically intended to provide educational awareness of Gulf Coast habitats (and associated species and cultural values). Cumulative effects associated with Alterative 3 would vary widely in both scope and severity depending on the location of specific actions. Alternatives 3 (and 4) projects may result in adverse impacts during construction as a result of in-water disturbances such as pile driving and dredging. These potential adverse impacts would be offset to some degree by the implementation of natural resource stewardship, water quality, and other NRDA and non-NRDA projects that result in benefits to the marine environment.

6.7.13 Marine Transportation

6.7.13.1 Alternatives 2 (and 4)

The effects of Alternatives 2 (and 4) would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Potential exists for multiple Alternatives 2 (and 4) projects to be conducted in a single water body. This may lead to additive effects such as limiting marine traffic in certain areas during construction that may be more readily apparent at the smaller spatial scale. Other impacts to marine transportation would be similar to those described under the No Action alternative. Over the long-term, Alternatives 2 (and 4) would not contribute to cumulative adverse impact to marine transportation based on the scale of projects and limited areas likely to be affected. Cumulative impacts to regional resources related to currently proposed Phase III Early Restoration projects proposed as part of this ERP/PEIS under Alternatives 2 (and 4) are discussed in Chapters 8 through 12.

6.7.13.2 Alternatives 3 (and 4)

Similar to Alternative 2, on-going and future activities such as those related to resource stewardship activities, water quality improvement programs, military operations, energy activities, and tourism and recreation, and construction activities associated with stewardship, NRDA, and non-NRDA restoration activities would impact marine transportation. Alternatives 3 (and 4) actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities specifically intended to provide educational awareness of Gulf Coast habitats (and associated species and cultural values). Cumulative effects associated with Alterative 3 would vary widely in both scope and severity depending on the location of specific actions. Alternatives 3 (and 4) projects may result in adverse impacts to marine transportation during construction if travel in certain areas is restricted, but these would not be expected to persist beyond construction. Therefore, Alternatives 3 (and 4) would not be expected to contribute incrementally to cumulative adverse impacts in the long-term.

6.7.14 Aesthetics and Visual Resources

6.7.14.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Construction-related actions are expected to result in short-term minor to moderate adverse impacts as a result of the presence of readily apparent construction equipment and personnel as well as barriers and construction-related dust and emissions, which would contrast with and detract from the natural viewshed. In the event that construction related actions involve dredging activities into scenic viewsheds, adverse impacts could be elevated to major, and would remain short-term. The effects of Alternatives 2 (and 4) would vary to a large degree on the location of the proposed projects, the degree to which these activities would be visible, and the duration of construction activities and how commonplace these activities are. In the event that these construction-related projects result in the long-term placement of structures or signage, long-term, minor adverse impacts would occur, with the magnitude of their impact decreasing over time as these objects become more commonplace in the area. Long-term benefits to aesthetics and visual resources are also expected as a result of improved habitat areas that reflect a more natural setting. Direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term beneficial impacts.

6.7.14.2 Alternatives 3 (and 4)

Under Alternatives 3 (and 4), proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in minor to moderate short-term construction related adverse impacts as a result of readily apparent construction equipment and personnel as well as barriers and construction-related dust and emissions, which would contrast with and detract from the natural viewshed. The addition of infrastructure and facilities into the existing landscape would present some degree of visual contrast, with long-term impacts ranging from minor to moderate dependent on the existing visual quality of the area. Long-term benefits to aesthetics and visual resources are also expected for projects that while enhancing recreational opportunities while also improving habitat such as beach renourishment and removal of land based debris. Direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term minor to moderate adverse impacts.

6.7.15 Public Health and Safety, Including Flood and Shoreline Protection

6.7.15.1 Alternatives 2 (and 4)

Under Alternatives 2 (and 4), proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternatives 2 (and 4) includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts, primarily as a result of the operation of heavy equipment and construction materials. In the event that hazardous materials are used and unintentionally released into the environment or the use of barges or boats contaminates surface waters could also result in minor, short-term adverse effects. Long-term beneficial impacts from restoration and rehabilitation projects could reduce the risk of potential future hazards or reduce currently present water contamination. It is anticipated the effects of Alternatives 2 (and 4) would vary depending on the type of activity, the proximity of the public and measures in place to reduce the potential or to avoid these impacts. Direct and indirect effects of Alternatives 2 (and 4) would largely result in long-term beneficial impacts.

6.7.15.2 Alternatives 3 (and 4)

Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short-term construction-related minor adverse impacts, stemming from the operation of heavy-equipment and construction materials as well as from the potential of hazard waste and materials contaminating the environment. Increased visitor use stemming could cause visitor use conflicts, leading to short-term minor adverse impacts. Projects centered on enhancing public access of areas would likely lead to long-term beneficial impacts to public safety by providing access to sites that currently lack infrastructure or require infrastructure improvements. Similarly, long-term benefits could be experienced through the promotion environmental and cultural stewardship, education and outreach project types in the event that users of the sites are more knowledgeable about potential harms in the project areas.

6.8 Potential Cumulative Impacts

The CEQ regulations to implement NEPA require the assessment of cumulative impacts in the decision-making process for federal projects, plans, and programs. Cumulative impacts are defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions" (40 C.F.R. §1508.7). As stated in the CEQ handbook, "Considering Cumulative Effects" (CEQ 1997), cumulative impacts need to be analyzed in terms of the specific resource, ecosystem, and human community being affected and should focus on effects that are truly meaningful. Cumulative impacts should be considered for all alternatives, including Alternative 1 - No Action.

The cumulative impacts analysis considers past, present and reasonably foreseeable future actions and their associated effects throughout the northern Gulf of Mexico region (Appendix 6-B). Because examining impacts at the scale of the Gulf of Mexico is so broad as to dilute any potentially measurably cumulative impacts, the evaluation in this PEIS focuses on areas where Early Restoration projects would likely occur.

The following analysis considers cumulative impacts from a programmatic perspective (see section 6.8 for discussion of proposed Early Restoration Programmatic Plan cumulative impact analyses). The following section describes the multi-step approach used for evaluating cumulative impacts in this document.

6.8.1 Methodology for Assessing Cumulative Impacts

The analyses of cumulative impacts are typically accomplished using four steps:

Step 1 — Identify Resources Affected

In this step, each resource affected by the alternatives is identified. It is important to note that when direct and indirect impact analyses conclude that a particular resource is not affected, a cumulative impact analysis for that resource is not required. This approach is relevant to the cumulative impact analyses in Chapters 8 through 12, and would be considered in future phases of Early Restoration. The following cumulative impact analysis is organized in tables corresponding to specific affected resources.

Step 2 — Establish Boundaries

In order to identify the past, present, and reasonably foreseeable actions to consider in the cumulative impact analysis, affected resource-specific spatial and temporal boundaries must be identified. The spatial boundary is the area where past, present, and reasonably future actions have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the alternatives being considered. The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. Appropriate spatial and temporal boundaries may vary for each resource.

Step 3 — Identify Cumulative Action Scenario

In this step, the past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific affected resource are identified. These actions fall within the spatial and temporal boundaries established in Step 2. The following programmatic analysis groups specific actions by cumulative action categories. These action categories are listed and described below. The more specific actions within each action category are listed in Appendix 6-B.

Step 4 — Cumulative Impact Analysis

This final step develops the analysis in the context of the affected environment of the incremental impact of the proposed action (X) when added to the impacts from applicable past, present, and reasonably foreseeable future actions (Y) to understand the potential cumulative impacts to an affected resource (Z), or, where the affects may interact and/or be additive, X+Y=Z.

6.8.2 Identification of Resources Affected and Boundaries of Analysis (Steps 1 and 2)

Resources Affected

The following section describes identifies the affected resources evaluated for cumulative impacts. In this Programmatic ERP/PEIS, cumulative impacts include all of the resources identified in the environment/affected resources sections. Specifically, the affected resources assessed include:

- Geology and Substrates
- Hydrology and Water Quality
- Air Quality
- Noise
- Habitats
- Living and Coastal Marine Resources
- Socioeconomics and Environmental Justice
- Cultural Resources
- Infrastructure
- Land and Marine Management
- Tourism and Recreation Use
- Fisheries and Aquaculture
- Marine Transportation
- Aesthetics and Visual Resources
- Public Health and Safety

Spatial Boundary of Analysis

As discussed above, the spatial boundaries used to provide the necessary context for the cumulative impact analysis typically are defined based on the particular resource being assessed. For the purpose of this analysis, the spatial boundary includes those areas where project types described in each alternative could likely occur, which is assumed to be the northern Gulf of Mexico region. More specifically, the study area includes coastal and adjacent counties/parishes and associated nearshore and marine environments where Early Restoration project types could occur. Chapters 8 through 12 describe more specific areas of analysis based on affected resources and project groupings for Phase III Early Restoration.

Temporal Boundary of Analysis Guidance on determining what actions to consider in the cumulative impact analysis comes from a variety of sources. The CEQ has produced several guidance documents, including a memorandum entitled "Guidance on Consideration of Past Actions in Cumulative Effects Analysis" (CEQ 2005). This CEQ document states that consideration of past actions is only necessary in so far as it informs agency decision-making. Typically the only types of past actions considered are those that continue to have present effects on the affected resources.[9] This present effect will dictate how far

[9] Note that the proposed Early Restoration actions are specifically intended to contribute to restoring for injuries resulting from this Spill. In addition, work continues on the injury assessment, as described in Chapter 4, and the actions proposed in this document consider the assessment described in Chapter 4. Therefore, the cumulative impact assessments (both programmatic and project-level) appropriately do not separately analyze the effects of the Spill itself.

into the past actions are considered and how typically the impacts of these past actions are largely captured in the discussion of the affected environment Chapter for each resource. The guidance states that "[a]gencies are not required to list or analyze the effects of individual past actions unless such information is necessary to describe the cumulative effect of all past actions." Agencies are allowed to aggregate the effects of past actions without delving into the historical details of individual past actions. Courts have agreed with this approach giving deference to CEQ's interpretation of NEPA and stating that, as it relates to past actions, NEPA requires "adequate cataloging of relevant past projects in the area" (Ecology Center v. Castaneda, 574 F.3d 652, 667 (9th Cir. 2009)).

Present actions are those that are currently occurring and also result in impacts to the same resources within the same spatial boundary that the alternatives impact. Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resource as the proposed alternatives. The determination of what future actions should be considered requires a level of certainty that they will occur to ensure that the consideration of future actions is not overly speculative. This level of certainty could be met by a number of factors such as the completion of permit applications, the subject of approved proposals or planning documents, or other similar evidence.

Determining how far into the future to consider actions is based on the impact of the alternatives being considered. Once the impacts of the alternatives are no longer experienced by the affected resource then future actions beyond that need not be considered. For this ERP/PEIS, future actions were identified as those actions likely to be initiated prior to finalization of the DARP. Additional future actions were also identified that may occur beyond finalization of the final, comprehensive damages assessment and restoration plan that were determined to be reasonably foreseeable and likely to contribute to the overall cumulative impacts.

6.8.3 Categories of Cumulative Actions in the Northern Gulf of Mexico Region (Step 3)

In order to effectively consider the potential cumulative impacts at a programmatic level, categories of similar actions have been identified. Within these categories, examples of actual past, present, and reasonably foreseeable future actions are described (see also Appendix 6-B). There may be additional small scale activities not currently identified; however, the categories and their associated described actions provide the necessary information to fully understand the potential cumulative impacts that may be experienced by specific affected resources.

6.8.3.1 Restoration Related to the Deepwater Horizon Spill

There are a number of past, present or future restoration efforts and actions related to the Spill. Although the full extent of these restoration actions are not known at this time, multiple large-scale restoration efforts occurring in the Gulf are anticipated in coming years, and coordination between DWH Early Restoration will be important. A brief description of some of these programs is below.

Emergency Restoration and Phase I and II Early Restoration. Partial resolution of the *Deepwater Horizon* litigation has resulted in funding that has contributed to NRDA specific restoration activities in the Gulf including Emergency and Early Restoration. Emergency restoration actions are those taken by the Trustees prior to the completion of the NRDA and restoration planning process to prevent or reduce continuing natural resource injuries and avoid potentially irreversible loss of natural resources (15 CFR §990.26). In 2010, the trustees approved three emergency restoration projects focused on SAV, shorebird habitats, and sea turtles (USDOI 2011). In addition, the trustees and BP entered into an agreement whereby BP set aside funds for early restoration projects agreed to by BP and the Trustees, and in accordance with applicable laws. These early restoration projects included eight early restoration projects developed in the *Deepwater Horizon Oil Spill Phase I Early Restoration Plan and Environmental Assessment* (USDOI 2012a) to address injuries to resources and services located throughout the Gulf of Mexico. Two additional restoration projects that were undertaken by the Trustees were described in the *Deepwater Horizon Oil Spill Phase II Early Restoration Plan and Environmental Review (2012).*[10]

RESTORE Act. The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012, or the RESTORE Act, was passed by Congress on June 29, 2012, and signed into law by President Obama on July 6, 2012. The RESTORE Act envisions a regional approach to restoring the long-term health of the natural ecosystems and economy of the northern Gulf of Mexico region. The RESTORE Act dedicates 80 percent of any civil and administrative penalties paid under the Clean Water Act, after the date of enactment, by responsible parties in connection with the *Deepwater Horizon* oil spill to the Gulf Coast Ecosystem Restoration Trust Fund for ecosystem restoration, economic recovery, and tourism promotion in the Gulf Coast region. Due to uncertainty around a variety of factors associated with ongoing litigation, the ultimate amount of administrative and civil penalties that may be available to the Trust Fund and the timing of their availability are unknown. However, as a result of the settlement of Clean Water Act civil claims against Transocean Deepwater Inc. and related entities, a total of $800 million, plus interest, will be deposited in the Trust Fund within the next two years – approximately $320 million of which has already been deposited. Thus, based upon the RESTORE Act and the payment schedule agreed to by the court for the Transocean settlement, by February 20, 2015, thirty percent of that total amount – $240 million, plus interest – will be deposited in the Trust Fund for allocation by the Gulf Coast Ecosystem Restoration Council under the Council-selected Restoration Component. Additional funding is dependent upon settlement or adjudication of civil or administrative claims against other parties responsible for the oil spill. A Draft Initial Comprehensive Plan (Gulf Coast Ecosystem Restoration Council 2013), developed by the Council, provides a framework to implement a coordinated, Gulf Coast region-wide restoration effort in a way that restores, protects, and revitalizes the Gulf Coast.[11]

Gulf Environmental Benefit Fund. In early 2013, a U.S. District Court approved two plea agreements resolving the criminal cases against BP and Transocean which arose from the Spill. The agreements direct a total of $2.544 billion to the National Fish and Wildlife Foundation (NFWF) to fund projects benefiting the natural resources of the northern Gulf of Mexico region that were impacted by the spill. NFWF is a non-profit organization created by Congress in 1984 "to protect and restore fish and wildlife and their habitats." Over the next five years, NFWF's newly established Gulf Environmental Benefit Fund will receive a total of $1.272 billion for barrier island and river diversion projects in Louisiana, $356 million each for natural resource projects in Alabama, Florida, and Mississippi, and $203 million for

[10] *Deepwater Horizon* Natural Resource Trustees. 2012. *Deepwater Horizon* Oil Spill Phase II Early Restoration Plan and Environmental Review. Available at: http://www.doi.gov/deepwaterhorizon/upload/Phase-II-ERP-ER-12-21-12-2.pdf.

[11] "Draft Initial Comprehensive Plan: Restoring the Gulf Coast's Ecosystem and Economy." Gulf Ecosystem Restoration Council. May 2013. Accessed at: http://www.restorethegulf.gov/sites/default/files/Gulf%20Restoration%20Council%20Draft%20Initial%20Comprehensive%20Plan%205.23.15.pdf

similar projects in Texas. The first 22 projects supported through the Fund were announced in November 2013 after consultation with state and federal resource agencies, and are distributed across the 5 Gulf States (a list of projects by state is included at the end of Chapters 8 through 12). The total value of the initial projects is more than $100 million.[12] The initial NFWF projects were announced in November 2013; as more information becomes available the Trustees will continue to consider the potential implications of these projects that may contribute to cumulative impacts of proposed Early Restoration.

North American Wetlands Conservation Fund. The North American Wetlands Conservation Fund (NAWCF) provides funding for wetlands conservation projects. As part of a criminal fine that BP agreed to pay for one misdemeanor count of violating the Migratory Bird Treaty Act, NAWCF will receive a total of $100 million over the next five years. The money will be used to fund "wetlands restoration and conservation projects" located in the Gulf or projects that would "benefit migratory bird species and other wildlife and habitat affected by" the oil spill. Specific projects are not yet identified. As more information becomes available, the Trustees will consider the potential for cumulative impacts associated with Early Restoration proposed actions**.**

National Academy of Sciences. The National Academy of Sciences (NAS) is a private, non-profit institution created by Congress in 1863 "to provide independent advice to the government on matters related to science and technology." NAS includes the National Research Council, the National Academy of Engineering, and the Institute of Medicine. NAS will receive a total of $500 million over the next five years. This includes other criminal recoveries to be paid by BP ($350 million) and Transocean ($150 million) under their respective criminal settlements. The money will be used for a 30-year "program focused on human health and environmental protection, including issues relating to offshore oil drilling" and the production and transportation of hydrocarbons in the Gulf and the outer continental shelf. More specificity on the program will be considered by the Trustees as the information becomes available.

6.8.3.2 Additional Relevant Environmental Stewardship and Restoration Activities

Resource Stewardship Activities. Stewardship activities within the Gulf of Mexico region include a diverse range of Federal, State, local governmental, non-governmental, and private coastal and marine habitat protection and restoration projects. These stewardship activities are intended to provide benefits to Gulf of Mexico resources, many of which are the same resources and services impacted by the *Deepwater Horizon* oil spill. Similarly, implementation of some stewardship activities would have impacts to many of the same resources components being evaluated under the *Deepwater Horizon* restoration. This section includes programs that focus on land protections and conservation easements and those that focus on habitat restoration. For information on examples of specific past, present and future actions see Appendix 6B.

Water Quality Improvement Programs. The condition of the Gulf of Mexico ecosystem reflects water quality impacts from urban development, industry, transportation, agricultural runoff, atmospheric deposition, and other sources throughout the Gulf of Mexico watershed. A number of authorities are in

[12] National Fish and Wildlife Foundation, accessed at: http://www.nfwf.org/gulf/Pages/home.aspx

place to reduce the discharge of contaminants that enter the Gulf of Mexico, e.g., OPA, CAA, CWA, the Farm Bill, The National Park Service Organic Act, and the Marine Protection, Research and Sanctuaries Act. Water quality improvement programs and authorities seek to address human uses that result in water quality impairment in the Gulf of Mexico in an effort to restore water quality conditions and are expected to continue into the foreseeable future.

Appendix 6B describes many of the Federal, State, and local projects and programs related to habitat restoration that have occurred in the past and present, and are expected to continue into the future.

6.8.3.3 Military Operations

Military operations in the Gulf of Mexico are undertaken primarily by the U.S. Air Force and the U.S. Navy within federally designated areas for the purposes of training personnel and research, design, testing, and evaluation activities. There are 18 U.S. military bases along the northern Gulf of Mexico and more than 40 military warning areas designated by the U.S. Air Force for conducting various testing and training missions, and by the U.S. Navy for various naval training and testing operations (BOEM 2011).

The Gulf of Mexico Range Complex is a combined air, land, and sea space that provides realistic training areas for U.S. Navy personnel. In coastal and marine areas, the Gulf of Mexico Range Complex includes military operations areas and overlying special use airspaces, the Naval Support Activity Panama City Demolition Pond, security group training areas, and supporting infrastructure. Four offshore operating areas located in the northern Gulf of Mexico—Corpus Christi, New Orleans, Pensacola, and Panama City—define where the U.S. Navy conducts surface and subsurface training and operations. The Security group training areas are also located in marine waters of the Gulf of Mexico Range Complex. There are two group training areas: off the coast of Panama City, Florida, and off the coast of Corpus Christi, Texas. These areas are used for machine gun and explosives training. Naval Support Activity, Panama City, Florida, conducts diver training and underwater research as well as ship salvage and submarine rescue exercises.

U.S. Fleet Aircraft operated by all Department of Defense (DoD) units train within a number of special use airspace locations that overlie the military operations areas, as designated by the Federal Aviation Administration. Special use airspaces are largely located offshore, extending from 3.5 miles out from the coast over international waters and in international airspace (BOEM 2011). Examples of actions considered in this cumulative action category are found in Appendix 6-B.

6.8.3.4 Marine Transportation

When considering the potential cumulative impacts associated with marine transportation, port development, shipping and maritime services, and associated navigation, channel construction, and maintenance are important. The Gulf of Mexico coast encompasses a comprehensive system of ports and waterways that provide the facilities and logistics for import and export of foreign and domestic goods, as well as intermodal transport between vessels, trucks, and railroads. Major shipping lanes run throughout the Gulf ecosystem and the volume and value of shipping and port activities is continually increasing. Marine transportation planning has been occurring to improve traffic congestion and other shipping issues. Additional examples of actions considered in this cumulative action category are found in Appendix 6-B. Some of these include:

- **Present Action**: The M-10 Marine Highway Corridor includes the Gulf of Mexico, the Gulf Intracoastal Waterway, and connecting commercial navigation channels, ports, and harbors from Brownsville, Texas, to Jacksonville and Port Manatee, Florida. The M-10 connects to other Marine Highway Corridors: the M-49 Corridor at Morgan City, Louisiana; the M-65 Corridor in Mobile, Alabama; and the M-55 in New Orleans, Louisiana.
- **Future Action**: For example, U.S. Department of Transportation's Maritime Administration (MARAD) has identified marine corridors, projects, and initiatives to establish all water routes to serve as extensions of the surface transportation system. These corridors are planned to ease traffic congestion and reduce air emissions resulting from truck traffic along the interstates and other roadways, particularly within the major cities along established transportation routes (MARAD n.d.).
- **Future Action**: Corridor traffic via land is expected to grow significantly by 2025 and the M-10 route would provide a maritime route that could ease congestion (including freight rail congestion) around Houston and along 400 miles of the corridor already operating at an unacceptable level of service (MARAD n.d.). The M-10 route is expected to provide public benefits by reducing congestion on roadways, reducing greenhouse gas emissions, and reducing road maintenance costs (MARAD n.d.).
- **Future Action**: Two projects are associated with the M-10 Marine Highway Corridor. The Cross Gulf Container Expansion Project will expand the frequency and capacity of container-on-barge traffic. The Gulf Atlantic Marine Highway Project is a public-private venture that would distribute containers between the Gulf, mid-Atlantic, and south Atlantic coasts of the U.S via the M-10 and M-95 Corridors from Brownsville, Texas, to South Carolina. Estimated load volumes between Brownsville and Port Manatee are expected to increase from approximately 300 in 2011 to 345-405 in 2020; connecting transport service to the M-95 corridor (Delaware to Houston) is estimated to increase from 500 to 675 (MARAD 2011). To accommodate the planned traffic for distribution of containers, 10 vessels could be manufactured (MARAD n.d.).
- **Ongoing and Future Actions**: In anticipation of the potential for increased maritime commerce as a result of the 2014 expansion of the Panama Canal, ports along the Gulf of Mexico have signed Memoranda of Use with the Panama Canal Authority and are expanding and upgrading their infrastructure. Memoranda of Use have been signed between the ports of Freeport, Galveston, Houston, and the Port of Corpus Christi Authority, Texas; Port of New Orleans, Louisiana; Alabama State Port Authority; Mississippi State Port Authority at Gulfport; and Broward County (Port Everglades Department), Manatee County Port Authority, and Tampa Port Authority, Florida (Panama Canal Authority 2012). Many of the ports are deepening and widening channels, improving existing facilities and developing new terminals, berths, and container storage areas in order to attract additional markets and maintain competitiveness.

6.8.3.5 Energy Activities

The Gulf of Mexico is one of the most important regions for energy and chemical resources. This sector is supported by numerous facilities including: platform fabrication yards, shipyards, support and transport facilities, pipelines, pipe coating yards, liquefied natural gas (LNG) processing and storage facilities, refineries, petrochemical plants, and waste management facilities, among others. Examples of actions considered in this cumulative action category are found in Appendix 6-B.

Offshore Oil Production. Management of the oil and gas resources of the outer continental shelf (OCS) is governed by the Outer Continental Shelf Lands Act, which sets forth procedures for leasing, exploration, and development and production of those resources. The BOEM within the Department of the Interior is responsible for implementing the requirements of the Act related to preparing the leasing program (BOEM 2011). Pursuant to the OCS Lands Act, BOEM has prepared *A Proposed Outer Continental Shelf Oil and Gas Leasing Program for 2012-2017.* The five-year proposed program includes a schedule of offshore oil and gas lease sales on the U.S. OCS. Of the 15 proposed lease sales included in the proposed program, 12 are in the Gulf of Mexico and include:

- Western Gulf of Mexico: A total of five annual area-wide lease sales began in the fall of 2012 that made available all un-leased acreage.
- Central Gulf of Mexico: A total of five annual area-wide lease sales beginning in the spring of 2013 that make available all un-leased acreage.
- Eastern Gulf of Mexico: A total of two sales, in 2014 and 2016, in areas of the Eastern Gulf of Mexico.

Transportation for most oil and gas from the Gulf of Mexico Proposed Planned Leasing Program is anticipated to be accomplished by extending and expanding existing offshore pipeline systems with some transport from barge and shuttle tankers.

Offshore Natural Gas Facilities. LNG facilities on the OCS are currently in various stages of the permitting process. The Bienville Offshore Energy Terminal approved in 2010, is a planned LNG facility located 63 mi south of Mobile Point, Alabama. In Louisiana, the Main Pass Block 299 mine, operated by Freeport-McMoRan, is leased to mine sulphur and salt in Federal waters of the Gulf of Mexico (lease OCS-G9372). The mine is located about 26 km (16 mi) offshore, east of Plaquemines Parish, Louisiana. Currently, the mine site is under development by Freeport-McMoRan and United LNG as the Main Pass Energy Hub (United LNG 2012). The development will contain a LNG liquefaction facility, and hydrocarbon and LNG storage in the salt caverns (United LNG 2012). It is expected to be operational by 2017.

State Oil and Gas Activities. All Gulf States, with the exception of Florida, have active oil and natural gas programs in offshore State waters and onshore areas. Texas and Louisiana have the highest levels of oil and gas activity in the Gulf of Mexico, and this is predicted to continue into the foreseeable future. Oil production in Texas in recent years has increased from 443 thousand barrels (Mbbl) in 2000 to 727 Mbbl in 2012. Texas's natural gas withdrawals increased from 5.6 billion cubic feet in 2000 to 7.1 billion cubic feet in 2012. Over 167,000 oil wells and over 102,000 gas wells are active in the State. Louisiana oil and gas production increased from 2010 to 2011 by 6 percent (68.1 Mbbl) in oil and 33.4 percent (2.9 trillion cubic feet (Tcf)) of natural gas. Oil production is forecasted to decrease slightly through 2030; however, natural gas production is expected to increase through 2020 to over 3 Tcf and then decrease to approximately 2.5 Tcf by 2030 (Louisiana Department of Natural Resources 2012). Mississippi Development Authority (MDA) has issued proposed rules for seismic exploration and state leasing for offshore oil and gas drilling in the State's coastal waters. Drilling of new wells for oil and gas has increased substantially from 1999 to present, and the number of producing wells increased to 6929 in 2010, up from 564 wells in 1970 (Alabama Oil and Gas Board 2011). Expansion of offshore oil and gas production is increasing shipbuilding along the Alabama coast due to demand for offshore supply and rig-tending vessels and infrastructure associated with repairing drilling rigs (GCERTF 2011). Examples of actions considered in this cumulative action category are found in Appendix 6-B.

6.8.3.6 Marine Mineral Mining, Including Sand and Gravel Mining

BOEM has authority to lease mineral resource deposits within coastal Gulf waters for phosphate, oyster shell, limestone, sand and gravel, and magnesium (MMS 2004). However, sand and gravel are the minerals that are primarily mined in Gulf of Mexico. Limitations of sand, both the correct composition and quantity, can be an issue in many areas of the Gulf. The BOEM Marine Minerals Program (MMP) is observing an increase in the requests for outer continental shelf sand because suitable state resources are becoming depleted. Examples of actions considered in this cumulative action category are found in Appendix 6-B.

6.8.3.7 Coastal Development and Land Use

The landscape of the northern Gulf of Mexico has been altered and will continue to be altered as a result of land use activities that include coastal development and redevelopment for residential, commercial, industrial, recreational, agricultural, and forestry purposes. Changes in land use patterns that result from a need for economic development, such as tourism-related coastal development, intensify demand on coastal resources and can lead to environmental degradation and natural hazard risks. Increasing populations within coastal communities such as resort and retirement communities can change the historic water-dependent land uses, which include public access for recreation, commercial and recreational fishing, and ship-building. Examples of actions considered in this cumulative action category are found in Appendix 6-B.

Based on building permit numbers, construction of single-family homes in Louisiana and Texas decreased after 2006. Mississippi and Alabama continue to have a low, but consistent level of building permits issued (NOAA 2011g). Development within the South Padre Island and Port Aransas areas of Texas and the Tampa Bay region of Florida is principally residential and mixed use development; however, many construction projects have been cancelled, reduced in scope, or timeframes extended to build-out as a result of the post 2008 economy.

Seasonal and retirement communities have also grown within the Gulf of Mexico region, especially in Gulf communities of Florida and Texas. Over 500,000 seasonal homes are located within the region, distributed as follows: Texas (14 percent); Louisiana (7 percent); Mississippi (1 percent); Alabama (4 percent) and Florida (74 percent) (NOAA 2011g).

6.8.3.8 Fisheries and Aquaculture

The Gulf of Mexico Fishery Management Council (GMFMC or Council) is one of eight regional Fishery Management Councils established by the Fishery Conservation and Management Act of 1976. The Council prepares fishery management plans which are designed to manage fishery resources within the 200-mile limit of the Exclusive Economic Zone (EEZ) in the Gulf of Mexico. The GMFMC has authority to regulate fisheries in federal waters, including aquaculture. Federal waters begin three to nine nautical miles offshore and extend to outer edge of the 200 mile EEZ. From Texas and Florida federal waters begin nine nautical miles out, and from Mississippi, Louisiana and Alabama, federal waters begin three nautical miles out (Gulf of Mexico Fishery Management Council 2013).

The Council manages and regulates commercial and recreational fishing in federal waters. It sets closures for sensitive and marine sanctuaries, quotas, trip limits, and minimum size limits for coastal migratory fish, reef fish, shellfish, and other fish. For recreational fishing, the Council regulates fishing activities, including setting seasons and closure; permitting activities; and setting daily and bag limits, and minimum size requirements. Currently no aquaculture activity occurs within federal waters, although an Aquaculture Fishery Management Plan (FMP) has been developed that would permit and regulate these operations. Examples of actions considered in this cumulative action category are found in Appendix 6-B.

The Council and NOAA National Marine Fisheries Service (NMFS) developed the Aquaculture FMP to maximize benefits to the Nation by establishing a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico. The primary goal of the proposed aquaculture permitting program is to increase the maximum sustainable yield and optimum yield of federal fisheries in the Gulf of Mexico by supplementing the harvest of wild caught species with cultured products. While the Aquaculture FMP has been approved, it has not been implemented. Implementation regulations are currently being developed for the Aquaculture FMP.

If the Aquaculture FMP is implemented, an estimated 5 to 20 offshore aquaculture operations would be permitted in the Gulf over the next 10 years, with an estimated annual production of up to 64 million pounds (NOAA 2009). The plan prohibits shrimp farming, and only allows the raising of native Gulf species.

Various state agencies are responsible for regulating recreational, commercial, and aquaculture activities within state waters, including: Florida Fish and Wildlife Conservation Commission, Florida Department of Environmental Protection, Florida Department of Agriculture and Consumer Service Division of Aquaculture; Alabama Department of Conservation and Natural Resources Marine Resources Division; Louisiana Department of Wildlife and Fisheries; Mississippi Department of Environmental Quality; Mississippi Department of Marine Resources ; Mississippi Department of Agriculture and Commerce; Mississippi Department of Wildlife, Fisheries, & Parks; and Texas Parks and Wildlife Department. These agencies manage, monitor, and regulate commercial fisheries and aquaculture within their state waters. Requirements from the agencies include licensing and permitting activities and operations; leasing of coastal submerged land for aquaculture; setting catch limits, quotas, and seasons, regulating harvesting and processing; and providing technical assistance.

As described on their website, the Gulf States Marine Fisheries Commission was established by an act of Congress (P.L. 81-66) in 1949 as a compact of the five Gulf States. Its charge is: "to promote better utilization of the fisheries, marine, shell and anadromous, of the seaboard of the Gulf of Mexico, by the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste of the fisheries from any cause." The Commission is composed of three members from each of the five Gulf States. Those members include the head of the marine resource agency of each state, a member of the legislature, and a citizen with knowledge of marine fisheries appointed by the governor.

6.8.3.9 Tourism and Recreation

The tourism industry in the Gulf region offers a wide variety of activities such as golfing, gambling, beach recreation, boating, ecotourism (wildlife watching, birding, visiting parks, beaches and wildlife refuges, scenic viewing), hunting and fishing. Many of these activities are directly dependent upon the coastal ecosystems of the Gulf of Mexico. Access to the waters, beaches, wildlife and scenic views in each of the five Gulf States supports a multi-billion dollar regional tourism industry (GCERTF 2011). Examples of actions considered in this cumulative action category are found in Appendix 6-B.

Efforts to promote and increase tourism in the Gulf States include marketing and advertising incentives, casino resort development, wildlife and cultural festivals, and golf tournaments. There are activities for increasing and diversifying passive recreation and tourism in the Gulf. These activities include birding, wildlife viewing, cultural heritage enjoyment, and water trails that can be traversed by canoe or kayak.

6.8.4 Cumulative Impact Analysis (Step 4)

The following section and associated tables describe the cumulative impacts of the alternatives being considered when combined with other past, present, and reasonably foreseeable future actions. The analysis provided below considers the impacts of the cumulative action categories and their corresponding actions identified above and in Appendix 6-B. The analysis recognizes that in most cases the contribution to the cumulative impacts for a given resource from implementing the action alternatives would be difficult to discern, at a broad programmatic level across the Gulf of Mexico, given the context and intensity of impacts from the other past, present, and future actions. In many situations, implementation of one of the action alternatives would likely help reduce overall long-term adverse impacts by providing a certain level of offsetting benefits, especially when considered in concert with other actions of similar nature (e.g., stewardship programs, non-NRDA restoration, etc.). The cumulative impact analysis is evaluated by affected resource.

There are several ways in which effects may come together to result in cumulative effects. For purposes of the following analysis, cumulative effects have been identified and may fall under one or more of the following categories, which are defined, for purposes of this analysis, as:

- **Additive adverse or beneficial effect**: Occurs when the negative or beneficial impact on a resource adds to effects from other actions;
- **Synergistic (Interactive) adverse effect**: Occurs when the net adverse impact on a resource is greater than the sum of the adverse impacts from individual actions (this could also result in a different type of impact than the impact of the individual impacts; e.g., increased temperature discharges in water when added to increased nutrient loading can result in reduced dissolved oxygen—a different impact) ; and
- **Synergistic (Interactive) beneficial effect**: Occurs when the net beneficial impact on a resource is greater than the sum of the benefits from individual actions (this could also result in a different type of impact than the impact of the individual impacts);
- **Countervailing effect**: Occurs when the net effect of two or more actions, when combined have an overall effect that is less than the sum of their individual effects.

In the following sections, the analysis is organized by resource and alternative. The analysis follows the pattern below:

- direct and indirect effects of the proposed action (X);
- the impacts to the resources from applicable past, present, and reasonably foreseeable future actions (Y); and
- potential cumulative impacts of the alternative and applicable actions on an affected resource (Z), where the effects may interact and be additive, more simply, X+Y=Z.

6.8.4.1 Physical Environment

As described in Chapter 3, the nearshore, marine environment is comprised of the coastline and the inner continental shelf, extending to depths of 600 feet. The offshore, marine environment consists of portions of the Gulf of Mexico that are more than 600 feet deep including the outer shelf, continental slope, and abyssal plain. Coastal transition areas typically include tidally influenced areas (e.g., marshes, estuaries, and coastal wetlands). Finally, upland environments are those habitats that are adjacent to coastal transition, but are not subject to a tidal regime or regularly inundated by water.

Construction and operation of energy and mining facilities (offshore and onshore), marine transportation facilities, commercial, industrial and residential development in coastal habitats, corridor improvements, etc. are detailed in Appendix 6-B (hereinafter "ongoing activities"). These actions may alter, damage or destroy elements in the physical environment through impacts including water quality degradation, substrate disturbances, and conversion of habitats to residential, commercial or industrial uses or other human disturbances. There are also many environmental stewardship and restoration projects that have occurred or are underway in the region (see Appendix 6-B) that may affect the physical environment.

6.8.4.1.1 Geology and Substrates

The northern Gulf of Mexico region includes upland surface soils, subsurface rock features, and submerged coastal and oceanic sediments. Sediment resources are particularly important along the areas dominated by deltaic processes (e.g., Mississippi River Delta), and where land building and erosion are dynamic and dependent on the availability of sediment resources. Table 6-4 analyzes cumulative impacts of the Programmatic ERP/PEIS Alternatives on geology and substrates.

Table 6-4. Cumulative Impacts to Geology and Substrates

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to geology and substrates from past, present, and reasonably foreseeable future actions, such as military activities, marine transportation, energy and mining activities, coastal development and land use would occur. The magnitude of these effects would vary by activity and location. For example, marine oil and gas exploration and extraction adversely affects the nearshore coastal areas from pipeline construction and marine transportation, but also affects upland areas as a result of shoreside-associated infrastructure including marine terminals, pipelines and transportation corridors through soil compaction and removal, reduced soil stability, and soil contamination. Coastal development and land use effects are largely confined to upland and nearshore coastal areas and include adverse effects such as rutting, removal of substrates, compaction, and erosion. In addition to these adverse effects, countervailing impacts associated with reduced erosion or increasing sediment availability from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration.

ALTERNATIVES	CUMULATIVE IMPACTS
	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast geology or substrates.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore barrier islands and beaches and conserve habitats. These actions are expected to result in minor to moderate short-term construction-related adverse impacts, primarily related to equipment staging and use, and rutting. The placement of new structures such as breakwaters could result in minor to moderate long-term adverse effects by changing the natural processes of sediment accretion and erosion, preventing washover events, and causing erosion in offsite locations. Removal of borrow materials would cause long-term minor impacts to localized areas. Construction activities could also cause long-term soil compaction. However, long-term benefits to geology and substrates are also expected, including reduction in sediment runoff decreased soil disturbance, reduction in erosion/loss of wetlands, stabilization of substrates, backfilling of submerged propeller scars. The effects of Alternative 2 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other past, present, and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these impacts would include soil compaction and removal, reduced soil stability, soil contamination, rutting, removal of substrates, compaction, and erosion. In addition to these adverse effects, countervailing impacts associated with reduced erosion or increasing sediment availability from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to geology and substrates. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to geology and substrates in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in minor to moderate short-term construction-related adverse impacts to geology and substrates, primarily related to equipment staging and use, and rutting. The placement of new structures such as piers, dune walkovers, or viewing platforms could result in minor to moderate long-term adverse effects by changing the natural processes of sediment accretion and erosion, preventing washover events, and causing erosion in offsite locations. Removal of borrow materials would cause long-term minor impacts to localized areas. Construction activities could also cause long-term soil compaction. However, long-term benefits to geology and substrates are also expected related to sediment deposition on beaches and creation of artificial reefs. Additional benefits could accrue where projects improve existing outdated or degraded infrastructure that cause erosion. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale.

ALTERNATIVES	CUMULATIVE IMPACTS
	Other past, present, and reasonably foreseeable future actions described above under the No Action alternative would be expected to continue. As described above, these impacts would include soil compaction and removal, reduced soil stability, soil contamination, rutting, removal of substrates, compaction, and erosion. In addition to these adverse effects, countervailing impacts associated with reduced erosion or increasing sediment availability from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to geology and substrates would likely occur. However Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to geology and substrates in localized areas. Alternative 3 would not contribute substantially to cumulative adverse impacts.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast geology and substrates under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these impacts would include soil compaction and removal, reduced soil stability, soil contamination, rutting, removal of substrates, compaction, and erosion. In addition to these adverse effects, countervailing impacts associated with reduced erosion or increasing sediment availability from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to geology and substrates would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to geology and substrates.

6.8.4.1.2 Hydrology and Water Quality

Gulf Coast hydrology and water quality are mainly affected by freshwater inputs (from inland waters of the Gulf of Mexico Watershed) and the movement of salt water. As stated in Chapter 3, the quantity and rate of freshwater inputs through contributing rivers can be altered by a number of natural and anthropogenic factors such as changes in rainfall and land cover; flood control practices; spillway operation; navigation structures such as locks, dams, weirs and other water control structures; consumption of freshwater by agriculture, municipal, and industrial interests; and the development of stormwater infrastructure. Freshwater inflows to the northern Gulf of Mexico contribute nutrients, sediments, and pollutants from upstream agriculture, stormwater runoff, industrial activities, and wastewater discharges. The influx of these constituents is further affected by currents and surface winds. In addition, the nearshore environment, including tidal marsh areas, has been physically modified (e.g., through channelization and canal construction), allowing saltwater intrusion, which impacts both surface and sub-surficial groundwater resources. These alterations can affect the influx of freshwater into the northern Gulf of Mexico resulting in alterations to salinity regimes in nearshore areas potentially increasing the frequency and magnitude of hypoxic events. On balance, the inflow of freshwater provides the freshwater and sediment inputs necessary for maintaining healthy nearshore salinity regimes and coastal landscapes, and offshore currents generally improve water quality through mixing and dilution. However, offshore currents can also serve as a conduit for pollution that can contribute to water quality degradation.

Table 6-5 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on hydrology and water quality.

Table 6-5. Cumulative Impacts to Hydrology and Water Quality

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to hydrology and water quality from past, present, and reasonably foreseeable future actions, such as military activities, marine transportation, energy and mining activities, coastal development and land use would occur. The magnitude of these effects would vary by activity and location. For example, drilling, pipeline construction, and marine transportation activities could affect offshore hydrology and water quality. Infrastructure associated with shoreside infrastructure, such as marine terminals, pipelines, transportation corridors, could lead to adverse impacts to hydrology and water quality in nearshore coastal and freshwater environments. These impacts would include disruption of sediments, increased turbidity, industrial, or other polluted stormwater runoff, saltwater intrusion or changes in the hydrologic regimes of waterbodies. In addition to these adverse effects, countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast hydrology and water quality.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts, primarily increases in turbidity. Shoreline protection could also result in minor long-term adverse effects by changing the ocean current patterns in the localized area. However, long-term benefits to hydrology and water quality are also expected, including improving wetland function, reduction in the inland flow of salt water, reduction in nutrient and sediment runoff, and reduction in erosion/loss of wetlands. The effects of Alternative 2 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to water quality and hydrology. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to hydrology and water quality in the Gulf Coast region because of the potential for

ALTERNATIVES	CUMULATIVE IMPACTS
	synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term construction-related adverse impacts, including increases in turbidity and sedimentation. In addition, these actions may result in minor long-term increases in stormwater runoff and pollutants as a result of conversion of pervious to impervious surfaces, discharge of fish hatchery effluent, and increased presence of boats and equipment in waterways. To the extent that projects replace or improve outdated or failing systems, long-term benefits may also accrue. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to hydrology and water quality would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to water quality in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast hydrology and water quality under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to hydrology and water quality would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to hydrology and water quality.

6.8.4.1.3 Air Quality and Greenhouse Gases

All of the Gulf Coast counties meet the NAAQS for nitrogen dioxide, sulfur dioxide, carbon monoxide, particulate matter, and lead. However, the Houston-Galveston-Brazoria area has been listed by EPA as nonattainment for existing ozone standards (U.S. EPA 2013) (IPCC 2013). Greenhouse gas emissions over a recent five year period (2007-2011) for the five state area has varied by state and overtime from 1,364.6 – 1,316.9 million metric tons of CO_2 Eq. (U.S. EPA 2013). National emissions in 2011 totaled

6,702 million metric tons CO2 Eq. (U.S. EPA 2013). This was a 1.6 percent reduction from 2010. Globally, greenhouse gas emissions rose by 4.6% in 2010 and increased by 1.3 gigaton (Gt) of CO2 Eq. between 2009 and 2010 (IEA 2012) reaching 30.3 Gt. of CO2 Eq.

Table 6-6 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on air quality and greenhouse gas emissions.

Table 6-6. Cumulative Impacts to Air Quality and Greenhouse Gas Emissions

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to air quality and greenhouse gas emissions from past, present and reasonably foreseeable future actions, such as emissions from vehicles, military activities, marine transportation, energy and mining activities, and coastal development and land use would continue. Largely due to its regulated nature, air quality would likely remain stable; however, it could decline over the short- and long terms in certain areas. Similarly, many of these same sources of emissions would contribute greenhouse gas emissions. These emissions add to global greenhouse gas levels, which are projected to rise up to 37 Gt. by 2035 (IEA 2012). Construction activities associated with natural resource restoration would also contribute to impacts to air quality and greenhouse gas emissions in the short-term. However, some level of countervailing beneficial impacts associated with restoration, conservation and recovery efforts from other environmental stewardship and restoration activities in the Gulf of Mexico that increase the ability of the region's natural resources to absorb emissions would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to air quality and greenhouse gas emissions.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts to air quality and GHG. The effects of Alternative 2 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Project types that protect habitat or increase native vegetation would result in some level of CO_2 absorption; however, the benefits would be difficult to measure. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these actions would result in short- and long-term adverse impacts to air quality in certain areas and would contribute greenhouse gases to global greenhouse gas levels. Construction activities associated with natural resource restoration would also contribute short term adverse impacts to air quality and greenhouse gas emissions; though some level of countervailing beneficial impacts could occur if they increase ability of the Region's natural resources to absorb emissions. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to air quality or greenhouse gas emissions. To the extent that they increase CO_2 absorption, Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in some long-term beneficial cumulative impacts to greenhouse gas emissions because of the potential for synergistic effects of Alternative 2 project types with these

ALTERNATIVES	CUMULATIVE IMPACTS
	other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term construction-related minor to moderate adverse impacts, including increases in air and greenhouse gas emissions. In addition, project types of Alternative 3 are expected to increase recreational use and visitation which would contribute to air quality and greenhouse gas emission rates in the long-term minor adverse impacts from the use of recreation equipment and vehicles (e.g., boats, cars, RVs) and from the operation and maintenance of certain facilities and services. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these actions would result in short- and long-term adverse impacts to air quality in certain areas and would contribute greenhouse gases to global greenhouse gas levels. Construction activities associated with natural resource restoration would also contribute short term adverse impacts to air quality and greenhouse gas emissions; though some level of countervailing beneficial impacts could occur if they increase ability of the Region's natural resources to absorb emissions. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to air quality and greenhouse gas emissions would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. It is unlikely that there would be any beneficial cumulative impacts associated with Alternative 3.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts air quality and greenhouse gas emissions under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these actions would result in short- and long-term adverse impacts to air quality in certain areas and would contribute greenhouse gases to global greenhouse gas levels. Construction activities associated with natural resource restoration would also contribute short term adverse impacts to air quality and greenhouse gas emissions; though some level of countervailing beneficial impacts could occur if they increase ability of the Region's natural resources to absorb emissions. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to air quality and greenhouse gas emissions would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. To the extent that they increase CO_2 absorption, Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts may result in some long-term beneficial cumulative impacts to greenhouse gas emissions because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities. However, the contribution from Alternative 4 would be difficult to measure.

6.8.4.1.4 Noise

Noise levels in areas of the Gulf Coast region are affected by a number of ongoing activities (Appendix 6-B). The primary sources of terrestrial noise in the coastal environment are transportation and construction-related activities. In the marine environment, sounds are also introduced from marine transportation, military activities, energy development and mineral-related activities (e.g., oil and gas exploration, drilling and production), among others.

Table 6-7 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on noise.

Table 6-7. Cumulative Impacts to Noise

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Past, present, and reasonably foreseeable future actions are likely to affect ambient noise in the Gulf Coast region, including energy and mining, coastal development, land use, military activities, and marine transportation. The magnitude (duration as well as decibel level) of these disruptions to existing ambient noise levels would vary by activity and location. For example, construction-related impacts would likely be limited in duration, while drilling activities, marine transportation, and coastal development could lead to long-term increases in ambient noise levels. New activity occurring in previously undisturbed areas would increase ambient noise levels, while disruptions in more industrial and heavily used areas would cause less increases to ambient noise levels given existing conditions. In addition to these adverse effects, some countervailing impacts to noise associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur, as lands are conserved from development, or new areas are vegetated that were previously bare. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse effects to noise levels in the Gulf Coast.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term minor to major construction-related adverse impacts to noise. Long-term noise impacts would only be expected in a case where newly conserved land was opened to recreational use. These impacts would be minor. The effects of Alternative 2 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Alternative 2 is expected to have little long-term impacts to ambient noise conditions. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these impacts would include short-term effects associated with construction activities, as well as longer term impacts associated with drilling activities, marine transportation, and coastal development. Some countervailing impacts associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to noise. Because it has little effect on noise over the long-term, Alternative 2 is not expected to substantially contribute to beneficial cumulative impacts to noise in the Gulf Coast region.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. These actions are expected to result in short-term minor to major construction-related adverse impacts to noise.

ALTERNATIVES	CUMULATIVE IMPACTS
	Long-term noise impacts would be expected where additional recreational use, in terms of foot, car, or boat traffic, is expected. These impacts would range from minor to moderate. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these impacts would include short-term effects associated with construction activities, as well as longer term impacts associated with drilling activities, marine transportation, and coastal development. Some countervailing impacts associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 3 would not contribute substantially to short-term or long-term cumulative adverse impacts to noise. Because it has little effect on noise over the long-term, Alternative 3 is not expected to substantially contribute to beneficial cumulative impacts to noise in the Gulf Coast region.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to noise under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Past, present and reasonably foreseeable future actions described above under the No Action would be expected to continue. As described above, these impacts would include short-term effects associated with construction activities, as well as longer term impacts associated with drilling activities, marine transportation, and coastal development. Some countervailing impacts from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to noise would likely occur. However, Alternative 4 would not contribute substantially to cumulative or beneficial or adverse impacts.

6.8.4.2 Biological Resources

Biological resources include habitats, as well as the plant and animal species (living coastal and marine resources) that utilize those habitats. Gulf Coast habitats and living coastal and marine resources vary throughout the region. Habitats discussed in Chapter 3 are important to protected species (e.g. SAV is considered a sensitive habitat that has declined and is protected that provides foraging for listed manatees) and have experienced degradation and losses over time.

6.8.4.2.1 Habitats

The Gulf Coast habitats are a mosaic of environments that include wetlands (marshes, mangrove stands, tidal wetlands, etc.), beaches, barrier islands and coastal transition zones (terrestrial and riparian areas, bottomland forests, etc.). These habitats (described fully in Chapter 3) provide key functions and resources required by the high diversity of plants and animals that depend on these habitats and their interconnections. Sensitive habitats include SAV, wetlands, turtle and bird nesting beaches, barrier islands, estuaries, coastal dunes, and reefs, among others. These sensitive habitats are widely dispersed along the Gulf Coast. Impacts to one habitat may result in cascading adverse effects to an array of other habitat types. For example, development in coastal transition zones may affect stormwater runoff, increased volume and rates of stormwater runoff and excessive sedimentation in receiving water bodies. This in turn, can result in sedimentation and impacts to coastal wetlands which, when intact, can protect shorelines and beaches from excessive erosion by slowing wave action, reducing storm surges and providing water surface area for high tides. Table 6-8 analyses the cumulative impacts of the Programmatic ERP/PEIS on habitats.

Table 6-8. Cumulative Impacts to Habitats

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to habitat from past, present, and reasonably foreseeable future actions would occur. The magnitude of these effects would vary by activity and location. Sensitive habitats would be more vulnerable to adverse impacts compared to more general habitat, though both would be impacted. Impacts to habitats would include habitat degradation through reduced quality (e.g., reduced water quality or introduction of invasive species), habitat fragmentation, and habitat loss. For example, marine oil and gas exploration and extraction adversely affects marine habitats through as a result of drilling, pipeline construction and marine transportation. Associated actions also similarly affect terrestrial habitats as a result of infrastructure development (marine terminals, pipelines, transportation corridors). Coastal development and land use impacts to habitats are largely confined to nearshore marine and terrestrial habitats. In addition, infrastructure improvements, terrestrial energy and mining development, and military operations all have associated construction and operation activities that impacted habitat through placement of facilities, roadways, airports, energy corridors and other land developments. Countervailing impacts associated with habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new or restore degraded habitats, protect habitats from fragmentation, and preserve unaffected quality habitats, especially sensitive habitats. For example, Phase I and Phase II efforts focused on marsh and dune habitat restoration as well as nesting bird and sea turtle habitat restoration. These actions provide benefits to sensitive habitats. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast habitats.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast habitats, including sensitive habitats, would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Most Alternative 2 project types would result in short-term minor to moderate adverse impacts to habitat as a result of construction activities. Adverse impacts could include: increased soil erosion, vegetation damage or removal, changes in water quality from turbidity and substrate disturbance from in-water work, and the potential introduction or opportunity for establishment of invasive species. Long-term minor to moderate adverse impacts could occur to habitats adjacent to new breakwaters or other shoreline protection structures as they could change natural current patterns, sediment accretion and erosion rates; alter availability of invertebrate prey; and cause changes to erosion in off-site locations. Long-term minor to moderate adverse impacts may also occur from habitat restoration projects where one habitat type is permanently converted to another target habitat type (e.g. displacement of unvegetated openwater habitat to restore wetlands or oyster reef).

ALTERNATIVES	CUMULATIVE IMPACTS
	However, since many of these project types focus on restoring or protecting natural resources, Gulf Coast habitats would largely experience long-term beneficial impacts through improved health, stability and resiliency of habitats, including sensitive habitats such as wetlands, barrier islands, areas of SAV, and reefs. These project types could help reestablish native plant communities, stabilize substrates and support sediment deposition, strengthen shorelines, and reduce erosion. Past, present and reasonably foreseeable future actions described above under the No Action alternative would be expected to continue. As described above, activities including energy and mining, coastal development and land use, military activities, and marine transportation would result in short- and long-term adverse impacts to habitats including habitat degradation through reduced quality (e.g., reduced water quality or introduction of invasive species), habitat fragmentation, and habitat loss. Construction activities from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities would also contribute short term adverse impacts. However, countervailing beneficial impacts from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new or restore degraded habitats, protect habitats from fragmentation, and preserve unaffected quality habitats, especially sensitive habitats. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to habitats. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts would result in long-term beneficial cumulative impacts to habitats in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short- and long-term adverse impacts to habitats. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Short-term adverse impacts would be related to construction or reconstruction activities such as those necessary for public access facilities, fish hatcheries, artificial reefs, campgrounds and education centers. Long-term adverse impacts include those that result from the operation, use and maintenance of facilities. These short- and long-term adverse impacts could include alteration of wetlands; covering, loss or shading of SAV or other habitats from placement of structures; filling of shallow water areas; localized plant species displacement or loss, introduction of invasive species, and degradation of habitats including potential habitat fragmentation as a result of an increased recreational activity and human use; increased soil erosion; changes in water quality from stormwater runoff associated with the conversion of upland pervious areas to impervious surfaces (parking areas, buildings, etc.) and increased turbidity and substrate disturbance from in-water work with heavy equipment or leaching of construction fluids. Some recreational enhancement projects may have long-term beneficial effects on habitats such as wetlands, barrier islands, beaches, coastal transition zones, SAV and shallow water habitats. For example, enhancement projects could reduce degradation and recreation use in habitats by redirecting use to a site that is more appropriate and conducive to recreational activities. These activities could also help stabilize substrates, support sediment deposition, and reduce erosion. In addition, the creation of artificial reefs could benefit sessile and benthic encrusting organisms by providing substrate and interstitial spaces for use as habitat and forage areas. Providing educational programs related to coastal resources could increase public awareness of Gulf Coast habitats by increasing public knowledge of, and support for, preservation and conservation of these habitats, as well as potentially resulting in behavioral changes during future public encounters with sensitive habitats.

ALTERNATIVES	CUMULATIVE IMPACTS
	Past, present and reasonably foreseeable future actions described above under the No Action alternative would be expected to continue. As described above, activities including energy and mining, coastal development and land use, military activities, and marine transportation would result in short- and long-term adverse impacts to habitats including habitat degradation through reduced quality (e.g., reduced water quality or introduction of invasive species), habitat fragmentation, and habitat loss. Construction activities from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities would also contribute short term adverse impacts. However, countervailing beneficial impacts from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new or restore degraded habitats, protect habitats from fragmentation, and preserve unaffected quality habitats, especially sensitive habitats. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to habitat would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to habitat in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast habitats under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Past, present and reasonably foreseeable future actions described above under the No Action alternative would be expected to continue. As described above, activities including energy and mining, coastal development and land use, military activities, and marine transportation would result in short- and long-term adverse impacts to habitats including habitat degradation through reduced quality (e.g., reduced water quality or introduction of invasive species), habitat fragmentation, and habitat loss. Construction activities from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities would also contribute short term adverse impacts. However, countervailing beneficial impacts from habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new or restore degraded habitats, protect habitats from fragmentation, and preserve unaffected quality habitats, especially sensitive habitats. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to habitat would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts would likely result in long-term beneficial cumulative impacts to habitats in the Gulf Coast region because of the potential for synergistic effects of Alternative 4 project types with these other environmental stewardship and restoration activities.

6.8.4.2.2 Living Coastal and Marine Resources

The Gulf Coast is home to a host of living coastal and marine resources that includes a diversity of plant and animal species. Some Gulf Coast species spend the vast majority of their live-cycle in a single habitat type (e.g., oysters on a reef). These species may be more vulnerable to habitat destruction than other species that utilize this habitat type intermittently. Certain species utilize a variety of Gulf Coast habitats for portions of their lifecycle (e.g. many juvenile fish species utilize estuaries until they reach maturity when they migrate to the open waters of the Gulf of Mexico). Other species, such as migratory birds, spend only part of the year in the Gulf Coast. More detail on species and their habitat needs is located in Chapter 3.

Impacts to Gulf Coast habitats from past, present, and reasonably foreseeable future actions, as described in Table 6-9, would also affect those living coastal and marine resources that rely on them. Actions that reduce/degrade habitat or increase/restore habitat would have corresponding impacts to the species that use those habitats. Therefore, the following cumulative impact analysis focuses on impacts to living coastal and marine resources.

Table 6-9. Cumulative Impacts to Living Coastal and Marine Resources

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to living coastal and marine resources from past, present, and reasonably foreseeable future actions would occur. The magnitude of these effects would vary by activity and location. Sensitive species would be more vulnerable to adverse impacts compared to more common species, though both would be impacted. Adverse impacts to living and coastal marine resources would include loss or degradation of nesting/spawning/rearing/resting/foraging areas (i.e., habitat degradation or loss as discussed in Table 6-8), reduced prey abundance, overfishing, incidental catch, reduced water quality, introduction of invasive species/competition, loss of movement corridors, and disturbance from increased human presence and activity. For example, military activities, marine transportation, energy and mining activities, commercial and recreational fishing, and coastal development would likely adversely impact marine species. Common species in the marine environment such as benthic organisms (mollusks, gastropods, etc.), fish from the sea bass, mackerel and bonefish families, are less susceptible to impacts from these actions because of their relative abundance and the availability of habitat. Marine species such as the endangered manatee, protected marine mammals, and listed fish could be affected by noise (construction equipment, drilling, military operations), water quality and substrate disturbances and degradation, vessel operation and habitat loss. Species such as manatees, sea turtles and listed fish have been adversely affected by habitat loss (nesting/spawning/rearing, foraging), reduced prey abundance, overfishing, incidental catch, and increased human presence and activity. In many cases these effects have prompted jurisdictional agencies to provide additional protections either through the ESA, MMPA or designating EFH or Critical Habitat for individual species or groups of species. Because protected species have already experienced population declines and their current populations are considered unstable, adverse impacts from past, present and reasonably foreseeable future actions would likely have a more substantial effect. Coastal development and land use, military activities, marine transportation facilities and corridor improvements, energy development, and infrastructure development all have associated construction and operation activities that have removed terrestrial species habitats (breeding/nesting, foraging), reduced prey abundance, and increased species mortality through placement of facilities, roadways, corridors for moving goods and services and residential and commercial development. Terrestrial protected species have also been indirectly affected by increases in human presence, habitat fragmentation, loss of wildlife movement corridors and water quality degradation from urban development and polluted runoff. For example, activities that fill wetland/aquatic habitat would reduce available nursery and foraging areas for some aquatic and terrestrial species, which could cause species to relocate such as migratory birds. Common terrestrial species such as white ibis, king rails, raccoons, box turtles, etc. are less susceptible to development pressures and tend to adapt to human presence and disturbances more readily than many protected species. However, development activities such as those

ALTERNATIVES	CUMULATIVE IMPACTS
	described above have resulted in cumulative adverse impacts to even common wildlife species. Countervailing impacts associated with habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new, or restore, degraded habitats; increase species populations; and decrease species stressors. For example, Phase I and Phase II Early Restoration efforts focused on marsh and dune habitat restoration as well as nesting bird and sea turtle habitat restoration. These actions provide benefits to both common and sensitive species. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast living coastal and marine resources.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast habitats and restoring and protecting oysters and other shellfish, finfish, sea turtles, and birds would be undertaken. Most Alternative 2 project types would result in short-term minor to moderate adverse impacts to living coastal and marine resources as a result of restoration construction activities. Project types that include in-water work or dredging could affect oyster populations and other benthic organisms from increased turbidity and siltation, which may increase mortality and inhibit spawning activities. Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal organisms. Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by construction activity or sediment placement. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and removal of benthos from dredged areas. Sensitive species such as sea turtle and marine mammals present in project areas where dredging or underwater use of equipment is occurring could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, which could temporarily displace individuals or prey. In addition, construction activities could result in the destruction of sea turtle eggs, or other ground nesters, deposited within the boundaries of the proposed project. Lighting from construction activities could disturb or interfere with female turtles nesting attempts (e.g., false crawls or use of marginal or unsuitable nesting areas) and could disorient hatchling turtles as they emerge from the nest and crawl to the water. Short-term minor displacement of local birds and terrestrial species or mortality of intertidal invertebrates could occur during construction, although most wildlife would be expected to move away to forage in other readily available foraging habitat during this activity. If construction occurs during the nesting season, nests could be destroyed, and chicks or fledglings could be harmed, causing a loss of recruitment and a longer term effect. Construction in terrestrial habitats could result in short-term impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, individual bird or terrestrial wildlife that rest, roost, forage or nest in or near the work area could be temporarily disturbed or displaced. Beach nourishment activities can result in short-term and minor to moderate impacts (such as disturbance and reduced foraging efficiency) to shorebirds if the birds are roosting and feeding in the area during a migration stopover or could result in harm or mortality if birds are nesting in the area. Predator control could have an adverse impact to some species, since these efforts such as constructing barriers could also exclude other non-target species that utilize those areas. Some Alternative 2 project types could result in long-term minor to moderate adverse impacts to living coastal and marine resources. Long-term minor to moderate adverse impacts could occur to living coastal and marine resources inhabiting areas adjacent to new breakwaters or other

ALTERNATIVES	CUMULATIVE IMPACTS
	shoreline protection structures as they could change natural current patterns, sediment accretion and erosion rates; alter availability of invertebrate prey; and cause changes to erosion in off-site locations. These structures could cause long term displacement of sea turtles as obstacles affecting the ability of female turtles to nest, the suitability of the nest incubation environment, and the ability of hatchlings to emerge from the nest and crawl to the ocean. In addition, the change in sediment accretion could cause long term impacts to benthic communities including shellfish. Similar habitat impacts to beaches could result in the long term displacement of shorebirds or other animals that use different beach-related habitats. Alternative 2 project types would result in long-term benefits to living coastal and marine resources. Project types that create or restore habitat, reduce erosion, improve water quality, and protect specific wildlife would have long term benefits for a variety of aquatic and terrestrial species. For example, the creation and restoration of wetlands could provide nesting and/or foraging habitat for birds as well as increasing habitat for terrestrial wildlife. Finfish could also benefit from wetlands restoration, which could provide habitat for foraging, spawning, and shelter. Restoring barrier islands and beaches could contribute to the quantity and quality of adjacent shallow water soft-bottom habitats that serve as nurseries and foraging areas for some finfish, while providing nesting habitat for birds. Impacts to living coastal and marine resources from past, present, and reasonably foreseeable future actions would occur. The magnitude of these effects would vary by activity and location. Sensitive species would be more vulnerable to adverse impacts compared to more common species, though both would be impacted. Adverse impacts to living and coastal marine resources would include loss or degradation of nesting/spawning/rearing/resting/foraging areas, reduced prey abundance, overfishing, incidental catch, reduced water quality, introduction of invasive species/competition, loss of movement corridors, and disturbance from increased human presence and activity. For example, military activities, marine transportation, energy and mining activities, commercial and recreational fishing, and coastal development would likely adversely impact marine species. Marine species such as the endangered manatee, protected marine mammals, and listed fish could be affected by noise, water quality and substrate disturbances and degradation, vessel operation and habitat loss. Because protected species have already experienced population declines and their current populations are considered unstable, adverse impacts from past, present and reasonably foreseeable future actions would likely have a more substantial effect. Coastal development and land use, military activities, marine transportation facilities and corridor improvements, energy development, and infrastructure development all have associated construction and operation activities that have removed terrestrial species habitats (breeding/nesting, foraging), reduced prey abundance, and increased species mortality through placement of facilities, roadways, corridors for moving goods and services and residential and commercial development. Terrestrial protected species have also been indirectly affected by increases in human presence, habitat fragmentation, loss of wildlife movement corridors and water quality degradation from urban development and polluted runoff. Countervailing impacts associated with habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new, or restore, degraded habitats; increase species populations; and decrease species stressors. For example, Phase I and Phase II Early Restoration efforts focused on marsh and dune habitat restoration as well as nesting bird and sea turtle habitat restoration. These actions provide benefits to both common and sensitive species. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative

ALTERNATIVES	CUMULATIVE IMPACTS
	adverse impacts to living coastal and marine resources. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to living coastal and marine resources in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. These actions are expected to result in short-term construction-related adverse impacts. Enhancing or constructing infrastructure could require in-water work with heavy equipment and long-term operation and maintenance of these facilities. Some short-term minor adverse effects could occur if resources, including oysters, fish, sea turtles, marine mammals, benthic communities, and pelagic microfaunal communities, were present in the construction area. Possible impacts could include increased turbidity, reduction of water quality, noise pollution, vibration, and disruption to the water column and habitat. Increased turbidity could limit available light necessary for photosynthesis, and disruption in the water column and surface water could disturb or kill some pelagic microfaunal communities. Fish present in the work area could be temporarily displaced, or eggs and larvae could be killed due to smothering or crushing by equipment, human activity, or sediment. Fish could also be subject to a temporary increase in sound pressure levels, a decrease in water quality, entrainment in dredge sediments, and alteration or removal of habitat; however, effects would not be expected to reduce local fish populations. Sensitive species such as sea turtles and marine mammals present in project areas where dredging, underwater use of equipment or reef placement could be subject to temporary increased noise, turbidity, and water quality changes as well as alteration or loss of forage or nesting habitat, all of which could temporarily displace individuals or prey during construction and result in short-term, minor impacts. Sea turtle and marine mammals may be present in project areas where use of explosives may be used to sink a vessel for creation of an artificial reef. Underwater explosions may affect marine life by causing death, injury, or behavioral reactions; depending on the distance an animal is located from a blast. This could result in short to long-term impacts to individuals and may result in minor to moderate impacts. Some hatcheries/aquaculture operations could result in long-term minor adverse effects to marine mammals or fish through unintentional exposure to disease through release of contaminated effluent or infected fish. Stocking of hatchery-reared finfish could also negatively impact the genetic diversity of the wild stock and affect the balance of the fish community, competing for food and habitat resources with finfish species present in the receiving waters. Construction in terrestrial habitats could result in short-term minor to moderate adverse impacts due to operation and staging of heavy equipment which can create noise, reduce or remove available habitat or disrupt normal movement of wildlife. As such, bird and terrestrial wildlife individuals that forage or nest in or near the work area could be temporarily disturbed or displaced. Stormwater runoff from impervious surfaces could enter waterways and increase turbidity as well as carry pollutants that could affect benthic organisms, fish or foraging bird species. Long-term minor to moderate adverse effects to species could result from the placement of piers, foundations, or other permanent structures; fill of shallow water areas; increased human traffic, and the conversion of pervious areas to impervious surfaces (parking areas, buildings, etc.). These actions could result in disturbance or displacement of local species. Increase site visitation could result in noise and other disturbances as well as degradation or fragmentation of habitats and upland areas used by wildlife in the vicinity.

ALTERNATIVES	CUMULATIVE IMPACTS
	The creation of artificial reefs could provide indirect benefits to marine fish, marine mammals, sea turtles, and potentially oysters and shallow water coral by providing food, shelter, or spawning areas. Whether the availability of new habitat will serve to increase fish and/or invertebrate biomass or will only serve to concentrate organisms at the site, is likely dependent on where the reef is sited and how it is designed. Providing educational features through coastal exhibits and collections, hands-on activities, educational outreach programs related to coastal resources could increase public awareness of marine resources and of their value to the ecosystem. This could result in a long-term benefit to nearshore benthic communities, oysters, marine mammals and other species beyond the lifespan of the project. To the extent that projects replace or improve outdated or failing systems, long-term benefits may also accrue. Impacts to living coastal and marine resources from past, present, and reasonably foreseeable future actions would occur. The magnitude of these effects would vary by activity and location. Sensitive species would be more vulnerable to adverse impacts compared to more common species, though both would be impacted. Adverse impacts to living and coastal marine resources would include loss or degradation of nesting/spawning/rearing/resting/foraging areas, reduced prey abundance, overfishing, incidental catch, reduced water quality, introduction of invasive species/competition, loss of movement corridors, and disturbance from increased human presence and activity. For example, military activities, marine transportation, energy and mining activities, commercial and recreational fishing, and coastal development would likely adversely impact marine species. Marine species such as the endangered manatee, protected marine mammals, and listed fish could be affected by noise, water quality and substrate disturbances and degradation, vessel operation and habitat loss. Because protected species have already experienced population declines and their current populations are considered unstable, adverse impacts from past, present and reasonably foreseeable future actions would likely have a more substantial effect. Coastal development and land use, military activities, marine transportation facilities and corridor improvements, energy development, and infrastructure development all have associated construction and operation activities that have removed terrestrial species habitats (breeding/nesting, foraging), reduced prey abundance, and increased species mortality through placement of facilities, roadways, corridors for moving goods and services and residential and commercial development. Terrestrial protected species have also been indirectly affected by increases in human presence, habitat fragmentation, loss of wildlife movement corridors and water quality degradation from urban development and polluted runoff. Countervailing impacts associated with habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new, or restore, degraded habitats; increase species populations; and decrease species stressors. For example, Phase I and Phase II Early Restoration efforts focused on marsh and dune habitat restoration as well as nesting bird and sea turtle habitat restoration. These actions provide benefits to both common and sensitive species. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to living coastal and marine resources, primarily as a result of increased education and awareness of resources and reef development.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast living coastal and marine resources under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Impacts to living coastal and marine resources from past, present, and reasonably foreseeable future actions would occur. The magnitude of these effects would vary by activity and location. Sensitive species would be more vulnerable to adverse impacts compared to more common species, though both would be impacted. Adverse impacts to living and coastal marine resources would include loss or degradation of nesting/spawning/rearing/resting/foraging areas, reduced prey abundance, overfishing, incidental catch, reduced water quality, introduction of invasive species/competition, loss of movement corridors, and disturbance from increased human presence and activity. For example, military activities, marine transportation, energy and mining activities, commercial and recreational fishing, and coastal development would likely adversely impact marine species. Marine species such as the endangered manatee, protected marine mammals, and listed fish could be affected by noise, water quality and substrate disturbances and degradation, vessel operation and habitat loss. Because protected species have already experienced population declines and their current populations are considered unstable, adverse impacts from past, present and reasonably foreseeable future actions would likely have a more substantial effect. Coastal development and land use, military activities, marine transportation facilities and corridor improvements, energy development, and infrastructure development all have associated construction and operation activities that have removed terrestrial species habitats (breeding/nesting, foraging), reduced prey abundance, and increased species mortality through placement of facilities, roadways, corridors for moving goods and services and residential and commercial development. Terrestrial protected species have also been indirectly affected by increases in human presence, habitat fragmentation, loss of wildlife movement corridors and water quality degradation from urban development and polluted runoff. Countervailing impacts associated with habitat restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. These actions would likely create new, or restore, degraded habitats; increase species populations; and decrease species stressors. For example, Phase I and Phase II Early Restoration efforts focused on marsh and dune habitat restoration as well as nesting bird and sea turtle habitat restoration. These actions provide benefits to both common and sensitive species. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to living coastal and marine resources.

6.8.4.3 Human Use and Socioeconomics

As described in Chapter 3, millions of people live, work, and recreate in the northern Gulf of Mexico region, and therefore, rely on the natural and physical resources the Gulf's environment provides. Land use in the region comprises a heterogeneous mix of industrial activities: manufacturing, marine, shipping, agricultural, and petrochemical industry activities; recreation; and tourism. Along the northern Gulf Coast there are numerous state-managed, protected areas and recreational sites (such as State Parks and beaches) as well as units of both the National Park Service (NPS) and the USFWS.

Construction and operation of energy and mining facilities (offshore and onshore), marine transportation facilities, commercial, industrial and residential development in coastal habitats, corridor improvements, etc. are detailed in Appendix 6-B (hereinafter "ongoing activities"). These actions may provide benefits to a number of Human Use Resources while also potentially adversely affecting other resources such as commercial fisheries and recreation.

There are also many environmental stewardship and restoration projects that have occurred or are underway in the Gulf Coast region (see Appendix 6-B) that may affect the human use and socioeconomics.

6.8.4.3.1 Socioeconomics and Environmental Justice

The population of the Gulf coastal counties and parishes was nearly 17 million in 2010 according to the U.S. Census. In 2009, the total economy of the Gulf of Mexico region supported over 22 million jobs (17.2% of all jobs in the U.S.), and produced over $2 trillion in GDP (16.7% of all GDP produced in the U.S.). In the same year, six ocean-dependent sectors of the regional economy (living marine resources, marine construction, marine transportation, offshore mineral extraction, ship and boat building, and marine-related tourism and recreation) accounted for 480,000 jobs (2.2% of all jobs in the region) and produced about $100 billion in GDP (4.3% of total regional GDP) (NOAA 2012).

Executive Order 12898 (Feb. 11, 1994) states that, to the greatest extent practicable, federal agencies must "identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." None of the alternatives presented below would contribute to adverse cumulative impacts to environmental justice issues.

Table 6-10 analyzes cumulative impacts of the Programmatic ERP/PEIS Alternatives on socioeconomics.

Table 6-10. Cumulative Impacts to Socioeconomics.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to socioeconomics from past, present, and reasonably foreseeable future actions, such as military activities, coastal development and land use, commercial and recreational fishing and aquaculture, tourism, marine mineral mining, and energy development including offshore and state oil and gas exploration and production—as well as construction activities associated with stewardship, NRDA, and non-NRDA restoration activities—are expected. All of these activities have the potential to affect employment and spending in the region. The magnitude of these effects to local and regional economies would vary by activity and location. Impacts of resource production activities would be dependent on whether materials, labor, equipment and supplies are sourced locally. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to the Gulf Coast economies.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions could cause short-term benefits to local economies, depending on the types of activities occurring. Workforce employment in construction, dredging,

ALTERNATIVES	CUMULATIVE IMPACTS
	and barge operation activities would benefit regional economies from projects occurring under Alternative 2. Locally purchased (or rented) equipment and materials would benefit the regional economy, including increased jobs, income, sales, and tax receipts. Increased recreational use associated with Alternative 3 would be expected to lead to long term beneficial economic effects. Short-term minor to moderate adverse impacts, primarily associated with temporary closures of areas to recreational uses could also occur. Long-term minor adverse impacts to socioeconomic conditions are anticipated. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, current and future activities such as those related to ongoing coastal development and land use, commercial and recreational fishing and aquaculture, tourism, marine mineral mining, and energy development, as well as construction activities associated with stewardship, NRDA, and non-NRDA restoration activities, would result in adverse and beneficial effects to local economies. These impacts would depend on regional economic conditions, the types of activities occurring, their economic impacts, and their location with respect to regional economies. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to Gulf Coast economies. Some projects may result in increased regional spending.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Similar to Alternative 2, workforce employment in infrastructure construction would benefit regional economies from projects occurring under Alternative 3. Locally purchased (or rented) equipment and materials would benefit the regional economy, including increased jobs, income, sales, and tax receipts. Additional recreational infrastructure and amenities, such as facilities, boat ramps, bathrooms, boardwalks, and amenities would increase access and improve recreational experiences. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, current and future activities such as those related to ongoing coastal development and land use, commercial and recreational fishing and aquaculture, tourism, marine mineral mining, and energy development, as well as construction activities associated with stewardship, NRDA, and non-NRDA restoration activities, would result in adverse and beneficial effects to local economies. These impacts would depend on regional economic conditions, the types of activities occurring, their economic impacts, and their location with respect to regional economies. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to economies of the Gulf Coast would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to economies of the Gulf Coast in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf economies under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, current and future activities such as those related to ongoing coastal development and land use, commercial and recreational

ALTERNATIVES	CUMULATIVE IMPACTS
	fishing and aquaculture, tourism, marine mineral mining, and energy development, as well as construction activities associated with stewardship, NRDA, and non-NRDA restoration activities, would result in adverse and beneficial effects to local economies. These impacts would depend on regional economic conditions, the types of activities occurring, their economic impacts, and their location with respect to regional economies. Although the impacts would vary based on regional economic conditions, the types of activities, their economic impacts, and their location, when Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, it is not expected to contribute substantially to cumulative adverse impacts. As described above, Alternative 4 would be expected to provide at least short-term incremental contributions to cumulative benefits to socioeconomics on a local level as a result of employment and other economic gains associated with the activities. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to economies of the Gulf Coast.

6.8.4.3.2 Cultural Resources

As stated in Chapter 3, people have lived in the coastal region of the Gulf of Mexico for more than 10,000 years. Today many unique and diverse cultures call the Gulf coast home. These cultures, past and present, are often closely linked to the environmental and natural resources that comprise the Gulf Coast ecosystem, and which these projects seek to help restore. Cultural resources encompass a range of traditional, archeological, and built assets. Historic properties in the affected coastal communities date from both the prehistoric and historic periods. Ongoing activities (Appendix 6-B) have resulted in varying degrees of damage to cultural resources. Table 6-11 analyzes cumulative impacts of the Programmatic ERP/PEIS Alternatives on cultural resources.

Table 6-11. Cumulative Impacts to Cultural Resources

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to cultural resources from past, present, and reasonably foreseeable future actions, such as marine transportation, energy and mining activities, fishing, coastal development and land, and construction activities as a result of non-federal restoration actions would continue to impact known and not yet documented cultural resources. The magnitude of these effects would vary by activity and location. For example, impacts would be higher for those currently unknown resources that are submerged, buried and/or undocumented. Impacts to these resources could occur as a result of incidental disturbance or damage from activities that drag (such as commercial fishing) or otherwise disturb (such as marine mineral mining, energy activities and coastal development) these resources. In addition to these adverse effects, countervailing impacts to cultural resources of restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. These beneficial impacts could include the identification and subsequent protection of cultural resources that may otherwise have been unknown or unprotected. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast cultural resources.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Projects implemented under Alternative 2 would be analyzed for potential effects to cultural resources prior to being implemented and most adverse effects to cultural resources would be avoided or minimized. However, inadvertent impacts to unknown sites, buildings, structures, or objects could occur, resulting in minor to moderate short-term and long-term impacts. The effects of Alternative 2 would vary depending on geographic location. Past, present, and reasonably foreseeable future activities described above under the No Action would be expected to continue. As described above, these impacts would include impacts on known as well as not-yet-documented cultural resources, and would vary by activity and location. In addition to adverse effects, countervailing impacts to cultural resources of restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. These beneficial impacts could include the identification and subsequent protection of cultural resources that may otherwise have been unknown or unprotected. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 is not expected to contribute substantially to short-term or long-term adverse or beneficial cumulative impacts to cultural resources.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Projects implemented under Alternative 3 would be analyzed for potential effects to cultural resources prior to being implemented and most adverse effects to cultural resources would be avoided or minimized. However, inadvertent impacts to unknown sites, buildings, structures, or objects could occur, resulting in minor to moderate short-term and long-term impacts. The effects of Alternative 3 would vary depending on geographic location. Past, present, and reasonably foreseeable future activities described above under the No Action would be expected to continue. As described above, these impacts would include impacts on known as well as not-yet-documented cultural resources, and would vary by activity and location. In addition to adverse effects, countervailing impacts to cultural resources of restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. These beneficial impacts could include the identification and subsequent protection of cultural resources that may otherwise have been unknown or unprotected. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 is not expected to contribute substantially to short-term or long-term adverse or beneficial cumulative impacts to cultural resources.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast cultural resources under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Past, present, and reasonably foreseeable future activities described above under the No Action would be expected to continue. As described above, these impacts would include impacts on known as well as not-yet-documented cultural resources, and would vary by activity and location. In addition to adverse effects, countervailing impacts to cultural resources of restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico could occur. These beneficial impacts could include the identification and subsequent protection of cultural resources that may otherwise have been unknown or unprotected. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to cultural resources would likely occur. However, Alternative 4 is not expected to contribute substantially to short-term or long-term adverse or beneficial cumulative impacts to cultural resources.

6.8.4.3.3 Infrastructure

The amount and placement of infrastructure and public service development depend heavily on population and migration patterns, and employment trends. Ongoing activities (Appendix 6-B) have resulted in varying degrees of damages and benefits to infrastructure, benefits are derived from a variety of infrastructure improvements. Table 6-12 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on infrastructure.

Table 6-12. Cumulative Impacts to Infrastructure

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to infrastructure from past, present, and reasonably foreseeable future actions, such as coastal development, military activities, energy activities, resource stewardship activities, water quality improvement programs, scientific research programs, and tourism and recreation would occur. The magnitude of these effects would vary by activity and location and would be highly dependent on the pressures on existing infrastructure (such as increased tourism or recreational use pressures on existing roads). In addition to these effects, infrastructure restoration, replacement, and expansion is likely to occur. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast infrastructure.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Projects requiring land-based construction activities and associated movement of construction materials and equipment by road could lead to short and long-term minor to major adverse impacts to infrastructure. Project types that enhance public access to natural resources for recreational use, enhance recreational experiences, and/or promote environmental and cultural stewardship, education, and outreach, may include construction activities such as backfilling of canals and shallow water bodies to create wetlands; removal of bulkheads, rip rap and other structures to restore hydrologic connectivity; dune restoration; or the

ALTERNATIVES	CUMULATIVE IMPACTS
	placement of breakwaters or other engineered erosion control structures on the shoreline. Impacts would result from increases in construction traffic; temporary or permanent closure of roads or parking lots; or damage to roadways. These would range in intensity based on the duration of road or parking lot closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of roadway damage. Similarly, projects requiring the permanent removal or relocation of infrastructure, such as the alteration of land cover for habitat conservation or the removal of piers or other coastal fixtures that are affecting SAV beds targeted for restoration, could lead to short and long-term minor to major adverse impacts on infrastructure. Projects that stabilize and protect shorelines, reduce erosion, or reduce the effects of wave activity, such as the construction of groins or breakwaters; beach re-nourishment; oyster reef placement; and restoration of SAV beds would have potential long-term beneficial impacts for infrastructure. These would result from the protection of roadways, parking lots, utilities, and other nearshore infrastructure from the effects of storm waves and associated shoreline erosion. Impacts to infrastructure from past, present, and reasonably foreseeable future actions, such as coastal development, military activities, energy activities, resource stewardship activities, water quality improvement programs, scientific research programs, and tourism and recreation would occur. The magnitude of these effects would vary by activity and location and would be highly dependent on the pressures on existing infrastructure (such as increased tourism or recreational use pressures on existing roads). In addition to these effects, infrastructure restoration, replacement, and expansion is likely to occur. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to infrastructure. Alternative 2 carried out in conjunction with other infrastructure improvement projects may result in long-term beneficial cumulative impacts to infrastructure in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other activities.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. Alternative 3 actions vary widely from construction of recreation and public access facilities (boat ramps, promenades, dune walkovers, parking facilities, artificial reef, etc.) to educational and cultural facilities. Many of the project types discussed under Alternative 3 would involve the transport of construction vehicles, equipment, and materials. These project types, which include techniques such as placement of artificial reef structures; construction of boardwalks, trails, roads, bridges and other types of public access; and the construction of boat ramps, piers, public bathrooms, lodging facilities and similar amenities, could lead to short and long-term minor to major impacts on infrastructure. The impacts associated with these projects would result from increases in construction traffic; temporary or permanent closure of roads, parking lots, or facilities; or damage to roadways or other infrastructure that provides access to the shoreline. The impacts to existing infrastructure, such as roadways, could also occur from increased vehicle use as a result of increased visitor use over time. These impacts would range in intensity based on the duration of road, parking lot or public access closure, the importance of individual roadways as regional transportation arterials; and the extent and duration of damage to roadways, facilities or access points. Future infrastructure improvements or increased maintenance could be necessary to address impacts to infrastructure. Impacts to infrastructure from past, present, and reasonably foreseeable future actions, such as coastal development, military activities, energy activities, resource stewardship activities, water quality improvement programs, scientific research programs, and tourism and recreation would occur. The magnitude of these effects would vary by activity and location and would be highly dependent on the pressures on existing infrastructure (such as increased tourism or recreational use pressures on existing roads). In addition to these effects, infrastructure restoration, replacement, and expansion are likely to occur. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 3 would not be expected to result in a substantial incremental contribution to cumulative adverse impacts to infrastructure, though infrastructure would likely be affected by ongoing and future activities requiring future investment. Alternative 3 project types may contribute to some long-term beneficial cumulative impacts to water quality in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast infrastructure under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Impacts to infrastructure from past, present, and reasonably foreseeable future actions, such as coastal development, military activities, energy activities, resource stewardship activities, water quality improvement programs, scientific research programs, and tourism and recreation would occur. The magnitude of these effects would vary by activity and location and would be highly dependent on the pressures on existing infrastructure (such as increased tourism or recreational use pressures on existing roads). In addition to these effects, infrastructure restoration, replacement, and expansion are likely to occur. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to infrastructure would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with infrastructure improvement projects has the potential to result in some long-term beneficial cumulative impacts to infrastructure.

6.8.4.3.4 Land and Marine Management

As stated in Chapter 3, land and marine areas may be set aside for a variety of active and passive recreational purposes. Land may be managed for wildlife and habitat protection and conservation, and/or scenic, cultural, and historical values. Land management may be at the Federal, State, local government levels, or by private organizations.

Ongoing activities (Appendix 6-B) have resulted in varying degrees of impacts to land and marine management. Table 6-13 analyzes cumulative impacts of the Programmatic ERP/PEIS Alternatives on land and marine management.

Table 6-13 Cumulative Impacts to Land and Marine Management.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to land and marine management from past, present, and reasonably foreseeable future actions, such as resource stewardship, water quality improvement projects, marine transportation, energy activities, and tourism and recreation would occur. The magnitude of these effects would vary by activity and location and could impact land and marine management at the Federal, State, local and private areas in the event that actions result in area closures, and associated interruption of operations, increased management responsibilities, or furloughs or layoffs of staff. In addition to these adverse effects, countervailing beneficial impacts associated with the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to land and marine management in the Gulf Coast.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Actions that would result in the temporary or permanent partial or full closure of national, state and local parks, wildlife refuges, wildlife management areas and marine protected areas during construction would result in short-term minor to moderate adverse impacts, primarily from the interruption of operations and use and/or the furlough or reassignment of staff. In the long-term benefits to land and marine management are also expected as restoration activities would help align management goals and assist management and staff to best manage properties for the benefit of the environmental and human environment. Restoration projects resulting in changes to land ownership and/or permitted uses including the use of fee acquisition could have long-term impacts; however, as the transactions are negotiated or arranged between willing parties it is not anticipated that adverse impacts to land and marine management would occur. The effects of Alternative 2 would vary depending on location, type of activity and existing management but overall direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include area closures and associated interruption of operations, increased management responsibilities, or furloughs or layoffs of staff. Countervailing beneficial impacts associated with the alignment of management goals and assistance provided to management and staff to best manage properties from restoration,

ALTERNATIVES	CUMULATIVE IMPACTS
	conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to land and marine management. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to land and marine management in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities from the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected lead to short-term adverse impacts, stemming from construction and land transfer activities that would result in the temporary full or partial closure of parks and refuges, in the interruption of operations, in furloughs or staff layoffs, or that would interfere with land managers' ability to fulfill management obligations and responsibilities. To the extent that projects better align management goals and assist management and staff to best manage properties for the benefit of the environmental and human environment, long-term benefits may also accrue. The effects of Alternative 3 would vary depending on geographic location, land ownership and project scale. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include area closures and associated interruption of operations, increased management responsibilities, or furloughs or layoffs of staff. Countervailing beneficial impacts associated with the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 3 would not contribute substantially to short-term or long-term cumulative adverse impacts to land and marine management. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to land and marine management in the Gulf Coast region because of the potential for synergistic effects of Alternative 3 project types with these other environmental stewardship and restoration activities leading to the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast land and marine management under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include area closures and associated interruption of operations, increased management responsibilities, or furloughs or layoffs of staff. Countervailing beneficial impacts associated with the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being

ALTERNATIVES	CUMULATIVE IMPACTS
	conducted under Phase I and Phase II Early Restoration. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to land and marine management would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to land and marine management.

6.8.4.3.5 Tourism and Recreational Use

Outdoor recreation, broadly defined, is any leisure time activity conducted outdoors for pleasure or sport, including activities from wilderness camping to watching outdoor performances. Other examples of recreational pursuits in the region include onshore and offshore wildlife observation, hunting, beach and other waterfront use, boating, and recreational fishing.

Ongoing activities (Appendix 6-B) have resulted in varying degrees of adverse impacts and benefits to tourism and recreational use. Table 6-14 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on tourism and recreational use.

Table 6-14. Cumulative Impacts to Tourism and Recreational Use

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to tourism and recreational use from past, present, and reasonably foreseeable future actions, such as marine transportation, energy and mining activities, coastal development and land use would occur. Adverse effects would include reduced recreational opportunities and visitor experience due to use conflicts. The magnitude of these effects would vary by activity and location. For example, industrial activities such as additional off-shore energy development or port construction may have limited effects on recreation or tourism if it is located in an industrial coastal location with little recreational activity. By contrast, construction or industrial development or activities in popular recreational areas would result in increased adverse impacts to tourism and recreational use due to restrictions or closures to areas or disturbances or other adverse impacts to visitor experience (e.g., noise) that would cause visitors to choose another location to visit. In addition to these adverse effects, countervailing impacts to tourism and recreational use associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast tourism and recreational use.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Construction-related short-term adverse impacts to recreation and tourism from temporary recreational site closures and adverse impacts on recreational experiences associated with noise, wildlife disturbances, view sheds, and other adverse impacts on recreational experiences would occur and would be expected to be minor to moderate. The effects of restoration actions would vary depending on their location and the rate of usage by tourists or recreation users. Long-term beneficial impacts would be expected for projects that would result in higher quality habitats on increases in wildlife populations that could then be used for tourism and recreational use. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include reduced recreational opportunities and visitor experience due to use conflicts. Countervailing impacts to tourism and recreational use associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to tourism and recreational use. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to tourism and recreational use in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short-term minor to moderate construction-related adverse impacts, from temporary recreational site closures and adverse impacts on recreational experiences associated with noise, wildlife disturbances, visual impacts and other adverse impacts on recreational experiences. The effects of restoration actions would vary depending on their location and the rate of usage by tourists or recreation users. Long-term beneficial impacts would be expected for projects that would result in improved infrastructure and connectedness to resource areas or those projects that lead to higher quality habitats on increases in wildlife populations that could then be used for tourism and recreational use. Other long-term beneficial impacts could occur as a result of expanded educational and stewardship programs. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include reduced recreational opportunities and visitor experience due to use conflicts. Countervailing impacts to tourism and recreational use associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to tourism and recreational use would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial

ALTERNATIVES	CUMULATIVE IMPACTS
	cumulative impacts to tourism and recreational use in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast tourism and recreational use under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include reduced recreational opportunities and visitor experience due to use conflicts. Countervailing impacts to tourism and recreational use associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to tourism and recreational use would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to tourism and recreational use.

6.8.4.3.6 Fisheries and Aquaculture

Commercial fisheries represent a multi-billion dollar industry to the northern Gulf Coast region and have traditionally included finfish, shrimp, oysters, and crabs. State, federal, and international agencies regulate fishery resources within their jurisdictions. NMFS (2011) defines aquaculture as "…the propagation and rearing of aquatic organisms in controlled or selected aquatic environments for any commercial, recreational, or public purpose." The Census of Aquaculture targets, "all commercial or noncommercial places from which $1,000 or more of aquaculture products were produced and either sold or distributed during the census year" (USDA National Agricultural Statistics Service 2005). Noncommercial operations include Federal, State, and tribal hatcheries (USDA National Agricultural Statistics Service 2005).

Ongoing activities (Appendix 6-B) have resulted in varying degrees of impacts to commercial fisheries and aquaculture. Table 6-15 summarizes cumulative impacts of the Programmatic ERP/PEIS Alternatives on fisheries and aquaculture.

Table 6-15. Cumulative Impacts to Fisheries and Aquaculture

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to fisheries and aquaculture from past, present, and reasonably foreseeable future actions, such as military activities, marine transportation, energy and mining activities, water quality improvement programs, restoration projects, resource stewardship projects, coastal development and land use and climate change would occur. The magnitude of these effects would vary by species, activity and location. For example, additional marine management could result in stricter harvest or gear requirements and lower harvest quotas depending on stock assessment and projects involving construction or dredging would have adverse impacts to water turbidity and quality. These types of impacts would depend on the particular species being harvested, the condition of the stock and the specific type of habitat. These potential adverse impacts would be offset to some degree by the implementation of natural resource stewardship, water quality, and

ALTERNATIVES	CUMULATIVE IMPACTS
	other NRDA and non-NRDA projects that result in benefits to the marine environment. In addition to these adverse effects, countervailing impacts associated with fisheries and aquaculture from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast fisheries and aquaculture.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions could cause short-term adverse impacts to commercial fishing by limiting allowable catch. However, overall long-term benefits to commercial fisheries would be anticipated because of improved habitats that are important to a number of fish and shellfish species and potential for increased populations and species stability. These projects are unlikely to impact aquaculture. Actions under Alternative 2 are expected to result in short-term construction-related adverse impacts, primarily increases in turbidity. Shoreline protection could also result in minor long-term adverse effects by changing the ocean current patterns in the localized area. However, long-term benefits to hydrology and water quality are also expected, including improving wetland function, reduction in the inland flow of salt water, reduction in nutrient and sediment runoff, and reduction in erosion/loss of wetlands. The effects of Alternative 2 would vary depending on location, type of activity and existing management but overall direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing beneficial impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to fisheries or aquaculture. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to fisheries and aquaculture in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities from the alignment of management goals and assistance provided to management and staff to best manage properties from restoration, conservation and recovery efforts.

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short-term construction-related adverse impacts, including increases in turbidity and sedimentation. In addition, these actions may result in minor long-term increases in stormwater runoff and pollutants as a result of conversion of pervious to impervious surfaces, discharge of fish hatchery effluent, and increased presence of boats and equipment in waterways. To the extent that projects replace or improve outdated or failing systems, long-term benefits may also accrue. The effects of Alternative 3 would vary depending on geographic location, proximity of restoration projects to one another, and spatial scale. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to fisheries and aquaculture would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to fisheries and aquaculture in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast fisheries and aquaculture under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable future activities described above under the No Action Alternative would be expected to continue. As described above, these impacts would include disruption of sediments, increased turbidity, and increased releases of contaminants. Countervailing impacts associated with water quality improvement from restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would also occur. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to fisheries and aquaculture would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to fisheries and aquaculture.

6.8.4.3.7 Marine Transportation

Marine transportation is an important component of the northern Gulf of Mexico regional economy, and the Gulf Coast is a major shipping center. The U.S. economy relies heavily on the ports in the northern Gulf of Mexico region for the import and export of both foreign and domestic goods.

Ongoing activities (Appendix 6-B) have resulted in varying degrees of impacts to marine transportation. Table 6-16 summarizes cumulative impacts of the Phase III ERP/PEIS Alternatives on marine transportation.

Table 6-16. Cumulative Impacts to Marine Transportation

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to marine transportation from past, present, and reasonably foreseeable future actions, such as military activities, energy and mining activities, water quality improvement programs, scientific research programs and tourism and recreation would occur as a result of transportation restrictions. . The magnitude and type of these effects would vary by activity and location. For example, resource stewardship activities and water quality improvement programs could affect access either through restrictions or emission controls whereas military operations, energy activities, and tourism and recreation would have beneficial impacts to marine transportation, due to an increase in shipping, maritime service, the expansion of the Panama Canal, and ridership from tourists. In addition to these effects, countervailing impacts to marine transportation associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast marine transportation.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Impacts from increases in shipping traffic in congested areas stemming from barge use of shipping lanes for the transportation of dredge and fill materials would be short-term and minor. Long-term beneficial impacts would occur as a result of reduced erosion from restoration and shoreline projects that would provide wave attenuation in areas such as the Gulf Intercoastal Waterway, ports, and harbors. Other long-term beneficial impacts could occur as a result of proper planning and coordination of dredging activities so to allow for dredging and fill from borrow sites that would work in improving navigational channels. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would be long-term and beneficial from the increase in shipping, maritime service, the expansion of the Panama Canal, and ridership from tourists. Countervailing impacts to marine transportation associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short or long-term cumulative adverse impacts to marine transportation. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to marine transportation in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short-term construction-related minor adverse impacts, in the event that shipping routes are blocked or obstructed by dredging equipment or barges or from increases in marine traffic from dredging, trenching or ground disturbing activities. Projects centered on the enhancement or increase of public access or recreational

ALTERNATIVES	CUMULATIVE IMPACTS
Opportunities	enhancements would similarly result in short-term minor impacts from increased recreational boat traffic or ferry traffic that would obstruct or slow commercial shipping traffic. In the event that existing navigational infrastructure is improved long-term beneficial impacts would be expected. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would be long-term and beneficial from the increase in shipping, maritime service, the expansion of the Panama Canal, and ridership from tourists. Countervailing impacts to marine transportation associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to marine transportation would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to marine transportation in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast marine transportation under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would be long-term and beneficial from the increase in shipping, maritime service, the expansion of the Panama Canal, and ridership from tourists. Countervailing impacts to marine transportation associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to marine transportation would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to marine transportation.

6.8.4.3.8 Aesthetics and Visual Resources

The current Gulf of Mexico coastal region is characterized by thousands of miles of shoreline, which is bordered by a variety of landscapes, including natural and maintained beaches, mangroves and other wetlands, developed areas such as towns and urban centers, as well as heavily industrialized areas including ports and infrastructure related to energy production.

Ongoing activities (Appendix 6-B) have resulted in varying changes and associated impacts to aesthetics and visual resources. Table 6-17 summarizes cumulative impacts of the Phase III ERP/PEIS Alternatives on aesthetics and visual resources.

Table 6-17. Cumulative Impacts to Aesthetics and Visual Resources

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to aesthetics and visual resources from past, present, and reasonably foreseeable future actions, such as military activities, marine transportation, energy and mining activities, coastal development and land use would occur. The magnitude of these detractions to the natural viewshed would vary by activity and location. For example, construction-related impacts would likely be limited in duration, while drilling activities, marine transportation, and coastal development could lead to long-term intrusions into the natural viewshed. New developments or activities occurring in previously undisturbed areas would continue to detract from natural viewsheds in otherwise undisturbed areas and likely create atmospheric pollution leading to reduced visibility. However, these same impacts in more industrial areas would have lower impacts to aesthetics and visual quality given the existing conditions. In addition to these adverse effects, countervailing impacts to aesthetics and visual resources associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast aesthetics and visual resources.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. Construction-related actions are expected to result in short-term minor to moderate adverse impacts as a result of the presence of readily apparent construction equipment and personnel as well as barriers and construction-related dust and emissions, which would contrast with and detract from the natural viewshed. In the event that construction related actions involve dredging activities into scenic viewsheds, adverse impacts could be elevated to major, and would remain short-term. The effects of Alternative 2 would vary to a large degree on the location of the proposed projects, the degree to which these activities would be visible, and the duration of construction activities and how commonplace these activities are. In the event that these construction-related projects result in the long-term placement of structures or signage, long-term, minor adverse impacts would occur, with the magnitude of their impact decreasing over time as these objects become more commonplace in the area. Long-term benefits to aesthetics and visual resources are also expected as a result of improved habitat areas that reflect a more natural setting. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would include introductions of construction equipment or long-term structures or signage, all of which would detract from natural viewshed. Countervailing impacts to aesthetics and visual resources associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to aesthetics and visual resources. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial

ALTERNATIVES	CUMULATIVE IMPACTS
	cumulative impacts to aesthetics and visual resources in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in minor to moderate short-term construction related adverse impacts as a result of readily apparent construction equipment and personnel as well as barriers and construction-related dust and emissions, which would contrast with and detract from the natural viewshed. The addition of infrastructure and facilities into the existing landscape would present some degree of visual contrast, with long-term impacts ranging from minor to moderate dependent on the existing visual quality of the area. Long-term benefits to aesthetics and visual resources are also expected for projects that while enhancing recreational opportunities while also improving habitat such as beach renourishment and removal of land based debris. Direct and indirect effects of Alternative 2 would largely result in long-term minor to moderate adverse impacts. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would include introductions of construction equipment or long-term structures or signage, all of which would detract from natural viewshed. Countervailing impacts to aesthetics and visual resources associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to aesthetics and visual resources would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to aesthetics and visual resources in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast aesthetics and visual resources under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other past, present, and reasonably foreseeable activities described above under the No Action would be expected to continue. As described above, these impacts would include introductions of construction equipment or long-term structures or signage, all of which would detract from natural viewshed. Countervailing impacts to aesthetics and visual resources associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to aesthetics and visual resources would likely occur. However, Alternative 4 would not contribute substantially to cumulative adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to aesthetics and visual resources.

6.8.4.3.9 Public Health and Safety, Including Flood and Shoreline Protection

Provision of public health and safety can be complicated by large storm events such as tropical storms and hurricanes (and associated storm surges, winds, and battering waves) that have historically caused extensive damage to the shoreline as well as infrastructure such as roadways, bridges and buildings. The Gulf's coastal communities are at increased risk for severe shoreline damage and storm surges. In addition, construction activities and increased human uses of resources can also pose risks to public health and safety.

Ongoing activities (Appendix 6-B) have resulted in varying degrees of impacts to public health and safety. Table 6-18 summarizes cumulative impacts of the Phase III ERP/PEIS Alternatives on public health and safety, including flood and shoreline protection.

Table 6-18. Cumulative Impacts to Public Health and Safety, Including Flood and Shoreline Protection

ALTERNATIVES	CUMULATIVE IMPACTS
Alternative 1 - No Action	Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Impacts to public health and safety from past, present, and reasonably foreseeable future actions, such as military activities, marine transportation, energy and mining activities, coastal development and land use and construction related activities would occur. The magnitude of these effects would vary by activity and location. For example, construction related activities would have a greater potential to impact public health and safety if these activities were to occur in areas experiencing higher levels of use or more dangerous activities. It is anticipated most activities would have safety plans in place to reduce risks to the public. In addition to these adverse effects, countervailing impacts to public health and safety associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. Under Alternative 1, proposed Early Restoration actions and their impacts would not occur. Therefore, Alternative 1 would not contribute to cumulative adverse or beneficial effects to Gulf Coast public health and safety.
Alternative 2 - Contribute to Restoring Habitats and Living Coastal and Marine Resources	Under Alternative 2, proposed Early Restoration project types specifically directed at restoring, enhancing and conserving Gulf Coast sensitive habitats would be undertaken. Alternative 2 includes project types such as create wetlands, restore SAV, restore barrier islands and beaches and conserve habitats. These actions are expected to result in short-term construction-related adverse impacts to public health and safety, primarily as a result of the operation of heavy equipment and construction materials. In the event that hazardous materials are used and unintentionally released into the environment or the use of barges or boats contaminates surface waters could also result in minor, short-term adverse effects. Long-term beneficial impacts from restoration and rehabilitation projects could reduce the risk of potential future hazards or reduce currently present water contamination. It is anticipated the effects of Alternative 2 would vary depending on the type of activity, the proximity of the public and measures in place to reduce the potential or to avoid these impacts. Direct and indirect effects of Alternative 2 would largely result in long-term beneficial impacts. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would occur as a result of operation of heavy equipment and construction materials as well as through the potential release of contaminants into the environment in the event that they are used. Countervailing impacts to public health and safety associated with restoration, conservation and recovery efforts associated with other

ALTERNATIVES	CUMULATIVE IMPACTS
	environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When analyzed in combination with other past, present, and reasonably foreseeable future actions, Alternative 2 would not contribute substantially to short-term or long-term cumulative adverse impacts to public health and safety. Alternative 2 carried out in conjunction with other environmental stewardship and restoration efforts may result in long-term beneficial cumulative impacts to public health and safety in the Gulf Coast region because of the potential for synergistic effects of Alternative 2 project types with these other environmental stewardship and restoration activities.
Alternative 3 - Contribute to Providing and Enhancing Recreational Opportunities	Under Alternative 3, proposed Early Restoration specifically directed at providing and enhancing recreational opportunities would be undertaken. These actions are expected to result in short-term construction-related minor adverse impacts, stemming from the operation of heavy-equipment and construction materials as well as from the potential of hazard waste and materials contaminating the environment. Increased visitor use could cause visitor use conflicts, leading to short-term minor adverse impacts. Projects centered on enhancing public access of areas would likely lead to long-term beneficial impacts to public safety by providing access to sites that currently lack infrastructure or require infrastructure improvements. Similarly, long-term benefits could be experienced through the promotion of environmental and cultural stewardship, education and outreach project types, so that, for example, users of the sites are more knowledgeable about potential hazards in the project areas (e.g., ocean currents, coastal storms and flooding, etc.). Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would occur as a result of operation of heavy equipment and construction materials as well as through the potential release of contaminants into the environment in the event that they are used. Countervailing impacts to public health and safety associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 3 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to public health and safety would likely occur. However, Alternative 3 would not contribute substantially to cumulative adverse impacts. Alternative 3 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to public health and safety in localized areas.
Alternative 4 - Contribute to Restoring Habitats, Living Coastal and Marine Resources, and Recreational Opportunities	The magnitude of adverse and beneficial impacts to Gulf Coast public health and safety under Alternative 4 would fall within the range of the impacts described above for Alternatives 2 and 3. Other ongoing and future activities described above under the No Action would be expected to continue. As described above, these impacts would occur as a result of operation of heavy equipment and construction materials as well as through the potential release of contaminants into the environment in the event that they are used. Countervailing impacts to public health and safety associated with restoration, conservation and recovery efforts associated with other environmental stewardship and restoration activities in the Gulf of Mexico would occur. These efforts include those being conducted under Phase I and Phase II Early Restoration. When Alternative 4 is analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to public health and safety would likely occur. However, Alternative 4 would not contribute substantially to cumulative

ALTERNATIVES	CUMULATIVE IMPACTS
	adverse impacts. Alternative 4 carried out in conjunction with other environmental stewardship and restoration efforts has the potential to result in some long-term beneficial cumulative impacts to public health and safety.

6.8.5 Cumulative Impact Analysis of Proposed Phase III Projects

Chapters 8 -12 provide more specific analyses based on the Phase III ERP projects being proposed by the Trustees. Overall, the proposed Phase III ERP projects represent relatively small areas of potential disturbance distributed across the very large geographic area of the northern Gulf of Mexico. The Trustees considered whether a cumulative impact analysis of the more specific issues associated with project level impacts would be best organized by project type or by geography. Given the very large distance between similar projects (e.g., living shoreline projects in Florida, Alabama and Mississippi), the Trustees determined that analysis of potential project-level cumulative impacts based on their spatial proximity is a rational approach, such that different types of projects occurring in proximity to each other would be evaluated together. The initial spatial sorting of Phase III projects for cumulative impact analysis is therefore organized by each of the five Gulf States. Additional rational assemblages of projects within each state are described in Chapters 8 through 12 to group projects with a potential for cumulative impacts together for purposes of cumulative impact analysis.

6.9 Other NEPA Considerations

6.9.1 Unavoidable Adverse Impacts

Section 102(2)(c)(ii) of NEPA requires that an EIS include information on any adverse environmental effects that cannot be avoided, should the proposed action be implemented. Unavoidable adverse impacts are the effects on human environment that would remain after mitigation measures have been applied. Unavoidable adverse impacts do not include temporary or permanent impacts that would be mitigated. While these impacts do not have to be avoided by the planning agency, they must be disclosed, considered and mitigated where possible (40 C.F.R. 1500.2(e)). For some restoration techniques, mitigation measures are identified as options that can be used to avoid, reduce, minimize or mitigate these impacts. However these mitigation options are provided for consideration in future project development and selection, vary based on site-specific conditions, and are not required mitigations as part of the action alternatives. Therefore, future tiered Early Restoration projects will consider appropriate mitigation measures. Unavoidable adverse impacts associated with conversion of habitat and built infrastructure are disclosed for relevant project types and Phase III projects where reasonably foreseeable. In addition, future Early Restoration planning phases and associated NEPA analyses would consider the extent to which adverse impacts can be avoided, including consideration of appropriate mitigation, and would describe those adverse impacts that are unavoidable. Many examples of mitigation measures are identified in Appendix 6-A.

6.9.2 Relationship Between Short-Term Uses Of The Human Environment And The Maintenance And Enhancement Of Long-Term Productivity

Section 102(2)(c)(iv) of NEPA requires that an EIS "discuss … the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity…." This section describes how the action alternatives would affect the short-term uses of the human environment and how that would affect the maintenance or enhancement of long-term productivity.

As described in Chapter 1, the purpose of this Programmatic ERP/PEIS is to accelerate meaningful restoration of injured natural resources and their services resulting from the Spill. This Plan would complement previous investments in Early Restoration in accordance with the Oil Pollution Act (OPA) and funds made available in the Framework Agreement. In order to meet this purpose, the Trustees have proposed alternatives intended to improve certain aspects of the human environment which would result in the maintenance and enhancement of the long-term productivity of a number of natural resources. Chapters 8 through 12 describe in detail the types of short- and long-term adverse impacts and/or benefits that would be expected for the different resource categories.

For a number of project types under Alternatives 2 and 4, such as creating and improving wetlands, protecting shorelines and reducing erosion, and restoring barrier islands and beaches, short-term adverse impacts generally include those associated with construction or implementation of restoration activities. Many of these impacts would be temporary and would not be expected to reduce long-term productivity. However, these project types are intended to enhance long-term productivity.

Some project types, particularly those in Alternatives 3 and 4, intend to provide and enhance recreational opportunities that would increase access to, and the recreational use of, resources. Dependent on how those uses are managed, these project types could result in both short-term and long-term impacts to habitats and resources. However, those impacts are not expected to degrade long-term productivity. Overall, the alternatives considered here are expected to enhance long-term productivity.

6.9.3 Irreversible and Irretrievable Commitment of Resources

Section 102(2)(c)(v) of NEPA requires that an EIS "discuss … any irreversible and irretrievable commitment of resources which would be involved in the proposed action should it be implemented" (40 C.F.R. §1502.16). However, NEPA and the CEQ regulations do not define "irreversible and irretrievable." For purposes of this analysis, a commitment of a resource incudes such things as agency funding or staff necessary to undertake a project. .

Implementation of any of the action alternatives would require an irreversible and irretrievable commitment of resources including staff time for project planning and development and the associated funding necessary to go through the consultation, coordination and decision-making processes. Other resource use that would be irreversible and irretrievable would be the use of energy through the combustion of fossil fuels and material resources for construction. However, the level of commitment would vary based on project type. For example the construction of a fish hatchery or aquaculture facility would require more resources than an action that replants vegetation on beaches as part of the "Restore Barrier Island and Beaches" project type.

6.9.4 Climate Change and NEPA

In 2010, the Council on Environmental Quality (CEQ) issued draft guidance on considering the effects of climate change and greenhouse gas emissions in their analysis of proposed action under NEPA (CEQ 2010). The draft climate change guidance also suggests ways that federal agencies should consider effects of climate change in developing projects that are resilient in nature and able to adapt to changes in the existing environmental conditions over time.

6.9.4.1 Current Climate Change Projections

The Intergovernmental Panel on Climate Change (IPCC) projects a rise of the world's oceans from 0.26 to 0.82 m by the end of the century, depending on the level of greenhouse gas emissions (IPCC 2013). In addition, the IPCC has concluded that "each of the last three decades has been successively warmer at the Earth's surface than any preceding decade since 1850" (IPCC 2013).

Climate change is projected to lead to a number of impacts in the southeastern United States, including increases in air and water temperatures, decreased water availability, an increase in the frequency of severe weather events, and ecosystem change. Average annual temperatures are predicted to increase 4 to 9 degrees F (USGCRP 2009). It is suggested that heavier rainfall is expected separated by increased dry periods, which would result in increased risk of flooding and drought (USGCP 2009).

Coastal environments are expected to be at increasing risk due to sea-level rise and increases in hurricane intensity and storm surge. Figure 6-1 illustrates the projected changes in sea level. Areas experiencing little-to-no change in mean sea level are illustrated in green. Areas illustrated with positive sea level trends (yellow-to-red) are experiencing both global sea level rise, and lowering or sinking of the local land, causing an apparently exaggerated rate of relative sea level rise. For example, some areas in Texas and Louisiana are experiencing subsiding land elevations further exacerbating effects of sea level rise (CCSP 2008).

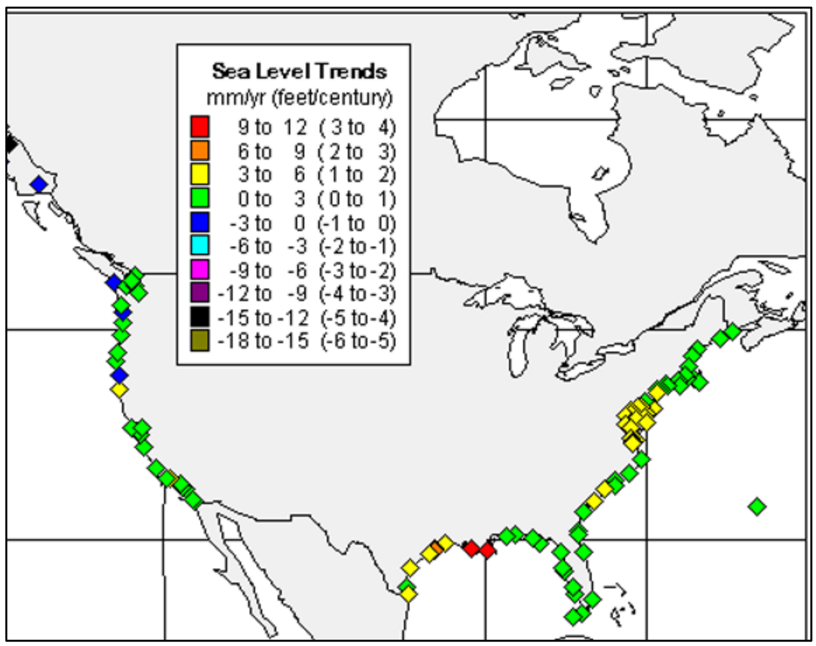

Figure 6-1. Regional Mean Sea Level Trends (NOAA 2013).

Climate change will likely have a number of impacts on the aquatic ecosystems of the northern Gulf. Higher ocean temperatures are expected to increase coral bleaching (Scavia et al. 2002). Sea-level rise and increasingly frequent coastal storms and hurricanes and associated storm surges will impact shorelines, altering coastal wetland hydrology, geomorphology, biotic structure, and nutrient cycling (Michener et al. 1997). Furthermore, an increase in atmospheric CO_2 concentrations is projected to increase freshwater discharge from the Mississippi River to the coastal ocean, decrease aquatic oxygen content, and expand the hypoxic zone in the northern Gulf of Mexico (Justic et al. 1997). Sea level rise could result in more frequently flooding low-lying areas which would permanently alter some ecological communities (USGCP 2009).

In addition to effects to natural resources, climate change effects will likely cause damage to transportation infrastructure affecting travel and damaging roads and bridges (USGCP 2009). Hurricanes and storms will continue to damage property. Long term development will need to consider climate related effects in design stages to improve structure resiliency.

6.9.4.2 Climate Change Considerations in Planning

The Council on Environmental Quality (CEQ 2011) provides the following general definition of Climate Change Adaptation:

> Climate change adaptation means adjusting to a changing climate to reduce the negative impacts already occurring and taking advantage of new opportunities. In general, planning in advance for climate change impacts will help avoid disruptions to Federal agency operations and allow the Government to design and implement programs that are capable of achieving their missions across a range of future climate conditions.

CEQ encourages preemptive planning to the extent practicable, and consideration of climate change adaptations designed to reduce the vulnerability of a system to the effects of climate change. An example would be designing projects that are resilient across a range of future climate scenarios. In their recent draft guidance, the CEQ relies on 40 C.F.R. §1502.24 when it states that "[w]ith regard to the effects of climate change on the design of a proposed action and alternatives, Federal agencies must ensure the scientific and professional integrity of their assessment of the ways in which climate change is affecting or could affect environmental effects of the proposed action" (CEQ 2010).

A recent Executive OrderOrder reinforces the direction to undergo planning efforts to develop projects that are more resilient to changes in the environment over time as a result of climate change effects. It states that:

The Federal Government must build on recent progress and pursue new strategies to improve the Nation's preparedness and resilience. In doing so, agencies should promote: (1) engaged and strong partnerships and information sharing at all levels of government; (2) risk-informed decision-making and the tools to facilitate it; (3) adaptive learning, in which experiences serve as opportunities to inform

Figure 6-2. Gulf Coast Vulnerability to Sea Level Rise Index (USGS National Index of Coastal Vulnerability to Sea-Level Rise, Data Basin 2014).

Yellow areas have moderate vulnerability to seas level rise, orange areas have high vulnerability and red areas have very high vulnerability.

and adjust future actions; and (4) preparedness planning. (Executive Order -- Preparing the United States for the Impacts of Climate Change, November 1, 2013)

Projects associated with the project types evaluated in this Programmatic ERP/PEIS are not inconsistent with the Executive Order and CEQ Guidance on climate change.

Consideration of coastal vulnerability from climate change factors is important in planning. The IPCC defines vulnerability as "the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes" (IPCC 2007). Factors affecting coastal vulnerability include the physical characteristics of a particular setting and climate and non-climate drivers (Burkett and Davidson 2012). Climate drivers include sea level change, waves and currents, winds, storminess, atmospheric CO2, atmospheric temperature, water properties, sediment supply, and groundwater availability (Burkett and Davidson 2012). Figure 6-2 illustrates coastal vulnerability as a result of projected sea level rise for the northern Gulf Coast. Consideration of factors such as sea level rise, changes to shorelines and altered hydrology at the project design stage has allowed, and will allow, for the anticipation of a range of environmental changes and the development of Early Restoration projects that would be more resilient over time.

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Chapter 6 Appendix 6-A: Potential Mitigation Measures and Best Management Practices

Guidance was provided by the federal regulatory agencies to the project proponents as part of the regulatory processes. The guidance included Best Management Practices (often called BMPs) that are commonly required through the federal regulatory processes. Trustees will utilize appropriate BMPs to avoid or minimize impacts to natural resources, including listed species and their habitats.

The general regulatory process includes developing a project proposal, incorporating project specific measures as applicable and then entering into consultation or coordination under the relevant regulatory process (e.g., ESA, EFH, MBTA, MMPA, BGEPA, CWA). During this process, additional project-specific measures may be recommended or required. Not all measures are applicable to all projects and the same type of project implemented in different locations (e.g., dune walkovers in Florida and Texas) may not require the same BMPs due to differences in relevant conditions, such as species presence or absence or other factors.

Below is a list of BMPs that the Trustees have determined could be applicable to early restoration project types. The potential programmatic environmental consequences described in Chapter 6 are presented largely without factoring in the types of specific project actions and requirements (BMPs) that could avoid or minimize the potential adverse effects at a project-specific level in planning and implementation. An exception is the analysis of impacts to protected biological resources and their habitats. For these resources, project types were specifically analyzed with the incorporation of BMPs that would be typically required by trust resource agencies, as these projects would generally not be able to move forward through agency review without incorporation of BMPs. Standard restoration approaches and practices would be considered as individual projects are proposed. These include but are not limited to steps taken through site selection, engineering and design, use of proven restoration techniques and best management practices, and other conditions or activities required for project-specific regulatory compliance. The project-specific BMPs that are discussed in further detail in the project-specific environmental reviews may include, but not be limited to the BMPs provided here.

The list of BMPs is organized by resource and includes a section on general construction measures. Several of the BMPs are described in larger documents and only the titles are included here. As regulatory agencies periodically update their guidance documents, future restoration proponents and practitioners are expected to be familiar with such updated guidance and BMPs and apply as required or as agreed to by the Trustees. Appropriate websites should be checked during project planning to see if updated guidance is available.

Applicable BMPs for the specific projects proposed in Chapters 8-12 are discussed in further detail in the project-specific environmental reviews in those respective chapters. Future projects tiered from this programmatic document will include the BMPs below or BMPs identified during project consultation, as appropriate. If changes to the BMPs below are warranted for specific future projects, those changes would be analyzed in the future NRDA analysis and associated tiered EA/EIS. Once BMPs have been accepted, the project will be implemented using those BMPs.

The general organization of this list of BMPs is as follows:

Birds
- Bald Eagle
- Migratory Birds
- Piping Plover and Red Knot
- Red-cockaded woodpecker

Mammals
- Beach Mice
- Manatee
- Bottlenose Dolphin
- Marine Mammals

Reptiles
- Reticulated flatwoods salamander
- Eastern Indigo Snake

Tortoises/Turtles
- Gopher tortoise
- Sea turtles – in water
- Sea turtles – nesting beaches

Fish
- Gulf sturgeon

Plants
- Protected Plants

Invasive Species

General Construction Measures

Birds

Bald Eagles

If bald eagle breeding or nesting behaviors are observed or a nest is discovered or known, have all activities avoid the nest by a minimum of 660 feet. If the nest is protected by a vegetated buffer where there is *no* line of sight to the nest, then the minimum avoidance distance is 330 feet. Maintain this avoidance distance from the onset of breeding/courtship behaviors until any eggs have hatched and eaglets have fledged (approximately 6 months).

If a similar activity (like driving on a roadway) is closer than 660 feet to a nest, maintain a distance buffer as close to the nest as the existing tolerated activity. If a vegetated buffer is present and there is no line of sight to the nest and a similar activity is closer than 330 feet to a nest, then maintain a distance buffer as close to the nest as the existing tolerated activity.

In some instances activities conducted within 660 feet of a nest may result in disturbance, particularly for the eagles occupying the Mississippi barrier islands. If an activity appears to cause initial disturbance, stop the activity and move all individuals and equipment away until the eagles are no longer displaying disturbance behaviors. Contact the Service's Migratory Bird Permit Office to determine how to avoid impacts or if a permit may be needed.

Migratory Birds

Use care to avoid birds when operating machinery or vehicles near birds.

During the project design phase, coordinate with the U.S. Fish and Wildlife Service and the State trust resource agency to site and design projects to avoid or minimize impacts to migratory bird nesting habitats or important feeding/loafing areas.

Avoid working in migratory bird nesting habitats during breeding, nesting, and fledging (approximately Mid February to late August). If project activities must occur during this timeframe and breeding, nesting, or fledging birds are present, contact the State trust resource agency to obtain the most recent guidance to protect nesting birds or rookeries and their recommendations will be implemented.

Conservation areas may already be marked to protect bird nesting areas. Stay out of existing marked areas.

If vegetation clearing is necessary, clear vegetation outside of migratory bird nesting season (approximately Mid February to late August) or have a qualified biologist inspect for active nests. If no active nests are found, vegetation may be removed. If active nests are found, vegetation can be removed after the nest successfully fledges.

Avoid driving over the wrack line or areas of dense seaweed, as these habitats may contain hatchlings and chicks that are difficult to see.

Install pointy, white, piling caps on exposed pilings to prevent bird roosting on piers, docks, and marinas.

Piping Plover and Red Knot

Provide all individuals working on a project with information in support of general awareness of piping plover or red knot presence and means to avoid birds and their critical or otherwise important habitats.

Avoid working in designated critical habitat when piping plover are present (approximately late July through mid-May) or important wintering sites for red knots when they are present(contact U.S. Fish and Wildlife Service for red knot time frames and habitats) to the maximum extent practicable. If work must be conducted when individuals are present, avoid working near concentrations of individuals or post avoidance areas to minimize disturbance.

For projects that result in large scale habitat changes, coordinate early with the U.S. Fish and Wildlife Service to enhance or protect habitat features preferred by the species (inlet shoals, lagoons, washover fans, ephemeral pools, baysides and mud flats). Do not remove sand from intertidal, sand, or mud flats.

Use dredged material to enhance adjacent emerged and submerged shoals and bayside habitats within and adjacent to project areas.

Minimize vegetation planting in preferred habitats and avoid removal of natural organic material ("wrack") year-around along the shoreline.

During recreational use, enforce leash or "no pet" policies in critical or important habitats.

Red-cockaded woodpecker

Avoid working within active red-cockaded woodpecker clusters (minimum convex polygon containing the aggregation of cavity trees used by a group of red-cockaded woodpeckers and a 200-foot wide buffer surrounding the polygon).

If avoidance is not possible or management activities in red-cockaded woodpecker suitable habitat are desired, conduct standard surveys to determine if the habitat is supporting any individuals or presence can be assumed. If red-cockaded woodpeckers are present (or assumed to be), avoid cavity trees and use mechanized equipment during the non-nesting season (approximately April 1 – July 31).

If tree removal is necessary, survey pine trees approximately 60 or more years old for active cavities within one year of the proposed removal. Extend surveys from the project site out to no less than ½ mile. Replace any cavities affected by the project via drilled cavity construction.

If impacts to suitable foraging habitat (pines approximately 30 or more years old and within ½ mile of an active cavity tree) are proposed, conduct a foraging habitat analysis. Foraging habitat may need to be replanted post-project.

Design projects within red-cockaded woodpecker suitable habitat such that prescribed fire needs are not impeded.

<u>Mammals</u>

Beach Mice

Avoid using vehicles and mechanical equipment within the dune system, including primary, secondary, and tertiary dunes.

Avoid storing or staging equipment, vehicles, and project debris in a manner or location where it could be colonized by mice.

If work must occur within the dune system, have a qualified, permitted, biologist survey the project site before work commences and flag potential burrows and tracks so that they can be avoided.

Where possible replace footpaths or low-lying dune walkovers with improved walkovers that do not fragment the dune system. For dune walkover construction in Florida and Alabama, *follow the Conservation Measures for Dune Walkover Construction* (USFWS 2013).

Avoid vegetation removal, including scrub vegetation. If vegetation is damaged or removed during project implementation, plant appropriate native plants in the same location to minimize erosion and provide a food source for beach mice. If forage plants are reduced or limited in the project area, supplemental beach mouse food sources may be necessary.

Manatee
In Florida, follow the most current version of the Standard Manatee Conditions for In-water Work available and the Additional Conditions for Project In-water Activities in Manatee Habitat (USFWS, 2011).

For in-water work in Alabama, Mississippi, and Texas where manatees could be present, follow conditions a, b, c, and d of the Standard Manatee Conditions for In-water Work. Report any collisions to the U.S. Fish and Wildlife Service or State trust resource agency. Temporary signs, if necessary, can be modified from the Florida Fish and Wildlife Conservation Commission's template to reflect local conditions. In Louisiana, follow the most recent version of the Standard Conditions for In-Water Work in the Presence of Manatees (USFWS n.d.a).

Bottlenose Dolphin
Follow the most current version of the Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012

Marine Mammals
Follow the most current version of the Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, Revised February 2008.

Reptiles

Reticulated flatwoods salamander
Avoid suitable habitat during all construction activities and do not permanently alter hydrology of the area. Avoid eliminating connectivity between suitable ponds.

Use silt fencing to prevent sedimentation or erosion of the project site into ponds.

If suitable habitat (including the approximately 1,500 buffer zone around breeding ponds) may be impacted, perform pre-project surveys within 2 miles of known breeding sites or assume the presence of reticulated flatwoods salamanders. Schedule work during the non-breeding season (summer) and maintain the natural contour of the ponds.

Eastern Indigo Snake
If suitable habitat or other evidence of Eastern indigo snake is discovered within the project area during site surveys, implement the most recent version of the U.S. Fish and Wildlife Service's *Standard Protection Measures for the Eastern Indigo Snake*.

Tortoises/Turtles

Gopher tortoise
If suitable habitat is present, have a qualified biologist conduct surveys to identify any gopher tortoise burrows. If burrows are within the project area and cannot be avoided through establishing a protective buffer (size determined by U.S. Fish and Wildlife Service and the State trust resource agency), implement standard procedures to relocate the tortoise within the project site but away from the areas of construction or restoration or consider conservation banks. A Candidate Conservation Agreement with Assurances may be appropriate for project sites within the non-listed range of the species.

Sea turtles – in water
Implement the following guidelines: Sea Turtle and Smalltooth Sawfish Construction Conditions, Revised: March 23, 2006 and Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012 and Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, Revised February 2008.

Sea turtles – nesting beaches
If a sea turtle (either adult or hatchling) is observed, maintain at least 200 feet between the turtle and personnel, equipment, or machinery and notify the sea turtle monitoring program. Allow the turtle to leave the area of its own volition.

During nourishment activities, use beach quality sand that is suitable for successful sea turtle nesting and hatchling emergence. Emulate the natural shoreline slope and dune system (including configuration and shape) to the maximum extent practicable.

In Florida and Alabama, avoid the use of vehicles and heavy machinery on nesting beaches during sea turtle nesting and hatching season (Approximately May through October).

- If work must occur on nesting beaches during sea turtle nesting season (May through August), begin work with vehicles or machinery after 9:00 am local time to allow the sea turtle monitoring program to detect and mark new nests and assess the need to relocate sea turtle nests that could be affected by the project construction. Avoid marked nests by at least 10 feet.
- If beach topography is altered, restore all areas to the natural beach profile by 8:00 pm local time each day during nesting and hatching season. Restore beach topography by raking tire ruts and filling pits or holes.
- Avoid driving over the wrack line or areas of dense seaweed, as these habitats may contain sea turtle hatchlings that are difficult to see.

All observed sea turtle nests located in Texas would be excavated and the eggs are relocated for incubation.

Construction in Texas should be scheduled to avoid Kemps nesting season, which extends from April 1 until October 1.

<u>Fish</u>

Gulf sturgeon
Avoid work in riverine critical habitats when Gulf sturgeon are likely to be present (April to October). Do not dredge in spawning areas when Gulf sturgeon are likely to be present.

During project implementation, maintain riparian buffers of at least 100 feet around critical habitat. Install silt fencing to prevent sedimentation or erosion into streams and rivers.

Operate dredge equipment in a manner to avoid risks to Gulf sturgeon (e.g., disengage pumps when the cutter head is not in the substrate; avoid pumping water from the bottom of the water column).

Implement the Sea Turtle and Smalltooth Construction Conditions, Revised: March 23, 2006 (NOAA, 2006) and Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012 as they are protective of Gulf sturgeon as well.

Plants

Protected Plants

Perform surveys to determine if protected plants (or suitable habitat) are on or adjacent to the project site. Have a qualified individual perform the surveys and follow suitable survey protocols. Conduct plant surveys during appropriate survey periods (usually flowering season).

Design projects to avoid known locations and associated habitat to the extent possible. Use “temporary" removal of plants and soil profile plugs (which include the A and B horizons) with the intent to replace to original location post construction as a last resort. Consider transplanting and seed banking only after all other options are exhausted.

Enhance and protect plants on-site and adjacent habitats to the maximum extent possible.

Use only native plants for post project restoration efforts.

Invasive Species

Develop and implement a Hazard Analysis and Critical Control Points (HACCP) plan to prevent and control invasive species. Use (ASTM E2590 - 08) or other version of HACCP or other similar planning tool.

Implement an Integrated Pest Management (IPM) approach to facility design, sanitation, and maintenance to prevent and control invasive and pest species.

Inspect sites, staging, and buffer areas for common invasive species prior to the onset of work. Map any invasive species detected and note qualitative or quantitative measures regarding abundance. Implement a control plan, if necessary, to ensure these species do not increase in distribution or abundance at a site due to project implementation. Inspect sites periodically to identify and control new colonies/individuals of an invasive species not previously observed prior to construction.

Prior to bringing any equipment (including personal gear, machinery, vehicles or vessels) to the work site, inspect each item for mud or soil, seeds, and vegetation. If present, clean the equipment, vehicles, or personal gear until they are free from mud, soil, seeds, and vegetation. Inspect the equipment, vehicles, and personal gear each time they are being prepared to go to a site or prior to transferring between sites to avoid spreading exotic, nuisance species.

Place and maintain predator-proof waste receptacles in strategic locations during project implementation to prevent an increase in predator abundance. For projects designed to enhance or increase visitor use, maintain predator-proof waste receptacles for the life of the project.

Have the appropriate state agency inspect any equipment or construction materials for invasive species prior to use.

Inspect and certify propagated or transplanted vegetation as pest and disease free prior to planting in restoration project areas.

General Construction Measures

Guidelines:

Construction Guidelines in Florida for Minor Piling-Supported Structures Constructed in or over Submerged Aquatic Vegetation (SAV), Marsh or Mangrove Habitat. U.S. Army Corps of Engineers/National Marine Fisheries Service August 2001

Key for Construction Conditions for Docks or Other Minor Structures Constructed in or Over Johnson's Seagrass (Halophila johnsonii). National Marine Fisheries Service/U.S. Army Corps of Engineers October 2002

National Artificial Reef Plan (as Amended): Guidelines for siting, construction, development, and assessment of artificial reefs, Revised February 2007

Guidelines for Marine Artificial Reef Materials 1997 GSMFC Number 121

Bubble Curtain Specifications for Pile Driving

Assessment and Mitigation of Marine Explosives: Guidance for Protected Species in the Southeast U.S.

Piling Installation

Push pilings into soft, bottom substrate to reduce noise from installation; do not drive and hammer pilings into bottom substrate unless necessary for proper construction.

Protected species

Provide all individuals working on a project with information in support of general awareness of and means to avoid impacts to protected species and their habitats present at the specific project site.

Survey for other at-risk or imperilled species. If found on site, contact the U.S. Fish and Wildlife Service and State trust resource agency to determine if avoidance or minimization measures or a Candidate Conservation Agreement with Assurances may be appropriate.

Site maintenance and conduct

Use the nearest, existing staging, access and egress areas, travel corridors, pathways, and roadways (including those provided by the State, local governments, land managers, trustee, or private property owner, with proper permissions) and do not create new staging areas, access (except dunewalk overs) or egress, or travel corridors through dune habitats.

Limit driving on the beach for construction to the minimum necessary within the designated travel corridor–established just above or just below the primary “wrack” line. Avoid driving on the upper beach whenever possible, and never drive over any dunes or beach vegetation. Check with the U.S. Fish and Wildlife Service and State trust resource agency for additional specific beach driving recommendations in Florida and Alabama.

Minimize construction noise to the maximum extent practicable when working near protected species and their habitats.

Maintain or improve all lighting regimes. Methods include: working during daylight hours only, prohibiting lighting on dune walkovers, and using wildlife-friendly lighting where lighting is necessary for human safety.

Post signs at kiosks, ramps, and piers to provide visitors with information to avoid and minimize impacts to protected species and their habitats while recreating. Develop signs in coordination with National Marine Fisheries Service, U.S. Fish and Wildlife Service and the local State trust resource agency.

Supply and maintain containers for waste fishing gear to avoid fish and wildlife entanglement.

Land and vegetation protection

Develop and implement an erosion control plan to minimize erosion during and after construction and where possible: use vegetative buffers (100 feet or greater), revegetate with native species or annual grasses, and conduct work during dry seasons.

Develop and implement a spill prevention and response plan, including: conducting daily inspections of all construction and related equipment to assure there are no leaks of antifreeze, hydraulic fluid, or other substances and cleaning and sealing all equipment that would be used in the water to rid it of chemical residue. Develop a contract stipulation to disallow use of any leaking equipment or vehicles.

Prohibit use of hazardous materials, such as: lead paint, creosote, pentachlorophenol, and other wood preservatives during construction in, over, or adjacent to, sensitive sites during construction and routine maintenance.

Where landscaping is necessary or desired, use native plants from local sources. If non-native species must be used, ensure they are non-invasive and use them in container plantings.

Wetland and aquatic resource protection

Complete an engineering design and post-construction inspection for projects where geomorphic elevations would be restored in wetlands, marshes, and shallow water habitats to ensure the success of the restoration project. Manage elevation of fill material to ensure projected consolidation rates were accomplished and that habitat suitable for wetland and marsh vegetation is developed.

Perform an engineering design and post-construction inspection for projects where geomorphic elevations are restored within wetlands, marshes, and shallow water habitats to ensure the success of the restoration project.

Avoid and minimize, to the maximum extent practicable, placement of dredged or fill material in wetlands and other aquatic resources.

Design construction equipment corridors to avoid and minimize impacts to wetlands and other aquatic resources to the maximum extent practicable.

To the maximum extent possible, implement the placement of sediment to minimize impacts to existing vegetation or burrowing organisms.

Place protective warning signs and buoys around at-risk habitats for infrastructure projects that could increase recreational uses in SAV or oyster areas.

Apply herbicide in accordance with the direction and guidance provided on the appropriate Environmental Protection Agency (EPA) labels and State statutes during land-based activities.

Only use suitable borrow sites (that do not contain *Sargassum,* SAV, or oysters) as dredging sites for sediment. Obtain sediments by beneficially using dredged material from navigation channels or by accessing material from approved offshore borrow areas. Sediments must closely match the chemical and physical characteristics of sediment at the restoration site. Additionally, use target borrow areas within reasonable proximity to suitable sites for sediment placement.

When local conditions indicate the likely presence of contaminated soils and sediments, test soil samples for contaminant levels, and take precautions to avoid disturbance of -or to provide for proper disposal of - contaminated soils and sediments. Evaluate methods prior to dredging to reduce the potential for impacts from turbidity or tarballs.

Perform maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area, as necessary, to prevent leaks and spills from entering the water.

Designate a vehicle staging area removed from any natural surface water resource or wetland to perform fueling, maintenance, and storage of construction vehicles and equipment. Inspect vehicles and equipment daily prior to leaving the storage area to ensure that no petroleum or oil products are leaking.

Upon completion of construction activities, restore all disturbed areas as necessary to allow habitat functions to return. Create and manage public access developments to enhance recreational experience and educational awareness to minimize effects to habitat within wetland and shallow water areas and to the long-term health of related biological communities.

Incorporate containment levees for fill cells for projects using marsh creation or other barrier island restoration. Remove these containment levees after construction to allow for the restoration of nature tidal exchange.

Use silt fencing where appropriate to reduce increased turbidity and siltation in the project vicinity. This would apply to both on land and in water work.

Continue oyster and clam shell recycling programs to provide natural material for creating additional oyster reefs.

Ensure shells to be introduced for reef creation are subjected to depuration in a secure open air area for a period of not less than 6 months.

Make all efforts to reduce the peak sound level and exposure levels of fish to reduce the potential impact of sound on fish present in the project areas.

Use a vibratory hammer whenever possible to reduce peak sound pressure levels in the aquatic environment.

Use sound attenuation devices where practicable for pulse-noise (impact hammers) to reduce peak sound pressure levels in the aquatic environment.

Stipulate the timing of activities to avoid impacts to spawning fish and eggs/larvae.

Use BMPs to reduce turbidity, such as turbidity blankets, to reduce the potential impact of turbidity on finfish.

Screen water withdrawal pipes to minimize potential entrainment of fish from the withdrawal area. Have project proponents coordinate with NMFS to create an intake screen that would minimize potential impingement of fish.

<u>Aquaculture facilities</u>

Treat effluent from aquaculture facilities to avoid dispersal of potential pathogens into receiving waters.

Make sure that all aquaculture facilities and fish raised in those facilities meet fish health standards and are screened for pathogens prior to release into receiving waters.

Implement a genetics management plan that ensures maintenance of genetic diversity of native stocks of finfish in the Gulf of Mexico.

Develop and implement a stocking management plan prior to the release of hatchery-reared finfish.

BMPs and Mitigation Measures – Benefits to Resources and the Human Environment

Potential BMPs and Mitigation Measures, including those described above as well as additional measures, have been organized into three tables to provide information on the potential benefits to natural resources and the human environment associated with implementing the measures:

1. Table 6A-1: *Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to Natural Resources.* This table presents the benefits to natural resources associated with implementation of a broad range of standard BMPs and Mitigation Measures;
2. Table 6A-2: *Potential Site-Specific and Construction Mitigation Measures and BMPs. Benefits to the Human Environment*: This table presents the benefits to the human environment associated with implementation of a broad range of standard BMPs and Mitigation Measures; and

3. Table 6A-3: *Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs.* This table presents BMPs and Mitigation Measures that may be implemented on –case-by-case basis when sensitive habitats or protected species may be present. These measures would not preclude implementation of BMPs or Mitigation Measures listed in Table 6A-1 or 6A-2, but may be implemented in addition to those deemed appropriate in Table 6A-1 or 6A-2 to further reduce potential for adverse effects to natural resources.

Table 6A-1. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to Natural Resources

Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
			Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
	Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
Tilling of compacted soil areas to reduce hardening.	X	X						X	X		X								X			X
Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated. Temporary roads in wet or flooded areas would be restored shortly after the work period was complete.	X	X		X	X		X	X	X	X	X		X	X		X	X	X	X	X	X	X
Selection and operation of heavy equipment to minimize adverse effects to the environment (e.g., minimally-sized, low-pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).	X	X		X	X		X	X	X	X	X					X	X	X	X	X	X	X
To the extent feasible, heavy equipment would work from the top of the bank, unless work from another location would result in less habitat disturbance.	X	X		X	X		X	X	X	X	X			X		X	X	X	X	X	X	X
Temporary stabilization of areas of upland soil disturbance by sediment and erosion control practices during construction, and re-vegetation with appropriate native species following construction.	X			X			X	X	X	X	X		X	X		X	X	X	X		X	X
When local conditions indicate the presence of contaminated soils/sediments is likely, soil samples would be tested for contaminant levels, and precautions would be taken to avoid disturbance of or provide for proper disposal of contaminated soils/sediments.	X	X	X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Prior to dredging, methods will be evaluated to reduce the potential for impacts from turbidity.				X	X		X	X	X	X	X	X	X	X		X	X	X	X	X		
Seasonal rainfall will be factored into the construction timeline to reduce ground disturbance during raining or flood seasons.	X	X		X	X		X	X	X	X	X		X	X		X	X	X	X	X	X	X
Employment of standard BMPs for construction to reduce erosion, stormwater runoff, transport of soil into receiving waters, or disturbance of sediment.	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X
Employment of temporary erosion controls prior to any land clearing or land disturbance	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X

Table 6A-1. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to Natural Resources

Potential Mitigation Measures	Geology and Substrates: Upland Geology and Substrates	Geology and Substrates: Nearshore Geology and Substrates	Hydrology and Water Quality: Freshwater Environments: Groundwater	Hydrology and Water Quality: Freshwater Environments: Surface Water	Hydrology and Water Quality: Saltwater Environment Fish Resources: Nearshore Coastal Environment	Hydrology and Water Quality: Saltwater Environment Fish Resources: Offshore Marine Environment	Habitats: Wetlands	Habitats: Barrier Islands	Habitats: Beaches	Habitats: Submerged Aquatic Vegetation (SAV)	Habitats: Terrestrial, Coastal, and Riparian Habitat	Living Coastal and Marine Resources: Nearshore Benthic Communities	Living Coastal and Marine Resources: Oysters	Living Coastal and Marine Resources: Pelagic Microfaunal Communities	Living Coastal and Marine Resources: Sargassum	Living Coastal and Marine Resources: Finfish: Demersal Fish	Living Coastal and Marine Resources: Finfish: Pelagic Fish	Living Coastal and Marine Resources: Finfish: Diadromous and Freshwater Fish	Living Coastal and Marine Resources: Sea Turtles	Living Coastal and Marine Resources: Marine Mammals	Living Coastal and Marine Resources: Birds	Living Coastal and Marine Resources: Terrestrial Wildlife
on the project site, which would be monitored during construction to ensure proper function. Turbidity curtains, hay bales, and erosion mats would be used where appropriate.																						
Confinement of vegetation removal and soil disturbance would be to the minimum area and the minimum length of time necessary to complete the action.	X	X	X	X	X	X	X	X	X	X	X			X		X	X	X	X	X	X	X
Site work stoppage under high flows or seasonal conditions that threaten to damage erosion and sediment control measures, except where efforts are aimed at avoiding or minimizing resource damage.	X	X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X
Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.			X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Development and implementation of spill prevention and control plans to minimize the risk of releasing petroleum and oil products to receiving waters.			X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Management of hazardous material generated, used, or stored onsite in accordance with Federal and State regulations, including notification of proper authorities.	X	X	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Application of herbicide during land-based activities would be in accordance with the direction and guidance provided on the appropriate Environmental Protection Agency (EPA) labels.			X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	X	X
Cleaning of construction equipment before moving between sites to prevent spread of invasive species							X	X	X	X	X	X		X					X	X	X	X
Identification of mooring locations for restoration-related barges and other boats to best avoid EFH and minimize damage to existing healthy reefs or adjacent SAV beds.							X	X	X	X	X		X	X		X	X	X	X	X		
Creation, as feasible, of a stockpile of topsoil; native channel material; and large, mature native trees and shrubs for reuse in the restoration process.	X	X						X	X		X								X		X	X
Upon completion of construction activities, all disturbed areas would be restored as	X	X	X	X	X		X	X	X	X	X	X		X		X	X	X	X	X	X	X

Table 6A-1. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to Natural Resources

	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
			Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
Potential Mitigation Measures	Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
necessary to allow habitat functions to return.																						
Temporal (e.g., time-of-year, seasonal) restrictions for construction activities applicable to protection of Federally listed threatened and endangered species, EFH, diadromous fish species, SAV, or other natural resources could be employed to avoid impacts.							X	X	X	X	X		X			X	X	X	X	X	X	X
Fueling, maintenance, and storage of construction vehicles and equipment within a designated vehicle staging area removed from any natural surface water resource or wetland. Vehicles and equipment would be inspected daily prior to leaving the storage area to ensure that no petroleum or oil products are leaking.			X	X	X		X	X	X	X	X	X	X	X		X	X	X	X	X	X	X
Conducting preconstruction surveys for the presence of sensitive natural and cultural resources.							X	X	X	X	X				X	X	X	X	X	X	X	X
Installation of protective buffers around sensitive wetlands, surface waters, and wildlife habitat. At a minimum, flagging or fencing sensitive resource areas adjacent to the action area would be employed to avoid accidental impacts.				X	X		X	X	X	X	X			X		X	X	X	X	X	X	X
The use of an appropriate assemblage of species native to the action area or region, including trees, shrubs, and herbaceous species, would be used in the re-vegetation and restoration processes.							X	X	X	X	X					X	X	X	X	X	X	X
Performing exploratory trenching																						
During all phases of the project, keeping equipment and vehicles within the limits of the initially disturbed areas. In addition, use existing roads to the maximum extent feasible to avoid additional surface disturbance.							X			X						X	X	X				
Restoration activities could utilize the Secretary of the Interior's Standards for the Treatment of Historic Properties. Archeological deposits should be avoided or excavated, analyzed, and curated with the proper State or Federal repository.																						
Construction workers and volunteers employed in the projects associated with restoration techniques would be adequately trained to ensure that impacts are																						

Table 6A-1. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to Natural Resources

	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
			Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
Potential Mitigation Measures	Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
minimized. Training may include but may not be limited to: understanding impacts to transportation and energy infrastructure.																						
Local companies should try to work with project leads to establish construction work times that overlap with off season tourism schedules.																						

Table 6A-2. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to the Human Environment.

	Socio-economics					Tourism and Recreation Use						Fisheries						
Potential Mitigation Measures	Demographics	Regional Economy	Cultural Resources	Infrastructure	Land and Marine Management	Wildlife Observation	Hunting	Beach and Waterfront	Boating	Recreational Fishing and Stock Enhancement	Tourism	Commercial Fisheries, Processing, and Sales	Aquaculture, Processing, and Sales (and Shellfish Leases)	Marine Transportation	Aesthetics and Visual	Public Health and Safety	Noise	Air Quality and Greenhouse Gases
Tilling of compacted soil areas to reduce hardening.																		
Use of existing access ways whenever possible. Temporary access roads would not be built in locations that would suggest a likelihood of excessive erosion (e.g., large slopes, erosive soils, proximity to water body). All temporary access roads would be restored when the action is completed, the soil would be stabilized, and the site would be re-vegetated. Temporary roads in wet or flooded areas would be restored shortly after the work period was complete.			X												X	X		X
Selection and operation of heavy equipment to minimize adverse effects to the environment (e.g., minimally-sized, low-pressure tires, minimal hard turn paths for tracked vehicles, temporary mats or plates within wet areas or sensitive soils).															X			X
To the extent feasible, heavy equipment would work from the top of the bank, unless work from another location would result in less habitat disturbance.						X	X	X										
Temporary stabilization of areas of upland soil disturbance by sediment and erosion control practices during construction, and re-vegetation with appropriate native species following construction.						X	X	X							X	X		X
When local conditions indicate the presence of contaminated soils/sediments is likely, soil samples would be tested for contaminant levels, and precautions would be taken to avoid disturbance of or provide for proper disposal of contaminated soils/sediments.	X															X		
Prior to dredging, methods will be evaluated to reduce the potential for impacts from turbidity.	X									X		X	X					
Seasonal rainfall will be factored into the construction timeline to reduce ground disturbance during raining or flood seasons.	X									X		X	X			X		

Table 6A-2. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to the Human Environment.

	Socio-economics					Tourism and Recreation Use						Fisheries						
Potential Mitigation Measures	Demographics	Regional Economy	Cultural Resources	Infrastructure	Land and Marine Management	Wildlife Observation	Hunting	Beach and Waterfront	Boating	Recreational Fishing and Stock Enhancement	Tourism	Commercial Fisheries, Processing, and Sales	Aquaculture, Processing, and Sales (and Shellfish Leases)	Marine Transportation	Aesthetics and Visual	Public Health and Safety	Noise	Air Quality and Greenhouse Gases
Employment of standard BMPs for construction to reduce erosion, stormwater runoff, transport of soil into receiving waters, or disturbance of sediment.	X		X			X	X	X		X		X	X		X	X		
Employment of temporary erosion controls prior to any land clearing or land disturbance on the project site, which would be monitored during construction to ensure proper function. Turbidity curtains, hay bales, and erosion mats would be used where appropriate.	X		X			X	X	X		X		X	X		X	X		
Confinement of vegetation removal and soil disturbance would be to the minimum area and the minimum length of time necessary to complete the action.			X	X		X	X	X							X	X		
Site work stoppage under high flows or seasonal conditions that threaten to damage erosion and sediment control measures, except where efforts are aimed at avoiding or minimizing resource damage.				X		X	X	X							X	X		
Maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area as necessary to prevent leaks and spills from entering the water.						X	X	X				X	X		X	X		X
Development and implementation of spill prevention and control plans to minimize the risk of releasing petroleum and oil products to receiving waters.						X	X	X		X		X	X		X	X		
Management of hazardous material generated, used, or stored onsite in accordance with Federal and State regulations, including notification of proper authorities.																X		X
Application of herbicide during land-based activities would be in accordance with the direction and guidance provided on the appropriate Environmental Protection Agency (EPA) labels.																X		
Cleaning of construction equipment before moving between sites to prevent spread of invasive species						X	X	X							X			
Identification of mooring locations for restoration-related barges and other boats to best avoid EFH and minimize damage to existing healthy reefs or adjacent SAV beds.						X	X	X		X		X	X					
Creation, as feasible, of a stockpile of topsoil; native channel material; and large,																		

Table 6A-2. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to the Human Environment.

Potential Mitigation Measures	Socio-economics					Tourism and Recreation Use						Fisheries						
	Demographics	Regional Economy	Cultural Resources	Infrastructure	Land and Marine Management	Wildlife Observation	Hunting	Beach and Waterfront	Boating	Recreational Fishing and Stock Enhancement	Tourism	Commercial Fisheries, Processing, and Sales	Aquaculture, Processing, and Sales (and Shellfish Leases)	Marine Transportation	Aesthetics and Visual	Public Health and Safety	Noise	Air Quality and Greenhouse Gases
mature native trees and shrubs for reuse in the restoration process.																		
Upon completion of construction activities, all disturbed areas would be restored as necessary to allow habitat functions to return.						X	X	X							X	X		
Temporal (e.g., time-of-year, seasonal) restrictions for construction activities applicable to protection of Federally listed threatened and endangered species, EFH, diadromous fish species, SAV, or other natural resources could be employed to avoid impacts.						X	X	X		X		X	X					
Fueling, maintenance, and storage of construction vehicles and equipment within a designated vehicle staging area removed from any natural surface water resource or wetland. Vehicles and equipment would be inspected daily prior to leaving the storage area to ensure that no petroleum or oil products are leaking.																X		
Conducting preconstruction surveys for the presence of sensitive natural and cultural resources.			X			X									X			
Installation of protective buffers around sensitive wetlands, surface waters, and wildlife habitat. At a minimum, flagging or fencing sensitive resource areas adjacent to the action area would be employed to avoid accidental impacts.						X	X	X		X		X	X			X		
The use of an appropriate assemblage of species native to the action area or region, including trees, shrubs, and herbaceous species, would be used in the re-vegetation and restoration processes.						X	X								X			
Cultural resource monitoring of construction in the vicinity of the development			X													X	X	X
Conducting records searches to determine the presence of known archaeological sites and historic structures within the area of potential effect. Identify the need for an archaeological and/or architectural survey. Conduct a survey, if needed.			X	X														
During all phases of the project, keeping equipment and vehicles within the limits of the initially disturbed areas. In addition, use existing roads to the maximum extent feasible to avoid additional surface disturbance.			X			X	X	X							X	X		

Table 6A-2. Potential Site-Specific and Construction Mitigation Measures and BMPs: Benefits to the Human Environment.

	Socio-economics					Tourism and Recreation Use						Fisheries						
Potential Mitigation Measures	**Demographics**	**Regional Economy**	**Cultural Resources**	**Infrastructure**	**Land and Marine Management**	**Wildlife Observation**	**Hunting**	**Beach and Waterfront**	**Boating**	**Recreational Fishing and Stock Enhancement**	**Tourism**	**Commercial Fisheries, Processing, and Sales**	**Aquaculture, Processing, and Sales (and Shellfish Leases)**	**Marine Transportation**	**Aesthetics and Visual**	**Public Health and Safety**	**Noise**	**Air Quality and Greenhouse Gases**
Restoration activities could utilize the Secretary of the Interior's Standards for the Treatment of Historic Properties. Archeological deposits should be avoided or excavated, analyzed, and curated with the proper State or Federal repository.			X															
Construction workers and volunteers employed in the projects associated with restoration techniques would be adequately trained to ensure that impacts are minimized. Training may include but may not be limited to: understanding impacts to transportation and energy infrastructure.			X	X	X	X	X	X		X		X	X	X		X	X	X
Local companies should try to work with project leads to establish construction work times that overlap with off season tourism schedules.		X									X							
Local companies and workforces should be used for construction or implementation the project if possible to support local economic benefits.		X																
Vocational training for out-of-work fisheries workers.		X										X	X					

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
				Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
BIRDS																							
Bald Eagle	If bald eagle breeding or nesting behaviors are observed or a nest is discovered or known, have all activities avoid the nest by a minimum of 660 feet. If the nest is protected by a vegetated buffer where there is *no* line of sight to the nest, then the minimum avoidance distance is 330 feet. Maintain this avoidance distance from the onset of breeding/courtship behaviors until any eggs have hatched and eaglets have fledged (approximately 6 months).																					X	
	If a similar activity (like driving on a roadway) is closer than 660 feet to a nest, maintain a distance buffer as close to the nest as the existing tolerated activity. If a vegetated buffer is present and there is no line of sight to the nest and a similar activity is closer than 330 feet to a nest, then maintain a distance buffer as close to the nest as the existing tolerated activity.																					X	
	In some instances activities conducted within 660 feet of a nest may result in disturbance, particularly for the eagles occupying the Mississippi barrier islands. If an activity appears to cause initial disturbance, stop the activity and move all individuals and equipment away until the eagles are no longer displaying disturbance behaviors. Contact the Service's Migratory Bird Permit Office to determine how to avoid impacts or if a permit may be needed.																					X	
Migratory Birds	Use care to avoid birds when operating machinery or vehicles near birds.																					X	
	During the project design phase, coordinate with the U.S. Fish and Wildlife Service and the State trust resource agency to site and design projects to avoid or minimize impacts to migratory bird nesting habitats or important feeding/loafing areas.																					X	
	Avoid working in migratory bird nesting habitats during breeding, nesting, and fledging (approximately Mid February to late August). If project activities must occur during this timeframe and breeding, nesting, or fledging birds are present, contact the State trust resource agency to obtain the most recent guidance to protect nesting birds or rookeries and their recommendations will be implemented.																					X	
	Conservation areas may already be marked to protect bird nesting areas. Stay out of existing marked																					X	

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
				Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	areas.																						
	If vegetation clearing is necessary, clear vegetation outside of migratory bird nesting season (approximately Mid February to late August) or have a qualified biologist inspect for active nests. If no active nests are found, vegetation may be removed. If active nests are found, vegetation can be removed after the nest successfully fledges.																					X	
	Avoid driving over the wrack line or areas of dense seaweed, as these habitats may contain hatchlings and chicks that are difficult to see.																					X	
	Install pointy, white, piling caps on exposed pilings to prevent bird roosting on piers, docks, and marinas.																					X	
Piping Plover and Red Knot	Provide all individuals working on a project with information in support of general awareness of piping plover or red knot presence and means to avoid birds and their critical or otherwise important habitats.																					X	
	Avoid working in designated critical habitat when piping plover are present (approximately late July through mid-May) or important wintering sites for red knots when they are present(contact U.S. Fish and Wildlife Service for red knot time frames and habitats) to the maximum extent practicable. If work must be conducted when individuals are present, avoid working near concentrations of individuals or post avoidance areas to minimize disturbance.																					X	
	For projects that result in large scale habitat changes, coordinate early with the U.S. Fish and Wildlife Service to enhance or protect habitat features preferred by the species (inlet shoals, lagoons, washover fans, ephemeral pools, baysides and mud flats). Do not remove sand from intertidal, sand, or mud flats. Use dredged material to enhance adjacent emerged and submerged shoals and bayside habitats within and adjacent to project areas.																					X	
	Minimize vegetation planting in preferred habitats and avoid removal of natural organic material ("wrack") year-around along the shoreline.																					X	

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
				Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	During recreational use, enforce leash or "no pet" policies in critical or important habitats.																					X	
Red-cockaded woodpecker	Avoid working within active red-cockaded woodpecker clusters (minimum convex polygon containing the aggregation of cavity trees used by a group of red-cockaded woodpeckers and a 200-foot wide buffer surrounding the polygon).																					X	
	If avoidance is not possible or management activities in red-cockaded woodpecker suitable habitat are desired, conduct standard surveys to determine if the habitat is supporting any individuals or presence can be assumed. If red-cockaded woodpeckers are present (or assumed to be), avoid cavity trees and use mechanized equipment during the non-nesting season (approximately April 1 – July 31).																					X	
	If tree removal is necessary, survey pine trees approximately 60 or more years old for active cavities within one year of the proposed removal. Extend surveys from the project site out to no less than ½ mile. Replace any cavities affected by the project via drilled cavity construction.																					X	
	If impacts to suitable foraging habitat (pines approximately 30 or more years old and within ½ mile of an active cavity tree) are proposed, conduct a foraging habitat analysis. Foraging habitat may need to be replanted post-project.																						
	Design projects within red-cockaded woodpecker suitable habitat such that prescribed fire needs are not impeded.																						
MAMMALS																							
Beach Mice	Avoid using vehicles and mechanical equipment within the dune system, including primary, secondary, and tertiary dunes.																						X
	Avoid storing or staging equipment, vehicles, and project debris in a manner or location where it could be colonized by mice.																						X
	If work must occur within the dune system, have a qualified, permitted, biologist survey the project site before work commences and flag potential burrows and tracks so that they can be avoided.																						X

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality: Freshwater Environments		Hydrology and Water Quality: Saltwater Environment Fish Resources		Habitats					Living Coastal and Marine Resources				Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	Where possible replace footpaths or low-lying dune walkovers with improved walkovers that do not fragment the dune system. For dune walkover construction in Florida and Alabama, *follow the Conservation Measures for Dune Walkover Construction* (USFWS 2013).																						X
	Avoid vegetation removal, including scrub vegetation. If vegetation is damaged or removed during project implementation, plant appropriate native plants in the same location to minimize erosion and provide a food source for beach mice. If forage plants are reduced or limited in the project area, supplemental beach mouse food sources may be necessary.																						X
Manatee	In Florida, follow the most current version of the *Standard Manatee Conditions for In-water Work* available and the *Additional Conditions for Project In-water Activities in Manatee Habitat* (USFWS, 2011).																				X		
	For in-water work in other states (Alabama, Mississippi, Louisiana, and Texas) where manatees could be present, follow conditions b, c, and d of the *Standard Manatee Conditions for In-water Work*. Report any collisions to the U.S. Fish and Wildlife Service or State trust resource agency. Temporary signs, if necessary, can be modified from the Florida Fish and Wildlife Conservation Commission's template to reflect local conditions.																				X		
Bottleneck Dolphin	Follow the most current version of the *Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012*																				X		
Marine Mammals	Follow the most current version of the *Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, Revised February 2008.*																				X		
REPTILES																							
Reticulated Flatwoods Salamander	Avoid suitable habitat during all construction activities and do not permanently alter hydrology of the area. Avoid eliminating connectivity between suitable ponds.																						X
	Use silt fencing to prevent sedimentation or erosion of the project site into ponds.																						X
	If suitable habitat (including the approximately 1,500 buffer zone around breeding ponds) may be																						X

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates: Upland Geology and Substrates	Geology and Substrates: Nearshore Geology and Substrates	Hydrology and Water Quality – Freshwater Environments: Groundwater	Hydrology and Water Quality – Freshwater Environments: Surface Water	Hydrology and Water Quality – Saltwater Environment Fish Resources: Nearshore Coastal Environment	Hydrology and Water Quality – Saltwater Environment Fish Resources: Offshore Marine Environment	Habitats: Wetlands	Habitats: Barrier Islands	Habitats: Beaches	Habitats: Submerged Aquatic Vegetation (SAV)	Habitats: Terrestrial, Coastal, and Riparian Habitat	Living Coastal and Marine Resources: Nearshore Benthic Communities	Living Coastal and Marine Resources: Oysters	Living Coastal and Marine Resources: Pelagic Microfaunal Communities	Living Coastal and Marine Resources: Sargassum	Living Coastal and Marine Resources – Finfish: Demersal Fish	Living Coastal and Marine Resources – Finfish: Pelagic Fish	Living Coastal and Marine Resources – Finfish: Diadromous and Freshwater Fish	Living Coastal and Marine Resources: Sea Turtles	Living Coastal and Marine Resources: Marine Mammals	Living Coastal and Marine Resources: Birds	Living Coastal and Marine Resources: Terrestrial Wildlife
	impacted, perform pre-project surveys within 2 miles of known breeding sites or assume the presence of reticulated flatwoods salamanders. Schedule work during the non-breeding season (summer) and maintain the natural contour of the ponds.																						
Eastern Indigo Snake	If suitable habitat or other evidence of Eastern indigo snake is discovered within the project area during site surveys, implement the most recent version of the U.S. Fish and Wildlife Service's *Standard Protection Measures for the Eastern Indigo Snake*.																						X
TORTOISES/TURTLES																							
Gopher tortoise	If suitable habitat is present, have a qualified biologist conduct surveys to identify any gopher tortoise burrows. If burrows are within the project area and cannot be avoided through establishing a protective buffer (size determined by U.S. Fish and Wildlife Service and the State trust resource agency), implement standard procedures to relocate the tortoise within the project site but away from the areas of construction or restoration or consider conservation banks. A Candidate Conservation Agreement with Assurances may be appropriate for project sites within the non-listed range of the species.																						X
Sea turtles – in water	Implement the following guidelines: *Sea Turtle and Smalltooth Sawfish Construction Conditions, Revised: March 23, 2006* and *Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012* and *Vessel Strike Avoidance Measures and Reporting for Mariners NOAA Fisheries Service, Southeast Region, Revised February 2008*.																			X			
Sea turtles – nesting beaches	In Florida and Alabama, avoid the use of vehicles and heavy machinery on nesting beaches during sea turtle nesting and hatching season (Approximately May through October).																			X			
	If work must occur on nesting beaches during sea turtle nesting season (May through August), begin work with vehicles or machinery after 9:00 am local time to allow the sea turtle monitoring program to detect and mark new nests and assess the need to relocate sea turtle nests that could be affected by the project construction. Avoid marked nests by at least 10 feet.																			X			
	If a sea turtle (either adult or hatchling) is observed, maintain at least 200 feet between the turtle																			X			

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates: Upland Geology and Substrates	Geology and Substrates: Nearshore Geology and Substrates	Hydrology and Water Quality: Freshwater Environments: Groundwater	Hydrology and Water Quality: Freshwater Environments: Surface Water	Hydrology and Water Quality: Saltwater Environment Fish Resources: Nearshore Coastal Environment	Hydrology and Water Quality: Saltwater Environment Fish Resources: Offshore Marine Environment	Habitats: Wetlands	Habitats: Barrier Islands	Habitats: Beaches	Habitats: Submerged Aquatic Vegetation (SAV)	Habitats: Terrestrial, Coastal, and Riparian Habitat	Living Coastal and Marine Resources: Nearshore Benthic Communities	Living Coastal and Marine Resources: Oysters	Living Coastal and Marine Resources: Pelagic Microfaunal Communities	Living Coastal and Marine Resources: Sargassum	Living Coastal and Marine Resources: Finfish: Demersal Fish	Living Coastal and Marine Resources: Finfish: Pelagic Fish	Living Coastal and Marine Resources: Finfish: Diadromous and Freshwater Fish	Living Coastal and Marine Resources: Sea Turtles	Living Coastal and Marine Resources: Marine Mammals	Living Coastal and Marine Resources: Birds	Living Coastal and Marine Resources: Terrestrial Wildlife
	and personnel, equipment, or machinery. Allow the turtle to leave the area of its own volition.																						
	If beach topography is altered, restore all areas to the natural beach profile by 20:00 hours each day during nesting and hatching season. Restore beach topography by raking tire ruts and filling pits or holes.																			X			
	Avoid driving over the wrack line or areas of dense seaweed, as these habitats may contain sea turtle hatchlings that are difficult to see.																			X			
	During nourishment activities, use beach quality sand that is suitable for successful sea turtle nesting and hatchling emergence. Emulate the natural shoreline slope and dune system (including configuration and shape) to the maximum extent practicable.																			X			
FISH																							
Gulf sturgeon	Avoid work in riverine critical habitats when Gulf sturgeon are likely to be present (April to October). Do not dredge in spawning areas when Gulf sturgeon are likely to be present.																		X				
	During project implementation, maintain riparian buffers of at least 100 feet around critical habitat. Install silt fencing to prevent sedimentation or erosion into streams and rivers.																		X				
	Operate dredge equipment in a manner to avoid risks to Gulf sturgeon (e.g., disengage pumps when the cutter head is not in the substrate; avoid pumping water from the bottom of the water column).																		X				
	Implement the Sea Turtle and Smalltooth Construction Conditions, Revised: March 23, 2006 (NOAA, 2006) and *Measures for Reducing Entrapment Risk to Protected Species, Revised: May 22, 2012* as they are protective of Gulf sturgeon as well.																		X				
PLANTS																							
Protected plants	Perform surveys to determine if protected plants (or suitable habitat) are on or adjacent to the project site. Have a qualified individual perform the surveys and follow suitable survey protocols. Conduct plant surveys during appropriate survey periods (usually flowering season).					X		X	X	X	X	X											

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality: Freshwater Environments		Hydrology and Water Quality: Saltwater Environment Fish Resources		Habitats					Living Coastal and Marine Resources				Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	Design projects to avoid known locations and associated habitat to the extent possible. Use “temporary" removal of plants and soil profile plugs (which include the A and B horizons) with the intent to replace to original location post construction as a last resort. Consider transplanting and seed banking only after all other options are exhausted.					X		X	X	X	X	X											
	Enhance and protect plants on-site and adjacent habitats to the maximum extent possible.					X		X	X	X	X	X											
	Use only native plants for post project restoration efforts.					X		X	X	X	X	X											
Invasive species	Develop and implement a HACCP plan to prevent and control invasive species. Use (ASTM E2590 - 08) or other version of HACCP or other similar planning tool.					X	X	X	X	X	X	X											
	Implement an Integrated Pest Management (IPM) approach to facility design, sanitation, and maintenance to prevent and control invasive and pest species.					X	?	X	X	X	X	X											
	Inspect sites, staging, and buffer areas for common invasive species prior to the onset of work. Map any invasive species detected and note qualitative or quantitative measures regarding abundance. Implement a control plan, if necessary, to ensure these species do not increase in distribution or abundance at a site due to project implementation. Inspect sites periodically to identify and control new colonies/individuals of an invasive species not previously observed prior to construction.					X	X	X	X	X	X	X											
	Prior to bringing any equipment (including personal gear, machinery, vehicles or vessels) to the work site, inspect each item for mud or soil, seeds, and vegetation. If present, clean the equipment, vehicles, or personal gear until they are free from mud, soil, seeds, and vegetation. Inspect the equipment, vehicles, and personal gear each time they are being prepared to go to a site or prior to transferring between sites to avoid spreading exotic, nuisance species.					X	X	X	X	X	X	X											
	Place and maintain predator-proof waste receptacles in strategic locations during project implementation to prevent an increase in predator abundance. For projects designed to enhance or increase visitor use, maintain predator-proof waste receptacles for the life of the project.					X	X	X	X	X	X	X											

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates		Hydrology and Water Quality				Habitats					Living Coastal and Marine Resources										
				Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
		Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	Have the appropriate state agency inspect any equipment or construction materials for invasive species prior to use.					X	X	X	X	X	X	X											
	Inspect and certify propagated or transplanted vegetation as pest and disease free prior to planting in restoration project areas.					X		X	X	X	X	X											
GENERAL CONSTRUCTION MEASURES																							
	Guidelines: - *Construction Guidelines in Florida for Minor Piling-Supported Structures Constructed in or over Submerged Aquatic Vegetation (SAV), Marsh or Mangrove Habitat.* U.S. Army Corps of Engineers/National Marine Fisheries Service August 2001 - *Key for Construction Conditions for Docks or Other Minor Structures Constructed in or Over Johnson's Seagrass (Halophila johnsonii).* National Marine Fisheries Service/U.S. Army Corps of Engineers October 2002 - *National Artificial Reef Plan (as Amended): Guidelines for siting, construction, development, and assessment of artificial reefs*, Revised February 2007 - *Guidelines for Marine Artificial Reef Materials* 1997 GSMFC Number 121 - *Bubble Curtain Specifications for Pile Driving* - *Assessment and Mitigation of Marine Explosives: Guidance for Protected Species in the Southeast U.S.*					X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Piling installation	Push pilings into soft, bottom substrate to reduce noise from installation; do not drive and hammer pilings into bottom substrate unless necessary for proper construction.																X	X	X	X	X	X	
Protected species	Provide all individuals working on a project with information in support of general awareness of and means to avoid impacts to protected species and their habitats present at the specific project site.																		X	X	X	X	X
	Survey for other at-risk or imperilled species. If found on site, contact the U.S. Fish and Wildlife Service and State trust resource agency to determine if avoidance or minimization measures or a					X	X	X	X	X	X	X											

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

Category	Potential Mitigation Measures	Geology and Substrates: Upland Geology and Substrates	Geology and Substrates: Nearshore Geology and Substrates	Hydrology and Water Quality: Freshwater Environments: Groundwater	Hydrology and Water Quality: Freshwater Environments: Surface Water	Hydrology and Water Quality: Saltwater Environment Fish Resources: Nearshore Coastal Environment	Hydrology and Water Quality: Saltwater Environment Fish Resources: Offshore Marine Environment	Habitats: Wetlands	Habitats: Barrier Islands	Habitats: Beaches	Habitats: Submerged Aquatic Vegetation (SAV)	Habitats: Terrestrial, Coastal, and Riparian Habitat	Living Coastal and Marine Resources: Nearshore Benthic Communities	Living Coastal and Marine Resources: Oysters	Living Coastal and Marine Resources: Pelagic Microfaunal Communities	Living Coastal and Marine Resources: Sargassum	Living Coastal and Marine Resources: Finfish: Demersal Fish	Living Coastal and Marine Resources: Finfish: Pelagic Fish	Living Coastal and Marine Resources: Finfish: Diadromous and Freshwater Fish	Living Coastal and Marine Resources: Sea Turtles	Living Coastal and Marine Resources: Marine Mammals	Living Coastal and Marine Resources: Birds	Living Coastal and Marine Resources: Terrestrial Wildlife
	Candidate Conservation Agreement with Assurances may be appropriate.																						
Site maintenance and conduct	Use the nearest, existing staging, access and egress areas, travel corridors, pathways, and roadways (including those provided by the State, local governments, land managers, trustee, or private property owner, with proper permissions) and do not create new staging areas, access (except dunewalk overs) or egress, or travel corridors through dune habitats.					X	X	X	X	X	X	X								X		X	X
	Limit driving on the beach for construction to the minimum necessary within the designated travel corridor–established just above or just below the primary "wrack" line. Avoid driving on the upper beach whenever possible, and never drive over any dunes or beach vegetation. Check with the U.S. Fish and Wildlife Service and State trust resource agency for additional specific beach driving recommendations in Florida and Alabama.					X			X	X										X		X	X
	Minimize construction noise to the maximum extent practicable when working near protected species and their habitats.																			X	X	X	X
	Maintain or improve all lighting regimes. Methods include: working during daylight hours only, prohibiting lighting on dune walkovers, and using wildlife-friendly lighting where lighting is necessary for human safety.					X			X	X		X								X	X	X	X
	Post signs at kiosks, ramps, and piers to provide visitors with information to avoid and minimize impacts to protected species and their habitats while recreating. Develop signs in coordination with National Marine Fisheries Service, U.S. Fish and Wildlife Service and the local State trust resource agency.					X		X	X	X	X	X							X	X	X	X	X
	Supply and maintain containers for waste fishing gear to avoid fish and wildlife entanglement.																X	X	X	X	X	X	X
Land and vegetation protection	Develop and implement an erosion control plan to minimize erosion during and after construction and where possible: use vegetative buffers (100 feet or greater), revegetate with native species or annual grasses, and conduct work during dry seasons.				X	X		X	X	X	X	X											
	Develop and implement a spill prevention and response plan, including: conducting daily			X	X	X	X	X	X	X	X	X											

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	inspections of all construction and related equipment to assure there are no leaks of antifreeze, hydraulic fluid, or other substances and cleaning and sealing all equipment that would be used in the water to rid it of chemical residue. Develop a contract stipulation to disallow use of any leaking equipment or vehicles.																						
	Prohibit use of hazardous materials, such as: lead paint, creosote, pentachlorophenol, and other wood preservatives during construction in, over, or adjacent to, sensitive sites during construction and routine maintenance.			X	X	X	X	X	X	X	X	X											
	Where landscaping is necessary or desired, use native plants from local sources. If non-native species must be used, ensure they are non-invasive and use them in container plantings.					X		X	X	X		X											
Wetland and aquatic protection	Complete an engineering design and post-construction inspection for projects where geomorphic elevations would be restored in wetlands, marshes, and shallow water habitats to ensure the success of the restoration project. Manage elevation of fill material to ensure projected consolidation rates were accomplished and that habitat suitable for wetland and marsh vegetation is developed.		X			X		X															
	Perform an engineering design and post-construction inspection for projects where geomorphic elevations are restored within wetlands, marshes, and shallow water habitats to ensure the success of the restoration project.		X			X		X															
	Avoid and minimize, to the maximum extent practicable, placement of dredged or fill material in wetlands.							X															
	Design construction equipment corridors to avoid and minimize impacts to wetlands to the maximum extent practicable.							X															
	To the maximum extent possible, implement the placement of sediment to minimize impacts to existing vegetation or burrowing organisms.					X		X					X										
	Place protective warning signs and buoys around at-risk habitats for infrastructure projects that					X					X			X									

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	could increase recreational uses in SAV or oyster areas.																						
	Apply herbicide in accordance with the direction and guidance provided on the appropriate Environmental Protection Agency (EPA) labels and State statutes during land-based activities.				X	X		X	X	X	X	X											
	Only use suitable borrow sites (that do not contain *Sargassum,* SAV, or oysters) as dredging sites for sediment. Obtain sediments by beneficially using dredged material from navigation channels or by accessing material from approved offshore borrow areas. Sediments must closely match the chemical and physical characteristics of sediment at the restoration site. Additionally, use target borrow areas within reasonable proximity to suitable sites for sediment placement.					X	X	X	X	X		X	X	X		X				X		X	X
	When local conditions indicate the likely presence of contaminated soils and sediments, test soil samples for contaminant levels, and take precautions to avoid disturbance of -or to provide for proper disposal of - contaminated soils and sediments. Evaluate methods prior to dredging to reduce the potential for impacts from turbidity or tarballs.				X	X	X	X	X	X	X	X											
	Perform maintenance of generators, cranes, and any other stationary equipment operated within 150 feet of any natural or wetland area, as necessary, to prevent leaks and spills from entering the water.				X	X		X	X	X		X											
	Designate a vehicle staging area removed from any natural surface water resource or wetland to perform fueling, maintenance, and storage of construction vehicles and equipment. Inspect vehicles and equipment daily prior to leaving the storage area to ensure that no petroleum or oil products are leaking.				X	X		X	X	X													
	Upon completion of construction activities, restore all disturbed areas as necessary to allow habitat functions to return. Create and manage public access developments to enhance recreational experience and educational awareness to minimize effects to habitat within wetland and shallow water areas and to the long-term health of related biological communities.				X	X		X	X	X		X											
	Incorporate containment levees for fill cells for projects using marsh creation or other barrier island restoration. Remove these containment levees after construction to allow for the				X	X		X	X														

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	restoration of nature tidal exchange.																						
	Use silt fencing where appropriate to reduce increased turbidity and siltation in the project vicinity. This would apply to both on land and in water work.				X	X		X	X	X	X	X											
	Continue oyster and clam shell recycling programs to provide natural material for creating additional oyster reefs.					X								X									
	Ensure shells to be introduced for reef creation are subjected to depuration in a secure open air area for a period of not less than 6 months.					X								X									
	Make all efforts to reduce the peak sound level and exposure levels of fish to reduce the potential impact of sound on fish present in the project areas.																X	X	X				
	Implement monitoring of restored oyster beds to evaluate success.					X									X								
	Use a vibratory hammer whenever possible to reduce peak sound pressure levels in the aquatic environment.																X	X	X	X	X		
	Use sound attenuation devices where practicable for pulse-noise (impact hammers) to reduce peak sound pressure levels in the aquatic environment.																X	X	X	X	X		
	Stipulate the timing of activities to avoid impacts to spawning fish and eggs/larvae.																X	X	X				
	Use BMPs to reduce turbidity, such as turbidity blankets, to reduce the potential impact of turbidity on finfish.				X	X	X										X	X	X				
	Screen water withdrawal pipes to minimize potential entrainment of fish from the withdrawal area. Have project proponents coordinate with NMFS to create an intake screen that would minimize potential impingement of fish.																X	X	X				
Aquaculture facilities	Treat effluent from aquaculture facilities to avoid dispersal of potential pathogens into receiving waters.				X	X																	
	Make sure that all aquaculture facilities and fish raised in those facilities meet fish health standards and are screened for pathogens prior to release into receiving waters.																X	X	X	X	X	X	

Table 6A-3: Potential Site, Habitat and Species-Specific Construction Mitigation Measures and BMPs

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				Freshwater Environments		Saltwater Environment Fish Resources											Finfish						
	Potential Mitigation Measures	Upland Geology and Substrates	Nearshore Geology and Substrates	Groundwater	Surface Water	Nearshore Coastal Environment	Offshore Marine Environment	Wetlands	Barrier Islands	Beaches	Submerged Aquatic Vegetation (SAV)	Terrestrial, Coastal, and Riparian Habitat	Nearshore Benthic Communities	Oysters	Pelagic Microfaunal Communities	Sargassum	Demersal Fish	Pelagic Fish	Diadromous and Freshwater Fish	Sea Turtles	Marine Mammals	Birds	Terrestrial Wildlife
	Implement a genetics management plan that ensures maintenance of genetic diversity of native stocks of finfish in the Gulf of Mexico.																X	X	X				
	Develop and implement a stocking management plan prior to the release of hatchery-reared finfish.																X	X	X				

Chapter 6 Appendix 6-B: Additional Past, Present, and Reasonably Foreseeable Future Actions

The following tables describe additional actions or programs considered as part of the ERP-PEIS cumulative impact analysis. The tables are organized by the category of actions being evaluated.

Table 6B-1. Example Habitat Conservation and Protection Programs in the Gulf Coast Region

FEDERAL OR FEDERAL/STATE/LOCAL PARTNERSHIP ACTIVITIES	
The National Marine Sanctuaries	• Two sanctuaries are located in the Gulf of Mexico: Flower Garden Banks, which includes 36,000 acres of waters offshore of Texas and Louisiana, and the 2900 square mile area in the Florida Keys.
The National Wildlife Refuge System	• 36 National Wildlife Refuges are located within the coastal areas of the Gulf of Mexico. No new National Wildlife Refuges have been proposed in the Gulf of Mexico proposed planning area.
National Estuarine Research Reserves	• Federal and State partnerships. Past actions have included the establishment of four estuarine research reserves in the Gulf of Mexico area from Texas to Tampa Bay. There are no known future nominated estuaries planned for the National Estuarine Research Reserves in the Gulf of Mexico.
Gulf of Mexico Marine Protected Areas (MPAs) (State and Federal)	• There are approximately 295 MPAs located within the Gulf of Mexico region, covering nearly 40 percent of the Gulf of Mexico U.S. marine waters. MPAs by jurisdiction include 19 in Texas, 17 in Louisiana, 21 in Mississippi, 7 in Alabama, 217 in Florida, and 33 in Federal Waters.
USDA NRCS Wetlands Reserve Program (WRP)	• The WRP is one of the largest private lands wetland restoration and easement programs in the U.S.
USDA Conservation Reserve Program (CRP)	• The CRP is the largest private lands buffer and conservation cover rental contract program in the U.S. Annual enrolled acreage for 2012 (USDA 2012): ○ Texas: 3.3 million acres ○ Louisiana: 325,174 acres ○ Mississippi: 829,056 acres ○ Alabama: 360,489 acres ○ Florida: 51,966 acres
USDA Grassland Reserve Program (GRP)	The GRP is jointly administered by the Farm Service Agency and the Natural Resources Conservation Service to protect and enhance working grazing lands, grasslands and rangelands through rental contracts and conservation easements.
USDA NRCS Farm and Ranch Land Protection Program (FRPP)	The FRPP provides funding to eligible States, Indian tribes, and non-governmental organizations for purchase of conservation easements to protect agricultural use and related conservation values of eligible land by limiting nonagricultural uses of that land.
USDA NRCS Environmental Quality Incentives Program (EQIP)	• EQIP provides financial and technical assistance to farmers and ranchers in order to improve water and air quality, conserve ground and surface water resources, reduce soil erosion and sedimentation, and improve or create wildlife habitat.
USDA NRCS Wildlife Habitat Incentives Program (WHIP)	• WHIP provides financial and technical assistance to wildlife-minded landowners and producers who want to develop and improve wildlife habitat on agricultural land, nonindustrial private forest land, and Indian land.

FEDERAL OR FEDERAL/STATE/LOCAL PARTNERSHIP ACTIVITIES	
The National Park System	• National Park Service lands along the coast or in coastal areas of the Gulf of Mexico include the Everglades National Park, Big Cypress National Preserve, Dry Tortugas National Park, Padre Island National Seashore, Gulf Islands National Seashore, Palo Alto Battlefield National Historical Park, Jean Lafitte National Historic Park, New Orleans Jazz National Historical Park, and DeSoto National Memorial.
NOAA Coastal and Estuarine Land Conservation Program	• The Coastal and Estuarine Land Conservation Program grants to Gulf of Mexico State agencies and local governments to acquire property or conservation easements in the coastal zone or coastal watershed.
USFWS ESA Recovery/Habitat Plans	• As part of the recovery plans for some ESA listed species Critical Habitat has been designated as described in chapter 3. • FWS Habitat Conservation programs including : Endangered Species Grants, Partners for Fish and Wildlife, the Coastal Program; the National Coastal Wetlands Conservation Grant Program; North American Wetlands Conservation Grants, Fish Passage Program; and National Fish Habitat Partnerships.
MSFCA EFH Fishery Management Plans	• EFH has been designated for 55 fish and shellfish species in the Gulf of Mexico. Habitat Areas of Particular Concern (HAPCs) have been defined for some of these designations.
North American Bird Conservation Initiative - Bird Conservation Regions	• The North American Bird Conservation Initiative strategy is to foster coordination and collaboration on key issues of concern, including bird monitoring, conservation design, private lands, international collaboration, and State and Federal agency support for integrated bird conservation. Five NABCI BCRs overlap the area of the northern Gulf of Mexico as described in chapter 3 of this Draft PEIS.

STATE ACTIVITIES	
Texas	• Texas Coastal Management Program; Texas Land and Water Resources Conservation and Recreation Plan; Texas Prairie Wetlands Project; Texas Wetland Conservation Plan; Water for Texas (2012 State Water Plan); Texas 2011 Regional Water Plans; Texas Parks and Wildlife Conservation Programs; Seagrass Conservation Plan for Texas; and the Coastal Erosion Protection Planning and Response Act Program are active coastal and land protection programs.
Louisiana	• Louisiana's 2012 Comprehensive Master Plan for a Sustainable Coast guides all coastal restoration and hurricane protection efforts.
Mississippi	• Coastal Preserves Program works to protect sensitive coastal habitats using Tidelands Trust Funds to acquire coastal areas. The Mississippi Coastal Improvement Program provides resources to address storm damage, saltwater intrusion, erosion, fish and wildlife, and other purposes. Other efforts include: Mississippi Comprehensive Resource Management Plan and Mississippi's Vision for Gulf Coast Recovery, Restoration, and Protection.
Alabama	• Through the Forever Wild Program, and other programs, the Alabama has invested in land protection around the Mobile-Tensaw River delta. Other projects that are likely to be implemented are identified in the Coastal Recovery Commission of Alabama's Roadmap to Resilience
Florida	• Florida Forever program has protected 294,930 acres of functional wetlands, as part of its 9.9 million acres of conservation lands protected.
Private and Non-governmental Conservation Easements—Past to 2010 (Conservation Registry 2012)	
Texas	• Total of 282,060 acres.
Louisiana	• Total of 363,000 acres including holdings of The Nature Conservancy which is one of the largest landowners.
Mississippi	• Total of 294,000 acres including Ducks Unlimited holdings of 289,000 acres.
Alabama	• Total of 71,000 acres including Alabama Land Trust holdings of 23,000 acres.
Florida	• Total of 483,000 acres including Southwest Florida Water Management District holdings of 53,187 acres.

Table 6B-2 below describes many of the Federal, State, and local projects and programs related to habitat restoration that have occurred in the past and present, and are expected to continue into the future. Because of the number of individual restoration projects that are implemented through these programs, major agency or non-governmental programs have been described generically. These many and various types of restoration programs and thousands of projects they compose are implemented at many different scales and in accordance with the various programs, authorities, and bodies that enable restoration activities.

Table 6B-2. Example Restoration Programs in the Gulf Coast Region

FEDERAL ACTIVITIES	
Coastal Impact Assistance Program (CIAP)	• The CIAP provides funding to the six OCS oil- and gas-producing states – Alabama, Alaska, California, Louisiana, Mississippi and Texas – for the conservation, protection and preservation of coastal areas, including wetlands. Each State has an approved plan for implementing appropriations.
The National Estuary Program	• The National Estuary Program provides focused management to benefits habitats, water quality, and other desired resource management objectives for: Coastal Bend Bays and Estuaries, Corpus Christi Bay, Galveston Bay, Barataria-Terrebonne Estuarine Complex, Mobile Bay, Tampa Bay, Sarasota Bay, and Charlotte Harbor.
USDA NRCS Gulf of Mexico Initiative (GOMI)	• NRCS delivers voluntary financial and easement assistance through existing conservation programs in 16 priority watersheds in the Gulf of Mexico watershed. GOMI objectives are to improve water quality, increase water conservation and enhance wildlife habitat within watersheds draining into the Gulf of Mexico through long-term contracts with private landowners would result in implementation of a wide range of conservation practices and land protection easements.
USDA NRCS Migratory Bird Habitat Initiative	• The Migratory Bird Habitat Initiative was established in response to the Deepwater Horizon disaster to provide immediate food and critical habitat for bird populations potentially impacted by the spill.
USDA Farm Bill Conservation Programs (non-easement)	• A number of USDA programs and projects have been implemented in the Gulf of Mexico region to address resource concerns, including wildlife habitat, water quality and quantity, soil quality, and other resource concerns.
USFWS State Wildlife Grants	• USFWS administers several grant programs to support wildlife restoration benefiting Gulf of Mexico ecosystems. USFWS has provided funding to all Gulf states.
Gulf of Mexico Community-Based Restoration Program	• The Gulf of Mexico Community-Based Restoration Program is a multi-year, regional partnership between the Gulf of Mexico Foundation, the NOAA CRP, the EPA Gulf of Mexico Program, and the Gulf States and Caribbean Territories. The purpose of this partnership is to strengthen the conservation efforts of the NOAA CRP and EPA Gulf of Mexico Program by supporting on-the-ground restoration activities and fostering local stewardship of ecologically significant areas.
USACE Programs	• The Water Resource Development Act authorizes USACE to plan and establish wetland areas as part of an authorized water resources development project. The Mississippi Coastal Improvement Program was established by USACE after Hurricane Katrina. The program is comprehensive, consisting of structural, non-structural, and environmental improvement projects for coastal Mississippi. The Northern Gulf of Mexico Regional Sediment Management Plan and Projects addresses restoration and sediment management at a regional scale.
State And Regional Activities	
State and Regional Invasive Species Management Activities	• Invasive species have been the focus of a number of efforts, including: Southeast Aquatic Resource Partnership, Gulf and South Atlantic Regional Panel on Aquatic Invasive Species, Aquatic Nuisance Species Task Force, and National Invasive Species Council.

FEDERAL ACTIVITIES	
Texas	• Oyster restoration efforts in Galveston Bay are underway to address siltation and destruction of oyster beds due to hurricane impacts. Seagrass Conservation Plan for Texas and the Coastal Erosion Protection Planning and Response Act Program are also active coastal restoration/conservation programs. Other restoration priorities and projects being implemented in Texas include: protection and restoration of Chenier Plain wetlands, ICWW shoreline habitat protection and restoration, freshwater inflow and saltwater intrusion initiatives, water quality initiatives in priority watersheds associated with bay ecosystems (e.g., Galveston, San Antonio, Nueces, and Laguna Madre and Aransas Bays, and rookery island protection and restoration efforts.
Louisiana	• Louisiana's 2012 Comprehensive Master Plan for a Sustainable Coast ("Master Plan") represents fundamental state policy with regards to coastal planning and restoration. It was drafted following extensive technical and public input and consultation and includes a suite of restoration and protection measures designed to achieve a sustainable and resilient coastal landscape and to protect Louisiana's coastal resources from inundation. • The Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) and the Louisiana Coastal Wetlands Conservation and Restoration Task Force—a State and Federal partnership—has authorized over 185 projects since its inception representing over 133,000 acres of coastal wetland restoration. A total of 93 projects have been completed, representing 80,000 acres. CWPPRA will implement 91 projects, representing 53,000 acres in the foreseeable future. • LDWF cultch planting ongoing since 1917. Since the initiation of the program, LDWF has placed over 1.5 million cubic yards of cultch material on nearly 30,000 acres. • Other Federal statewide efforts include the Louisiana Coastal Area Near-Term Plan and CPRA's Annual Plans. CPRA's Mississippi River Hydrodynamic and Delta Management Studies authorized through USACE Water Resources Development will address water and sediment management on the Mississippi River. Other restoration actions may be funded through CIAP and/or state surplus dollars.
Mississippi	• Mississippi Coastal Improvement Program provides resources to address storm damage, saltwater intrusion, erosion, fish and wildlife, and other purposes. Fifteen "interim" projects were funded following Hurricane Katrina. Mississippi Coastal Improvement Program has developed a comprehensive program for coastal restoration and protection, especially focused on barrier islands. • In 2009, USACE funded barrier island and other restoration activities. A regional Sediment Management Master Plan is in development to address Gulf barrier island restoration.
Alabama	• State of Alabama is focused on barrier island restoration. Restore Coastal Alabama Project will restore 100 miles of oyster reefs and over 1000 acres of coastal marsh and seagrass beds. Community-based oyster and marsh restoration projects with non-governmental organizations are also underway. Future efforts include the implementation of an Alabama Coastal Resiliency Plan.
Florida	• Florida's Comprehensive Everglades Restoration Plan contributes to Gulf of Mexico restoration efforts. Other programs include Coastal Wildlife Conservation Initiative to address native wildlife and coastal ecosystems and the Statewide Beaches Habitat Conservation Plan led by the Florida Department of Environmental Protection.

FEDERAL ACTIVITIES	
Example Regional Restoration Planning Efforts	
Gulf of Mexico Foundation: Community Based Restoration Partnership	• Gulf of Mexico Foundation has administered the program, managing over 75 restoration projects throughout the Gulf and Caribbean. Example projects include: 2012 Community Based Restoration Partnership Projects ○ Bon Secour Shoreline and Habitat Restoration ○ Galt Preserve Restoration ○ Restoring Coral Reefs with in-situ Nursery Techniques 2011 Community Based Restoration Partnership Projects ○ Oyster Reef Restoration in the Texas Coastal Bend ○ Elmer's Island Community-led Restoration ○ Habitat Restoration in Mobile Bay ○ Enhancement of mangrove shorelines in Clam Bayou ○ Newman Branch Creek Phase II Restoration
NFWF	• NFWF has supported over 450 projects in the Gulf of Mexico with a total value of more than $128 million (NFWF 2012)
The Gulf Coast Joint Venture	• The Gulf Coast Joint Venture is a partnership among Federal and State Agencies, non-profit organizations, and private landowners dedicated to the conservation of priority bird habitat along the U.S. Gulf of Mexico coast. Habitat projects are developed and implemented by 5 regional Initiative Teams of biologists and managers of public and private lands. The Gulf Coast Joint Venture partners include numerous other organizations and hundreds of individuals that are involved in specific collaborative habitat, planning or evaluation projects.

Water Quality Improvement Programs

Table 6B-3 describes many of the Federal, State, and local projects and programs that protect and restore Gulf of Mexico water quality. The programs listed are only representative of efforts being undertaken throughout the Mississippi River and other tributaries to the Gulf of Mexico. In particular, the states outside of the study area but contributing to these waters are implementing programs similar in scope and magnitude to those described below.

Table 6B-3. Example Regulatory and Voluntary Programs to Improve Water Quality in the Gulf Coast Region

USEPA	• Vessel emission control in the Gulf of Mexico - emission standards to reduce the environmental impact from marine spark-ignition engines and vessels by requiring manufacturers to control exhaust emissions from fuel tanks and fuel lines. • Mercury Reduction to Gulf of Mexico - Mercury and Air Toxics Standards for power plants to limit mercury, acid gas, and other pollution from power plants. • Targeting Clean Water section 319 programs in 2015 to regional landscape initiatives, such as the MSR and the Gulf of Mexico, as States develop comprehensive strategies for reducing nitrogen and phosphorus pollution. • Proposed targeted reductions of atmospheric deposition for mercury, sulfur, nitrogen, and other pollutants to U.S. waters, including the Gulf of Mexico. • Under purview of the Clean Water Act, USEPA provide programs to help prevent and control pollutants in our nations waters (i.e. TMDL)
Hypoxia Task Force Action Plan	• Implementation of comprehensive nutrient and phosphorus reduction strategies for States in the Mississippi and Atchafalaya River Basin.
National Ocean Policy Implementation Plan	• National Ocean Council with NOAA, USDA, USGS, and Hypoxia Task Force members propose identification of collaborative measures with regional partnerships to improve water quality in the Gulf of Mexico in 2012; • MSR interagency monitoring, modeling, and assessment partnership to be established in 2013; • With interested States, MSR proposed the collaborative development and implementation of state-wide nitrogen and phosphorus reduction strategies in the MSR and Gulf region in 2014.
USDA NRCS	• The Migratory Bird Habitat Initiative was established in response to the Deepwater Horizon disaster to provide immediate food and critical habitat for bird populations potentially impacted by the spill. • Nutrient Management Implementation--28 million acres of land have come under nutrient management systems within the MSR since 2000, including 4 million acres added in Fiscal Year 2009 and 2010. • Soil Erosion Control--Conservation practices were applied to 34 million acres of land for erosion control from Fiscal 2005 to Fiscal 2010, including 10 million acres in Fiscal 2009 and 2010.
USACE	• Steele Bayou Project-Mississippi - flood control/sediment reduction project in the MSR watershed in which sediment control and water management practices were installed including eight low-head weirs to maintain minimum water depths in the channels and 67 sediment control structures to prevent sediment from filling the channels.
Louisiana-Nutrient Discharge Reductions	• Louisiana Department of Environmental Quality works with industries and municipalities along the Mississippi River to reduce nutrient discharges
Mississippi State Nutrient Reduction Strategy and Delta Farmers	• The Mississippi Department of Environmental Quality participates with the State Nutrient Reduction Strategy Work Group, to develop a consistent approach among MSR States to reduce nutrient loadings to the Gulf. The Mississippi Department of Environmental Quality is co-leading an effort with Delta Farmers Advocating Resource Management to develop a nutrient reduction strategy for the Delta region of Mississippi. • Mississippi/Gulf of Mexico Watershed Nutrient Task Force is working to address statewide nutrient reduction and upper-basin information and technology exchange.

Florida Numerical Nutrient Limits	• Authorized by the Watershed Restoration Act 1999, Florida is implementing nutrient reduction strategies through its total maximum daily load program and setting numerical nutrient limits on the amount of allowable nutrients that can be discharged into State waters.
GOMA, Alabama, Florida, Louisiana, Mississippi, and Texas Nutrient Reduction Strategies	• States and the GOMA to develop and implement State nutrient reduction frameworks to restore local water quality conditions.
Non-Governmental Organizations	• Mississippi River Water Quality Collaborative sponsored by the McKnight Foundation brings together representatives from more than 20 non-governmental organizations from states along the Mississippi River corridor to explore strategies for comprehensive, river-wide water quality improvements. • Lower Mississippi River Conservation Committee, Lower Mississippi River Aquatic Resource Management Plan, a 10-year operational plan to address the primary factors adversely affecting aquatic resources in the river's active floodplain and backwater areas • Ducks Unlimited, • The Conservation Fund, • The Nature Conservancy; • Louisiana Environmental Action Network, • Tennessee Clean Water Network, • Iowa Environmental Council, • Minnesota Center for Environmental Advocacy; • Mississippi River Basin Alliance
International Water Quality Projects	• North American Emissions Control Area-2010 to control marine vessel pollution in international waters.

Other Cumulative Actions

Table 6B-4. Example Military Activities and Projects in the Gulf Coast Region

INSTALLATION	ACTIVITY
Eglin Air Force Base, Pensacola, Florida	• Installation of a fiber optic cable between Eglin and Santa Rosa Island • Three new missions resulting from BRAC 2005 realignment; 59 F-35 Primary Assigned Aircraft and associated cantonment construction and limited flight training operations added under the Record of Decision in 2008 (United States Air Force 2009) • More than 50 planned Military Construction projects beyond FY 2010 with approximately 2 million square feet (Eglin Air Force Base Development Plan)
Hurlburt Field, Eglin Complex, Florida	• Selected as preferred location for future receipt of a 140-person Air Force Reserve MQ-1 Predator squadron that would provide intelligence, surveillance, reconnaissance and precision-strike capability for joint force commanders • More than 50 transportation and capital improvement projects at Hurlburt Field over 2011-2016; $24 million in construction and maintenance projects in FY 2012 (Hurlburt Field 2012)
Naval Air Station Pensacola, Florida	• Potential decrease in Pensacola area jobs of about 3,784 through BRAC 2005 recommendations that realign and consolidate commands; • New training aircraft arrivals through 2020 may require operational and facility changes, including longer runways, new overlays, taxiways, parking aprons and updated operational training space. • Addition of fleet aircraft and missions would intensify the number of flight operations (Escambia County 2003)
BRAC 2005 Recommendations Naval Air Station Corpus Christi, Texas	• Reduction of jobs through realignment and consolidation of commands; general and supporting new construction and facility upgrades required (BRAC 2012)
Naval Air Station Ingleside, Texas	• Base closure under BRAC 2005; main property will revert to Port of Corpus Christi Authority; • Electromagnetic Reduction Facility available for re-use – potential for construction of a marine business park and marina (U.S. Department of the Navy 2010)
Naval Support Area, Panama City, Florida	• The Naval Support Area is expected to continue to expand in the future as the number of classes and students increases with increasing modernization of naval forces, advances in technology and as modern warfare increases research, design, testing and evaluation activities projects. Naval Support Area Panama City uses nine federally designated U.S. Navy Restricted Areas in St. Andrew Bay for near-shore, open water operations along with additional training areas in the Gulf of Mexico. (Bay County 2009).
Operating Training Area	• Military activities that occur within the Gulf of Mexico waters can result in impacts to marine mammals, sea turtles and other marine fauna although the areas restricted to military use may also function as MPAs when not in use. The U.S. Navy has developed range-complex monitoring plans to provide marine mammal and sea turtle monitoring in compliance with the MMPA and the EPA.

Table 6B-5. Example Shipping and Maritime Port Projects the Gulf Coast Region

Texas	
Brownsville	• Lease negotiations with a company based in China to develop a 35-acre site (Port of Brownsville 2012) • Feasibility study on widening and deepening ship channel (USACE 2012; Federal Register 2011)
Galveston	• Cruise ship terminal improvements; proposed lease for 185-acre rail access and bulk cargo terminal on Pelican Island (National Council for Public-Private Partnerships 2012; Seaport Press Review 2012) • Galveston – Upper Galveston Bay – dredged material placement Atkinson Island; beach nourishment Galveston (Brown 2011)
Houston	• Bayport Container and Cruise Terminal full build out expected in 2030; (Port of Houston Authority 2011) • Pelican Island and Houston Ship Channel Disposal Area Management Practices (Brown 2011) • Beneficial Uses Group Project over 50 years would create 4,250 acres of inter-tidal salt marsh in Galveston Bay; create Evia Island for bird nesting habitat and restore Redfish and Goat Islands (Better Bay 2012)
Port Arthur, Beaumont	• Rail yard rehabilitation and construction of a rail spur for intermodal connections (South East Texas Regional Planning Commission 2010)
Port Lavaca-Point Comfort	• Expansion of the turning basin, development of a dry bulk unloading dock and the Calhoun Terminal for liquefied natural gas (LNG) (World PortSource 2012).
Freeport	• $400+ million capital investment plan including phased build out of Velasco Terminal and a future multimodal facility (Port of Freeport Texas 2011)
Texas City	• Phased development of international terminal on 1000 acres to include six berths and 400 acres of container yard. (City of Texas City n.d.)
Corpus Christi	• The Corpus Christi channel improvement project would create nearly 200 acres of shallow-water habitat using dredged material (Port of Corpus Christi 2012).
Maintenance dredging	• Corpus Christi Ship Channel, Freeport Harbor, Houston Ship Channel, Galveston and the Gulf Intracoastal Waterway (USACE 2012; Brown 2011)
Louisiana	
New Orleans	• Expansion and improvements to cruise ship facilities; proposed mixed use redevelopment including maritime and commercial uses; phased expansion of terminal (Port of New Orleans 2012a; Port of New Orleans 2012b; Port of New Orleans 2011; Port of New Orleans 2007) • Relocation of the France Road and Jourdan Road terminals (Port of New Orleans 2012a)
Plaquemines	• Dredged material project to build six bird islands of marsh, shrub/scrub, bare land, and beach habitats that form a chain about 2.5 mi long parallel to the seaward end of the Baptiste Collette Bayou channel. Unconfined dredged material was placed at sub-tidal elevations and was used for restoration of subsided and eroded inter-tidal marsh on the western side of Southwest Pass (Gagliano et al. 2008) • Maintenance dredging Mississippi River outlets at Baptiste Collette Bar • West Pointe a la Hache wetlands project will recreate marsh habitat by harvesting sediment from the Mississippi River (USFWS 2009).
Baton Rouge	• Annual harbor dredging at Mississippi River (USACE 2012)
Lake Charles	• Biennial maintenance dredging of ship channel (USACE 2012)

Port of South Louisiana	• Globalplex Intermodal Terminal redevelopment including 150 acres for expansion (Port of South Louisiana 2011)
Gulf Intracoastal Waterway, Louisiana	• Maintenance dredging (USACE 2012)
Mississippi	
Pascagoula	• New $1.1 billion terminal opened in October 2011; upgrading existing facilities (Port of Pascagoula 2012) • Harbor dredged material management plan is in the final approval stage (Port of Pascagoula 2012); widening of the Pascagoula Bar Channel; Bayou Cassotte Channel widening improvements; Pascagoula and Gulfport harbors dredging (USACE 2012)
Biloxi Harbor	• Dredged material from maintenance of Biloxi Harbor was used to create approximately 30 acres of tidal marsh on the north shore of the east end of the Deer Island (USACE 2011b; Great Lakes Commission 2010)
Alabama	
Perdido Pass	• Maintenance dredging (USACE 2012)
Florida	
Port Manatee	• Incentives for development of 5,000 acres adjacent to the port; planning for intermodal container yard development [Florida Seaport and Transportation and Economic Development Council (FSTEDC) 2011] • Dredging and extension of Berth 12 and extension by 584 ft (USACE 2012)
Port Everglades	• New cruise terminal constructed. Renovation of 4 other cruise terminals part of a 15-yr agreement with Carnival Cruise lines; new 41-acre container terminal; 30-year lease and operating agreement to develop an intermodal container transfer facility (FSTEDC 2011)
Port of Pensacola	• Land available for permanent dredged materials disposal (9 acres) and for future development (8.5 acres)
Port of Tampa	• $100 million improvements including phased expansion of container facilities (two new terminals, expansion of container yard); plans for new product distribution center capacity; upgrading and expanding bulk cargo facilities; expanded cruise service (FSTEDC 2011).
Port of Panama City	• Bulkhead maintenance and rehabilitation; general and bulk cargo area expansions; intermodal distribution center (Port of Panama City 2012) • Deepening of channel and berthing areas (Port of Panama City 2012)
Port of Freeport	• Deepening and widening (USACE 2012).
Maintenance dredging	• Pensacola Harbor Entrance Channel, Port Everglades and Tampa harbors (USACE 2012)
Tampa Bay	• Beneficial use placement in the planning stages for USACE projects, including the creation of wetlands and additional bird nesting habitat just south of Bird Island.

Table 6B-6. Example Tourism and Recreation Programs and Initiatives Within the Gulf Coast Region

INCENTIVE PROGRAMS	
Texas	
Texas Nature Tourism Council	• A council of the Texas Travel Industry Association whose mission is to promote the value of nature tourism in Texas and to educate Texans and visitors about the State's nature tourism resources. The Council also assists and educates businesses, individuals and other entities that provide nature-based tourism services and facilities to the public (Texas Tourism Council 2012).
The Nature Tourism Program of Texas A&M Agrilife Extension	• Provides educational and training programs, materials and consultations for professionals, landowners and the general public to assist people who are interested in nature tourism as a business enterprise, conservation or community development program (Texas A&M University 2012).
Texas Heritage Trail	• The Texas Heritage Trail Program an award-winning heritage tourism initiative that encourages communities, heritage regions, and the State to partner and promote historic and cultural resources. Local preservation efforts, combined with statewide marketing of heritage regions as tourism destinations, increase visitation to cultural and historic sites and is based on 10 scenic driving trails including the Gulf Coast Byway, a portion of the Texas Tropical Trail (Texas Historical Commission 2012).
Houston Wilderness	• Houston Wilderness is a broad-based alliance of business, environmental and government interests that acts in concert to protect, preserve and promote the unique biodiversity of the region's remaining ecological capital from bottomland hardwoods and prairie grasslands to pine forests and wetlands. These eco-region landscapes decrease repetitive flooding, improve water quality, boost outdoor recreation, ecotourism, and economic growth (Houston Wilderness, 2014)
Texas Tourism	• The Office of the Governor, Economic Development and Tourism (Texas Tourism) is responsible for promoting Texas as a premier travel destination. The office works in concert with its partners (convention and visitors bureaus, local chambers of commerce, private travel-related organizations and associations) to promote travel to Texas in both the domestic and international tourism marketing arenas (Texas Office of the Governor, 2014).
Louisiana	
Louisiana Office of Tourism	• Louisiana provides grants and opportunities for partnering for tourism promotion within Louisiana to strengthen marketing opportunities (Louisiana Office of Tourism 2012).

INCENTIVE PROGRAMS	
Mississippi	
Mississippi Tourism Rebate Program	• Program for qualifying new tourism projects that allows a portion of the sales tax paid by visitors to the eligible tourism-oriented enterprise project to reimburse eligible costs incurred during the construction of the project. Qualifying projects include tourism attractions, hotels, public golf courses and marinas and resort developments (Visit Mississippi 2011).
Mississippi-Alabama	
Nature Tourism Initiative	• Tourism initiative for coastal Alabama and Mississippi to evaluate nature-oriented businesses and to provide resources to meet their needs to in order to provide a “quality nature experience for the guests while also encouraging good stewardship and sustainability of the area’s natural resources”. The Mississippi-Alabama Sea Grant Consortium has developed goals and objects for sustainable development including a goal for developing “healthy coastal economies that include working waterfronts, an abundance of recreation and tourism opportunities, and coastal access for all citizens.” (Mississippi-Alabama Sea Grant Consortium 2012)
Florida	
Partnership for Florida’s Tourism	• A grassroots coalition designed to raise awareness of the importance of tourism and to increase public funding of tourism marketing. The Partnership is comprised of the Florida Restaurant and Lodging Association, Florida Attractions Association, Florida Association of RV Parks and Campgrounds, Florida Association of Destination Marketing Organizations and VISIT FLORIDA (Partnership for Florida’s Tourism 2012).

CHAPTER 7: INTRODUCTION TO PROPOSED PHASE III EARLY RESTORATION PROJECTS

This chapter provides introductory, overview information about the Phase III Early Restoration projects that are proposed for implementation by the Trustees. The Trustees anticipate that additional projects will be proposed and approved as the Early Restoration process continues. As noted throughout this document, Early Restoration actions are not intended to provide the full extent of restoration needed to make the environment and the public whole for the injuries to natural resources caused by the Spill. Furthermore, after injury assessment activities are complete, there will be additional opportunities for consideration of restoration projects as the NRDA claim development and restoration planning processes move forward. Throughout the restoration process, public input and comment will be considered.

The remainder of this chapter provides:

- A summary of proposed Phase III projects;
- A general description of the methodologies used to estimate Offsets for the projects;
- A general description of the Trustees' approach to environmental compliance; and
- A brief overview of each proposed project.

Detailed information about each project, as well as project-specific information on affected environments and evaluations of environmental consequences, is provided in Chapters 8-12. Each chapter covers the projects proposed for implementation within each individual Gulf Coast state, including those on federally managed lands within those states.

7.1 Overview of Proposed Phase III Early Restoration Projects

Table 7-1 lists the 44 proposed Phase III projects, identifies the state in which each is located or proximate, and relates each project back to the project type(s) and programmatic alternatives described in Chapter 5.

The Trustees are proposing 44 Phase III Early Restoration projects totaling approximately $627 million in estimated project costs (including contingencies). These projects are being evaluated in the Phase III ERP/PEIS to permit the Trustees to expeditiously implement any selected projects and to avoid the delay in implementation that would be incurred by evaluating these projects under individual NRDA restoration plans and supporting individual NEPA analyses. Ecological projects comprise $396.9 million (63%) of this total, and recreational projects comprise the remaining $230 million (37%). Within the ecological project category, barrier island restoration accounts for $318.4 million of estimated project costs, followed by restoration of living shorelines ($66.6 million), oysters ($8.6 million), seagrasses ($2.7 million) and dune projects ($0.6 million). Overview information concerning all of the proposed projects is presented below. More detailed project information and environmental analyses for the proposed Phase III Early Restoration projects are included in Chapters 8-12 of this document.

In both tables, the proposed projects are organized by state, from west to east within the Gulf. The ultimate decision to select each of these projects for implementation will be a consensus decision by all Trustees, and will be made in a future Record of Decision. Based on the analysis in this document, including consideration of public comments, the Trustees prefer the proposed action as described in the project summary for each of the 44 projects, and thus prefer the 44 projects for Phase III Early Restoration.

State Trustees will be the lead for project implementation and management of projects located in their states, except as otherwise noted in Chapters 8-12. For example, two of the proposed projects would be implemented on federally managed lands within the boundaries of Florida, but for organizational purposes are included with the Florida projects. Projects highlighted in gray below have undergone design, cost or Offset modification between the Draft Phase III ERP/PEIS and the Final Phase III ERP/PEIS; see the summary project descriptions below as well as the associated state chapters (8-12) for more details.

Table 7-1. Proposed Phase III Early Restoration Projects: Relationship to Programmatic Alternatives.

			ALTERNATIVE 4											
			ALTERNATIVE 2									ALTERNATIVE 3		
	PROPOSED PROJECT	LOCATION	CREATE AND IMPROVE WETLANDS	PROTECT SHORELINES AND REDUCE EROSION	RESTORE BARRIER ISLANDS AND BEACHES	RESTORE AND PROTECT SUBMERGED AQUATIC VEGETATION	CONSERVE HABITAT	RESTORE OYSTERS	RESTORE AND PROTECT FINFISH	RESTORE AND PROTECT BIRDS	RESTORE AND PROTECT SEA TURTLES	ENHANCE PUBLIC ACCESS TO NATURAL RESOURCES FOR RECREATIONAL USE	ENHANCE RECREATIONAL EXPERIENCES	PROMOTE ENVIRONMENTAL AND CULTURAL STEWARDSHIP, EDUCATION, AND OUTREACH
1	Freeport Artificial Reef	TX											X	
2	Matagorda Artificial Reef	TX											X	
3	Mid/Upper Texas Coast Artificial Reef - Ship Reef[1]	TX											X	
4	Sea Rim State Park Improvements	TX										X	X	
5	Galveston Island State Park Beach Redevelopment	TX										X	X	
6	Louisiana Outer Coast Restoration	LA[2]			X									
7	Louisiana Marine Fisheries Enhancement, Research, and Science Center	LA											X	X
8	Hancock County Marsh Living Shoreline Project	MS	X	X										
9	Restoration Initiatives at the INFINITY Science Center	MS										X	X	X
10	Popp's Ferry Causeway Park	MS										X	X	X
11	Pascagoula Beach Front Promenade	MS										X	X	
12	Alabama Swift Tract Living Shoreline	AL		X										
13	Gulf State Park Enhancement Project	AL										X	X	X
14	Alabama Oyster Cultch	AL						X						

			ALTERNATIVE 4											
			ALTERNATIVE 2									ALTERNATIVE 3		
	PROPOSED PROJECT	LOCATION	CREATE AND IMPROVE WETLANDS	PROTECT SHORELINES AND REDUCE EROSION	RESTORE BARRIER ISLANDS AND BEACHES	RESTORE AND PROTECT SUBMERGED AQUATIC VEGETATION	CONSERVE HABITAT	RESTORE OYSTERS	RESTORE AND PROTECT FINFISH	RESTORE AND PROTECT BIRDS	RESTORE AND PROTECT SEA TURTLES	ENHANCE PUBLIC ACCESS TO NATURAL RESOURCES FOR RECREATIONAL USE	ENHANCE RECREATIONAL EXPERIENCES	PROMOTE ENVIRONMENTAL AND CULTURAL STEWARDSHIP, EDUCATION, AND OUTREACH
	Restoration													
15	Beach Enhancement Project at Gulf Islands National Seashore	FL[3]											X	
16	Gulf Islands National Seashore Ferry Project	FL[3]										X		
17	Florida Cat Point Living Shoreline Project	FL	X	X										
18	Florida Pensacola Bay Living Shoreline Project	FL	X	X										
19	Florida Seagrass Recovery Project	FL				X								
20	Perdido Key State Park Beach Boardwalk Improvements	FL										X	X	
21	Big Lagoon State Park Boat Ramp Improvement	FL										X	X	
22	Bob Sikes Pier Parking and Trail Restoration	FL										X	X	
23	Florida Artificial Reefs	FL										X	X	
24	Florida Fish Hatchery	FL										X	X	
25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle	FL										X	X	
26	Shell Point Beach Nourishment	FL											X	
27	Perdido Key Dune Restoration Project	FL			X									
28	Florida Oyster Cultch Placement Project	FL						X						
29	Strategically Provided Boat Access Along Florida's Gulf Coast	FL										X	X	
30	Walton County Boardwalks and Dune Crossovers	FL										X	X	
31	Gulf County Recreation Projects	FL										X	X	
32	Bald Point State Park Recreation Areas	FL										X	X	
33	Enhancements of Franklin County Parks and Boat Ramps	FL										X	X	X
34	Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access	FL										X	X	

			ALTERNATIVE 4											
			ALTERNATIVE 2									ALTERNATIVE 3		
	PROPOSED PROJECT	LOCATION	CREATE AND IMPROVE WETLANDS	PROTECT SHORELINES AND REDUCE EROSION	RESTORE BARRIER ISLANDS AND BEACHES	RESTORE AND PROTECT SUBMERGED AQUATIC VEGETATION	CONSERVE HABITAT	RESTORE OYSTERS	RESTORE AND PROTECT FINFISH	RESTORE AND PROTECT BIRDS	RESTORE AND PROTECT SEA TURTLES	ENHANCE PUBLIC ACCESS TO NATURAL RESOURCES FOR RECREATIONAL USE	ENHANCE RECREATIONAL EXPERIENCES	PROMOTE ENVIRONMENTAL AND CULTURAL STEWARDSHIP, EDUCATION, AND OUTREACH
	Improvements													
35	Navarre Beach Park Gulfside Walkover Complex	FL										X	X	
36	Navarre Beach Park Coastal Access	FL										X	X	
37	Gulf Breeze Wayside Park Boat Ramp	FL										X	X	
38	Developing Enhanced Recreational Opportunities at the Escribano Point Portion of the Yellow River Wildlife Management Area	FL										X	X	X
39	Norriego Point Restoration and Recreation Project	FL										X	X	X
40	Deer Lake State Park Development	FL										X	X	
41	City of Parker – Oak Shore Drive Pier	FL										X	X	
42	Panama City Marina Fishing Pier, Boat Ramp and Staging Docks	FL										X	X	
43	Wakulla Marshes Sands Park Improvements	FL										X	X	
44	Northwest Florida Estuarine Habitat Restoration, Protection and Education – Fort Walton Beach	FL										X	X	X

[1] As described in more detail in Chapter 8, the Trustees include an alternative (the Corpus Artificial Reef Project) to the Mid/Upper Texas Coast Artificial Reef Ship Reef Project, to be implemented in the event the Ship Reef Project becomes technically infeasible (e.g., an appropriate ship cannot be acquired with available funding). The Corpus Artificial Reef Project 'Alternative' has its own project description, description of Affected Environment and analysis of environmental consequences in Chapter 8; is categorized within the same Programmatic Alternative as the Ship Reef Project; and would provide similar Offsets.

[2] One component of this proposed project would be implemented on federally-managed lands and managed by DOI.

[3] These proposed projects would be implemented on federally-managed lands and managed by DOI.

7.2 Offsets Estimation Methodologies

The Trustees used three primary methods to estimate Offsets for Early Restoration projects: Habitat Equivalency Analysis ("HEA"), Resource Equivalency Analysis ("REA"), and monetized estimates of project benefits. A general overview of each of these methods is provided below. Table 7-2 provides the estimated cost (including contingencies) of each project and information about the type(s) of Offsets negotiated with BP for each project. More detailed information about estimated Offsets for each proposed project can be found in Chapters 8-12 of this document.

The methods used to estimate Offsets for Early Restoration projects were implemented pursuant to the Framework Agreement and are based on the expected benefits for each project. In the context of Early Restoration under the Framework Agreement, the Trustees used the best information and methodologies available to judge the adequacy of proposed Early Restoration actions relative to OPA regulatory evaluation standards (see 15 C.F.R. § 990.54(a)), while determining that the agreements reached with BP under the Framework Agreement were also fair, reasonable, and in the public interest. It is important to note that, under the Framework Agreement, neither the amount of the Offsets nor the methods of estimation used in analyzing any project are a precedent for assessing the gains provided by any other projects either during the Early Restoration process or in the assessment of total injury.

In the future, the Trustees will credit these Early Restoration Offsets against the Trustees' total assessment of BP's NRD liability, consistent with the project stipulations and the Framework Agreement.

7.2.1 Habitat Equivalency Analysis (HEA) and Resource Equivalency Analysis (REA)

HEA and REA are methods commonly used in natural resource damage assessments. HEA is used to quantify changes in ecological services on a habitat basis (e.g., acres of marsh habitat) whereas REA is used to quantify changes in ecological services[1] in resource specific units (e.g., birds, oysters, etc.). When HEA or REA is used to estimate restoration credits, anticipated ecological benefits resulting from the proposed activity often are expressed in units that reflect the present (current) value over a project's lifespan. For purposes of the proposed Early Restoration projects included in this document, the Trustees expressed HEA-estimated Offsets as "discounted service acre years" ("DSAYs")[2] of the specific habitat types to be restored. For example, the Trustees estimated the present value of Offsets associated with a proposed Early Restoration project focused on primary dune restoration in terms of "primary dune DSAYs".

[1] As stated in Chapter 1, examples of ecological services include biological diversity, nutrient cycling, food production for other species, habitat provision, and other services that natural resources provide for each other.

[2] 1 "DSAY" = the discounted (to a specified base year) services provided by one acre of habitat for one year.

Table 7-2. Proposed Phase III Early Restoration Projects: Estimated Costs and Offsets.

	PROJECT	LOCATION	COST (including potential contingencies)[3]	OFFSET[1]							
				BACK BARRIER MARSH HABITAT	SALT MARSH HABITAT	BEACH/DUNE HABITAT	SUBMERGED AQUATIC VEGETATION HABITAT	OYSTER SECONDARY PRODUCTIVITY	BENTHIC SECONDARY PRODUCTIVITY	PELICAN, TERN/SKIMMER AND GULL FLEDGLINGS	RECREATIONAL USE
1	Freeport Artificial Reef	TX	$2,155,365								X
2	Matagorda Artificial Reef	TX	$3,552,398[2]								X
3	Mid/Upper Texas Coast Artificial Reef - Ship Reef[3]	TX	$1,919,765[2]								X
4	Sea Rim State Park Improvements	TX	$210,100								X
5	Galveston Island State Park Beach Redevelopment	TX	$10,745,060								X
6	Louisiana Outer Coast Restoration	LA[4]	$318,363,000	X		X				X	
7	Louisiana Marine Fisheries Enhancement, Research, and Science Center	LA	$22,000,000								X
8	Hancock County Marsh Living Shoreline Project	MS	$50,000,000		X				X		
9	Restoration Initiatives at the INFINITY Science Center	MS	$10,400,000								X
10	Popp's Ferry Causeway Park	MS	$4,757,000								X
11	Pascagoula Beach Front Promenade	MS	$3,800,000								X
12	Alabama Swift Tract Living Shoreline	AL	$5,000,080		X				X		
13	Gulf State Park Enhancement Project	AL	$85,505,305								X
14	Alabama Oyster Cultch Restoration	AL	$3,239,485					X			
15	Beach Enhancement Project at Gulf Island National Seashore	FL[5]	$10,836,055								X
16	Gulf Islands National Seashore Ferry Project	FL[5]	$4,020,000								X
17	Florida Cat Point Living Shoreline Project	FL	$775,605		X				X		
18	Florida Pensacola Bay Living Shoreline Project	FL	$10,828,063		X				X		
19	Florida Seagrass Recovery Project	FL	$2,691,867				X				
20	Perdido Key State Park Beach Boardwalk Improvements	FL	$588,500								X
21	Big Lagoon State Park Boat Ramp Improvement	FL	$1,483,020								X
22	Bob Sikes Pier Parking and Trail Restoration	FL	$1,023,990								X
23	Florida Artificial Reefs	FL	$11,463,587								X
24	Florida Fish Hatchery	FL	$18,793,500								X

[3] Actual costs may differ depending on future contingencies, but will not exceed the amount shown without further agreement between the Trustees and BP.

	PROJECT	LOCATION	COST (including potential contingencies)[3]	OFFSET[1]							
				BACK BARRIER MARSH HABITAT	SALT MARSH HABITAT	BEACH/DUNE HABITAT	SUBMERGED AQUATIC VEGETATION HABITAT	OYSTER SECONDARY PRODUCTIVITY	BENTHIC SECONDARY PRODUCTIVITY	PELICAN, TERN/SKIMMER AND GULL FLEDGLINGS	RECREATIONAL USE
25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle	FL	$2,890,250								X
26	Shell Point Beach Nourishment	FL	$882,750								X
27	Perdido Key Dune Restoration Project	FL	$611,234			X					
28	Florida Oyster Cultch Placement Project	FL	$5,370,596					X			
29	Strategically Provided Boat Access Along Florida's Gulf Coast	FL	$3,248,340								X
30	Walton County Boardwalks and Dune Crossovers	FL	$743,276								X
31	Gulf County Recreation Projects	FL	$2,118,600								X
32	Bald Point State Park Recreation Areas	FL	$470,800								X
33	Enhancement of Franklin County Parks and Boat Ramps	FL	$1,771,385								X
34	Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access Improvements	FL	$262,989								X
35	Navarre Beach Park Gulfside Walkover Complex	FL	$1,221,847								X
36	Navarre Beach Park Coastal Access	FL	$614,630								X
37	Gulf Breeze Wayside Park Boat Ramp	FL	$309,669								X
38	Developing Enhanced Recreational Opportunities on the Escribano Point Portion of the Yellow River Wildlife Management Area	FL	$2,576,365								X
39	Norriego Point Restoration and Recreation Project	FL	$10,228,130								X
40	Deer Lake State Park Development	FL	$588,500								X
41	City of Parker- Oak Shore Drive Pier	FL	$993,649								X
42	Panama City Marina Fishing Pier, Boat Ramp, and Staging Docks	FL	$2,000,000								X
43	Wakulla Mashes Sands Park Improvements	FL	$1,500,000								X
44	Northwest Florida Estuarine Habitat Restoration, Protection, and Education- Fort Walton Beach	FL	$4,643,547								X
		Total	$627,198,302								

	PROJECT	LOCATION	COST (including potential contingencies)[3]	OFFSET[1]							
				BACK BARRIER MARSH HABITAT	SALT MARSH HABITAT	BEACH/DUNE HABITAT	SUBMERGED AQUATIC VEGETATION HABITAT	OYSTER SECONDARY PRODUCTIVITY	BENTHIC SECONDARY PRODUCTIVITY	PELICAN, TERN/SKIMMER AND GULL FLEDGLINGS	RECREATIONAL USE

[1] Offset Types indicated in this table provide general information about Offsets, for overview purposes only. Important, detailed information about Offsets is provided in project-specific write-ups included in Chapters 8-12.
[2] In Texas, the combined cost of the Matagorda and Mid/Upper Texas Coast Ship Artificial Reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for the projects.
[3] As described in more detail in Chapter 8, the Trustees include an alternative (the Corpus Artificial Reef Project) to the Mid/Upper Texas Coast Artificial Reef Ship Reef Project, to be implemented in the event the Ship Reef Project becomes technically infeasible (e.g., an appropriate ship cannot be acquired with available funding). The Corpus Artificial Reef Project 'Alternative' has its own project description, description of Affected Environment and analysis of environmental consequences in Chapter 8; is categorized within the same Programmatic Alternative as the Ship Reef Project; and would provide similar Offsets.
[4] One component of this proposed project would be implemented on federally-managed lands and managed by DOI.
[5] These proposed projects would be implemented on federally-managed lands and managed by DOI.

REA-estimated benefits are expressed in resource-specific units, rather than on a habitat basis. For example, the Trustees estimated the present value of Offsets associated with Early Restoration projects focused on construction of living shorelines in terms of discounted kilogram years (DKg-Y) of benthic secondary productivity (in addition to a habitat credit for living shorelines, estimated as DSAYs of salt marsh habitat).[4]

The Trustees considered a variety of project-specific factors when applying HEA and REA methods to estimate the ecological benefits of restoration projects, including, but not limited to:

- The date at which ecological services from a restoration project are expected to begin to accrue;
- The rate of ecological service accrual over time;
- The time period over which ecological services will be provided;
- The quantity and quality of ecological services provided by the restored habitat or resource relative to those not affected by the Spill; and
- The size of the restoration action.

HEA- and REA-based Offsets negotiated by the Trustees and BP use 2010 (the year of the Spill) as the base year and a 3.0 percent annual discount rate for calculation of present values.[5] For each of the proposed Phase III ecological Early Restoration projects, the Trustees and BP either agreed to:

[4] 1 "DKG-Y" = the discounted (to a specified base year) kilograms of biomass generated by the project in one year, reflecting the expected survival and growth of that biomass during that year.

[5] It is standard practice to use a 3.0 percent annual discount rate for this type of analysis; please see (NOAA 1999) for a detailed discussion of the basis for its use.

- A primary Offset;
- A primary Offset, plus specified agreements on methods for converting Offset units if needed to better match units ultimately used in the Trustees' final assessment of injury;
- A primary Offset to be applied against a specified injury, and a secondary Offset to be applied only if the primary Offsets are at the time of final case resolution determined to be in excess of the injury ultimately determined and quantified in the Trustees' final assessment of injury; or
- More than one Offset, reflecting project-specific evaluation of the types of benefits expected to be generated by a particular project.

Detailed information about Offsets negotiated for each proposed Phase III Early Restoration project is provided in subsequent chapters of this document.

7.2.2 Monetized Offsets

The expected benefits of some restoration projects can be monetized, or expressed in terms of the dollar value of expected benefits to the public, rather than in terms of ecological gains. As with HEA and REA, monetization approaches are used to estimate Offsets over a restoration project's expected lifespan. For this Final Phase III ERP/PEIS, the Trustees used a monetizing approach to estimate Offsets for proposed recreational use projects designed to achieve a range of goals, including:

- Enhancing public access to natural resources for recreational use;
- Enhancing recreational experiences; and/or
- Promoting environmental and cultural stewardship, education and outreach.

More specifically, the Trustees relied on a benefit-to-cost ratio ("BCR") approach to estimate Offsets for the proposed Phase III Early Restoration recreational use projects. This approach uses existing economic literature and preliminary estimates of project inputs (see below for additional detail) to develop BCRs representing average benefit-to-cost ratios. For example, a project with an estimated cost of $10 and a BCR of 1.5 would be assigned a monetized Offset of $15.[6] This monetized Offset would later be applied to monetized estimates of recreational use losses attributable to the Spill.

Estimated project inputs considered by Trustees as part of the process for developing BCRs for recreational use losses include, but are not limited to:

- The number of participants expected to benefit from each project;
- The benefit these individuals are expected to derive from a new experience or enhanced experience;
- The time frame over which the benefits will be provided, in terms of both start date as well as expected duration of benefits; and
- The discount rate used to calculate the present value of future benefits (3.0 percent, expressed in 2010 dollars).

The BCR is applied to the amount of Early Restoration funds that are provided by BP for a project, but not to funds provided from other sources.

[6] $15 = $10 * 1.5

Based on review and analysis of relevant economics literature and project-specific information, the Trustees developed BCRs applicable to two groupings of proposed projects, based on their expected levels of benefits relative to their costs. Specifically, one BCR was established for projects expected to yield lower levels of benefits relative to costs (to represent the lower end of the range of project-specific BCRs), and a second BCR was established for projects expected to have higher levels of benefits relative to costs (to represent the higher end of the BCR range).

The Trustees and BP agreed to apply a BCR of 1.5 to the proposed recreational use projects expected to have lower benefit-to-cost ratios and a BCR 2.0 to the remaining proposed recreational use projects. Thus, proposed projects in the lower BCR category would provide BP with a monetized Offset equal to 1.5 times the project funding provided by BP, to be applied against monetized injuries to recreational use arising from the Spill. For the remaining proposed projects, BP would receive a monetized Offset equal to 2.0 times the project funding provided by BP.

7.3 Monitoring

NRDA regulations call on Trustees, when developing a restoration plan under OPA, to establish restoration objectives that are specific to the injuries (15 C.F.R. § 990.55(b)(2)). These objectives should clearly specify the desired project outcome, and the performance criteria by which successful restoration under OPA will be determined (15 C.F.R. § 990.55(b)(2)). The monitoring component of a restoration plan is further described in 15 C.F.R. § 990.55(b)(3).

Performance monitoring for the proposed Early Restoration projects will be designed to evaluate the effectiveness of the restoration actions in meeting the restoration objectives and to assist in determining the need for corrective actions. While the Trustees intend to strive for consistency in performance monitoring parameters, frequency, and duration for similar project types, flexibility in monitoring design is necessary to account for inherent differences between restoration projects. Monitoring of Early Restoration projects may also include additional monitoring or evaluation of Early Restoration projects for compliance with other laws (e.g., to address Endangered Species Act monitoring needs) or to assist future restoration planning, etc.

7.4 Consistency with Project Evaluation Criteria

Chapters 8-12 of this document provide project-specific information addressing each project's consistency with project evaluation criteria identified in Chapter 2. These criteria are summarized again below for reference.

The following evaluation criteria are from the OPA regulations (15 C.F.R. § 990.54):

- The cost to carry out the alternative;
- The extent to which each alternative is expected to meet the Trustees' goals and objectives in returning the injured natural resources and services to baseline and/or compensating for interim losses (the ability of the restoration project to provide comparable resources and services; that is, the nexus between the project and the injury is an important consideration in the project selection process);
- The likelihood of success of each alternative;
- The extent to which each alternative will prevent future injury as a result of the incident, and avoid collateral injury as a result of implementing the alternative;

- The extent to which each alternative benefits more than one natural resource and/or service; and
- The effect of each alternative on public health and safety.

If the Trustees conclude that two or more alternatives are equally preferable, the most cost-effective alternative must be chosen (15 C.F.R. § 990.54(b)).

The Framework Agreement states Early Restoration projects are to meet all of the following criteria:

- Contribute to making the environment and the public whole by restoring, rehabilitating, replacing, or acquiring the equivalent of natural resources or services injured as a result of the Spill, or compensating for interim losses resulting from the incident;
- Address one or more specific injuries to natural resources or services associated with the incident;
- Seek to restore natural resources, habitats, or natural resource services of the same type, quality, and of comparable ecological and/or recreational use value to compensate for identified resource and service losses resulting from the incident;
- Are not inconsistent with the anticipated long-term restoration needs and anticipated final restoration plan; and
- Are feasible and cost-effective.

In addition, the introductions to Chapters 8-12 include additional, Trustee-specific information about their Early Restoration project screening process, beyond the general project screening information provided in Chapter 2. Finally, to limit repetition in the discussion of OPA criteria in the proposed Phase III project information portions of Chapters 8-12, the Trustees note that:

- The potential of each proposed project to cause collateral injury (15 C.F.R. §990.54(a)(4)) is evaluated and that analysis is informed by each proposed project's environmental consequence analysis; and
- The potential impact of each proposed project on public health and safety (15 C.F.R. §990.54(a)(6)), is addressed by each proposed project's environmental consequence analysis where applicable for individual projects.

7.5 Environmental Compliance

Chapters 8-12 of this document provide detailed information and OPA and NEPA analyses for each proposed Phase III Early Restoration project, its expected environmental consequences and its consistency with the programmatic alternative(s). In addition, coordination and reviews to ensure compliance with a variety of other legal authorities potentially applicable to the proposed Phase III Early Restoration projects have been initiated. While many of these reviews are still in process and some may not be finalized before issuance of the Record of Decision, progress to date suggests that all the proposed projects will be able to meet permitting and other environmental compliance requirements and that all projects will be implemented in accordance with all applicable laws and regulations. Additional, project-specific information and analyses regarding the environmental compliance status of proposed Phase III Early Restoration projects are provided below and in Chapters 8-12 of this document.

These sections of the Final Phase III ERP/PEIS have been updated with progress made since the release of the Draft Phase III ERP/PEIS, as applicable.

Examples of applicable laws or Executive Orders include, but are not necessarily limited to, the following:

7.5.1 Endangered Species Act (16 U.S.C. §§ 1531 et seq.)

Numerous species throughout the Gulf of Mexico are listed as threatened or endangered and protected by the Endangered Species Act of 1973 (ESA). Section 7(a)(2) of the ESA requires every Federal agency, in consultation with and with the assistance of the Secretaries of the Interior and Commerce, to ensure that any action it authorizes, funds, or carries out, in the United States or upon the high seas, is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of critical habitat.

To comply with the ESA, the Trustees have initiated or re-initiated consultations and conferences[7] with the U.S. Fish and Wildlife Service and National Marine Fisheries Service (NMFS) to evaluate the effects the proposed Phase III Early Restoration projects may have on listed, proposed, and candidate species and their designated or proposed critical habitats. The Trustees developed a list of species and critical habitats that could be affected by each proposed project, documented the types of potential impacts from the proposed project to species and critical habitats, incorporated BMPs, as applicable from the Chapter 6 appendix of this PEIS, and where necessary, proposed project specific avoidance and minimization measures. Based on this information, projects were analyzed to determine if they: would have no effect; may affect, but not likely to adversely affect; or were likely to adversely affect listed species or candidate and proposed species, if listed. Projects were also analyzed to determine if critical habitat (or proposed critical habitat if designated) would be adversely modified or destroyed.

Several projects included in Chapters 8-12 completed ESA consultation or permitting prior to the preparation of the Draft Phase III ERP/PEIS document. In these instances, the pre-existing consultations or permits were reviewed to determine if the consultations/permits were still valid. Specifically, projects were reviewed to determine if: 1) any new species or critical habitats had been proposed, listed or designated; 2) the proposed action had changed in a manner or extent that might affect a candidate, proposed, or listed species or proposed or designated critical habitat in a manner or an extent not previously considered; 3) or if new information was available to reveal that effects from the proposed action might affect species or critical habitats in a manner or to an extent not previously considered. If any single criterion above was met, the consultation was reinitiated. The outcomes of these ESA consultations and conferences, including required conservation measures and/or BMPs where applicable, are included in the specific project descriptions in this Final Phase III ERP/PEIS (see Chapters 8-12).

[7] Conference is a process of early interagency cooperation involving informal or formal discussions between a Federal agency and the Services pursuant to section 7(a)(4) of the ESA regarding the likely impact of an action on proposed species or proposed critical habitat. While conferences are only *required* for proposed Federal actions likely to jeopardize *proposed* species or destroy or adversely modify proposed critical habitat, the Trustees chose to conference on candidate and proposed species and proposed critical habitats to develop recommendations to minimize or avoid adverse effects.

For all projects that have completed consultations, none proposed in the Phase III ERP/PEIS were determined to adversely modify or destroy critical habitat either designated or proposed. Most consultations resulted in either a 'no effect' or 'not likely to adversely affect' determination for listed species (or candidate and proposed species if listed). While some projects may give rise to adverse effects to listed or proposed species in the form of incidental take, the incidental take authorized through the ESA consultation will not jeopardize the continued existence of the species. The outcomes of these ESA consultations are included in each specific project description (see Chapters 8-12). As noted in the project descriptions, several projects are still in the consultation process.

7.5.2 Migratory Bird Treaty Act (16 U.S.C. §§ 703-712)

There are more than 400 species of migratory birds and millions of individual resident birds that reside along the Gulf Coast for all or part of the year. The Migratory Bird Treaty Act of 1918 (MBTA) implements various treaties and conventions between the U.S., Canada, Japan, Mexico, and the former Soviet Union for the protection of migratory birds. Under MBTA, unless permitted by regulations, it is unlawful to pursue, hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell, barter, purchase, deliver or cause to be shipped, exported, imported, transported, carried, or received any migratory bird, part, nest, egg or product, manufactured or not. USFWS regulations broadly define "take" under MBTA to mean "pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 C.F.R. §10.12).

Each proposed Phase III Early Restoration project has been reviewed by the USFWS to ensure "take," pursuant to the MBTA, does not occur. The review process included the project sponsor documenting species or groups of birds likely to be present in the project area and likely behaviors the birds would be exhibiting on or near the project site (i.e., breeding, nesting, feeding, foraging, resting, or roosting). If migratory birds may be present in a project area, avoidance measures (either included in the Chapter 6 appendix and/or the project specific sections of Chapters 8-12) would be implemented to ensure these birds (including parts, nests, eggs, or products) are not wounded or killed during construction or use of the project area. Avoidance measures, where applicable, are described within each specific project description. No project involves actions expected to hunt, take, capture or kill; attempt to take, capture or kill; possess, offer to or sell or barter, purchase, deliver or cause migratory birds to be shipped, exported, imported, transported, carried, or received.

7.5.3 Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. §§ 1801 et seq.)

The 1996 Magnuson-Stevens Fishery and Conservation and Management Act (MSA) requires cooperation among NMFS , anglers, and federal and state agencies to protect, conserve, and enhance essential fish habitat (EFH). EFH encompasses waterbodies, habitats, and substrates, managed by federal or regional fishery management councils, which are necessary for fish to complete various life history stages such as breeding, spawning, feeding or growth, and survival to maturity. EFH for multiple fish species is present throughout the Gulf Coast. To comply with requirements of the MSA, the Trustees obtained information on areas designated as EFH from NMFS at http://www.habitat.noaa.gov/protection/efh/newInv/index.html, and from text descriptions in Fishery Management Plans also available at that website. An EFH consultation to assess potential effects to EFH from each proposed project was completed after the release of the Phase III DERP/PEIS. The outcomes of these EFH consultations are included in each specific project description (see Chapters 8-12).

For projects determined to possibly have adverse effects on essential fish habitat, the potential negative effects are expected to be temporary and minor or minimized by proposed BMPs in the project description. As a result, EFH conservation recommendations were not made for any of the projects.

7.5.4 Marine Mammal Protection Act (16 U.S.C. §§ 1361-1421h)

There are more than 22 species of marine mammals in the Gulf of Mexico, including dolphins, whales, and the West Indian manatee. The Marine Mammal Protection Act, as amended, prohibits the taking of marine mammals, where "take" is defined as "the act of hunting, killing, capture, and/or harassment of any marine mammal; or, the attempt at such" 16 U.S.C. § 1362(13). The Marine Mammal Protection Act does provide a mechanism (section 101(a)(5) (A-D)) for allowing, upon request, the "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) within a specified geographic region. Proposed projects were analyzed to evaluate the potential for any such non-fishery interactions with marine mammals. Based on that analysis, either: 1) no incidental take of marine mammals is anticipated, and a Marine Mammal Protection Act authorization will not be required or sought for the proposed project; or 2) if there is potential that marine mammals may be incidentally harassed or otherwise "taken" during the construction or implementation phases of a project, discussions of whether any best management practices can be implemented to avoid or reduce the potential for take are underway. Should incidental take be anticipated, the appropriate authorization would be sought and obtained for the relevant aspects of the project.

While the manatee is also protected by the ESA, take of manatees, incidental or otherwise, is not presently authorized under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 U.S.C. 1461 *et seq*.). Therefore, each ESA consultation where manatees may be affected, included conservation measures to ensure potential effects were avoided or minimized to an insignificant and discountable level under the ESA. The ESA consultations considered the likelihood of mantee presence and the potential adverse effects of the proposed projects to the manatee. While manatees are not likely to be present at most of the project locations, they could be transiting the project areas. Therefore, avoidance measures for manatee were incorporated into all of the ESA consultations proposing in-water work where manatees could possibly be transiting (see project specific details in Chapters 8-12).

7.5.5 Bald and Golden Eagle Protection Act (16 U.S.C. § 668-668c)

Bald eagles are present along the Gulf Coast. The Bald and Golden Eagle Protection Act of 1940 prohibits anyone, without a permit issued by the Secretary of the Interior, from "taking" bald eagles, including their parts, nests, or eggs. The Bald and Golden Eagle Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (16 U.S.C. § 668c). For the purpose of this document "disturb" means: to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available: 1) injury to an eagle, 2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or 3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior (50 C.F.R. § 22.3). In addition to immediate impacts, this definition also covers impacts that result from human-induced alterations initiated around a previously used nest site during a time when eagles are not present, if, upon the eagle's return, such alterations agitate or bother an eagle to a degree that interferes with or interrupts normal breeding, feeding, or sheltering habits, and causes injury, death, or nest abandonment.

Eagles are not as sensitive to human disturbance during migration and wintering as they are while nesting. However, wintering eagles can congregate at specific sites year-after-year (i.e., established roost sites) for purposes of feeding and sheltering. Therefore, each proposed project has been reviewed to evaluate bald eagle status in the action area and determine if best management practices (see Chapter 6 Appendix) need to be put into place to avoid non-purposeful "taking" or "disturbing" of bald eagles. Specifically, the review process included the project sponsor documenting the presence or absence of known bald eagle nests or congregation/roosting sites. If nests or congregations were known, projects were evaluated to determine if activities would be able to maintain a standard buffer distance (based on vegetation cover and nearby similar activities). If a standard buffer distance for project construction and the nest could be maintained, then the buffer distance became a required BMP for project implementation. If a standard buffer distance could not be maintained, then the sponsor would need to either alter the project or seek a non-purposeful take permit. All of the projects proposed in Chapters 8-12 that have nearby eagle nesting known, have indicated they can comply with standard buffer distances and as such do not need a non-purposeful take permit.

Although very rare, golden eagles are occasionally observed along the Gulf coast during migration, and it is likely that any measures taken to protect bald eagles or other migratory birds will also protect golden eagles.

7.5.6 Coastal Zone Management Act (16 U.S.C. §§ 1451-1456)

The goal of the Coastal Zone Management Act (CZMA) is to encourage states to preserve, protect, develop, and where possible, to restore and enhance the resources of the nation's coastal zone. The CZMA encourages coastal states to develop and implement comprehensive management programs that balance the need for coastal resource protection with the need for economic growth and development in the coastal zone. Coastal management plans developed by a coastal state must be approved by the Secretary of the U.S. Department of Commerce. Once a coastal management plan is approved, the CZMA requires federal agency activities affecting the land or water uses or natural resources of a state's coastal zone to be consistent, to the maximum extent practicable, with the applicable, enforceable policies of that state's federally approved coastal management program. This requirement is addressed through processes that provide for state review of a federal agency's determination of consistency with the relevant state's approved program. Restoration activities proposed to be undertaken or authorized by federal agencies are subject to review for "federal consistency" under the CZMA.

The Federal Trustees involved in development of this Final Phase III ERP/PEIS reviewed the specific restoration projects for consistency with the federally-approved coastal management programs in the states where coastal uses or resources would be affected by proposed project activities and submitted their determinations of consistency to the appropriate state agencies for review coincident with the public review of the Draft Phase III ERP/PEIS. All States concurred with the federal determination of consistency at this point in the Early Restoration planning process (i.e. for purposes of selection of these projects in Final Phase III ERP/PEIS Record of Decision). Selected Early Restoration projects remain subject to additional state consistency reviews required of applicants during permitting processes required for implementation.

7.5.7 Coastal Barrier Resources Act

The Coastal Barrier Resources Act (CBRA) established the John H. Chafee Coastal Barrier Resources System, a defined set of geographic units along the Atlantic, Gulf of Mexico, Great Lakes, U.S. Virgin Islands, and Puerto Rico coasts. The CBRA restricts federal expenditures of funds for activities located within the Coastal Barrier Resources System unless those activities meet one of the listed exceptions under the CBRA. A federal agency proposing to spend funds within the Coastal Barrier Resources System must consult with the U.S. Fish and Wildlife Service (Service) to determine whether the proposed federal expenditure meets one of the CBRA exceptions or is otherwise subject to restrictions. The Service has reviewed the Early Restoration projects subject to the CBRA and is currently engaged in intra-Service consultation to confirm that exceptions to the CBRA's funding restrictions apply to those projects.

7.5.8 Clean Air Act (42 U.S.C. §7401 et seq.)

The Clean Air Act (CAA) requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. NAAQS have been set for six common air pollutants (also known as criteria pollutants), consisting of particle pollution or particulate matter, ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. Particulate matter is defined as fine particulates with a diameter of 10 micrometers or less (PM_{10}), and fine particulates with a diameter of 2.5 micrometers or less ($PM_{2.5}$). When a designated air quality area or airshed in a state exceeds one or more of the NAAQS, that area may be designated as a "nonattainment" area. Areas with levels of pollutants below the health-based standards are designated as "attainment" areas. To determine whether an area meets the NAAQS, air monitoring networks have been established and are used to measure ambient air quality. No violations of the NAAQS are expected to occur from implementation of any selected early restoration project.

7.5.9 Federal Water Pollution Control Act (Clean Water Act, 33 U.S.C. §§ 1251 et seq.) and/or Rivers and Harbors Act (33 U.S.C. §§ 401 et seq.)

Waters of the United States, as defined by the Clean Water Act and implementing regulations, and navigable waterways, regulated by the Rivers and Harbors Act, are present throughout the Gulf Coast and could potentially be affected by proposed projects. Section 404 of the Clean Water Act requires United States Army Corps of Engineers (USACE) authorization prior to discharging dredged or fill material into waters of the United States, including wetlands. Section 10 of the Rivers and Harbors Act requires USACE authorization prior to any work in, under or over navigable waters of the United States, or which affects the course, location, condition or capacity of such waters. Authorization from the USACE pursuant to Section 103 of the Marine Protection, Research and Sanctuaries Act may also be required for the transportation of dredged material for the purpose of dumping it in ocean waters.

There may be other provisions of the Clean Water Act or Rivers and Harbors Act that are also applicable to proposed Early Restoration projects depending on site-specific circumstances. Specifically with regard to the Rivers and Harbors Act, this includes Section 14, which applies to activities that could affect completed public works projects. Under Section 401 of the Clean Water Act, projects that entail discharge to wetlands or other waters within Federal jurisdiction must obtain State certification of compliance with State water quality standards. Under Section 401, States can review and approve, condition, or deny all Federal permits or licenses that might result in a discharge to State waters, including wetlands. Section 402 of the Clean Water Act establishes the National Pollutant Discharge

Elimination System (NPDES) permit program to regulate point source discharges of pollutants into waters of the United States. A NPDES permit sets specific limits for point sources discharging pollutants into waters of the United States and establishes monitoring and reporting requirements, as well as special conditions. The EPA is charged with administering the permit program, but can authorize States to assume many of the permitting, administrative, and enforcement responsibilities. All five Gulf coast States are authorized to issue NPDES permits.

For proposed projects with activities that might be subject to provisions included above, project sponsors are coordinating with the appropriate U.S. Army Corps of Engineers District and/or State office responsible for authorizing such activities to help identify whether a permit is needed and, if so, what type. This early coordination helps facilitate information-sharing and communication, thus maximizing available efficiencies in the permitting process. Early coordination also allows for advance discussion of measures to avoid and minimize potential project impacts and helps inform sponsors on additional factors that are considered in the permit decision-making process. USACE authorization under Clean Water Act Section 404 or Rivers and Harbors Act Section 10 has already been completed for some of the proposed projects considered in this document. For those proposed Early Restoration projects still requiring USACE and/or State authorization, coordination is ongoing and authorization will ultimately be completed prior to project implementation.

7.5.10 National Historic Preservation Act (16 U.S.C. §§ 470 et seq.)

People have lived in the coastal region of the Gulf of Mexico for more than ten thousand years. Today many unique and diverse cultures call the Gulf Coast home. These cultures, past and present, are often closely linked to the environmental and natural resources that comprise the Gulf Coast ecosystem that the proposed projects seek to help restore. The National Historic Preservation Act of 1966 (NHPA) charges the Federal Government with protecting the cultural heritage and resources of the nation. A complete review of proposed projects under Section 106 of the NHPA would be completed as environmental review continues (see Chapters 8-12). Projects will be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

7.5.11 Executive Order 13112: Invasive Species

The potential introduction of terrestrial and aquatic non-native invasive species of plants, animals, and microbes is a constant concern. Non-native invasive species could alter existing terrestrial or aquatic ecosystems, may cause economic damages and losses (Pimentel et al. 2005), and are frequently the second most common reason for protecting species under the Endangered Species Act. To address these concerns, the prevention, management, and control of non-native invasive species, as it pertains to federal agencies, was formally addressed in Executive Order 13112. The executive order directs federal agencies to work together to "prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." Therefore, all projects would provide an evaluation of the possible transport and spread of non-native invasive species due to planned activities and provide measures to avoid and minimize habitat and trust resource impacts (see Chapters 8-12). The amount of measures taken will vary for each project based on the potential risk of invasive species introduction, the presence of transport vectors, and the sensitivity of receiving areas.

7.5.12 Additional Executive Orders

The following Executive Orders (EO) are also evaluated as applicable in Chapters 8-12.

7.5.12.1 EO 11988: Floodplain Management

EO 11988 Floodplain Management requires federal agencies to avoid to the extent possible the long and short-term adverse impacts associated with the occupancy and modification of flood plains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

7.5.12.2 EO 11990: Protection of Wetlands

EO 11990 Protection of Wetlands is intended to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity affecting a wetland cannot be avoided.

7.5.12.3 EO 12114: Environmental Effects Abroad of Major Federal Actions

EO 12114 enables responsible officials of Federal agencies having ultimate responsibility for authorizing and approving actions encompassed by this Order to be informed of pertinent environmental considerations and to take such considerations into account, with other pertinent considerations of national policy, in making decisions regarding such actions. This Order requires Federal agencies with facilities located outside the United States to consider the impact of major actions on the environment.

7.5.12.4 EO 12898: Environmental Justice

EO 12898 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of programs, policies, and activities on minority or low income populations. Environmental justice review should be incorporated into the NEPA process and, where disproportionate adverse effects on minority and low-income populations are identified, address those impacts.

7.5.12.5 EO 12962: Recreational Fisheries

EO 12962 Recreational Fisheries is intended to conserve, restore and enhance aquatic systems to provide for increased recreational fishing opportunities nationwide.

7.5.12.6 EO 13112: Invasive Species

EO 13112 Invasive Species applies to all federal agencies whose actions may affect the status of invasive species and requires agencies to identify such actions and to the extent practicable and permitted by law (1) take actions specified in the Order to address the problem consistent with their authorities and budgetary resources ; and (2) not authorize, fund, or carry out actions that they believe are likely to cause or promote the introduction or spread of invasive species in the United States or elsewhere unless, “pursuant to guidelines that it has prescribed, the agency has determined and made public its determination that the benefits of such actions clearly outweigh the potential harm caused by invasive species; and the benefits of such actions clearly outweigh the potential harm caused by invasive species; and that all feasible and prudent measures to minimize risk of harm will be taken in conjunction with the actions.

7.5.12.7 EO 13175: Consultation and Coordination with Indian Tribal Governments

EO 13175 Consultation and Coordination with Indian Tribal Governments reaffirms the federal government's commitment to a government-to-government relationship with Indian Tribes, and directed federal agencies to establish procedures to consult and collaborate with tribal governments when new agency regulations would have tribal implications.

7.5.12.8 EO 13186: Responsibilities of Federal Agencies to Protect Migratory Birds

EO 13186 Responsibilities of Federal Agencies to Protect Migratory Birds directs executive departments and agencies to take certain actions to further implement the Migratory Bird Treaty Act.

7.6 Overview of Proposed Phase III Early Restoration Projects

Figure 7-1 below identifies the location of each Phase III project. The following subsections list and briefly describe each of the 44 proposed projects. The list is organized by the state in which the proposed project will take place.

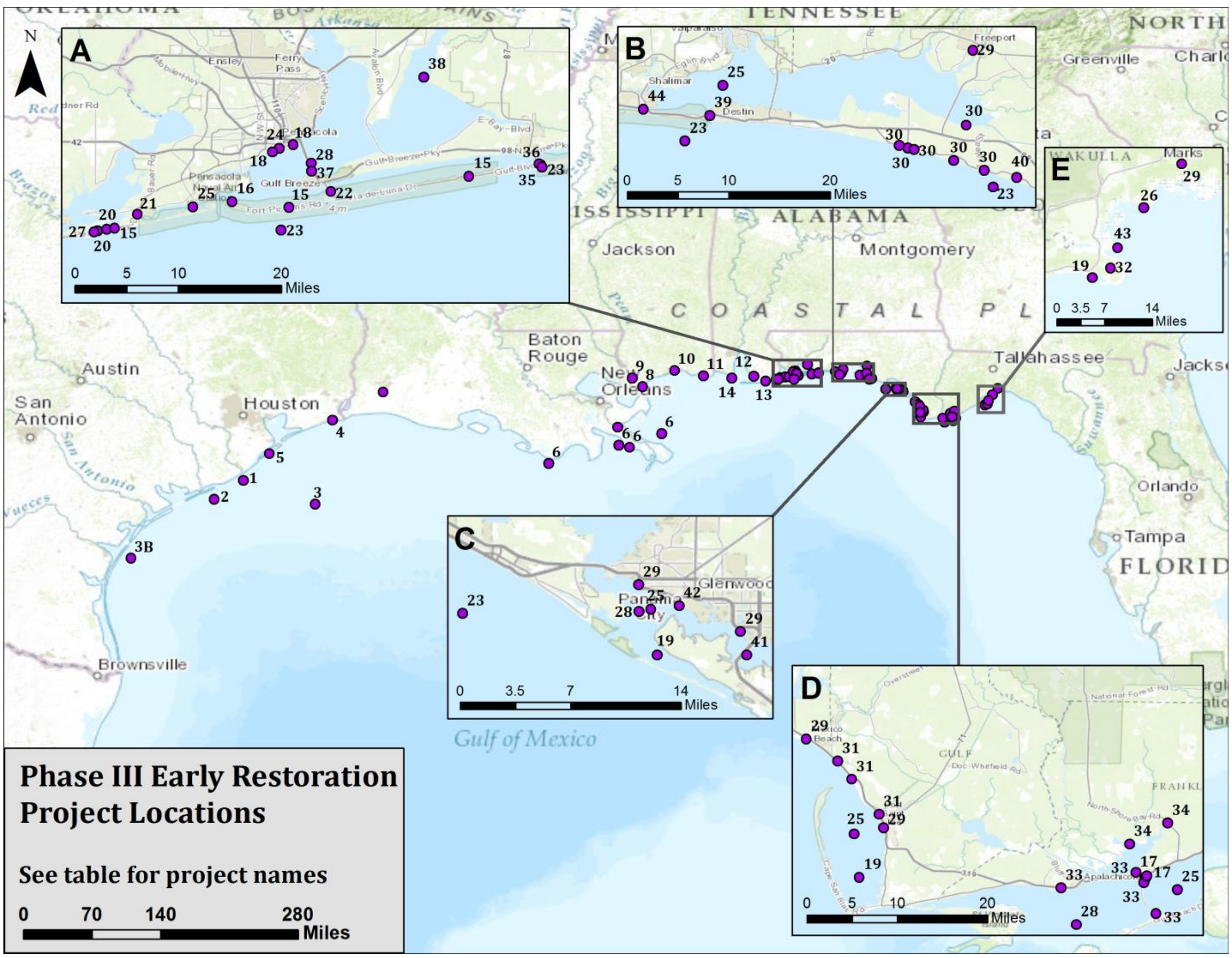

Figure 7-1 Phase III Early Restoration Project Locations

Main Map Panel			Map Inset B	
1	Freeport Artificial Reef		23	Florida Artificial Reefs *
2	Matagorda Artificial Reef		25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle *
3	Mid/Upper Texas Coast Artificial Reef - Ship Reef		29	Strategically Provided Boating Access Along Florida's Gulf Coast *
3B	Mid/Upper Texas Coast Artificial Reef - Corpus Artificial Reef (Alternative)		30	Walton County Boardwalks and Dune Crossovers *
4	Sea Rim State Park Improvements		39	Norriego Point Restoration and Recreation Project
5	Galveston Island State Park Beach Redevelopment		40	Deer Lake State Park Development
6	Louisiana Outer Coast Restoration *		44	Northwest Florida Estuarine Habitat Restoration, Protection and Education- Fort Walton Beach
7	Louisiana Marine Fisheries Enhancement, Research, and Science Center *		**Map Inset C**	
8	Hancock County Marsh Living Shoreline Project		19	Florida Seagrass Recovery Project *
9	Restoration Initiatives at the INFINITY Science Center		23	Florida Artificial Reefs *
10	Popp's Ferry Causeway Park		25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle *
11	Pascagoula Beach Front Promenade		28	Florida Oyster Cultch Placement *
12	Alabama Swift Tract Living Shoreline		29	Strategically Provided Boating Access Along Florida's Gulf Coast *
13	Gulf State Park Enhancement Project		41	City of Parker - Oakshore Drive Pier
14	Alabama Oyster Cultch Restoration		42	Panama City Marina Fishing Pier, Boat Ramp, and Staging Docks
Map Inset A			**Map Inset D**	
15	Beach Enhancement Project at Gulf Islands National Seashore *		17	Florida Cat Point Living Shoreline *
16	Gulf Islands National Seashore Ferry Project		19	Florida Seagrass Recovery Project *
18	Florida Pensacola Bay Living Shoreline Project *		25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle *
20	Perdido Key State Park Beach Boardwalk Improvements *		28	Florida Oyster Cultch Placement *
21	Big Lagoon State Park Boat Ramp Improvement		29	Strategically Provided Boating Access Along Florida's Gulf Coast *
22	Bob Sikes Pier Parking and Trail Restoration		31	Gulf County Recreation Projects *
23	Florida Artificial Reefs *		33	Enhancement of Franklin County Parks and Boat Ramps *
24	Florida Fish Hatchery		34	Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access Improvements *
25	Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle *		**Map Inset E**	
27	Perdido Key Dune Restoration Project		19	Florida Seagrass Recovery Project *
28	Florida Oyster Cultch Placement *		26	Shell Point Beach Nourishment
35	Navarre Beach Park Gulfside Walkover Complex		29	Strategically Provided Boating Access Along Florida's Gulf Coast *
36	Navarre Beach Park Coastal Access and Dune Restoration		32	Bald Point State Park Recreation Areas
37	Gulf Breeze Wayside Park Boat Ramp		43	Wakulla County Mashes Sands Park Improvements
38	Developing Enhanced Recreational Opportunities on the Escribano Point Portion of the Yellow River Wildlife Management Area			* multiple project locations

7.6.1 Texas

7.6.1.1 Freeport Artificial Reef Project

The proposed Freeport Artificial Reef Project will increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Brazos BA-336), the George Vancouver (Liberty Ship) Artificial Reef, located within Texas state waters in the Gulf of Mexico, approximately 6 miles from Freeport, Texas. The current reef site is permitted for 160 acres, but only has materials in 40 acres. The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre permitted area onto sandy substrate at a water depth of 55 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational fishing and diving opportunities. The estimated cost for this project is $2,155,365.

7.6.1.2 Matagorda Artificial Reef Project

The proposed Matagorda Artificial Reef Project will create a new artificial reef site (Outer Continental Shelf Block Brazos BA-439) within Texas state waters in the Gulf of Mexico, approximately 10 miles offshore of Matagorda County, Texas. The proposed project will create a new artificial reef within the 160-acre permitted area, through deployment of predesigned concrete pyramids onto sandy substrate at a water depth of 60 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. This project would enhance recreational fishing opportunities. The estimated cost for this project is $3,552,398, which includes an increase of $66,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.[8]

7.6.1.3 Mid/Upper Texas Coast Artificial Reef Ship Reef Project[9]

The proposed Ship Reef Project will create a new artificial reef site (Outer Continental Shelf Block High Island HI-A-424) in deep waters of the Gulf of Mexico, about 67 miles south-southeast of Galveston, Texas (**Error! Reference source not found.**). The proposed project will create an artificial reef by sinking ship that is at least 200 feet long within the 80-acre permitted reef site, in waters that are approximately 135 feet deep. The ship will be cleaned of hazardous substances to meet EPA criteria, as

[8] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

[9] Should this proposed project become technically infeasible, the Trustees would implement the "Texas Artificial Reef (Mid/Upper Coast)- Corpus Reef " Project: The proposed Corpus Artificial Reef Project will increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Mustang Island MU-775) located within Texas state waters in the Gulf of Mexico and approximately 11 miles from Packery Channel (near Corpus Christi Bay, Texas. Previous deployments at the reef site placed artificial reef materials into the northwest quadrant and in the center of the 160-acre reef site. The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre project area onto sandy substrate at a water depth of 73 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational fishing opportunities. The estimated cost for this project is $1,919,765, which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements. This project is an alternative to the Ship Reef Project, and is proposed for implementation only in the event that the Ship Reef Project proves to be technically infeasible.

well as pass all required Federal and State inspections, including EPA, TPWD, and USCG. The project would enhance recreational fishing and diving opportunities. This Early Restoration project proposal would fund a portion of the costs to implement this project. The estimated cost for the NRD Early Restoration portion of this project is $1,919,765 which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.[10] Additional funds from donations to the TPWD Texas Artificial Reef Program will be used to complete the project.

7.6.1.4 Sea Rim State Park Improvements

Sea Rim State Park is located along the upper Texas coast in Jefferson County, Texas, southwest of Port Arthur, Texas. The proposed Sea Rim State Park Improvements project would construct two wildlife viewing platforms (Fence Lake and Willow Pond), one comfort station, and one fish cleaning shelter in the Park. These improvements would enhance visitor use and enjoyment of Park resources. The estimated cost for this project is $210,100.

7.6.1.5 Galveston Island State Park Beach Redevelopment

Galveston Island State Park is a 2,000-acre park in the middle of Galveston Island, southwest of the City of Galveston in Galveston County, Texas. The proposed Galveston Island State Park Beach Redevelopment project includes the building of multi-use campsites, tent campsites, dune access boardwalks, equestrian facilities, as well as restroom and shower facilities on the beach side of the Park. These improvements would enhance visitor use and enjoyment of Park resources. The estimated cost for this project is $10,745,060.

7.6.2 Louisiana

7.6.2.1 Louisiana Outer Coast Restoration

The Trustees propose to restore beach, dune, and back-barrier marsh habitats at four barrier island locations in Louisiana. From west to east, the four locations are Caillou Lake Headlands (also known as Whiskey Island), Chenier Ronquille, Shell Island (West Lobe and portions of East Lobe), and North Breton Island. The total estimated cost to implement Louisiana Outer Coast Restoration is $318,363,000.

7.6.2.2 Louisiana Marine Fisheries Enhancement, Research, and Science Center

The Louisiana Marine Fisheries Enhancement, Research, and Science Center ("the Center") would establish state of the art facilities to responsibly develop aquaculture-based techniques for marine fishery management. The proposed project would include two sites (Calcasieu Parish and Plaquemines Parish) with the shared goals of fostering collaborative multi-dimensional research on marine sport fish and bait fish species; enhancing stakeholder involvement; and providing fisheries extension, outreach, and education to the public. Specifically, the project would provide Louisiana with an important management tool for monitoring the long term health of wild populations of popular recreation marine species by developing the ability to release known numbers of marked juveniles into pre-determined habitats as part of well-designed studies that would allow for measurement and detection of changes in

[10] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

wild populations of marine sport fish species. The Center would also establish living laboratories to support a variety of marine fisheries outreach and educational activities for the public. The estimated cost for this project is $22,000,000.

7.6.3 Mississippi

7.6.3.1 Hancock County Marsh Living Shoreline Project

The proposed Hancock County Marsh Living Shoreline project is intended to employ living shoreline techniques including natural and artificial breakwater material and marsh creation to reduce shoreline erosion by dampening wave energy while encouraging reestablishment of habitat that was once present in the region. The project would provide for construction of up to 5.9 miles of living shoreline, approximately 46 acres of marsh creation, and 46 acres of subtidal oyster reef would be created in Heron Bay to increase secondary productivity in the area. The project would include shoreline erosion reduction, creation of habitat for secondary productivity, and protection and creation of salt marsh habitat. The estimated cost for this project is $50,000,000.

7.6.3.2 Restoration Initiatives at the INFINITY Science Center

The proposed project, Restoration Initiatives at the INFINITY Science Center, would provide the public enhanced and increased access to coastal natural resources injured by the Spill and response actions. The goal is to restore lost recreational opportunities through the provision of increased access to coastal estuarine habitats, wildlife viewing areas and educational features. The project would enhance and expand a state-of-the-art interactive science, education, interpretive, and research center for use by visitors seeking to experience and learn about the coastal natural resources of the Gulf of Mexico. The project also would serve as a launching point for a comprehensive scenic byway trail system that can take visitors to beaches and tidal coastal estuarine environments. The INFINITY Science Center is located in Hancock County, Mississippi, and is adjacent to the Hancock County Marsh Preserve and coastal estuarine habitats. The INFINITY Science Center is a partnership between public and private entities such as NASA, the State of Mississippi, and private funders. The estimated cost for the Restoration Initiatives at INFINITY Science Center Early Restoration project is $10,400,000.

7.6.3.3 Popp's Ferry Causeway Park

The proposed Popp’s Ferry Causeway Park Project would improve a portion of a site in Back Bay, in Harrison County, Mississippi, that is owned by the City of Biloxi by expanding a park environment where visitors could experience the coastal estuarine ecosystem. The intent is to restore lost recreational use. The project would provide for construction of an interpretive center, nature trails, boardwalks, and other recreational enhancements and would enhance visitor access to the adjacent coastal estuarine environment while updating and constructing amenities, which would allow visitors to fish, crab, and observe nature. The estimated cost for this project is $4,757,000.

7.6.3.4 Pascagoula Beachfront Promenade

The proposed Pascagoula Beachfront Promenade project is intended to restore lost recreational opportunities resulting from the Spill and related response actions. This project would enhance recreational shoreline access via the construction of a lighted concrete beachfront pedestrian pathway adjacent to a sand beach in Pascagoula, Mississippi. Project funds would be used to help complete a two-mile, 10-ft.-wide lighted concrete pathway complete with amenities. This Early Restoration project proposal would fund a portion (8,200 ft.) of the 10-ft. wide promenade, a portion of which has already been constructed. The estimated cost for this project is $3,800,000.

7.6.4 Alabama

7.6.4.1 Alabama Swift Tract Living Shoreline

The proposed Alabama Swift Tract Living Shoreline project is intended to employ living shoreline techniques that utilize natural and/or artificial breakwater material to stabilize shorelines along an area in the eastern portion of Bon Secour Bay, Alabama. As the lead implementing Trustee, NOAA would create breakwaters to dampen wave energy and reduce shoreline erosion while also providing habitat and increasing benthic secondary productivity. The project would provide for construction of up to 1.6 miles of breakwaters in Bon Secour Bay adjacent to the 615 acre Swift Tract parcel, which is part of the Weeks Bay National Estuarine Research Reserve (NERR). Over time, the breakwaters are expected to develop into reefs that support benthic secondary productivity, including, but not limited to, bivalve mollusks, annelid worms, shrimp, and crabs. The estimated cost for this project is $5,000,080.

7.6.4.2 Gulf State Park Enhancement Project

The proposed Gulf State Park Enhancement Project would implement ecologically-sensitive improvements to Gulf State Park (GSP) including: (1) rebuilding the Gulf State Park Lodge and Conference Center; (2) building an Interpretive Center; (3) building a Research and Education Center; (4) visitor enhancements including trail improvements and extensions, overlooks, interpretive kiosks and signage, rest areas, bike racks, bird watching blinds, or other visitor enhancements; and (5) ecological restoration and enhancement of degraded dune habitat. Early Restoration funds would contribute $85,505,305, a portion of the total project costs.

7.6.4.3 Alabama Oyster Cultch Restoration

The proposed Alabama Oyster Cultch project would enhance and improve the oyster populations in the estuarine waters of Alabama. The project would place approximately 30,000 – 40,000 cubic yards of suitable oyster shell cultch over approximately 319 acres of subtidal habitat in Mobile County, AL, in proximity to other oyster reefs currently managed by the Alabama Department of Conservation and Natural Resources (ADCNR) and within the historic footprint of oyster reefs in the area. The estimated cost for this project is $3,239,485.

7.6.5 Florida

7.6.5.1 Beach Enhancement Project at Gulf Island National Seashore

This project involves removing fragments of asphalt and road-base material (limestone aggregate and some chunks of clay) that have been scattered widely over the Fort Pickens, Santa Rosa, and Perdido Key areas of the Florida District of Gulf Islands National Seashore, managed by the National Park Service, and replanting areas, as needed, where materials are removed. These materials originated from roads damaged during several storms and hurricanes. The asphalt- and road-base-covered conditions are clearly unnatural and impact the visitor experience both aesthetically and physically in these National Seashore lands. This project would enhance the visitor experience in the cleaned-up areas. The exact method for removing the material would be left to the contractor hired if the project is approved, but would involve primarily mechanized equipment, supplemented by small crews using hand tools. The estimated cost for this project is $10,836,055.

7.6.5.2 Gulf Islands National Seashore Ferry Project

The proposed DOI Ferry project involves the purchase of up to three ferries to be used to ferry visitors (no automobiles) between the City of Pensacola, Pensacola Beach, and the Fort Pickens area of the Gulf Islands National Seashore (Seashore) in Florida. The need for an alternative means to access the Fort Pickens area of the Seashore was made especially apparent when hurricanes and storms in 2004 and 2005 destroyed large segments of the road, eliminating vehicle access through this eight-mile-long area. A viable ferry service to this area of the Seashore would allow visitors to enjoy the Seashore not only if the road were to be destroyed again, but also by providing alternative options for visitor access. Operational responsibility for the boats (i.e., all aspects of the ferry service including preparing a business plan, staffing, ticket sales, vessel maintenance and repairs, insurance, licensing, getting regular inspections, etc.) has not yet been determined but would likely be either Escambia County or the National Park Service (or their contractor). The determination would be made by the ferry service stakeholders and would be based on several factors, including adequacy of staffing, experience, institutional stability, etc. Regardless of the operator, however, all BMPs described in this Environmental Review would be followed such that impacts to all stakeholders' trust resources are protected. The estimated cost for this project is $4,020,000.

7.6.5.3 Florida Cat Point Living Shoreline Project

The proposed Cat Point (Franklin County) Living Shoreline project is intended to employ living shoreline techniques that utilize natural and/or artificial breakwater material to reduce shoreline erosion and provide habitat off Eastpoint, Florida. Combining these objectives, this project would create breakwaters to reduce wave energy, increase benthic secondary productivity, and create salt marsh habitat. Proposed activities include expanding an existing breakwater by creating up to 0.3 miles of new breakwater that will provide reef habitat and creating salt marsh habitat. The total estimated cost for this project is $775,605.

7.6.5.4 Florida Pensacola Bay Living Shoreline Project

The proposed Pensacola Bay Living Shorelines project is intended to employ living shoreline techniques that utilize natural and/or artificial breakwater material to reduce shoreline erosion and provide habitat at two sites within a portion of Pensacola Bay. This project would create reefs to reduce wave energy, increase benthic secondary productivity, and create salt marsh habitat. Proposed activities include constructing breakwaters that will provide reef habitat and creating salt marsh habitat at both sites. In total, approximately 18.8 acres of salt marsh habitat and 4 acres of reefs would be created. The estimated cost for this project is $10,828,063.

7.6.5.5 Florida Seagrass Recovery Project

The proposed Florida Seagrass Recovery project will address boat damage to shallow seagrass beds in the Florida panhandle by restoring scars located primarily in turtle grass (Thalassia testudinum) habitats located in St. Joseph Bay Aquatic Preserve in Gulf County, with additional potential sites in Alligator Harbor Aquatic Preserve in Franklin County, and St. Andrews Aquatic Preserve, in Bay County. A boater outreach and education component of the project will install non-regulatory Shallow Seagrass Area signage, update existing signage and buoys where applicable, and install educational signage and provide educational brochures about best practices for protecting seagrass habitats at popular boat ramps in St. Joseph Bay, Alligator Harbor, and St. Andrews Bay. The total estimated cost for this project is $2,691,867.

7.6.5.6 Perdido Key State Park Beach Boardwalk Improvements

The proposed Perdido Key project would improve a number of existing boardwalks in Perdido Key State Park in Escambia County. The proposed improvements include removing and replacing six existing boardwalks leading to the beach from two public access areas. The total estimated cost for this project is $588,500.

7.6.5.7 Big Lagoon State Park Boat Ramp Improvement

The proposed Big Lagoon State Park project would involve enhancing an existing boat ramp and surrounding facilities in the Big Lagoon State Park in Escambia County. These improvements would include adding an additional lane to the boat ramp, expanding boat trailer parking, improving traffic circulation at the boat ramp, and providing a new restroom facility to connect the park to the Emerald Coast Utility Authority (ECUA) regional sanitary sewer collection system. The total estimated cost for this project is $1,483,020.

7.6.5.8 Bob Sikes Pier Parking and Trail Restoration

The proposed Bob Sikes Pier project would improve access to a fishing pier in the Pensacola area in Escambia County as well as enhancing the quality of the experience for its recreational users. The proposed improvements include renovating parking areas, enhancing bicycle/pedestrian access, and aesthetic improvements to the surrounding area. The estimated cost for this project is $1,023,990.

7.6.5.9 Florida Artificial Reefs

The proposed Florida Artificial Reef Creation and Restoration project involves creating artificial reefs in Escambia, Santa Rosa, Okaloosa, Walton, and Bay Counties. These proposed improvements include emplacing artificial reefs in already permitted areas. As required by the ESA consultation with NMFS, the pyramid designs originally planned for this project were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. The total estimated cost for this project is $11,463,587.

7.6.5.10 Florida Fish Hatchery

The proposed Florida Gulf Coast Marine Fisheries Hatchery/Enhancement Center project would involve constructing and operating a saltwater sportfish hatchery in Pensacola, Florida. This project would enhance recreational fishing opportunities. The total estimated cost for this project is $18,793,500.

7.6.5.11 Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle

The proposed Scallop Enhancement for Increased Recreational Fishing Opportunity in the Florida Panhandle project would involve enhancing local scallop populations in targeted areas in the Florida Panhandle. The proposed improvements include the harvesting and redistribution of naturally-occurring juvenile scallops supplemented with stocking from a commercial scallop hatchery. The total estimated cost for this project is $2,890,250.

7.6.5.12 Shell Point Beach Nourishment

The proposed Shell Point Beach Nourishment project would involve the renourishment of Shell Point Beach in Wakulla County. The proposed improvements include the placement of approximately 15,000 cubic yards of sand on the county owned section of the beach from an approved upland borrow area to restore the width and historic slope/profile of this beach. The total estimated cost for this project is $882,750.

7.6.5.13 Perdido Key Dune Restoration Project

The proposed Perdido Key Dune Restoration project will restore appropriate dune vegetation to approximately 20 acres of degraded beach dune habitat in Perdido Key, Florida, including habitat used by the federally endangered Perdido Key Beach Mouse. The project will consist of planting appropriate dune vegetation (e.g., sea oats, panic grasses, cord grasses, sea purslane, beach elder) approximately 20 – 60' seaward of the existing primary dune to provide a buffer to the primary dune and enhance dune habitats. In addition, gaps in existing dunes within the project area will be re-vegetated to provide a continuous dune structure. The total estimated cost for this project is $611,234.

7.6.5.14 Florida Oyster Cultch Placement Project

The proposed Florida Oyster Cultch project would enhance and improve the oyster populations in Pensacola Bay, Andrew Bay and Apalachicola Bay. The proposed improvements include the placement of a total of 42,000 cubic yards of suitable cultch material over 210 acres of previously constructed oyster bars for the settling of native oyster larvae and oyster colonization in three Florida Bays. The total estimated cost for this project is $5,370,596.

7.6.5.15 Strategically Provided Boat Access along Florida's Gulf Coast Project Components

7.6.5.15.1 City of Mexico Beach Marina Project

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (City of Mexico Beach Marina) project would improve the existing Mexico Beach Canal Park boat ramp in the City of Mexico Beach. The proposed improvements include replacing the boardwalk dock with a concrete surface and increasing the width, removing and replacing eighteen existing finger piers, and replacement of the existing retaining wall. The total estimated cost of the project is $1,763,554.

7.6.5.15.2 Panama City St. Andrews Marina Docking Facility Expansions

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (Panama City St. Andrews Marina Docking Facility Expansions) project would improve the existing St. Andrews Marina docking facility in Panama City. The proposed improvements include adding three boat slips, replacing the boat ramp, and replacing a fixed wooden dock with a concrete floating dock. The total estimated cost of the project is $250,029.

7.6.5.15.3 Strategically Provided Boat Access - City of Parker, Donaldson Point Boat Ramp Improvements

The Strategically Provided Boat Access along Florida's Gulf Coast: City of Parker, Donaldson Point Boat Ramp Improvements project component has been dropped from the Final Phase III ERP/PEIS. During the public comment period it was discovered that some uncertainty existed as to whether the City of Parker owned the property at which the proposed boat ramp was to be constructed. Rather than get involved in lengthy and costly legal investigations into ownership the City of Parker requested the Trustees to withdraw this project component. Total funds allocated to Donaldson Point Boat Ramp project component were $60,569.00; these funds will be reallocated to the Earl Gilbert component of the Strategically Provided Boat Access along Florida's Gulf Coast project (see Chapter 12 for additional details).

7.6.5.15.4 City of Parker, Earl Gilbert Dock and Boat Ramp Improvements

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (City of Parker Earl Gilbert Dock and Boat Ramp Improvements) project would improve the existing Earl Gilbert dock and boat ramp in the City of Parker. The proposed work includes improving the existing dock and expanding the existing parking. The total estimated cost of the project is $169,929.

7.6.5.15.5 City of Port St. Joe, Frank Pate Boat Ramp Improvements

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (City of Port St. Joe Frank Pate Boat Ramp Improvements) project would improve the existing Frank Pate boat ramp in the City of Port St. Joe. The proposed improvements include constructing an additional boarding dock, boat trailer parking, access drive, staging area, and a fish cleaning station. The total estimated cost of the project is $806,972.

7.6.5.15.6 City of St. Marks Boat Ramp Improvements

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (City of St. Marks Boat Ramp Improvements) project would improve the existing City of St. Marks boat ramp. The proposed improvements include adding a boarding dock to the one-lane boat ramp. The total estimated cost of the project is $50,006.

7.6.5.15.7 Walton County, Choctaw Beach Boat Ramp Improvements

The Strategically Provided Boat Access along Florida's Gulf Coast: Walton County, Choctaw Beach Boat Ramp Improvements project component has been dropped from the Final Phase III ERP/PEIS. Walton County requested the Trustees to withdraw the project component so the County could seek funding from other sources to construct this project. Total funds allocated to the Choctaw Beach Boat Ramp project component were $140,642.00; these funds will be reallocated to the Mexico Beach component of the Strategically Provided Boat Access along Florida's Gulf Coast project (see Chapter 12 for additional details).

7.6.5.15.8 Walton County, Lafayette Creek Boat Dock Improvements

The proposed Strategically Provided Boat Access along Florida's Gulf Coast (Walton County Lafayette Creek Boat Dock Improvements) project would improve the existing Lafayette Creek boat dock in Walton County. The proposed improvements include expanding the dock by 400 feet at the boat ramp to accommodate larger vessels and additional vessels. The total estimated cost of the project is $207,850.

7.6.5.16 Walton County Boardwalks and Dune Crossovers

7.6.5.16.1 Ed Walline Beach Access Improvements

The proposed Walton County Ed Walline Beach Access Improvements project would improve the Ed Walline regional beach access facility in Walton County. The proposed improvements include replacing pavilions and restroom fixtures and updating all interior plumbing. The total estimated cost of the project is $117,700.

7.6.5.16.2 Gulfview Heights Beach Access Improvements

The proposed Walton County Gulfview Heights Beach Access Improvements project would improve the Gulfview Heights beach access facility in Walton County. The proposed improvements include replacing restroom fixtures, updating all interior plumbing, and repairing all soffits on pavilions. The total estimated cost of the project is $87,981.

7.6.5.16.3 Grayton Dunes Beach Access Boardwalk Improvements

The proposed Walton County Grayton Dunes Beach Access Boardwalk Improvements project would improve the Grayton Dunes beach access and boardwalk facility in Walton County. The proposed improvements include replacing the dune walkover allowing beach visitors to access the beach. The total estimated cost of the project is $168,076.

7.6.5.16.4 Dothan Beach Access Boardwalk Improvements

The proposed Walton County Dothan Beach Access Boardwalk Improvements project would improve the Dothan Beach Access Boardwalk in Walton County. The proposed improvements include replacing the dune walkover allowing beach visitors to access the beach. The total estimated cost of the project is $188,909.

7.6.5.16.5 Palms of Dune Allen West Beach Access Improvements

The proposed Walton County Palms of Dune Allen West Beach Access Improvements project would improve the Palms of Dune Allen West beach access facility in Walton County. The proposed improvements include constructing a dune walkover, allowing beach visitors to access the beach. The total estimated cost of the project is $112,109.

7.6.5.16.6 Bayside Ranchettes Park Improvements

The proposed Walton County Bayside Ranchettes Park Improvements project would improve the Bayside Ranchettes Park in Walton County. The proposed improvements include constructing a parking area, a picnic table, a dock, and steps into the water allowing access to the bay. The total estimated cost of the project is $68,501.

7.6.5.17 Gulf County Restoration Projects

7.6.5.17.1 Highland View Boat Ramp

The proposed Gulf County Highland View Boat Ramp project would improve the existing Highland View boat ramp in Gulf County. As part of this project, the amenities at this boat ramp site would be upgraded. No work to the ramp itself if planned. This work would include some renovations to the existing pier structure such as replacing planking and side bumpers. Expanding the pier footprint is not anticipated and no new piling placement is expected. Additional work would include renovating and expanding the existing informal sand parking area to provide a more stable long-term surface. In addition, current project plans call for providing some sort of restroom facilities (e.g., a port-a-potty). The total estimated cost of the project is $176,550.

7.6.5.17.2 Indian Pass Boat Ramp

The Gulf County Recreation Projects: Indian Pass Boat Ramp project component is being dropped from the Final Phase III ERP/PEIS. Gulf County requested Trustees to withdraw the project component so the County could pursue the construction of a new ramp at a nearby location and abandon this facility. Total funds allocated to Indian Pass Boat Ramp project component were $176,550.00; these funds will be reallocated to the Windmark component of the Gulf County Restoration project (see Chapter 12 for additional details).

7.6.5.17.3 Improvements at Beacon Hill Veterans' Memorial Park

The proposed Gulf County Beacon Hill Veterans' Memorial Park Improvements project would improve and enhance the existing facilities at the Beacon Hill Veterans' Memorial Park Gulf County. The proposed project will improve the park, including: the construction of a small amphitheater, pavilions, upgrade/replace existing restrooms and possible development of a nature trail and additional area for vehicle parking.. The total estimated cost of the project is $588,500.

7.6.5.17.4 Windmark Beach Fishing Pier Improvements

The proposed Gulf County Windmark Beach Fishing Pier Improvements project would construct a fishing pier at Windmark Beach in Gulf County. The proposed improvements include constructing a fishing pier into the Gulf of Mexico. The total estimated cost of the project is $1,353,550.

7.6.5.18 Bald Point State Park Recreation Areas

The proposed Bald Point State Park Recreation Areas project would improve the existing visitor areas at Bald Point State Park in Franklin County. The project activity would involve constructing a visitor day-use area including picnic pavilions, a restroom with an aerobic treatment system and associated septic system drainfield, and an integrated system of boardwalks providing access through the area to a new floating dock, and a canoe/kayak launch area on Chaires Creek. The total estimated cost of the project is $470,800.

7.6.5.19 Enhancement of Franklin County Parks and Boat Ramps

7.6.5.19.1 Abercrombie Boat Ramp Project

The Enhancement of Franklin County Parks and Boat Ramps: Abercrombie Boat Ramp Project component is being dropped from the Final Phase III ERP/PEIS. Franklin County requested the Trustees to withdraw this project component since the County was awarded funding from other sources to construct this project. Total funds allocated to the Abercrombrie Boat Ramp project component were $176,550.00; these funds will be reallocated to other components of the Enhancement of Franklin County Parks and Boat Ramps project (see Chapter 12 for additional details).

7.6.5.19.2 Waterfront Park

The proposed Franklin County Waterfront Park project would improve the existing Waterfront Park in Apalachicola. The proposed improvements include enhancing existing parking and adjacent tie-up docks to enhance water access. In addition an existing onsite building would be enhanced to serve as an information center and dockmaster office. The total estimated cost of the project is $324,800.

7.6.5.19.3 Indian Creek Park

The proposed Franklin County Indian Creek Park project would improve the existing Indian Creek Park boat launch facility in Franklin County. The proposed improvements include constructing restroom facilities, connecting them to an existing central wastewater facility nearby, and renovating the existing boat ramp, bulkhead, and parking area to enhance water access. The total estimated cost of the project is $429,100.

7.6.5.19.4 Eastpoint Fishing Pier Improvements

The proposed Franklin County Eastpoint Fishing Pier Improvement project would add restroom facilities to the base of the existing public East Point Fishing Pier in Franklin County. The proposed improvements include not only constructing new restrooms, but a holding tank that would be pumped out regularly. In addition, signage will be installed/updated to provide users of the ramp with information on sensitive species and areas and appropriate actions to take with species interactions (e.g., what to do if a sea turtle or nesting migratory bird is encountered).The total estimated cost of the project is $294,250.

7.6.5.19.5 St. George Island Fishing Pier Improvements

The proposed Franklin County St. George Island Fishing Pier Improvements project would enhance the existing public St. George Island public Fishing Pier in Franklin County. The proposed improvements include constructing restrooms and a holding tank that would be pumped out regularly since there is no central wastewater facility on the island. The proposed improvements also include renovating the existing bulkhead that leads up to the pier and protects the road to the pier. The total estimated cost of the project is $723,235.

7.6.5.20 Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access Improvements

7.6.5.20.1 Cash Bayou

The proposed Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access Improvements: Cash Bayou project would improve public access at Cash Bayou in the Apalachicola River Wildlife and Environmental Area. The proposed improvements include constructing a fishing and wildlife observation structure and parking area. The total estimated cost of the project is $209,171.

7.6.5.20.2 Sand Beach

The proposed Apalachicola River Wildlife and Environmental Area Fishing and Wildlife Viewing Access Improvements: Sand Beach project would improve public access at Sand Beach in the Apalachicola River Wildlife and Environmental Area. The proposed improvements include constructing an elevated boardwalk that would be built on an existing, periodically wet interpretative trail. The total estimated cost of the project is $53,818.

7.6.5.21 Florida Navarre Beach Park Coastal Access and Dune Restoration

The proposed Navarre Beach Park Coastal Access project would improve access for the public seeking to access the beach and water of Santa Rosa Sound from the existing pavilion/parking lot areas. In addition, construction of a new canoe/kayak launch would increase access opportunities to the waters of the sound for recreational boaters. The enhancement of the recreational experience from these infrastructure improvements would also be complemented by the restoration of a roughly 1 acre parcel of degraded dune habitat in the project area. The estimated cost for this project is $614,630.

7.6.5.22 Navarre Beach Park Gulfside Walkover Complex

The proposed Navarre Beach Park Gulfside Walkover Complex project would enhance access to the shoreline at Navarre Beach Park to enhance recreational use of the natural resources. The proposed improvements include constructing an entrance, driveway, and parking area; constructing a restroom facility; constructing pavilions with boardwalk connections; lifeguard tower; and constructing a dune walkover that will provide access to the beach. The total estimated cost of the project is $1,221,847. The footprint for this project was relocated between the Draft and Final Phase III ERP/PEIS to remove the need for an incidental take permit from the state (see Chapter 12 for additional details).

7.6.5.23 Gulf Breeze Wayside Park Boat Ramp

The proposed Gulf Breeze Wayside Park Boat Ramp Improvements project would improve the existing boat ramp at Wayside Park in the City of Gulf Breeze, Santa Rosa County, FL. The proposed improvements include repairing the existing boat ramp and seawall cap, constructing a public restroom facility, and repairing and enhancing the parking area to improve access. The total estimated cost of the project is $309,669.

7.6.5.24 Developing Enhanced Recreational Opportunities on the Escribano Point Portion of the Yellow River Wildlife Management Area

The proposed Developing Enhanced Recreational Opportunities on the Escribano Point Portion of the Yellow River Wildlife Management Area project would improve public access and enjoyment of natural resources at the Escribano Point portion of the Yellow River Wildlife Management Area. The proposed improvements include a one-time assessment and mapping activities necessary for developing the site for outdoor recreation purposes, hurricane debris removal and road repair,constructing an entrance kiosk, information facilities, parking facilities, interpretive facilities, fishing facilities, picnicking facilities, primitive camping sites, wildlife viewing areas, and bear-proof containers for trash and food storage. The total estimated cost of the project is $2,576,365.

7.6.5.25 Norriego Point Restoration and Recreation Project

The proposed Norriego Point Restoration and Recreation project would involve stabilizing, enhancing and re-establishing recreational activities available at Norriego Point. Improvements would include constructing erosion control structures and new park amenities including a picnic pavilion with restrooms, showers, and drinking fountains; educational signage; a multi-use trail; bike racks; and vehicle parking along the access road adjacent to the park land. The total estimated cost of the project is $10,228,130.

7.6.5.26 Deer Lake State Park Development

The proposed Deer Lake State Park Recreation Areas project would improve the existing visitor areas at Deer Lake State Park in Walton County. The proposed improvements would include adding a paved access road, parking, picnic shelters, restroom facilities, plantings (trees, grass, shrubs), and necessary utilities (water, sewer, and electrical). The total estimated cost of the project is $588,500.

7.6.5.27 City of Parker – Oak Shore Drive Pier

The proposed City of Parker Oak Shore Drive Pier project would construct a fishing pier at Oak Shore Drive in the City of Parker, Bay County Florida. The proposed work includes construction of a 500 foot long fishing pier. The total estimated cost of the project is $993,649.

7.6.5.28 Panama City Marina Fishing Pier, Boat Ramp, and Staging Docks

The proposed Panama City Marina Fishing Pier, Boat Ramp, and Staging Docks project would provide additional recreational fishing opportunities for the public in Panama City in Bay County. The proposed improvements include constructing a 400-foot long pier, replacing a poorly functioning boat ramp, and constructing new staging docks associated with the boat ramp at the Panama City Marina. The total estimated cost of the project is $2,000,000.

7.6.5.29 Wakulla County Mashes Sands Park Improvements

The proposed Wakulla County Mashes Sands Park Improvements project would improve recreation areas at the Wakulla County Mashes Sands Park. The proposed improvements include constructing observation platforms, boardwalks, and walking paths, improving the boat ramp area, and picnic areas, renovating the parking area, and the restroom facility, and constructing a canoe/kayak launch site. The total estimated cost of the project is $1,500,000.

7.6.5.30 Northwest Florida Estuarine Habitat Restoration, Protection, and Education- Fort Walton Beach

The proposed Northwest Florida Fort Walton Beach Educational Boardwalk project would construct new boardwalks and connect them to existing boardwalks as well as conducting several small natural resource and habitat enhancement projects in Fort Walton Beach. The proposed improvements include constructing a new educational and interactive boardwalk, expansion of an existing intertidal oyster reef, and restoration of a degraded salt marsh. The total estimated cost of the project is $4,643,547.

7.7 Organization and Content of Proposed Phase III Project Chapters

Chapters 8-12 provide information and analysis related to the specific projects listed above located in Texas, Louisiana, Mississippi, Alabama, and Florida respectively.

Within each chapter, there is a subsection for each proposed Phase III project. Each project-specific subsection begins with a general description of the project and relevant background information, followed by: 1) a discussion of the project's consistency with project evaluation criteria; 2) a description of planned performance criteria, monitoring and maintenance; 3) a description of the type and quantity of Offsets BP would receive if the project is selected for implementation; and 4) information about estimated project costs.

Following this project information is a project-specific environmental review, which provides information specific to each project's affected environment and analysis about anticipated environmental consequences for the individual, proposed projects.[11] Each of the proposed projects is consistent with project types identified and evaluated in the Trustees' programmatic alternatives (see Chapters 5 and 6). The following Chapters also include the Trustees' project-specific environmental reviews analyzing project locations, methods, timing and other factors, project benefits, potential adverse consequences, and otherwise address environmental compliance needs.

7.8 Adoption of Existing NEPA Analyses

Four of the proposed projects or project components are the subject of existing NEPA analyses prepared by other federal agencies. These projects or components are analyzed in whole or in part in these NEPA documents. As lead agency for preparation of this PEIS, DOI has responsibility for the adequacy of the NEPA analysis, and would accordingly be the agency to adopt the applicable existing NEPA analyses. The DOI (or any of its bureaus) is not a cooperating agency on the NEPA analyses DOI has adopted. They are:

[11] This format is not precisely followed for all Florida projects because some are grouped together for environmental review purposes.

7.8.1 Louisiana

- Louisiana Outer Coast Restoration Project components:
  - Chenier Ronquille Barrier Island – Environmental Assessment for the Chenier Ronquille Barrier Island Restoration Project (NOAA 2013).
  - Caillou Lake Headlands - Louisiana Coastal Area Integrated Feasibility Study and Final Environmental Impact Statement for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010).
  - Shell Island - Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final Environmental Impact Statement (USACE 2012).

7.8.2 Mississippi

  - Pascagoula Beachfront Promenade Project - Environmental Assessment for the Department of Housing and Urban Development for the Beachfront Promenade Project (HUD 2011)

Federal agencies are encouraged to coordinate and take appropriate advantage of existing NEPA documents and studies, including adoption and incorporation by reference. Under CEQ NEPA Regulations (40 C.F.R. § 1506.3), DOI NEPA Regulations (43 C.F.R. § 46.120), and individual DOI bureau NEPA procedures, DOI may adopt another federal agency's NEPA analysis to streamline the NEPA compliance process.

DOI may adopt another federal agency's NEPA analysis or portion thereof if it meets the standards for an adequate analysis under the CEQ NEPA regulations, and if it adequately assesses the environmental effects of the proposed action and reasonable alternatives (40 C.F.R. 1506.3(a); 43 C.F.R. 46.120(c)). If DOI adopts another agency's NEPA analysis, the supporting record must include an evaluation of whether new circumstances, new information or changes in the action or its impacts not previously analyzed may result in significantly different environmental effects (43 C.F.R. 46.120(c)). The Spill was not previously considered in the Caillou Lake Headlands – Louisiana Coastal Area Integrated Feasibility Study and Final Environmental Impact Statement (Caillou Lake Headlands FIES) for the Terrebonne Basin Barrier Shoreline Restoration. The Spill was not considered as part of the affected environment in the Caillou Lake Headlands FEIS, and therefore the environmental consequences of the Caillou Lake Headlands alternatives were not considered in light of the Spill. However, the environmental consequences of the Caillou Lake Headlands alternatives would occur regardless of the Spill and the relative impacts of the alternatives considered would not materially change because of the Spill.

In addition to the requirements listed above, DOI may adopt another federal agency's NEPA analysis if DOI independently reviews the analysis and finds that the analysis complies with the DOI NEPA regulations, relevant provisions of the CEQ NEPA regulations and with other program requirements (43 C.F.R. 46.320(a)). DOI must also ensure that DOI's public involvement requirements are met before adopting another federal agency's NEPA analysis (43 C.F.R. 46.320(d)). When appropriate, the Responsible Official may augment the analysis to be consistent with the DOI's proposed action (43 C.F.R. 46.320(b)).

DOI has independently evaluated the existing NEPA analyses pertinent to the four proposed projects or project components listed above. DOI believes these existing NEPA analyses meet the standards for adequate NEPA analyses under the CEQ NEPA regulations, and that they adequately assess the environmental effects of the proposed restoration projects and reasonable alternatives. All applicable environmental commitments previously made in the adopted NEPA documents are incorporated by reference into this Final PEIS.

Summaries of the adopted NEPA analyses for the Caillou Lake Headlands, Chenier Ronquille Barrier Island and Shell Island components of the proposed Louisiana Outer Coast Restoration project are found in Chapter 9, "Proposed Phase III Early Restoration Projects: Louisiana", Sections 9.2, 9.3 and 9.4, respectively. The currently proposed project designs for Shell Island and Caillou Lake Headlands are slightly different from the designs previously evaluated under the existing NEPA documents. These differences in design, however, have been considered and do not result in significantly different environmental effects.

Chapter 10, "Proposed Phase III Early Restoration Projects: Mississippi", includes the proposed Mississippi Pascagoula Beachfront Promenade restoration project (Section 10.7), and contains a summary of the NEPA analysis DOI has adopted. The Pascagoula Beachfront Promenade adopted EA required augmentation due to changes in the proposed action. The project proposed in the Phase III ERP contained elements not analyzed in the 2011 HUD EA, requiring additional analysis (43 C.F.R. 46.320(b)). Elements that were added to the project after the 2011 HUD EA (additional promenade and visitor amenities) are the subject of additional analysis in Section 10.7 and this analysis indicates these additional elements are not expected to "result in significantly different environmental effects" (43 C.F.R. 46.120(c)).

Accordingly, DOI has adopted these NEPA analyses and incorporates them in this PEIS.

7.9 References

HUD (U.S. Department of Housing and Urban Development). 2011. Environmental Assessment for HUD-funded Proposals, Pascagoula Beach Promenade Project. Prepared by BMI Environmental Services, LLC., for the City of Pascagoula.

National Oceanic and Atmospheric Administration (NOAA). 1999. Discounting and the Treatment of Uncertainty in Natural Resource Damage Assessment: Technical Paper 99-1. Silver Spring, MD. Available at: http://www.whitehouse.gov/omb/circulars/a094/a094.pdf.

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United States Army Corps of Engineers (USACE). 2010. Louisiana Coastal Area Integrated Feasibility Study and Final Environmental Impact Statement for the Terrebonne Basin Barrier Shoreline Restoration Terrebonne Parish, Louisiana. Available at: http://www.lca.gov/Projects/3/final_reports.aspx.

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CHAPTER 8: PROPOSED PHASE III EARLY RESTORATION PROJECTS: TEXAS

8.1 Introduction

Following the *Deepwater Horizon* oil spill (Spill), Texas Trustees engaged coastal governments, stakeholders, non-governmental organizations, state and regional agencies, and the public through a variety of public outreach and coordination efforts to discuss NRDA, the restoration planning process, and potential restoration projects related to the Spill. In addition to the meetings discussed in Section 2.1.5 of this document, State Trustees met with stakeholders to provide information and solicit suggestions. Numerous conference calls were also held to coordinate with these stakeholders. Texas also solicited restoration project ideas from the public through outreach at coastal events, including the Freeport Fishin' Fiesta, the Groundwater to the Gulf Summer Teacher Institute, Galveston Bay Days, and the Texas General Land Office (TGLO) Coastal Expo.

Over 250 project ideas in or pertinent to Texas have been received through the Gulf Spill Restoration Site, and have been considered for Early Restoration.[1] Based on outreach efforts, Texas Trustees compiled a list of potential projects for restoration of injured natural resources and services, including recreational use services, and evaluated them based on their alignment with the project evaluation criteria introduced in Chapter 2 of this document. From there, the projects were refined in a group to address multiple categories of injured resources, as well multiple methodologies for implementation. A final consideration was also the likelihood that specific projects could be negotiated successfully with BP. Texas Trustees will continue to accept restoration project ideas. To submit a project idea online, or to view project ideas that have already been submitted, please go to the Gulf Spill Restoration Site (http://www.gulfspillrestoration.noaa.gov/). Projects proposed but not selected for this phase of Early Restoration planning will be considered for future stages of both early and long-term restoration.

Based on the process outlined above, analysis of the evaluation criteria set forth in the OPA regulations and the Framework Agreement, the Trustees are proposing the following Phase III Early Restoration projects in Texas:

1. Expansion of the George Vancouver (Liberty Ship) Artificial Reef in Texas State Waters of the Gulf of Mexico (Freeport Artificial Reef Project);
2. Creation of the Matagorda Artificial Reef in Texas State Waters of the Gulf of Mexico (Matagorda Artificial Reef Project);
3. Creation of an Artificial Reef on the Mid/Upper Texas Coast (Ship Reef Project);[2]
4. Sea Rim State Park Improvements Project (Sea Rim State Park Project); and
5. Galveston Island State Park Beach Redevelopment Project (Galveston Island State Park Project).

[1] As of September 16, 2013.

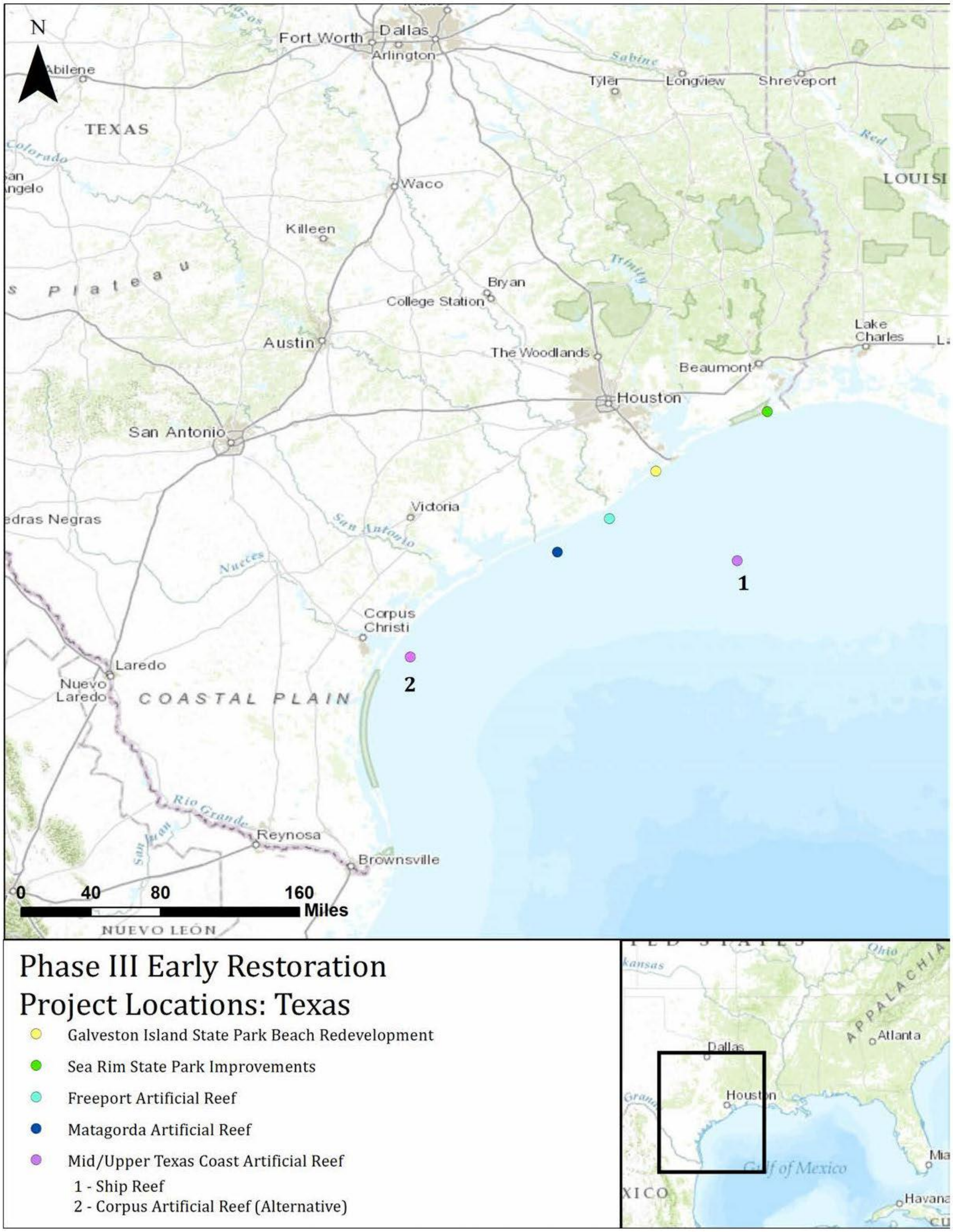
[2] If the Ship Reef Project becomes technically infeasible (if, e.g. an appropriate ship cannot be obtained), an alternative project, the Expansion of the Corpus Christi Artificial Reef in Texas State Waters of the Gulf of Mexico (Corpus Artificial Reef Project) will be implemented instead. Project information and analysis of the Corpus Artificial Reef Project also is provided in this chapter.

The figure below provides a map of the locations of all of the proposed projects in Texas. These projects are consistent with the goal of compensating the public for natural resource injuries resulting from the Spill. The Early Restoration projects proposed in this Phase III ERP/PEIS are not intended to fully compensate the public for injuries caused by the Spill. Additional restoration actions will be required.

Within the remainder of this chapter, there is a subsection for each proposed Phase III Early Restoration project. Each project-specific subsection begins with a general description of the project and relevant background information, followed by: (1) a discussion of the project's consistency with project evaluation criteria; (2) a description of planned performance criteria, monitoring and maintenance; (3) a description of the type and quantity of Offsets BP would receive upon project implementation; and (4) information about estimated project costs.

Following project information is a project-specific environmental review, which provides information regarding the individual project's affected environment and analysis about anticipated environmental consequences of each proposed project. Although each of the proposed projects falls within the Trustees' preferred Programmatic Alternative (Alternative 4) identified and evaluated in Chapters 5 and 6, the Trustees have prepared individual environmental reviews to help ensure that project-specific environmental compliance concerns are addressed.

In order to determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts (local, state-wide, etc.) and their duration (e.g., whether they are short- or long-term impacts). Intensity refers to the severity of impact and could include the timing of the action (e.g., more intense impacts would occur during critical periods like high visitation or wildlife breeding/rearing, etc.). Intensity is also described in terms of whether the impact would be beneficial or adverse. Both context and intensity were considered in the project-specific environmental reviews.



Location of all Phase III Early Restoration projects proposed in Texas.

8.2 Freeport Artificial Reef Project: Project Description

8.2.1 Project Summary

The proposed Freeport Artificial Reef Project will increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Brazos BA-336), the George Vancouver (Liberty Ship) Artificial Reef, located within Texas state waters in the Gulf of Mexico, approximately 6 miles from Freeport, Texas (Figure 8-1). The current reef site is permitted for 160 acres, but only has materials in 40 acres. The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre permitted area onto sandy substrate at a water depth of 55 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational fishing and diving opportunities. The estimated cost for this project is $2,155,365.

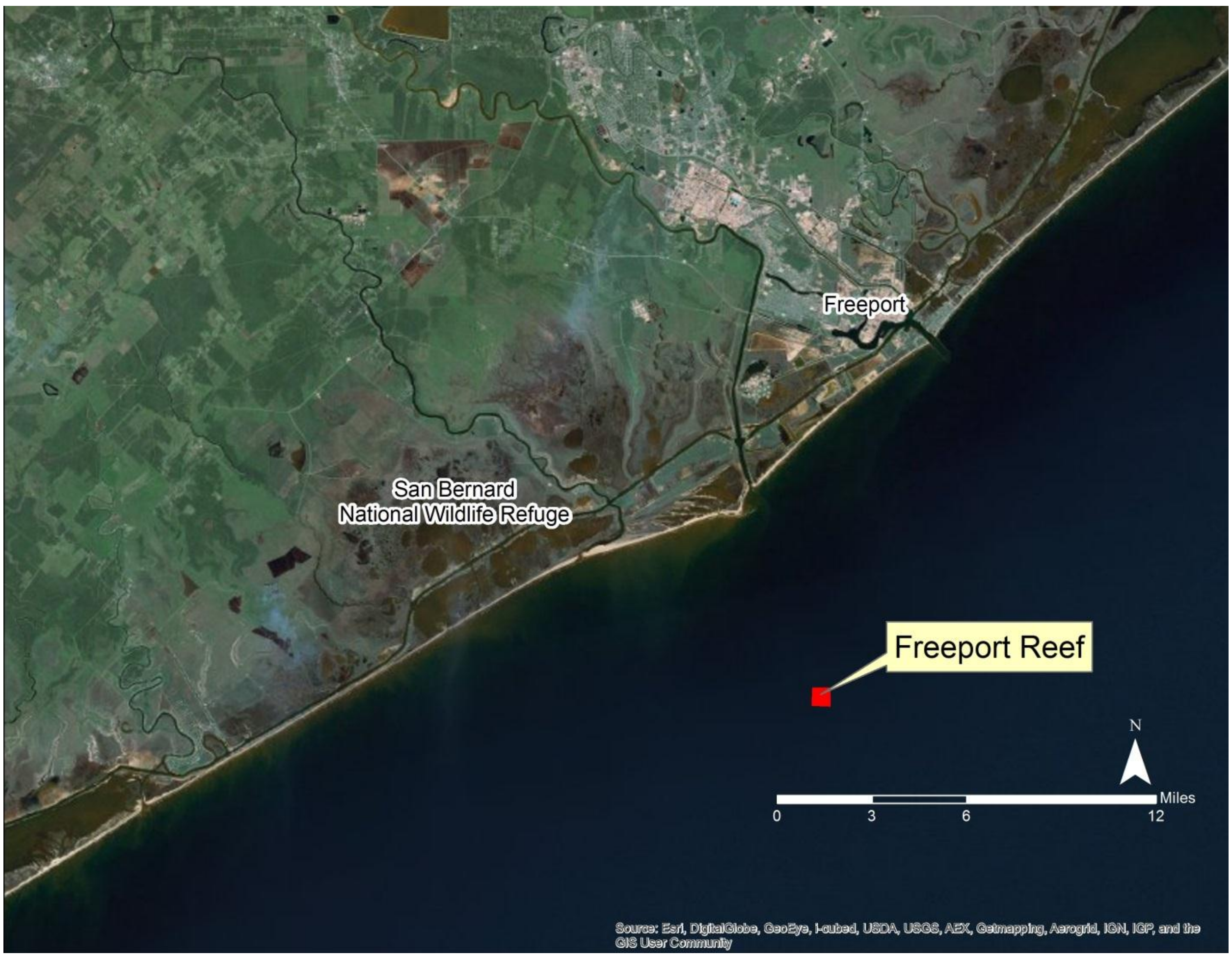


Figure 8-1. Location of the proposed Freeport Artificial Reef Project.

8.2.2 Background and Project Description

The purpose of the Freeport Artificial Reef Project is to enhance recreational fishing opportunities (and limited diving opportunities since water clarity is not usually conducive for diving) for Texas. Texas Parks and Wildlife Department (TPWD) created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989 (Title 5, Texas Parks and Wildlife Code Chapter 89). The Program establishes artificial reefs to create reef fishery habitat as well as enhance commercial and recreational fishing and diving opportunities in state and nearby federal waters. Artificial reefs provide complex, durable and stable habitats for many fishes and marine invertebrates. From an economic standpoint, artificial reefs attract anglers and divers to provide a significant fiscal boost to local economies.

The proposed project will increase the amount of reef materials in a currently permitted artificial reef site, the George Vancouver (Liberty Ship) Artificial Reef, located within Texas state waters in the Gulf of Mexico in the Outer Continental Shelf Block Brazos (BA-336). The current reef site is permitted for 160 acres, but only has materials in 40 acres of the site. The 40 acres contain the Vancouver Liberty Ship, an obsolete 441-foot WWII ship, as well as additional reef material including quarry rock (≥1 ton), concrete culverts, and 100 pyramid structures similar to those proposed for this project. The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre permitted area onto sandy substrate at a water depth of 55 feet, about 6 miles from Freeport, Texas.

The project site is a legacy reef that was originally permitted and created in 1976 with the sinking of the George Vancouver Liberty Ship. The reef permit was later transferred from the Texas Coastal and Marine Council to TPWD in the 1980s before the TPWD's Artificial Reef Program was formally established. The TPWD Coastal Resources Advisory Committee (composed of individuals from relevant industries and groups appointed by the Chairman of the Texas Parks and Wildlife Commission) provided input into the expansion of the reef. The reef is utilized by numerous fishermen. Anecdotal information confirms that the George Vancouver Liberty Ship has attracted divers over the years; however diver use is limited by low visibility at depth due to water clarity. Commercial trawl fishermen avoid the reef site as it is a well-known "wreck" marked with a navigational buoy and on NOAA charts. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program adheres to the Guidelines for Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. Previous deployments at the permitted reef site placed artificial reef materials (the Vancouver Liberty Ship, quarry rock, concrete culverts, and pyramid structures) in a portion of the 160-acre reef site. The Freeport Artificial Reef Project will randomly space 800 to 950 additional predesigned pyramids in the remaining portions of the permitted area.

Texas' artificial reefs are generally created and placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. The predesigned concrete pyramids will be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project will use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-2). This modification was required by the National Marine Fisheries Service (NMFS) in order to complete the Endangered Species Act (ESA) consultation (NMFS 2014a). Each pyramid should penetrate the substrate by no more than 2 feet, and the pyramids will be randomly spaced over the designated portion of the 160-acre permitted reef.

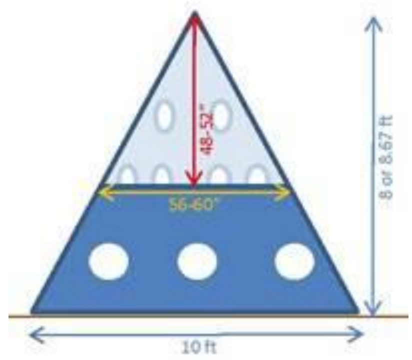


Figure 8-2. An example of the predesigned pyramid structures with the open side.

8.2.3 Evaluation Criteria

This proposed Freeport Artificial Reef Project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Freeport Artificial Reef Project is intended to enhance recreational fishing opportunities (and limited diving opportunities since water clarity is not usually conducive for diving) by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas, which can be more than 30 miles offshore. Transportation to the structures within state waters can be accomplished with smaller boats as well as decreased travel time and cost. The project would enhance opportunities for the public's use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible, utilizes proven techniques with established methods and documented results, and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement). Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. § 990.54(a)(1) and Section 6e of the Framework Agreement).

The site selection of this reef occurred through the work of the Texas Coastal and Marine Council in the early 1970s. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reef sites. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best scientific data available in the decision-making process. The proposed Freeport Artificial Reef Project meets the requirements of the Texas Artificial Reef Act and the goals of the Texas Artificial Reef Fishery Management Plan. The TPWD Coastal Resource Advisory Committee provided input into the expansion of the reef site. As a result, the proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3)).

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.2. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, the best management practices (BMPs) and measures to avoid or minimize impacts described in Section 8.2 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.2.4 Performance Criteria, Monitoring and Maintenance

The Freeport Artificial Reef Project includes monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring has been designed around the project objective, which is to increase the amount of reef materials in a currently permitted artificial reef site (BA-336) through the random placement of 800 to 950 predesigned concrete pyramids within the open portions of the permitted reef site.

Performance criteria for this project will include a determination of successful construction of the project according to design, and then monitoring and maintenance to confirm that the reef materials are in place and available for recreational fishing. In order to determine successful placement of the constructed pyramids in accordance with the design, multi-beam side-scan surveys will be used to document the location of the pyramid structures and ensure all materials are located within the deployment zone and meet all permit conditions, including USCG clearance restrictions. Monitoring using side-scan sonar will be conducted annually (for 2 years) and after major storm events to document any movement and settling of the structures. Recreational use of the reef observed during the side-scan monitoring will also be documented.

While not funded through Early Restoration, recreational use monitoring is being conducted through ongoing research. Currently Texas A&M University-College Station is studying the social and economic impacts of Texas artificial reefs. Also, as TPWD's Artificial Reef Program looks to expand existing reefs and identify locations for new permitted reef areas, TPWD's Artificial Reef Program will continue to receive feedback from user groups regarding placement and use of reefs in Texas.

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A USCG approved marker buoy is already installed at the Freeport reef site and will be maintained per USCG requirements. Regular maintenance of the buoy marker would include cleaning the chain, replacing the reflective

TPWD decal as needed, and replacing or repairing the buoy as needed. Monitoring and maintenance activities will be managed by the TPWD's Artificial Reef Program.

8.2.5 Offsets

The Early Restoration benefits provided by the project, also known as Natural Resource Damage (NRD) Offsets, are $4,310,730 expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill[3] .This Offset is based on the use of a benefit-to-cost (BCR) ratio of 2.0, reflecting the value that users are expected to be provided by the implementation of the proposed project relative to its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.2.6 Cost

The total estimated cost to implement this project is $2,155,365. This cost reflects estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

[3] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

8.3 Freeport Artificial Reef Project: Environmental Review

The proposed Freeport Artificial Reef Project would increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Brazos BA-336), the George Vancouver (Liberty Ship) Artificial Reef, located within Texas state waters in the Gulf of Mexico, approximately 6 miles from Freeport, Brazoria County, Texas. The current reef site is permitted for 160 acres, but only has materials in 40 acres. The 40 acres contain the Vancouver Liberty Ship, an obsolete 441-foot WWII ship (sunk in 1976), as well as additional reef material including quarry rock (≥1 ton), concrete culverts, and 100 pyramid structures similar to the proposed pyramids for this project (Figure 8-3). The proposed project would place predesigned concrete pyramids in the remaining portions of the 160-acre permitted area onto sandy substrate at a water depth of 55 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational opportunities. The estimated cost for this project is $2,155,365.

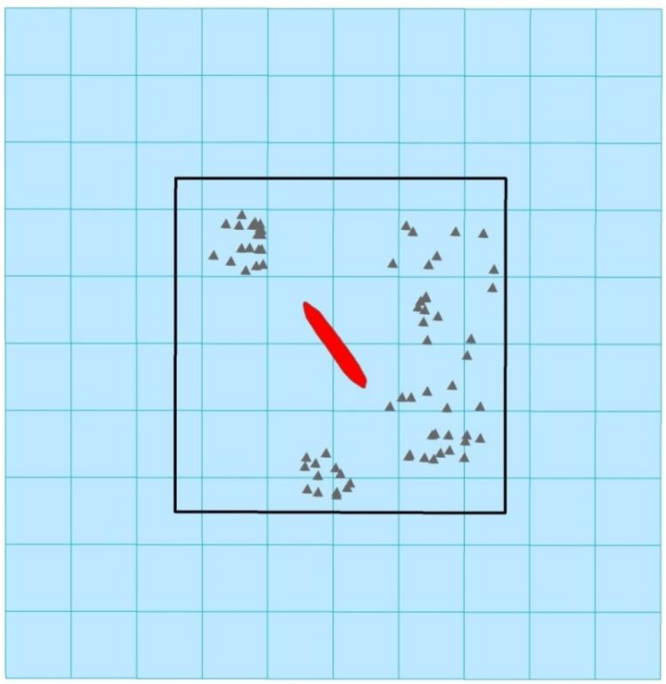


Figure 8-3. Diagram of the 160-acre Freeport Artificial Reef Project area. The gray triangles indicate the area where concrete pyramids are currently located. The red oval depicts the location and orientation of the Liberty Ship. Other artificial reef materials are currently in the project area within the area designated by the black square.

8.3.1 Introduction and Background

Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Freeport Artificial Reef Project is intended to enhance recreational fishing opportunities by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas, which can be more than 30 miles offshore. Transportation to the reef sites within state waters can be accomplished with smaller boats and the short distance allows for a decreased travel time and cost when compared to other offshore options. This project would enhance the public's use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including the Texas Coastal Management Program, and compliance with federal requirements including, but not limited to, the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a U.S. Army Corps of Engineers (USACE) permit (SWG-2010-00264) for the Freeport Artificial Reef Project under Section 10 of the Rivers and Harbors Act in May 2012. During the permitting process, the Freeport Artificial Reef Project was determined to be consistent with the goals and policies of the Texas Coastal Management Program. The USACE permit requires that a 50-meter avoidance zone surrounding the wreck of the George Vancouver be established. TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and avoid impacts to coastal waters. Additionally, the lease requires that the project meet the requirements for clearance and distance from shipping lanes, safety fairways, and anchorages, as established by the USACE and the USCG. A USCG approved marker buoy is already installed at the Freeport reef site and will be maintained per USCG requirements by the TPWD's Artificial Reef Program (Figure 8-4).

Figure 8-4. Example of a USCG approved marker buoy.

The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also adheres to the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best available scientific data in the decision-making process. The proposed Freeport Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

8.3.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Freeport Artificial Reef Project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.3.3 Project Location

The Freeport Artificial Reef Project is located in Texas state waters in the Gulf of Mexico in the Outer Continental Shelf Block, Brazos (BA-336). It is located about 6 miles offshore from Brazoria County, Texas at a center point of 28.793009° N, 95.347796° W (North American Datum 1983). The permitted area is 160 acres of sandy substrate at a water depth of 55 feet. The reef site has been permitted for a 33-foot clearance (33 feet of clear water between the surface and any reef material), which allows for a 22-foot profile of material off the ocean bottom.

The location for the Freeport Artificial Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). Artificial reefs in Texas are designed to enhance existing marine habitat without compromising or adversely affecting bottoms that already have significant hard substrate (i. e. coral reefs, rock outcrops, etc.). Therefore, reefs would not be created on existing natural hard bottom substrates.

8.3.4 Construction and Installation

This project would involve deploying approximately 800 to 950 three-sided predesigned concrete pyramids in the project area. The predesigned concrete pyramids would be complex and have a large surface area which would attract marine life. The predesigned concrete pyramids would be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project would use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-5). This modification was required by NMFS in order to complete the ESA consultation (NMFS 2014a). Each pyramid should penetrate the substrate by no more than 2 feet, and the structures would be randomly spaced over the designated portion of the 160-acre permitted reef (areas without reef materials).

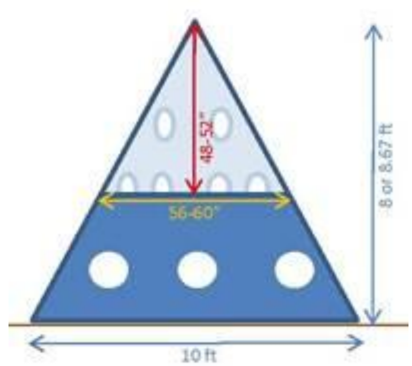


Figure 8-5. An example of the predesigned pyramid structures with the open side.

Texas' artificial reefs are generally placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. A vessel that would minimize its use of anchors or a dynamically positioned vessel (i.e. not anchored) would slowly lower the pyramids into specific position by crane or another method. During pyramid deployment, position is usually maintained visually by use of a temporary marker buoy attached to the first pyramid deployed. A GPS antenna would be positioned at the top of the crane boom to monitor the location of the pyramids as they are placed. As the crane cable lowers the pyramid into the water, a buoy attached to the release mechanism on the crane cable will be pushed upward by water pressure (the orange buoy can be seen at the top of the crane cable in Figure 8-6). When the pyramid nears 5 feet from ocean bottom, the buoy will trigger the release mechanism and the pyramid will drop to the bottom in an up-right position.

Figure 8-6. Photograph of previous artificial reef material deployment completed in Texas.

It is expected that the pyramids would be transported directly from the manufacturer, and therefore a designated staging and stockpiling site is not anticipated. The contractor may choose to have the pyramids built locally, likely working with a local concrete company. Previously purchased pyramids were built in an empty lot at the Port of Corpus Christi.

Request for Proposals (RFPs) to complete the Freeport Artificial Reef Project would be developed and publicly noticed for bid when funds are secured. The process of requesting bid proposals, bid review, and award of contracts may take 4 to 6 months. Once contracts for project implementation are awarded, construction of the pyramids is expected to take 3 to 8 months to complete. If transportation is required, it is expected to take 1-2 weeks depending upon where the manufacturer is based and transportation method (type of vessel). Based on previous artificial reef projects completed in Texas, it is anticipated that one crane barge, one tugboat, one supply barge, two excavators, and two small trucks may be used during reef deployment. Deployment of the pyramids into the project area is expected to take 4 days, working 14 hours per day (daylight hours), but is dependent on weather conditions. The date the contract is awarded may impact the timing of the project. Contracts awarded towards the end of the year (August – December) may not be completed until the following spring or early summer, depending on weather conditions. Before and after reef construction, surveys would be used to verify the correct placement of materials in the project area.

8.3.5 Operations and Maintenance

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A USCG approved marker buoy is already installed at the Freeport reef site and will be maintained per USCG requirements. Regular maintenance of the buoy marker includes cleaning the chain, replacing the reflective TPWD decal as needed, and replacing or repairing the buoy as needed. Monitoring and maintenance activities would continue to be managed by the TPWD's Artificial Reef Program.

8.3.6 Affected Environment and Environmental Consequences

The USACE prepared an Environmental Assessment and Statement of Findings (EA and SOF) in response to TPWD's application for a permit to create an artificial reef in the Freeport Artificial Reef Project area (USACE 2012).[4] The possible consequences of this proposed work were studied for environmental concerns, social well-being, and the public interest, in accordance with regulations published in 33 C.F.R. Parts 320-332. The following factors were determined to be particularly relevant to this application and were evaluated appropriately, as they relate to the least environmentally damaging practicable alternative described in the alternative analysis section: historical and cultural resources, water quality, endangered species, fish and wildlife values, EFH, wetland/special aquatic species, navigation, federal projects, safety, economics, and air pollution. The USACE considered the following factors during the evaluation process and determined that they were not particularly relevant to the permit application: shoreline erosion and accretion, recreation, aesthetics, land use, conservation, floodplain values, energy needs, food and fiber production, and mineral needs. The EA and SOF found that this project would benefit the Texas state fisheries by providing an augmented natural habitat for juvenile fish, which in turn would increase recreational fisheries.

When considering the overall impacts that would result from this project, in context with the overall impacts from similar past, present, and reasonably foreseeable future projects, the USACE concluded that their cumulative impacts are not considered to be significantly adverse since the project involves the creation of artificial reefs to create habitat for juvenile fish. Overall, the project would result in minimal environmental impacts and minimal impacts on fish and wildlife values.

The USACE added a Special Condition to the permit authorization, requiring establishment of a 50-meter avoidance zone surrounding the wreck of the George Vancouver and prohibiting the placement of reef building material within this avoidance zone.

The USACE determined that there would be no significant environmental effects identified from the proposed work. The impact of this proposed activity on aspects affecting the quality of the human environment was evaluated, and the USACE determined that this action does not require an Environmental Impact Statement. The USACE made the determination to issue a permit for the Freeport Artificial Reef Project, which was issued in May 2012 (SWG-2010-00264).

8.3.6.1 Physical Environment

The Gulf of Mexico is the ninth largest body of water in the world and consists of the intertidal zone, continental shelf, continental slope, and abyssal plain. The nearshore coastal environment extends from estuarine waters seaward to the continental shelf edge of the Gulf of Mexico, including the coastline

[4] For purposes of the proposed action under NRDA, the EA and SOF do not provide enough analysis to incorporate the findings by reference (per CEQ's NEPA regulations at 40 C.F.R. §1502.21). The Trustees therefore conducted the more detailed analysis documented here, and are not adopting the USACE EA or information from the SOF. As is appropriate, the Trustees will make an independent decision, and will not rely on the findings of the separate USACE NEPA process. The EA and SOF are discussed in this document for informational purposes only.

and the continental shelf at depths from 0 to 600 feet. The northern Gulf of Mexico is dominated by inputs from the Mississippi River Basin, which drains 41% of the contiguous United States and contributes 90% of the freshwater entering the Gulf (EPA 2011a). Freshwater inflows to the Gulf provide nutrients and create hydrological conditions that create a wide range of ecosystems with unique features and habitats. The description of the physical environment of the Gulf of Mexico is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.3.6.1.1 Geology and Substrates

Affected Resources

The Freeport Artificial Reef Project is located on the continental shelf in Texas waters approximately 6 miles off the coast of Brazoria County, Texas. The nearshore deployment of artificial reef material would be implemented within a portion of the 160-acre permitted area that does not currently contain artificial materials. The predominant sediment is clay overlain with deposits of sand and silt, mainly from the Mississippi River. Soft bottom habitat is not a unique habitat of concern like the hard bottom, deepwater coral, and deepwater community habitats.

The nearshore deployment of artificial reef material would be implemented within the permitted area, avoiding areas where there are existing artificial reef materials. In general, the substrate consists of flat to gently sloping soft, thick bottom with no vegetation such as seagrasses and no dynamic physical features or hard bottom outcrops that would support corals or habitats conducive for foraging or shelter.

Environmental Consequences

The proposed Freeport Artificial Reef Project would be placed on Gulf sediments 55 feet below the surface of the water. Detailed surveys of the ocean bottom have been completed. Any hard outcrops or uneven surfaces identified by the surveys would be avoided during deployment of reef materials. During the placement process, pyramids would slowly be lowered via crane, bobcat or front-end loader, or other mechanical means onto the Gulf's floor, avoiding existing artificial reef structures and a 164-foot (50-meter) buffer zone surrounding the Vancouver Liberty Ship. Each of the 800 to 950 structures would weigh approximately 6,000 pounds and cover an approximately 43-square foot area (10-foot by 10-foot by 10-foot). The installation of each structure would result in some short-term disturbance of the substrate, which would resettle after each construction day. There would be some substrate compaction associated with weight of each structure resulting in a minor long-term impact. However, the substrate itself is very common in the coastal waters. Overall the disturbances to soils or substrates would likely be minor as the impacts would not result in changes to the character of the sediments, geologic features would be avoided and the level of compaction would occur over the local project area.

8.3.6.1.2 Hydrology and Water Quality

Affected Resources

The water quality in this area is highly influenced by input of sediment and nutrients from the Mississippi and Atchafalaya Rivers. A turbid surface layer of suspended particles is associated with the freshwater plume from these rivers. The river system supplies nitrate, phosphate, and silicate to the shelf (Minerals Management Service 2005). Although the Mississippi–Atchafalaya River System accounts for greater than 90% of freshwater discharge into the northern Gulf of Mexico, there are times when the Brazos River is the main source of fresh water to the inner Texas shelf. The Brazos River is the only major Texas river that does not discharge into an embayment system (DiMarco et al. 2012).

Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use. However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

There are no significant currents in the Freeport Artificial Reef Project area. There may be some surface currents during storm events, but these would be temporary and not expected to impact the reefs, which would be at least 45 feet below the water surface.

Environmental Consequences

Short-term increases in turbidity would result from the in-water construction work. The installation of each structure would result in some short-term disturbance of the substrate and locally increased turbidity, which would likely resettle after each construction day. BMPs would include minimizing anchors/anchor spread during deployment and lowering materials slowly. These BMPs along with other avoidance and impact minimization measures required by state and federal regulatory agencies would be employed to minimize any water quality and sedimentation impacts. Given its location, the project would not result in any impacts to wetlands or floodplains. In addition, the placement of reef structures would not alter the hydrology of the area. Water quality would not be affected by reef materials as these materials are non-hazardous. Any associated sedimentation (turbidity plume) would quickly dissipate after the material hits the bottom. There would likely be short-term minor adverse impacts to water quality as there would be localized turbidity issues associated with structure placement, though water quality would quickly be restored after construction ends.

8.3.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The proposed Freeport Artificial Reef Project area is 6 miles offshore and is not classified for National Ambient Air Quality Standards (NAAQS) criteria pollutants under the Clean Air Act. The nearest county, Brazoria County, which falls within an area the EPA designates as the Houston-Galveston-Brazoria Intrastate Air Quality Control Region (HGB). The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. The EPA currently lists the HGB as nonattainment for existing ozone standards.

Implementation of the project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation.

Environmental Consequences

The Freeport Artificial Reef Project implementation would require the use of heavy equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Fine particulate matter associated with the concrete reef materials may become airborne during transportation and deployment. Any air quality impacts that would occur would be localized and short in duration. After project completion, impact to air quality would be limited to ambient pollutants from boat traffic. Increased boat traffic caused by anglers traveling to the reef could potentially increase air pollution in the vicinity; however, increases in air pollution would still be anticipated to be *de minimis*. Therefore, any adverse impacts to air quality would be short-term and minor.

Engine exhaust from barges, tugboats, excavators, and trucks would contribute to an increase in greenhouse gas (GHG) emissions. Impact minimization measures would be employed to reduce the release of GHG during project implementation. The following minimization measures have been identified to reduce or eliminate GHG emissions from the project:

- Shut down idling construction equipment, if feasible;
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including trucks, excavators, barges, and tugboats, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Table 8-1. Estimated greenhouse gas impacts.

EQUIPMENT[5]	NUMBER OF 8-HOUR DAYS	CO_2 (METRIC TONS) [6]	CH_4 (CO_2e) (METRIC TONS) [7]	NO_x (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Pickup truck	8	1.28	0.001	0.008	1.28
Excavator	8	3.04	0.002	0.016	3.04
Tugboat[8]	4	64.00	0.12	0.48	64.60
Boats (x2)	4	10.40	0.016	0.80	10.48
Crane Barge	4	6.36	0.008	0.044	6.40
Supply Barge	4	5.20	0.008	0.040	5.240
TOTAL		**90.28**	**0.155**	**0.668**	**91.04**

[5] Emissions assumptions for all equipment based on 8 hours of operation.

[6] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[7] CH_4 and NO_x emissions assumptions and CO_2e calculations based on EPA 2011b.

[8] Fuel economy assumptions for a 3000 hp marine diesel tug based on Walsh 2008.

Based on the assumptions described in the table above, and the small scale and short duration of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

8.3.6.1.4 Noise

Affected Resources

Implementation of the Freeport Artificial Reef Project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation. The heavy equipment, vehicles, and boats would produce noise both above the water surface and throughout the water column. The primary sources of ambient (background) noise in the project area are operation of vehicles, aircraft, commercial and recreational vessels, and natural sounds such as wind and wildlife.

Environmental Consequences

The construction and transport of the reef materials and the actual deployment would all produce noise. However, the levels of noise would be consistent with the existing background noise in the respective areas. Because construction noise is temporary, negative impacts to the human environment during construction activities would be short-term and minor, as only those in the immediate project area would be aware of the increase in noise; however, it would not affect their activities.

After completion, the noise level should be limited to ambient noise from boat traffic. Increased boat traffic caused by anglers traveling to the reef would increase the noise level in the vicinity; however, that noise level would be associated with the activity and not dissuade users of the area. Overall, long-term noise effects from boating and other recreational activities would be minor. Therefore, any short-term or long-term noise impacts would be minor.

8.3.6.2 Biological Environment

The northern Gulf of Mexico contains a range of habitats that support diverse and productive ecosystems with both nursery and feeding grounds for ecologically and economically important species (GCERTF 2011). These habitats and species are connected through the movement of organisms (population and genetic connectivity) and the exchange of nutrients and organic matter (horizontally from nearshore to offshore, and vertically from the surface waters to the ocean floor). These habitats shelter 97% of all fish and shellfish harvested from the region during spawning or other parts of their life cycle (NOAA 2010). Habitats, resources, and their ecological connection are all part of the biological environment of the northern Gulf of Mexico. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

8.3.6.2.1 Living Coastal and Marine Resources

The Freeport Artificial Reef Project consists of a permitted 160-acre artificial reef area, located approximately 6 miles off the coast of Brazoria County in a water depth of 55 feet. The project area does not contain seagrass beds or hard substrates that would support corals or hard structure habitats. There are existing artificial reef materials which would be avoided during project implementation. The primary living coastal and marine resources are marine and estuarine fauna (fish, shell beds, benthic organisms).

Affected Resources

Biological interactions as well as physiochemical factors such as substrate, temperature, salinity, water depth, currents, oxygen, nutrient availability, and turbidity are critical in determining the distribution, composition, and abundance of continental shelf soft bottom communities. Soft sediment infaunal communities on the continental shelf are generally dominated, in both number of species and individuals, by surface-deposit-feeding polychaete worms, followed by crustaceans and mollusks (Bureau of Ocean Energy Management 2012). Common species on the sediment surface include sea anemones, brittle stars, portunid crabs, and penaid shrimp. These animals are typically distributed on the basis of water depth and sediment composition or grain size, with seasonal components also being present in shallower water areas.

Benthic fauna include infauna (animals that live in the substrate, including mostly burrowing worms, crustaceans, and mollusks) and epifauna (animals that live on or are attached to the substrate, crustaceans, as well as echinoderms, mollusks, hydroids, sponges, and soft and hard corals). Shrimp and demersal fish are closely associated with the benthic community. Substrate is the single most important factor in the distribution of benthic fauna (densities of infaunal organisms increase with sediment particle size), although temperature and salinity are also important in determining the extent of faunal distribution. Depth and distance from shore also influence the benthic faunal distribution. Lesser important factors include illumination, food availability, currents, tides, and wave shock (Minerals Management Service 2005). In general, the vast majority of bottom substrate available to benthic communities in the project area consists of soft, muddy bottoms; the benthos here is dominated by polychaetes.

Many fish species including sharks, snapper, grouper, and mackerel can also be found in the project area.

Environmental Consequences

Fauna in the project area may be affected by the Freeport Artificial Reef Project. Some species may leave the area during deployment activities, but they would likely return after activities cease. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the placement of the reef structures. However, these types of species are not typically numerous in these areas and the footprint of the reef structures is small (10-foot by 10-foot by 10-foot). The relative abundance of sessile organisms would not be significantly impacted since the footprint is small and spacing between pyramids, although random, would be greater than 20 feet apart. The small overall surface impact (with potential impact to sessile organisms) of the reef material is considered a trade-off to the overall habitat potential of the reef material itself. The existing habitat is sand-silt with little to no vertical relief. The artificial reef materials would provide for more surface area in the water column, thereby providing for additional areas for sessile organisms to attach. By providing food and shelter, artificial reefs can enhance overfished populations of resident reef fish like snapper and grouper. Transient species like mackerel, shark, and billfish can also benefit by feeding on the resident fish (USACE 2011).

The placement of reef materials on the soft bottom may temporarily increase turbidity in localized areas as sediments are resuspended into the water column. Increased turbidity can affect the use of the project area by juvenile and adult fish as well as adult shrimp species, which are common in the project area throughout the year. However, the resuspended sediments are expected to settle after each construction day.

Non-native colonization is not within Trustee control and the materials used for this project would not be colonized any faster than any other materials in the Gulf (i.e. bridges, piers, ship wrecks, standing petroleum platforms, etc.). Lionfish, an invasive species, are already present in large numbers in the Gulf and have been seen on the TPWD artificial reef sites from the High Island area (near the National Flower Banks Marine Sanctuary), south to the Texas Clipper artificial reef site near Mexico in the last several years. Divers remove them during monitoring trips by the TPWD's Artificial Reef Program when they can.

This project would likely result in short-term minor adverse impacts due to construction-related disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. The reef project would provide overall long-term benefits to marine species providing additional reef fish habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans.

8.3.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the U.S. Fish and Wildlife Service (FWS) or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, essential fish habitat (EFH) protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act, and eagles protected under the Bald and Golden Eagle Protection Act. The Freeport Artificial Reef Project would be implemented several miles offshore in waters greater than 50 feet depth (where there is no bird nesting habitat), therefore the discussion that follows focuses on species protected by the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Marine Mammal Protection Act. The FWS concurred that the proposed project would not affect federally listed, proposed and candidate species or critical habitats under the jurisdiction of the FWS, or result in take of bald eagles or migratory birds (FWS 2013).

Affected Resources

Endangered Species

Five species of endangered or threatened species of sea turtles were identified as possibly being present in the project area: loggerheads, green, hawksbill, Kemp's ridley, and leatherback turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. Due to the already existing reef structures in the permitted area, endangered or threatened species may utilize the project area as habitat for foraging, breeding, or resting. This area has not been designated as critical habitat for any of the sea turtle species.

There is no designated or proposed critical habitat for any other federally-listed, proposed, or candidate species in the project area.

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 55 managed fish and shellfish (GMFMC 1998). The Freeport Artificial Reef Project is located in an area that is designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish. No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified at the project location.

Table 8-2. EFH within the vicinity of the Freeport Artificial Reef proposed area of effect.

Species	Life stage(s) Found at Location	Fisheries Management Plan
Highly Migratory Species (HMS)		
Scalloped Hammerhead Shark (*Sphyrna lewini*)	All	HMS
Great Hammerhead Shark (*Sphyrna mokarran)*	All	HMS
Bull Shark (*Carcharhinus leucas*)	All	HMS
Atlantic Sharpnose Shark (*Rhizopriondon terraenovae)*	All	HMS
Bonnethead Shark *(Sphyrna tiburo)*	All	HMS
Blacktip Shark (*Carcharhinus limbatus)*	All	HMS
Spinner Shark (*Carcharhinus brevipinna*)	Neonate, Juvenile	HMS
Lemon Shark (*Negaprion brevirostris*)	Neonate, Juvenile	HMS
Finetooth Shark (*Carcharhinus isodon*)	All	HMS
Dusky Shark (*Carcharhinus obscures*)	Adult, Juvenile	HMS
Tiger Shark (*Galeocerdo cuvier*)	Adult, Juvenile	HMS
Red Drum		
Red Drum (*Sciaenops ocellatus*)	Adult	Red Drum
Shrimp		
Brown Shrimp *(Farfantepenaeus aztecus)*	Eggs, Larvae, Adult, Spawning Adult	Shrimp
White shrimp (*Litopenaeus setiferus*)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Coastal Migratory Pelagics		
Cobia (*Rachycentron canadum*)	Larvae, Juvenile, Adult, Spawning Adult	Coastal Migratory Pelagics
King Mackerel (*Scomberomorus cavalla*)	Juveniles, Adults	Coastal Migratory Pelagics
Reef Fish (Triggerfish, Jacks, Snappers, Groupers)		
Gray triggerfish (*Balistes capriscus*)	Eggs, Adults, Spawning Adult	Reef
Greater amberjack (*Seriola dumerili*)	Eggs, Larvae, Spawning Adult	Reef
Almaco jack (*Seriola rivoliana*)	Eggs, Spawning Adult	Reef
Red snapper (*Lutjanus campechanus*)	All	Reef
Gray (mangrove) snapper (*Lutjanus griseus*)	Adult, Spawning Adult	Reef
Dog Snapper (*Lutjanus jocu*)	Eggs, Larvae, Spawning Adult	Reef
Lane snapper (*Lutjanus synagris)*	Eggs, Juvenile, Adult	Reef
Wenchman (*Pristipomoides aquilonaris*)	Adult	Reef
Vermilion snapper (*Rhomboplites aurorubens*)	Juvenile	Reef
Goliath grouper (*Epinephelus itajara*)	Adult	Reef
Gag (*Mycteroperca microlepis*)	Adult	Reef

Marine Mammals

Marine mammals known to occur in the Gulf of Mexico include 21 species of cetaceans (whales and dolphins) plus the West Indian manatee. The Freeport Artificial Reef Project area is located within the NOAA-defined nearshore (estuarine waters to the continental shelf edge (depths of 0-656 feet)).

Typically whales do not occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Of the 22 species of marine mammals known to occur in the Gulf of Mexico, only three protected species of dolphins commonly occur in nearshore waters (bottlenose, Atlantic spotted, and Risso's). The bottlenose dolphin inhabits the Gulf of Mexico year round and is the most commonly observed dolphin in nearshore waters. The Atlantic spotted dolphins prefer warm-temperate waters over the continental shelf, edge, and upper reaches of the slope and are very active at the surface. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>328 feet in depth) (Davis et al. 2002; NMFS 2008). Because of the relatively shallow depth of 55 feet at the project location and the established ranges and depths that the majority of the cetaceans occupy, it is not anticipated that these species would be encountered in the project area during construction.

Of the five listed endangered whale species (sperm whale, sei whale, fin whale, blue whale, humpback whale), only the sperm whale is considered to commonly occur in the Gulf of Mexico. The sperm whale is predominantly found in deep ocean waters, generally deeper than 3,280 feet, on the outer continental shelf. Due to the relatively shallow depth of 55 feet in the project area, the sperm whale, or any other endangered whale, is not likely to be present during the deployment of the materials.

The West Indian Manatee has been observed in Texas waters; however, sightings are very rare and almost always occur in the coastal bays and estuaries. Manatees, which tend to stay near the shoreline, are not expected to be encountered in the project area, which is 6 miles offshore. Because the FWS concurred that the project would not affect West Indian manatee under the ESA, the Trustees determined that no take of manatee under the MMPA is anticipated.

Environmental Consequences

Project deployment would have minor short-term impacts to protected species and their habitats in the areas where the reef materials would be placed. Short-term minor impacts may occur if species using the project area are temporarily disturbed. Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish. The avoidance of artificial reefs areas by the commercial shrimp trawling industry should have a positive impact to sea turtles by providing habitat in which turtles can avoid entanglement in trawls. Overall, the addition of the artificial reef should have a positive impact on federally-listed sea turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, by enhancing their foraging habitat.

At the conclusion of the ESA consultation, NMFS concurred that the project is not likely to adversely affect federally-listed sea turtles (NMFS 2014a). The project area is not located within designated Gulf sturgeon critical habitat (68 FR 13370, March 19, 2003), nor proposed loggerhead sea turtle critical habitat (78 FR 43005, July 18, 2013). As part of the ESA consultation, no best management practices were identified. However, project implementation will adhere to NMFS's Sea Turtle and Smalltooth Sawfish Construction Conditions (2006), The Texas Artificial Reef Fishery Management Plan (TPWD 1990), the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NOAA Fisheries 2007).

While most motile fauna such as crab, shrimp, and finfish have the ability to avoid the area during the sinking process, this project will permanently displace a small portion of the existing natural soft bottom and sand habitat within the project area. This project would result in a minor long-term impact to marine soft bottom EFH by covering it with reef pyramid structures and effectively converting the naturally occurring soft bottom to artificial hard bottom substrate. Soft bottom habitat is very abundant in the Gulf of Mexico whereas hard bottom habitat acreage is much more limited. The relative abundance of soft bottom habitat within and surrounding the project area would not be significantly impacted due to the small footprint of each pyramid (10-foot by 10-foot by 10-foot) and the anticipated 20-foot spacing between the pyramids. The conversion from soft bottom habitat to hard bottom substrate would be considered a habitat trade off by providing new hard structures to be colonized by encrusting marine organisms.

NMFS concurred with the EFH assessment for the project, which determined that temporary and localized turbidity impacts and permanent impacts to soft bottom EFH would occur; however, the creation of new hard structure in the Gulf may also create benefits to some species managed under the Magnuson-Stevens Act by providing foraging habitat, cover, and conditions favorable for encrusting benthic colonization (NMFS 2014b).

The Freeport Artificial Reef site is located at a depth of 55 feet. Typically marine mammal species in the Gulf are found in deeper waters on the outer continental shelf or along the shelf break; therefore, they should not be impacted during the deployment of the material and no incidental take of marine mammals is anticipated. Deployment of the reef materials would be short in duration (4 days) and materials would be lowered slowly, providing fish and wildlife opportunity to leave the reef deployment area. Impacts to wildlife would be avoided via management guidelines and techniques as appropriate. During reef deployment, a monitor would be present that would be able to halt work if sea turtles, smalltooth sawfish, whales, or other federally protected species are in the project area. Work would be halted until such time as the area is deemed safe to continue the operation (i.e., species have left the area). Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006).

8.3.6.3 Human Uses and Socioeconomics

In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

8.3.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

There are over 1.2 million saltwater recreational anglers in Texas. A 1995 study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs (Ditton et al. 1995). Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs each year. Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Commercial shrimping is a highly productive industry within the Gulf of Mexico. The Texas shrimp fishery is one of the most valuable and one of the largest seafood industries in the United States. TPWD sells about 3,500 commercial shrimp boat licenses and about 600 non-commercial shrimp trawl licenses each year. Texas commercial landings exceeded 27.7 million pounds of shrimp in 2010, worth more than $91 million to the commercial fishermen (http://www.tpwd.state.tx.us/fishboat/fish/commercial/comland.phtml). Preliminary data on shrimping frequency indicates a high level of shrimping occurs in the Gulf of Mexico waters in the vicinity of the proposed area (Culbertson et al. 2004). One study reported that shrimping intensities in the western Gulf of Mexico were highest near shore and tapered off gradually at deeper depths (McDaniel et al. 2000).

There are oil and gas pipelines, leases, and an anchorage area within a 5-mile radius of the project. There would be no negative impacts to the exploration and production of oil and gas. The project is not located near any Department of Defense danger zones. The Texas Artificial Reef Plan requires that artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline, nor in prohibited areas and danger zones designated by the U.S. Department of Defense. The reef area is on the NOAA navigation charts and there is a buoy in the project area. Typically, fishermen avoid known hazards that can snag nets to reduce potential damage to equipment and vessels.

Environmental Consequences

Because the Freeport Artificial Reef Project is located offshore, it would have no negative impacts on the socioeconomic status of the communities and counties adjacent to the project. There would be indirect beneficial effects to the local economy due to increased fishing and diving opportunities provided by the artificial reef. Artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. Given the demand for fishing on artificial structures, the creation of Freeport Reef would help increase recreational opportunities. In turn, this is anticipated to increase sales of items such as bait and supplies, boat launch fee revenue, and harbor occupancy. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The project would benefit the local economies adjacent to the project site by increasing use of the harbors, boat ramps, bait camps, and private fishing charter businesses. Commercial fishermen notate obstructions on navigation charts or GPS waypoints to avoid snags and potential damage to equipment and vessels. Overall, socioeconomics would not be adversely impacted as a result of the proposed project. The proposed project is expected to have a positive beneficial impact to the local economy through indirect benefits associated with increased fishing opportunities and tourism.

Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There is not a minority or low-income population in the impact zone – the Gulf of Mexico, 6 miles offshore, is uninhabited. Furthermore, there are no adverse effects to low income or minority populations anticipated from the proposed project.

8.3.6.3.2 Cultural Resources

Affected Resources

The permitted area has been investigated for Historic Properties as documented in the report titled "Marine Remote-Sensing Survey for Archeological Assessment of the Vancouver Artificial Reef Expansion, Gulf of Mexico, Brazoria County, Texas" (Tubby 2012). The George Vancouver Liberty Ship was previously used as artificial reef material within the permitted area and is considered an historic resource. The ship is the only historic resource that was found and identified within the permit area as a result of the investigation and would be avoided during project implementation. The USACE permit requires that a 50-meter avoidance zone surrounding the wreck of the George Vancouver be established.

Environmental Consequences

A detailed archaeology of the entire reef area has been conducted and all areas that could contain historic or culturally important resources would be avoided. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.3.6.3.3 Land and Marine Management

Affected Resources

The Freeport Artificial Reef Project area is located approximately 6 miles offshore of Brazoria County, Texas on state-owned submerged lands. TPWD obtained a USACE permit (SWG-2010-00264) for the Freeport Artificial Reef Project under Section 10 of the Rivers and Harbors Act in May 2012. During the permitting process, the Freeport Artificial Reef Project was determined to be consistent with the goals and policies of the Texas Coastal Management Program (USACE 2012). The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and avoid impacts to coastal waters. Additionally, the lease requires that the project meet the requirements for clearance and distance from shipping lanes, safety fairways, and anchorages, as established by the USACE and the USCG. A USCG approved marker buoy is already installed at the Freeport reef site and will be maintained per USCG requirements.

TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The program establishes artificial reefs to create reef fishery habitat and enhance commercial and recreational fishing opportunities in state and nearby federal waters. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also follows guidance in the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. The proposed Freeport Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

Environmental Consequences

The Freeport Artificial Reef Project would be located offshore, and would not be subject to zoning, land-use planning, or land developments plans. The Texas Artificial Reef Fisheries Management Plan requires that the project not be located within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline; therefore, by following these requirements the project would not have any impacts to the oil and gas production facilities and pipelines in the area of the project. In addition, the project is located greater than 5 miles from the designated shipping fairway and would comply with the USACE and USCG requirement of a minimum of 33 feet clearance above the reef. Therefore, land and marine management would be unaffected by the Freeport Reef Project.

8.3.6.3.4 Aesthetics and Visual Resources

Affected Resources

Reef materials would be loaded onto a boat or barge and transported offshore. The artificial reef materials would be placed on the ocean floor and would not be visible from the surface or shore. The reef is already identified by a buoy with reflective TPWD decals.

Environmental Consequences

The use of barges and large equipment could have a temporary visual impact during the time of project implementation. The deployment time would be short in duration, and therefore any visual impacts would be short in duration as well. The artificial reef would be placed on the ocean floor and would not be visible above the surface. The buoy is already in place, and therefore would not introduce a new visual component to the area. After completion, visual impacts would be limited to boat traffic. Increased boat traffic caused by anglers traveling to the reef would be consistent with the surroundings or designated uses. The boats would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Therefore, the Freeport Artificial Reef Project is expected to have only minor short-term impacts on aesthetics and visual resources.

8.3.6.3.5 Tourism and Recreational Use

Artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. There are over 1.2 million saltwater recreational anglers in Texas. One study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs. Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs (Ditton et al. 1995). Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Environmental Consequences

The size of the Freeport Artificial Reef Project and the ability to only work in a small portion of the reef site at a time should help to minimize impacts to any recreational activities occurring nearby. Recreational and commercial fishing boats may be in the area during deployment. Any boats in the area would be coordinated with prior to the deployment of any materials to ensure safety of everyone in the vicinity. The nearest access point from land is the Freeport Ship Channel to the northeast. The channel is serviced by public boat ramps, marinas, and harbors, which makes the project very accessible to the public. In addition, during scoping meetings conducted by TPWD, numerous constituents related the need for more artificial reefs in Texas waters to enhance offshore fishing for smaller vessels. Given the demand for fishing on artificial structures, the enhancement of the Freeport Reef would increase recreational fishing opportunities. In turn, this project is anticipated to increase sales of items such as bait and supplies, boat launch fee revenue, and harbor occupancy. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. These economic benefits would be concentrated in the service and retail industry sectors. Anglers would be able to fish around the area during deployment of the pyramids. Therefore, no adverse impacts to tourism and recreational use are anticipated. The project should result in beneficial impacts to tourism and recreational uses over the long term.

8.3.6.3.6 Infrastructure

Affected Resources

The Freeport Artificial Reef Project area is located approximately 6 miles offshore of Brazoria County. The project area is located in 55 feet of water and is permitted for a 33-foot clearance to ensure that it would not impede boat traffic. The project is located less than 5 miles from the Freeport Harbor Anchorage area. The reef area is about 8 miles to the shipping fairway, approximately 5,230 feet to oil and gas pipelines, and about 6 miles to the nearest platform.

The Texas Artificial Reef Fisheries Management Plan requires that all artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline.

Environmental Consequences

The project would not impact the existing shipping lanes, fairways or oil and gas production facilities or pipelines. All navigation safety measures would be followed. Navigation occurring in the area would not be adversely affected by this project since the structures would have a minimum 33-foot clearance. Therefore, infrastructure would be unaffected by the proposed project.

8.3.6.3.7 Public Health and Safety and Shoreline Protection

Affected Resources

The Freeport Artificial Reef Project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. During construction of the predesigned concrete pyramids, the Guidelines for Marine Artificial Reef Materials would be followed and the materials would be stable, durable, and complex, and would be clean and free of any hazardous substances. The permitted reef area is located approximately 6 miles offshore and not in an area that would impact shoreline erosion. The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels.

Environmental Consequences

Because of the nature and location of the Freeport Artificial Reef Project, no impacts to public health and safety, or shoreline erosion are anticipated as a result of the construction of the reef or the reef itself. No hazardous waste would be created during construction of the improvements. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. No adverse effects to public health and safety and shoreline projection are expected as a result of this project.

8.3.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Freeport Artificial Reef Project would increase the amount of reef materials in an artificial reef site which is currently permitted for 160 acres, but only has materials in 40 acres. The project would place predesigned concrete pyramids in the remaining portions of the permitted area onto sandy substrate at a water depth of 55 feet. The project is consistent with Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. This restoration project would enhance recreational fishing opportunities. The Trustees have started coordination and reviews under the National Historic Preservation Act and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Endangered Species Act, Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Section 10 of the Rivers and Harbors Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.4 Matagorda Artificial Reef Project: Project Description

8.4.1 Project Summary

The proposed Matagorda Artificial Reef Project will create a new artificial reef site (Outer Continental Shelf Block Brazos BA-439) within Texas state waters in the Gulf of Mexico, approximately 10 miles offshore of Matagorda County, Texas (Figure 8-7). The proposed project will create a new artificial reef within the 160-acre permitted area, through deployment of predesigned concrete pyramids onto sandy substrate at a water depth of 60 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. This project would enhance recreational fishing opportunities. The estimated cost for this project is $3,552,398, which includes an increase of $66,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.[9]

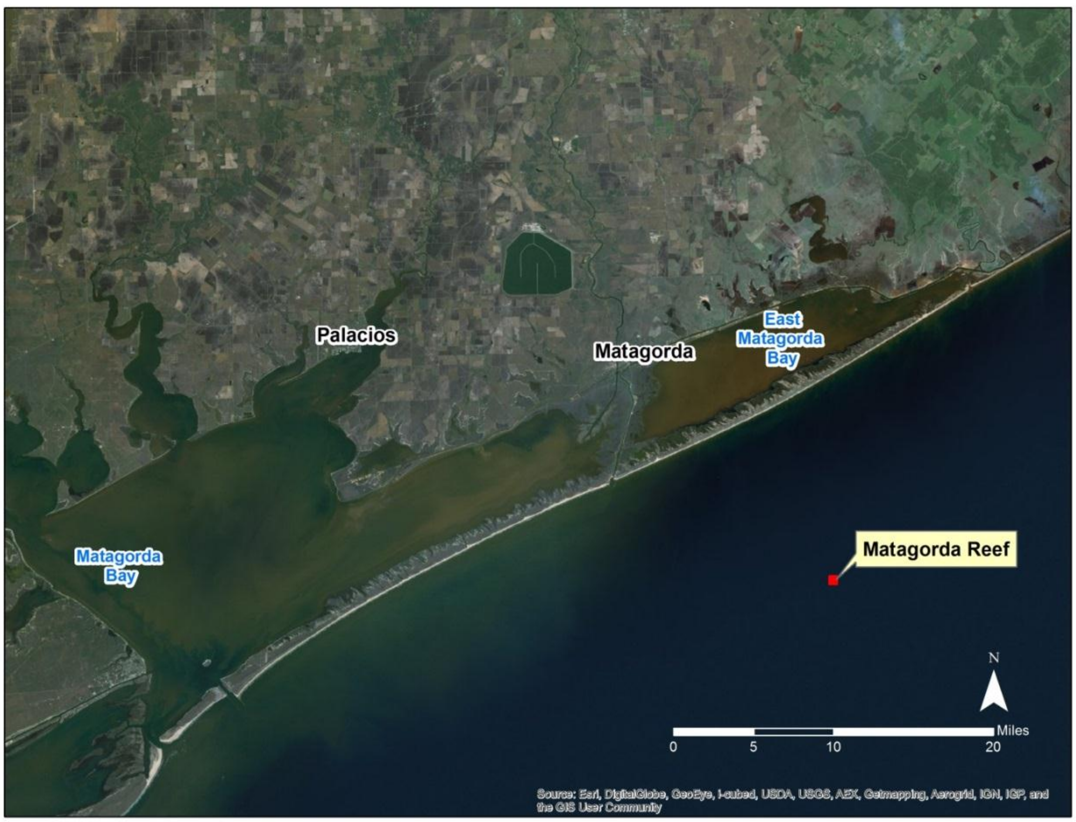


Figure 8-7. Location of the proposed Matagorda Reef Project.

[9] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

8.4.2 Background and Project Description

The purpose of the Matagorda Artificial Reef Project is to enhance recreational fishing opportunities (and limited diving opportunities since water clarity is not usually conducive for diving) for Texas. TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The Program establishes artificial reefs to create reef fishery habitat as well as enhance commercial and recreational fishing opportunities in state and nearby federal waters. Artificial reefs provide complex, durable and stable habitats for many fishes and marine invertebrates. From an economic standpoint, artificial reefs attract anglers and divers to provide a significant fiscal boost to local economies.

The proposed project will create a new artificial reef located within Texas state waters in the Gulf of Mexico in the Outer Continental Shelf Block Brazos (BA-439). The project area is 160 acres of barren, sandy substrate at a water depth of 60 feet, about 10 miles offshore of Matagorda County, Texas.

The location for the Matagorda Artificial Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). TPWD's Artificial Reef Program also adheres to the Guidelines for Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs.

The Texas Sea Grant Extension Service and the Matagorda County local government were consulted for several years before TPWD applied for the reef site permit in 2009. The Texas Sea Grant Extension Service engaged in extensive communication with local fishermen (recreational and commercial), divers, the general public, and local government to assist in developing a local reef site that would enhance marine habitat, provide additional angling opportunities, and strengthen the local economy. The Matagorda reef location was approved after further discussion with the Matagorda County officials and verification that the site adhered to guidance provided in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). Consultation with the TGLO was completed as required to ensure that the site was consistent with the goals and policies of the Texas Coastal Management Plan (USACE 2010). The TPWD Coastal Resource Advisory Committee (composed of individuals from relevant industries and groups appointed by the Chairman of the Texas Parks and Wildlife Commission) also provided input into the location of the reef site. The reef site is located in an area that provides easy access for the local community, does not encroach on existing natural hard substrate, and can be promoted by the local government to encourage tourism and spending to benefit the local economy.

The Matagorda Artificial Reef Project will create a new reef by deploying 1,600 predesigned concrete pyramids randomly within the 160-acre project area. Texas' artificial reefs are generally created and placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. The predesigned concrete pyramids will be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project will use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-8). This modification was required by NMFS in order to complete the ESA consultation (NMFS 2014a). Each pyramid should penetrate the substrate by no more than 2 feet.

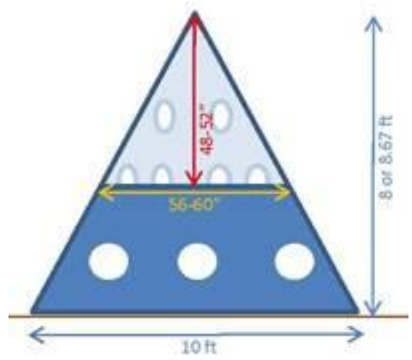


Figure 8-8. An example of the predesigned pyramid structures with the open side.

8.4.3 Evaluation Criteria

This proposed project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Matagorda Artificial Reef Project is intended to enhance recreational fishing opportunities by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas which can be more than 30 miles offshore. Transportation to the structures within state waters can be accomplished with smaller boats as well as decreased travel time and cost. The project would enhance opportunities for public use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible, utilizes proven techniques with established methods and documented results and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement). Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. § 990.54(a)(1) and Section 6e of the Framework Agreement).

The project area was chosen to be appropriate for artificial reef placement, in part, because of public support for the site. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reef sites. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best scientific data available in the decision-making process. The proposed Matagorda Artificial Reef Project meets the requirements of the

Texas Artificial Reef Act and the goals of the Texas Artificial Reef Fishery Management Plan. The Matagorda County local government, the Texas Sea Grant Service, local fishermen, divers, and the public provided input into the selection of the reef site. As a result, the proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3)).

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.4. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, the BMPs and measures to avoid or minimize impacts described in Section 8.4 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.4.4 Performance Criteria, Monitoring and Maintenance

The Matagorda Artificial Reef Project includes monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring has been designed around the project objective, which is to create an artificial reef through the random placement of 1,600 predesigned concrete pyramids within the permitted artificial reef site (BA-439).

Performance criteria for this project will include a determination of successful construction of the project according to design, and then monitoring and maintenance to confirm that the reef materials are in place and available for recreational fishing. In order to determine successful placement of the constructed pyramids in accordance with the design, multi-beam side-scan surveys will be used to document the location of the pyramid structures and ensure all materials are located within the deployment zone and meet all permit conditions, including USCG clearance restrictions. Monitoring using side-scan sonar will be conducted annually (for 2 years) and after major storm events to document any movement and settling of the structures. Recreational use of the reef observed during the side-scan monitoring will also be documented.

While not funded through Early Restoration, recreational use monitoring is being conducted through ongoing research. Currently Texas A&M University-College Station is studying the social and economic impacts of Texas artificial reefs. Also, as TPWD's Artificial Reef Program looks to expand existing reefs and identify locations for new permitted reef areas, TPWD's Artificial Reef Program will continue to receive feedback from user groups regarding placement and use of reefs in Texas.

No ongoing maintenance beyond the annual surveys is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A buoy waiver was received from USCG so buoy maintenance is not expected for the Matagorda Reef Project. The reef site is not located in a high traffic area and therefore no adverse impacts are expected by not marking the site with a buoy. Monitoring and maintenance activities will be managed by the TPWD's Artificial Reef Program.

8.4.5 Offsets

The Early Restoration benefits provided by the project, also known as NRD Offsets, are $7,104,796[10] expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill [11]. This Offset is based on the use of a BCR ratio of 2.0, reflecting the value that users are expected to be provided by the implementation of the proposed project relative to its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.4.6 Cost

The total estimated cost to implement this Matagorda Artificial Reef Project is $3,552,398, which includes an increase of $66,000 over the original estimated cost to complete unanticipated marine archaeological environmental compliance requirements. This cost reflects estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

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[10] The NRD Offset has been updated from the Draft Phase III ERP/PEIS to reflect the increased cost for completing the marine archaeological environmental compliance requirements.

[11] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

8.5 Matagorda Artificial Reef Project: Environmental Review

The proposed Matagorda Artificial Reef Project would create a new artificial reef site (Outer Continental Shelf Block Brazos BA-439) within Texas state waters in the Gulf of Mexico, approximately 10 miles offshore of Matagorda County, Texas. The proposed project would create an artificial reef within the 160-acre permitted area, through deployment of predesigned concrete pyramids onto sandy substrate at a water depth of 60 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. This project would enhance recreational fishing opportunities. The estimated cost for this project is $3,552,398, which includes an increase of $66,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.

8.5.1 Introduction and Background

Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Matagorda Artificial Reef Project is intended to enhance recreational fishing opportunities by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas which can be more than 30 miles offshore. Transportation to the reef sites within state waters can be accomplished with smaller boats and the short distance allows for a decreased travel time and cost when compared to other offshore options. There are no other artificial reef areas in state waters offshore of Matagorda County, Texas. This project would enhance the public's use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including the Texas Coastal Management Program, and compliance with federal requirements including, but not limited to, the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and have found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a USACE permit (SWG-2009-01139) for the Matagorda Artificial Reef Project under Section 10 of the Rivers and Harbors Act in December 2010. During the permitting process, the Matagorda Artificial Reef Project was determined to be consistent with the goals and policies of the Texas Coastal Management Program (USACE 2010).

TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and avoid impacts to coastal waters. Additionally, the lease requires that the project meet the requirements for clearance and distance from shipping lanes, safety fairways, and anchorages, as established by the USACE and the USCG. The USCG reviewed the project and determined that private aids to navigation are not required for this project.

The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also adheres to the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NOAA Fisheries 2007) when constructing artificial reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best available scientific data in the decision-making process. The proposed Matagorda Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

8.5.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Matagorda Artificial Reef Project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.5.3 Project Location

The Matagorda Artificial Reef Project is located within Texas state waters in the Gulf of Mexico in the Outer Continental Shelf Block, Brazos (BA-439). The project is located about 10 miles offshore from Matagorda County, Texas and 17 miles from the mouth of the Colorado River at a center point of 28.516972° N, 95.781252° W (North American Datum 1983). The permitted area is 160 acres of sandy substrate at a water depth of 60 feet. The reef site has been permitted for a 50-foot clearance (50 feet of clear water between the surface and any reef material), which allows for a 10-foot profile of material off the ocean bottom.

The location for the Matagorda Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). Artificial reefs in Texas are designed to enhance existing marine habitat without compromising or adversely affecting bottoms that already have significant hard substrate (i. e. coral reefs, rock outcrops, etc.). Therefore, reefs would not be created on existing natural hard bottom substrates.

The project area was chosen to be appropriate for artificial reef placement, in part, because of public support for the site. The public, Matagorda County local government, the Texas Sea Grant Service, local fishermen and divers provided input into the selection of the reef site. The TPWD developed the Texas Artificial Reef Fishery Management Plan (TPWD 1990) which guides the decision-making process for selecting reef sites and materials and defines parameters for prioritizing areas for reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best scientific data available in the decision-making process.

8.5.4 Construction and Installation

Surveys of the project were conducted in December 2013 to identify potential hard bottom substrates and cultural resources. This project would create a new reef by deploying approximately 1,600 predesigned concrete pyramids in the project area. The predesigned concrete pyramids would be complex and have a large surface area which would attract marine life. The predesigned concrete pyramids would be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project would use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-9). This modification was required by NMFS in order to complete the Endangered Species Act consultation (NMFS 2014a). Each pyramid should penetrate the substrate by no more than 2 feet, and the structures would be randomly spaced over the 160-acre permitted reef site.

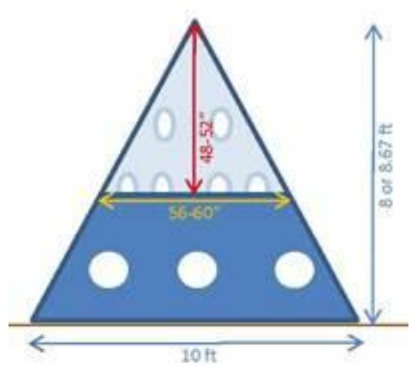

Figure 8-9. An example of the predesigned pyramid structures with the open side.

Texas' artificial reefs are generally placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. A vessel that would minimize its use of anchors or a dynamically positioned vessel (i.e. not anchored) would slowly lower the pyramids into specific position by crane or another method. During pyramid deployment, position is usually maintained visually by use of a temporary marker buoy attached to the first pyramid deployed. A GPS antenna would be positioned at the top of the crane boom to monitor the location of the pyramids as they are placed. As the crane cable lowers the pyramid into the water, a buoy attached to the release mechanism on the crane cable will be pushed upward by water pressure (the orange buoy can be seen at the top of the crane cable in Figure 8-10). When the pyramid nears 5 feet from ocean bottom, the buoy will trigger the release mechanism and the pyramid will drop to the bottom in an up-right position.

Figure 8-10. Photograph of previous artificial reef material deployment completed in Texas.

It is expected that the pyramids would be transported directly from the manufacturer, and therefore a designated staging and stockpiling site is not anticipated. The contractor may choose to have the pyramids built locally, likely working with a local concrete company. Previously purchased pyramids were built in an empty lot at the Port of Corpus Christi.

Request for Proposals (RFPs) to complete the Matagorda Artificial Reef Project would be developed and publicly noticed for bid when funds are secured. The process of requesting bid proposals, bid review, and award of contracts may take 4 to 6 months. Once contracts for project implementation are awarded, construction of the pyramids is expected to take 3 to 8 months to complete. If transportation is required, it is expected to take 1-2 weeks depending upon where the manufacturer is based and transportation method (type of vessel). Based on previous artificial reef projects completed in Texas, it is anticipated that one crane barge, one tugboat, one supply barge, two excavators, and two small trucks may be used during reef deployment. Deployment of the pyramids into the project area is expected to take 10 days, working 14 hours per day (daylight hours), but is dependent on weather conditions. The date the contract is awarded may impact the timing of the project. Contracts awarded towards the end of the year (August – December) may not be completed until the following spring or early summer, depending on weather conditions. Before and after reef construction, surveys would be used to verify the correct placement of materials in the project area.

8.5.5 Operations and Maintenance

No ongoing maintenance beyond the annual surveys is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A buoy waiver was received from the USCG, so buoy maintenance is not expected for the Matagorda Reef Project. Monitoring and maintenance activities would be managed by the TPWD's Artificial Reef Program.

8.5.6 Affected Environment and Environmental Consequences

The USACE prepared an Environmental Assessment and Statement of Findings (EA and SOF) in response to TPWD's application for a permit to create an artificial reef in the project area (USACE 2010).[12] The possible consequences of this proposed work were studied for environmental concerns, social well-being, and the public interest, in accordance with regulations published in 33 C.F.R. Parts 320-332. The EA and SOF found:

- The project will result in the creation of an artificial reef that will augment natural fisheries habitat for juvenile reef fish for the benefit of the public;
- There are no existing natural reefs located within the project site;
- Construction of the reef will enhance the fish and wildlife values of the site;
- Sport and recreational fishing will be enhanced in the area; and
- There will be minimal cumulative environmental impacts from this project.

In the conclusion of the EA and SOF, the USACE made the determination to issue a permit for the Matagorda Reef Project, which was issued in December 2010 (SWG 2009-001139).

8.5.6.1 Physical Environment

The Gulf of Mexico is the ninth largest body of water in the world and consists of the intertidal zone, continental shelf, continental slope, and abyssal plain. The nearshore coastal environment extends from estuarine waters seaward to the continental shelf edge of the Gulf of Mexico, including the coastline and the inner continental shelf at depths from 0 to 600 feet. The northern Gulf of Mexico is dominated by inputs from the Mississippi River Basin, which drains 41% of the contiguous United States and contributes 90% of the freshwater entering the Gulf (EPA 2011a). Freshwater inflows to the Gulf provide nutrients and create hydrological conditions that create a wide range of ecosystems with unique features and habitats. The description of the physical environment of the Gulf of Mexico is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.5.6.1.1 Geology and Substrates

Affected Resources

The Matagorda Artificial Reef Project is located on the continental shelf in Texas waters approximately 10 miles off the coast of Matagorda County, Texas. The predominant sediment is clay overlain with deposits of sand and silt, mainly from the Mississippi River. Soft bottom habitat is not a unique habitat of concern like the hard bottom, deepwater coral, and deepwater community habitats. The nearshore deployment of artificial reef material would be implemented within a permitted area that does not contain existing artificial materials. The project area covers 160 acres of flat to gently sloping soft, thick

[12] For purposes of the proposed action under NRDA, the EA and SOF do not provide enough analysis to incorporate the findings by reference (per CEQ's NEPA regulations at 40 C.F.R. §1502.21). The Trustees therefore conducted the more detailed analysis documented here, and are not adopting the USACE EA or information from the SOF. As is appropriate, the Trustees will make an independent decision, and will not rely on the findings of the separate USACE NEPA process. The EA and SOF are discussed in this document for informational purposes only.

bottom with no vegetation such as seagrasses and no dynamic physical features or hard bottom outcrops that would support corals or habitats conducive for foraging or shelter.

Environmental Consequences

The proposed project would be placed on Gulf sediments 60 feet below the surface of the water. Prior to reef construction, a survey of the project area would be conducted. Any hard outcrops or uneven surfaces identified by the survey would be avoided during deployment of reef materials. During the placement process, pyramids would slowly be lowered via crane, bobcat or front-end loader, or other mechanical means onto the Gulf's floor. Each of the 1,600 structures would weigh approximately 6,000 pounds and cover approximately 43 square-foot area (10-foot by 10-foot by 10-foot). The installation of each structure would result in some short-term disturbance of the substrate, which would resettle after each construction day. There would be some substrate compaction associated with weight of each structure resulting in a minor long-term impact. However, the substrate itself is very common in the coastal waters. Overall the disturbances to soils or substrates would likely be minor as the impacts would not result in changes to the character of the sediments, geologic features would be avoided and the level of compaction would occur over the local project area.

8.5.6.1.2 Hydrology and Water Quality

Affected Resources

The water quality in this area is highly influenced by input of sediment and nutrients from the Mississippi and Atchafalaya Rivers. A turbid surface layer of suspended particles is associated with the freshwater plume from these rivers. The river system supplies nitrate, phosphate, and silicate to the shelf (Minerals Management Service 2005).

Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use. However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

There are no significant currents in the project area. There may be some surface currents during storm events, but these would be temporary and not expected to impact the reefs, which would be at least 50 feet below the water surface.

Environmental Consequences

Short-term increases in turbidity would result from the in-water construction work. The installation of each structure would result in some short-term disturbance of the substrate and locally increased turbidity, which would likely resettle after each construction day. BMPs would include minimizing anchors/anchor spread during deployment and lowering materials slowly. These BMPs along with other avoidance and impact minimization measures required by state and federal regulatory agencies would be employed to minimize any water quality and sedimentation impacts. Given its location, the project would not result in any impacts to wetlands or floodplains. In addition, the placement of reef structures would not alter the hydrology of the area. Water quality would not be affected by reef materials as these materials are non-hazardous. Any associated sedimentation (turbidity plume) would quickly dissipate after the material hits the bottom. There would likely be short-term minor adverse impacts to water quality as there would be localized turbidity issues associated with structure placement, though water quality would quickly be restored after construction ends.

8.5.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources
The proposed Matagorda Artificial Reef Project area is 10 miles offshore and is not classified for NAAQS criteria pollutants under the Clean Air Act. The nearest county, Matagorda County, is not listed as a nonattainment area for any pollutant by the EPA.

Implementation of the project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation.

Environmental Consequences
Matagorda Artificial Reef Project implementation would require the use of heavy equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Fine particulate matter associated with the concrete reef materials may become airborne during transportation and deployment. Any air quality impacts that would occur would be localized and short in duration. After project completion, impact to air quality would be limited to ambient pollutants from boat traffic. Increased boat traffic caused by anglers traveling to the reef could potentially increase air pollution in the vicinity; however, increases in air pollution would still be anticipated to be *de minimis*. Therefore, any adverse impacts to air quality would be short-term and minor.

Engine exhaust from barges, tugboats, excavators, and trucks would contribute to an increase in GHG emissions. Impact minimization measures would be employed to reduce the release of GHG during project implementation. The following minimization measures have been identified to reduce or eliminate GHG emissions from the project:

- Shut down idling construction equipment, if feasible;
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including trucks, excavators, barges, and tugboats, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Table 8-3. Estimated greenhouse gas impacts.

EQUIPMENT[13]	NUMBER OF 8-HOUR DAYS	CO_2 (METRIC TONS)[14]	CH_4 (CO_2e) (METRIC TONS)[15]	NO_X (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Pickup truck[16]	10	1.60	0.001	0.01	1.6
Excavator	10	3.80	0.002	0.02	3.8
Boats (x2)	10	26.00	0.040	0.20	26.2
Tugboat[17]	10	160.00	0.30	1.2	161.5
Crane Barge	10	15.90	0.021	0.11	16.0
Supply Barge	10	13.00	0.020	0.10	13.1
TOTAL		**220.30**	**0.384**	**1.64**	**222.2**

Based on the assumptions described in the table above, and the small scale and short duration of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

8.5.6.1.4 Noise

Affected Resources

Implementation of the Matagorda Artificial Reef Project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation. The heavy equipment, vehicles, and boats would produce noise both above the water surface and throughout the water column. The primary sources of ambient (background) noise in the project area are operation of vehicles, aircraft, commercial and recreational vessels, and natural sounds such as wind and wildlife.

Environmental Consequences

The construction and transport of the reef materials and the actual deployment would all produce noise. However, the levels of noise would be consistent with the existing background noise in the respective areas. Because construction noise is temporary, negative impacts to the human environment during construction activities would be short-term and minor, as only those in the immediate project area would be aware of the increase in noise; however, it would not affect their activities.

After completion, the noise level should be limited to ambient noise from boat traffic. Increased boat traffic caused by anglers traveling to the reef would increase the noise level in the vicinity; however,

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[13] Emissions assumptions for all equipment based on 8 hours of operation.

[14] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[15] CH_4 and NO_x emissions assumptions and CO_2e calculations based on EPA 2011b.

[16] Emissions assumptions for an 8 cylinder, 6.2 liter gasoline engine Ford F150 pickup based on DOE 2013 and 18 gallon (half-tank) daily fuel consumption.

[17] Fuel economy assumptions for a 3000 hp marine diesel tug based on Walsh 2008.

that noise level would be associated with the activity and not dissuade users of the area. Overall, long-term noise effects from boating, personal vehicle use, and other recreational activities would be minor. Therefore, any short-term or long-term noise impacts would be minor.

8.5.6.2 Biological Environment

The northern Gulf of Mexico contains a range of habitats that support diverse and productive ecosystems with both nursery and feeding grounds for ecologically and economically important species (GCERTF 2011). These habitats and species are connected through the movement of organisms (population and genetic connectivity) and the exchange of nutrients and organic matter (horizontally from nearshore to offshore, and vertically from the surface waters to the ocean floor). These habitats shelter 97% of all fish and shellfish harvested from the region during spawning or other parts of their life cycle (NOAA 2010). Habitats, resources, and their ecological connection are all part of the biological environment of the northern Gulf of Mexico. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

8.5.6.2.1 Living Coastal and Marine Resources

The Matagorda Artificial Reef Project consists of a permitted 160 acre artificial reef area, located approximately 10 miles off the coast of Matagorda County in a water depth of 60 feet. The project area does not contain seagrass beds or hard substrates that would support corals or hard structure habitats. There are no existing artificial reef materials in the project site. The primary living coastal and marine resources are marine and estuarine fauna (fish, shell beds, benthic organisms).

Affected Resources

Biological interactions as well as physiochemical factors such as substrate, temperature, salinity, water depth, currents, oxygen, nutrient availability, and turbidity are critical in determining the distribution, composition, and abundance of continental shelf soft bottom communities. Soft sediment infaunal communities on the continental shelf are generally dominated, in both number of species and individuals, by surface-deposit-feeding polychaete worms, followed by crustaceans and mollusks (Bureau of Ocean Energy Management 2012). Common species on the sediment surface include sea anemones, brittle stars, portunid crabs, and penaid shrimp. These animals are typically distributed on the basis of water depth and sediment composition or grain size, with seasonal components also being present in shallower water areas.

Benthic fauna include infauna (animals that live in the substrate, including mostly burrowing worms, crustaceans, and mollusks) and epifauna (animals that live on or are attached to the substrate, crustaceans, as well as echinoderms, mollusks, hydroids, sponges, and soft and hard corals). Shrimp and demersal fish are closely associated with the benthic community. Substrate is the single most important factor in the distribution of benthic fauna (densities of infaunal organisms increase with sediment particle size), although temperature and salinity are also important in determining the extent of faunal distribution. Depth and distance from shore also influence the benthic faunal distribution. Lesser important factors include illumination, food availability, currents, tides, and wave shock (Minerals Management Service 2005). In general, the vast majority of bottom substrate available to benthic communities in the project Area consists of soft, muddy bottoms; the benthos here is dominated by polychaetes.

Many fish species including sharks, snapper, grouper, and mackerel can also be found in the project area.

Environmental Consequences

Fauna in the project area may be affected by the Matagorda Artificial Reef Project. Some species may leave the area during deployment activities, but they would likely return after activities cease. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the placement of the reef structures. However, these types of species are not typically numerous in these areas and the footprint of the reef structures is small (10-foot by 10-foot by 10-foot). The relative abundance of sessile organisms would not be significantly impacted since the footprint is small and spacing between pyramids, although random, would be greater than 20 feet apart. The small overall surface impact (with potential impact to sessile organisms) of the reef material is considered a trade-off to the overall habitat potential of the reef material itself. The existing habitat is sand-silt with little to no vertical relief. The artificial reef materials will provide for more surface area in the water column, thereby providing for additional areas for sessile organisms to attach. By providing food and shelter, artificial reefs can enhance overfished populations of resident reef fish like snapper and grouper. Transient species like mackerel, shark, and billfish can also benefit by feeding on the resident fish (USACE 2011).

The placement of reef materials on the soft bottom may temporarily increase turbidity in localized areas as sediments are resuspended into the water column. Increased turbidity can affect the use of the project area by juvenile and adult fish as well as adult shrimp species, which are common in the project area throughout the year. However, the resuspended sediments are expected to settle after each construction day.

Non-native colonization is not within Trustee control and the materials used for this project would not be colonized any faster than any other materials in the Gulf (i.e. bridges, piers, ship wrecks, standing petroleum platforms, etc.). Lionfish, an invasive species, are already present in large numbers in the Gulf and have been seen on the TPWD artificial reef sites from the High Island area (near the National Flower Banks Marine Sanctuary), south to the Texas Clipper artificial reef site near Mexico in the last several years. Divers remove them during monitoring trips by the TPWD's Artificial Reef Program when they can.

This project would likely result in short-term minor adverse impacts due to construction-related disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. The reef project would provide overall long-term benefits to marine species providing additional reef fish habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans.

8.5.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the FWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, EFH protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act. The Matagorda

Artificial Reef Project would be implemented several miles offshore in waters greater than 50 feet depth (where there is no bird nesting habitat), therefore the discussion that follows focuses on species protected by the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Marine Mammal Protection Act. The FWS concurred that the project would not affect federally listed, proposed and candidate species or critical habitats under the jurisdiction of the FWS, or result in take of bald eagles or migratory birds (FWS 2013).

Affected Resources

Endangered Species

Five species of endangered or threatened species of sea turtles were identified as possibly being present in the project area: loggerheads, green, hawksbill, Kemp's ridley, and leatherback turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. Since there are currently no artificial reef structures in the permitted area, no endangered or threatened species are likely to be utilizing the project area at the time of project implementation as habitat for foraging, breeding, or resting. The project area has not been designated as critical habitat for any of the sea turtle species.

There is no designated or proposed critical habitat for any other federally-listed, proposed, or candidate species in the project area.

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 55 managed fish and shellfish (GMFMC 1998). The Matagorda Artificial Reef Project is located in an area that is designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish. No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified at the project location.

Table 8-4. EFH within the vicinity of the Matagorda Artificial Reef proposed area of effect.

Species	Life stage(s) Found at Location	Fisheries Management Plan
Highly Migratory Species (HMS)		
Scalloped Hammerhead Shark (*Sphyrna lewini*)	All	HMS
Great Hammerhead Shark (*Sphyrna mokarran)*	All	HMS
Bull Shark (*Carcharhinus leucas*)	All	HMS
Atlantic Sharpnose Shark (*Rhizopriondon terraenovae)*	All	HMS
Bonnethead Shark *(Sphyrna tiburo)*	All	HMS
Blacktip Shark (*Carcharhinus limbatus)*	All	HMS
Spinner Shark (*Carcharhinus brevipinna*)	Neonate, Juvenile	HMS
Lemon Shark (*Negaprion brevirostris*)	Neonate, Juvenile	HMS
Finetooth Shark (*Carcharhinus isodon*)	All	HMS
Dusky Shark (*Carcharhinus obscures*)	Adult, Juvenile	HMS
Tiger Shark (*Galeocerdo cuvier*)	Adult, Juvenile	HMS
Red Drum		
Red Drum (*Sciaenops ocellatus*)	Adult	Red Drum
Shrimp		
Brown Shrimp *(Farfantepenaeus aztecus)*	Eggs, Larvae, Adult, Spawning Adult	Shrimp
White shrimp (*Litopenaeus setiferus*)	Eggs, Larvae, Adult, Spawning	Shrimp

Species	Life stage(s) Found at Location	Fisheries Management Plan
	Adult	
Pink shrimp (*Litopenaeus duararum*)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Coastal Migratory Pelagics		
Cobia (*Rachycentron canadum*)	Larvae, Juvenile, Adult, Spawning Adult	Coastal Migratory Pelagics
Reef Fish (Triggerfish, Jacks, Snappers, Groupers)		
Gray triggerfish (*Balistes capriscus*)	Eggs, Adults, Spawning Adult	Reef
Greater amberjack (*Seriola dumerili*)	Eggs, Larvae, Spawning Adult	Reef
Almaco jack (*Seriola rivoliana*)	Eggs, Spawning Adult	Reef
Red snapper (*Lutjanus campechanus*)	All	Reef
Gray (mangrove) snapper (*Lutjanus griseus*)	Adult, Spawning Adult	Reef
Lane snapper (*Lutjanus synagris)*	Eggs, Adult	Reef
Wenchman (*Pristipomoides aquilonaris*)	Adult	Reef
Vermilion snapper (*Rhomboplites aurorubens*)	Juvenile	Reef
Goliath grouper (*Epinephelus itajara*)	Adult	Reef
Yellowmouth grouper(*Mycteroperca interstitialis*)	Eggs, Larvae, Adult	Reef
Gag (*Mycteroperca microlepis*)	Adult	Reef

Marine Mammals

Marine mammals known to occur in the Gulf of Mexico include 21 species of cetaceans (whales and dolphins) plus the West Indian manatee. The project area is located within the NOAA-defined nearshore, estuarine waters to the continental shelf edge (depths of 0-656 feet). Typically whales do not occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Of the 22 species of marine mammals known to occur in the Gulf of Mexico, only three protected species of dolphins commonly occur in nearshore waters (bottlenose, Atlantic spotted, and Risso's). The bottlenose dolphin inhabits the Gulf of Mexico year round and is the most commonly observed dolphin in nearshore waters. The Atlantic spotted dolphins prefer warm-temperate waters over the continental shelf, edge, and upper reaches of the slope and are very active at the surface. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>328 feet in depth) (Davis et al. 2002; NMFS 2008). Because of the relatively shallow depth of 60 feet at the project location and the established ranges and depths that the majority of the cetaceans occupy, it is not anticipated that these species would be encountered in the project area during construction.

Of the five listed endangered whale species (sperm whale, sei whale, fin whale, blue whale, humpback whale), only the sperm whale is considered to commonly occur in the Gulf of Mexico. The sperm whale is predominantly found in deep ocean waters, generally deeper than 3,280 feet, on the outer continental shelf. Due to the relatively shallow depth of 60 feet in the project area, the sperm whale, or any other endangered whale, is not likely to be present during the deployment of the materials.

The West Indian manatee has been observed in Texas waters; however, sightings are very rare and almost always occur in the coastal bays and estuaries. Manatees, which tend to stay near the shoreline, are not expected to be encountered in the project area, which is 10 miles offshore. Because the FWS concurred that the project would not affect West Indian manatee under the ESA, the Trustees determined that no take of manatee under the MMPA would occur.

Environmental Consequences

Project deployment would have minor short-term impacts to protected species and their habitats in the areas where the reef materials would be placed. Short-term minor impacts may occur if species using the project area are temporarily disturbed. Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish. The avoidance of artificial reefs areas by the commercial shrimp trawling industry should have a positive impact to sea turtles by providing habitat in which turtles can avoid entanglement in trawls. Overall, the addition of the artificial reef should have a positive impact on federally-listed sea turtles, such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, by enhancing their foraging habitat.

At the conclusion of the ESA consultation, NMFS concurred that the project is not likely to adversely affect federally-listed sea turtles (NMFS 2014a). The project area is not located within designated Gulf sturgeon critical habitat (68 FR 13370, March 19, 2003), nor proposed loggerhead sea turtle critical habitat (78 FR 43005, July 18, 2013). As part of the Endangered Species Act consultation, no best management practices were identified. However, project implementation will adhere to NMFS's Sea Turtle and Smalltooth Sawfish Construction Conditions (2006), The Texas Artificial Reef Fishery Management Plan (TPWD 1990), the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NOAA Fisheries 2007).

While most motile fauna such as crab, shrimp, and finfish have the ability to avoid the area during the sinking process, this project will permanently displace a small portion of the existing natural soft bottom and sand habitat within the project area. This project would result in a minor long-term impact to marine soft bottom EFH by covering it with reef pyramid structures and effectively converting the naturally occurring soft bottom to artificial hard bottom substrate. Soft bottom habitat is very abundant in the Gulf of Mexico whereas hard bottom habitat acreage is much more limited. The relative abundance of soft bottom habitat within and surrounding the project area would not be significantly impacted due to the small footprint of each pyramid (10-foot by 10-foot by 10-foot) and the anticipated 20-foot spacing between the pyramids. The conversion from soft bottom habitat to hard bottom substrate would be considered a habitat trade off by providing new hard structures to be colonized by encrusting marine organisms.

NMFS concurred with the EFH assessment for the project, which determined that temporary and localized turbidity impacts and permanent impacts to soft bottom EFH would occur; however, the creation of new hard structure in the Gulf may also create benefits to some species managed under the Magnuson-Stevens Act by providing foraging habitat, cover, and conditions favorable for encrusting benthic colonization (NMFS 2014c).

The Matagorda Artificial Reef site is located at a depth of 60 feet. Typically marine mammal species in the Gulf are found in deeper waters on the outer continental shelf or along the shelf break; therefore, they should not be impacted during the deployment of the material and no incidental take of marine mammals is anticipated. Deployment of the reef materials would be short in duration (10 days) and materials would be lowered slowly, providing wildlife opportunity to leave the reef deployment area. Impacts to would be avoided via management guidelines and techniques. During reef deployment, a monitor would be present that would be able to halt work if sea turtles, smalltooth sawfish, whales, or other federally protected species are in the project area. Work would be halted until such time as the area is deemed safe to continue the operation (i.e., species have left the area). Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006).

8.5.6.3 Human Uses and Socioeconomics

In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

8.5.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

There are over 1.2 million saltwater recreational anglers in Texas. A 1995 study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs (Ditton et al. 1995). Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs each year. Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Commercial shrimping is a highly productive industry within the Gulf of Mexico. The Texas shrimp fishery is one of the most valuable and one of the largest seafood industries in the United States. TPWD sells about 3,500 commercial shrimp boat licenses and about 600 non-commercial shrimp trawl licenses each year. Texas commercial landings exceeded 27.7 million pounds of shrimp in 2010, worth more than $91 million to the commercial fishermen (http://www.tpwd.state.tx.us/fishboat/fish/commercial/comland.phtml). Preliminary data on shrimping frequency indicates a high level of shrimping occurs in the Gulf of Mexico waters in the vicinity of the proposed area (Culbertson et al. 2004). One study reported that shrimping intensities in the western Gulf of Mexico were highest near shore and tapered off gradually at deeper depths (McDaniel et al. 2000).

There are oil and gas platforms, leases, and pipelines within a 5-mile radius of the project; however, there would be no negative impacts to the exploration and production of oil and gas. The Matagorda Artificial Reef Project is not located near any Department of Defense danger zones. The Texas Artificial Reef Plan requires that artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline, nor in prohibited areas and danger zones designated by the U.S. Department of Defense. The reef area would be added to the NOAA navigation charts. Typically, fishermen avoid known hazards that can snag nets to reduce potential damage to equipment and vessels.

Environmental Consequences

Because this project is located offshore, it would have no negative impacts on the socioeconomic status of the communities and counties adjacent to the Matagorda Artificial Reef Project. There would be indirect beneficial effects to the local economy due to increased fishing opportunities provided by the artificial reef. Artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. Given the demand for fishing on artificial structures, the creation of Matagorda Reef would help increase recreational opportunities. In turn, this is anticipated to increase sales of items such as bait and supplies, boat launch fee revenue, harbor occupancy, and fuel. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The project would benefit the local economies adjacent to the project site by increasing use of the harbors, boat ramps, bait camps, and private fishing charter businesses. It is expected the commercial fishermen notate obstructions on navigation charts or GPS waypoints to avoid snags and potential damage to equipment and vessels. Overall, socioeconomics would not be adversely impacted as a result of the proposed project. The project is expected to provide a positive beneficial impact to the local economy through indirect benefits associated with increased fishing opportunities and tourism.

Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There is not a minority or low-income population in the impact zone – the Gulf of Mexico, 10 miles offshore, is uninhabited. Furthermore, there are no adverse effects to low income or minority populations anticipated from the proposed project.

8.5.6.3.2 Cultural Resources

Affected Resources

There are no known historic or prehistoric sites in the permitted reef area. A high-resolution geophysical survey was conducted in December 2013 to ensure that no historically or culturally significant areas would be impacted during the deployment of the artificial reef materials. The data collected during the survey was assessed for evidence of high probability areas for prehistoric occupations and shipwrecks. The evaluation of the high-resolution geophysical survey data from a survey conducted within the project area indicates that there were no landforms identified within the survey area that could be considered as high probability areas for prehistoric occupations. There were no sonar contacts identified within the survey area. Three unidentified magnetic anomalies were recorded that are low amplitude, short duration, isolated anomalies that do not exhibit characteristic features usually associated with shipwreck locations. The three unidentified magnetic anomalies are interpreted as probable modern debris. There were no other unusual depressions, scours, sediment changes, unidentified magnetic anomalies or unidentified seafloor targets observed within the survey area that could represent unidentified shipwreck remains.

Environmental Consequences
It is possible that historic shipwreck materials may not be detected by the geophysical instruments or may be obscured by modern debris. If wooden planking or other cultural materials that could represent shipwreck remains are encountered, field operations would cease and a representative from the Texas Historical Commission would be contacted to provide further guidance. If any culturally or historically important resources are identified during project preparations or pre-deployment surveys, such areas would be avoided during deployment of the pyramid structures. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.5.6.3.3 Land and Marine Management

Affected Resources
The project area is located approximately 10 miles offshore of Matagorda County, Texas on state-owned submerged lands. TPWD obtained a USACE permit (SWG-2009-01139) for the Matagorda Artificial Reef Project under Section 10 of the Rivers and Harbors Act in December 2010. During the permitting process, the Matagorda Artificial Reef Project was determined to be consistent with the goals and policies of the Texas Coastal Management Program (USACE 2010). The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and would avoid impacts to coastal waters. Additionally, the lease requires that the project meet the requirements for clearance and distance from shipping lanes, safety fairways, and anchorages, as established by the USACE and the USCG. The USCG reviewed the project and determined that a buoy is not required for this project.

TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The program establishes artificial reefs to create reef fishery habitat and enhance commercial and recreational fishing opportunities in state and nearby federal waters. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also follows guidance in the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating

Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. The proposed Matagorda Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

Environmental Consequences

The Matagorda Artificial Reef Project would be located offshore, and would not be subject to zoning, land-use planning, or land developments plans. The Texas Artificial Reef Fisheries Management Plan requires that the project not be located within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline; therefore, by following these requirements the project would not have any impacts to the oil and gas production facilities and pipelines in the area of the project. In addition, the project is located greater than 5 miles from the designated shipping fairway and would comply with the USACE and USCG requirement of a minimum of 50 feet clearance above the reef. Thus, the project would not adversely impact shipping and navigation use in the project area, and would be consistent with current uses. Therefore, land and marine management would be unaffected by the Matagorda Reef Project.

8.5.6.3.4 Aesthetics and Visual Resources

Affected Resources

Reef materials would be loaded onto a boat or barge and transported offshore. The artificial reef materials would be placed on the ocean floor and would not be visible from the surface or shore.

Environmental Consequences

The use of barges and large equipment could have a temporary visual impact during the time of project implementation. The deployment time would be short in duration and therefore any visual impacts would be short in duration as well. The artificial reef would be placed on the ocean floor and would not be visible above the surface. After completion, visual impacts would be limited to boat traffic. Increased boat traffic caused by anglers traveling to the reef would be consistent with the surroundings or designated uses. The boats would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Therefore, the Matagorda Artificial Reef Project is expected to have only minor short-term impacts on aesthetics and visual resources.

8.5.6.3.5 Tourism and Recreational Use

Affected Resources

Currently an artificial reef does not exist in the area. According to TPWD data, artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. There are over 1.2 million saltwater recreational anglers in Texas. One study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs. Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs (Ditton et al. 1995). Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Environmental Consequences

The size of the project and the ability to only work in a small portion of the reef site at a time should help to minimize impacts to any recreational activities occurring nearby. Because the Matagorda Artificial Reef Project is not placing materials near an existing artificial reef, it would not have any impacts on existing recreational reef fishing in the area. Though unlikely, it is possible that recreational and/or commercial fishing boats may be in the area during deployment. Any boats in the area would be coordinated with prior to the deployment of any materials to ensure safety of everyone in the vicinity. The nearest access points from land include Freeport Ship Channel to the northeast, the Colorado River Channel to the northwest and Matagorda Channel to the south. Each channel is serviced by public boat ramps, marinas, and harbors, which makes the project very accessible to the public. In addition, during scoping meetings conducted by TPWD, numerous constituents related the need for more artificial reefs in Texas waters to enhance offshore fishing for smaller vessels. Given the demand for fishing on artificial structures, the construction of the Matagorda reef would increase recreational fishing opportunities. In turn, this project is anticipated to increase sales of bait and supplies, boat launch fee revenue, and harbor occupancy. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. Anglers would be able to fish around the area during deployment of the pyramids. Therefore, no adverse impacts to tourism and recreational use are anticipated. The project should result in beneficial impacts to tourism and recreational uses over the long-term.

8.5.6.3.6 Infrastructure

Affected Resources

The project area is located approximately 10 miles offshore of Matagorda County. The project area is located in 60 feet of water and is permitted for a 50-foot clearance to ensure that it would not impede boat traffic. The project is located about 21 miles from the Matagorda Channel Anchorage area. The reef area is about 8 miles to the shipping fairway, approximately 5,230 feet to oil and gas pipelines, and about 2 miles to the nearest platform.

The Texas Artificial Reef Fisheries Management Plan requires that all artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline.

Environmental Consequences

The Matagorda Artificial Reef Project would not impact the existing shipping lanes, fairways or oil and gas production facilities or pipelines. All navigation safety measures would be followed. Therefore, infrastructure would be unaffected by this project.

8.5.6.3.7 Public Health and Safety and Shoreline Protection

Affected Resources

The Matagorda Artificial Reef Project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. During construction of the predesigned concrete pyramids, the Guidelines for Marine Artificial Reef Materials would be followed and the materials would be stable, durable, and complex, and would be clean and free of any hazardous substances. The permitted reef area is located approximately 10 miles offshore and not in an area that would impact shoreline erosion.   The project deployment would use mechanical equipment and marine vessels that use oil, lubricants, and fuels.

Environmental Consequences

Because of the nature and location of the Matagorda Artificial Reef Project, no impacts to public health and safety, or shoreline erosion are anticipated as a result of the construction of the reef or the reef itself. No hazardous waste would be created during construction of the improvements. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release will be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. No adverse effects to public health and safety and shoreline projection are expected as a result of this project.

8.5.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Matagorda Artificial Reef Project would create a new artificial reef site approximately 10 miles offshore of Matagorda County, Texas. It would create an artificial reef within the 160-acre permitted area, through deployment of predesigned concrete pyramids. The project is consistent with Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. This restoration project would enhance recreational fishing opportunities. The Trustees have started coordination and reviews under the National Historic Preservation Act and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Endangered Species Act, Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Section 10 of the Rivers and Harbors Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.6 Mid/Upper Texas Coast Artificial Reef - Ship Reef Project: Project Description

8.6.1 Project Summary

The proposed Ship Reef Project will create a new artificial reef site (Outer Continental Shelf Block High Island HI-A-424) in deep waters of the Gulf of Mexico, about 67 miles south-southeast of Galveston, Texas (Figure 8-11). The proposed project will create an artificial reef by sinking a ship that is at least 200 feet long within the 80-acre permitted reef site, in waters that are approximately 135 feet deep. The ship will be cleaned of hazardous substances to meet EPA criteria, as well as pass all required Federal and State inspections, including EPA, TPWD, and USCG. The project would enhance recreational fishing and diving opportunities. This Early Restoration project proposal would fund a portion of the costs to implement this project. The estimated cost for the NRD Early Restoration portion of this project is $1,919,765 which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements. [18] Additional funds from donations to the TPWD Texas Artificial Reef Program will be used to complete the project.

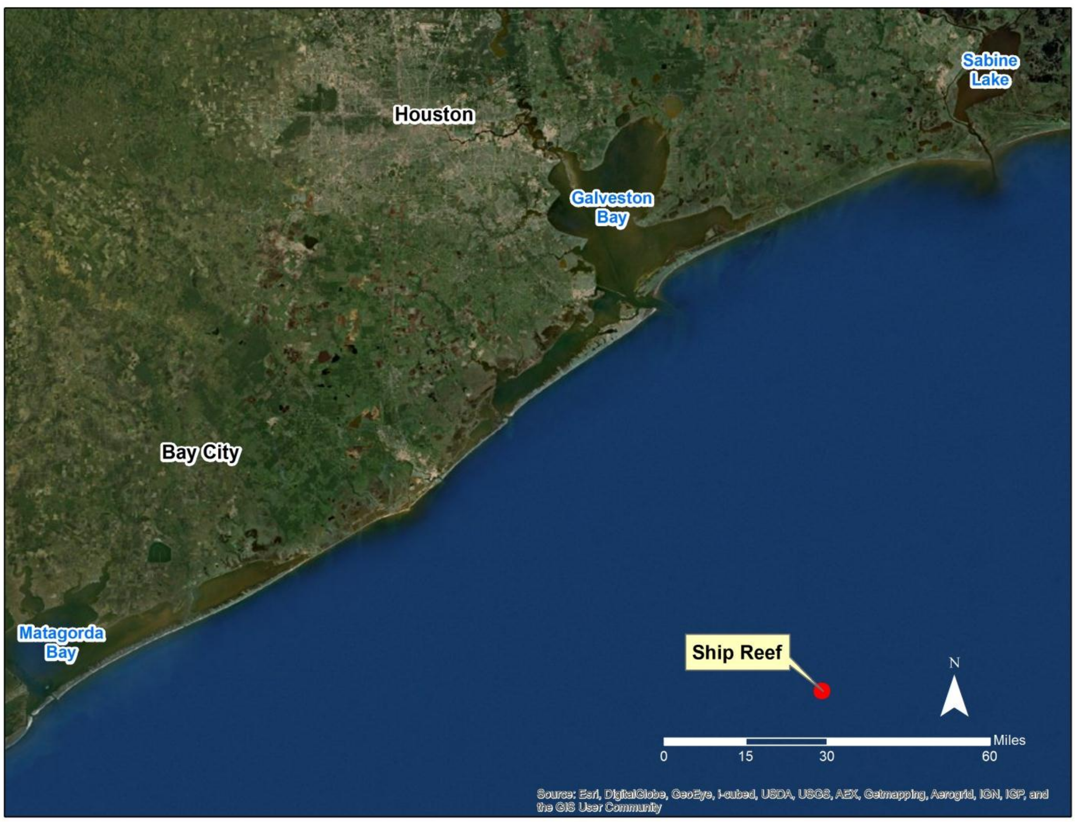

Figure 8-11. Location of the proposed Ship Reef Project.

[18] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

8.6.2 Background and Project Description

The purpose of the Ship Reef Project is to enhance recreational fishing and diving opportunities for Texas. TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The Program establishes artificial reefs to create reef fishery habitat as well as enhance commercial and recreational fishing opportunities in state and nearby federal waters. Artificial reefs provide complex, durable and stable habitats for many fishes and marine invertebrates. From an economic standpoint, artificial reefs attract anglers and provide a significant fiscal boost to local economies.

The proposed project will create a new artificial reef in the Gulf of Mexico in the Outer Continental Shelf Block High Island (HI-A-424). The permitted area is located approximately 67 miles offshore from Galveston, Texas in about 135 feet of water. The project area covers 80 acres of what is believed to be barren, sandy substrate along the continental shelf. An archaeology / bottom survey is currently being contracted to characterize and survey the bottom at this reef site.

The location for the Ship Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). TPWD's Artificial Reef Program also adheres to the Guidelines for Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007), and National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs (EPA and MARAD 2006) when creating artificial reefs. The 80-acre ship reef project area was selected after an evaluation of 35 permitted reef sites in the TPWD General Permit Zone in the High Island Outer Continental Shelf Block of the Gulf of Mexico. High Island 424 (HI-A-424) was selected after consideration of numerous factors, including water depth, proximity to other reef sites, proximity to shipping lanes, navigational concerns, buoy marking requirements, proximity to the Flower Garden Banks National Marine Sanctuary, potential user conflicts, interference with future petroleum operations, and constituency desires.

Texas will acquire and sink a ship that is at least 200 feet long in waters that are approximately 135 feet deep. The ship will be cleaned of hazardous substances to meet EPA criteria, as well as pass all required Federal and State inspections, including EPA, TPWD, and USCG. This project will support the recreational fisherman and divers in Texas by adding structure that will attract reef fish, and preserve the nautical heritage of the ship (Figure 8-12).

Figure 8-12. Example of a ship that was used to create an artificial reef in Texas.

The addition of a ship reef off of the northern coast of Texas has wide support from divers, anglers, fisheries managers, the public, and local governments. Ships are constructed of durable and stable material and once sunk, form complex habitats for attracting marine life, provide recreational opportunities for divers and anglers, and generate economic returns to local communities. The diving community has expressed interest in a ship reef that is designed specifically for diving. The TPWD's Artificial Reef Program recently received a petition of support for a ship reef project from the Texas Gulf Council of Diving Clubs with over 500 diver signatures.

8.6.3 Evaluation Criteria

This proposed Ship Reef Project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Ship Reef Project is intended to enhance recreational fishing and diving opportunities in the Gulf of Mexico offshore of Texas. This proposed ship reef will benefit anglers and divers by creating additional habitat to attract a high diversity of reef species in an area that has good visibility for recreational diving activities. The project would enhance opportunities for public use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible and utilizes proven techniques with established methods and documented results and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement). Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. § 990.54(a)(1) and Section 6e of the Framework Agreement).

This project area was chosen for placement of a ship artificial reef, in part, because of public support for the site. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reef sites.

All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with applicable laws and regulations, and use the best scientific data available in the decision-making process. The proposed Ship Reef Project meets the requirements of the Texas Artificial Reef Act and the goals of the Texas Artificial Reef Fishery Management Plan. The creation of a ship reef off the northern coast of Texas has received wide support from divers, anglers, fisheries managers, the public, and local governments. As a result, the proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3)). While the Trustees believe this to be a technically feasible project, should the Ship Reef Project become technically infeasible (e.g., due to a lack of appropriate ship options), the Trustees have also proposed as an alternate project an artificial reef project within Texas state waters (the Corpus Artificial Reef Project) in which predesigned pyramid reef structures will be deployed.

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.6. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, the BMPs and measures to avoid or minimize impacts described in Section 8.6 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation, operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.6.4 Performance Criteria, Monitoring and Maintenance

This Ship Reef Project includes monitoring efforts to ensure project methods are correctly implemented during implementation. Monitoring has been designed around the project objective, which is to create an artificial reef through the sinking of a ship within the permitted artificial reef site (HI-A-424).

Performance criteria for this project will include a determination of successful construction of the project according to design, and then monitoring and maintenance to confirm that the ship is in place and available for recreational fishing and diving. In order to determine successful placement of the ship according to design plans, multi-beam side-scan surveys and/or divers will verify final location and orientation of the ship before and after project implementation. The post-implementation survey will also be used to confirm that the final project meets all permit conditions, including USCG clearance restrictions. Monitoring using side-scan sonar and/or divers will be conducted annually (for 2 years) and after major storm events to document any movement and settling of the ship. Recreational use of the reef observed during the annual monitoring will also be documented.

While not funded through Early Restoration, recreational use monitoring is being conducted through ongoing research. Currently Texas A&M University-College Station is studying the social and economic impacts of Texas artificial reefs. Also, as TPWD's Artificial Reef Program looks to expand existing reefs and identify locations for new permitted reef areas, TPWD's Artificial Reef Program will continue to receive feedback from user groups regarding placement and use of reefs in Texas.

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A lighted buoy, as required by the USCG, would be installed within the reef area. Regular maintenance of the buoy marker would include cleaning the chain, replacing the light, and replacing or repairing the buoy as needed. The TPWD Artificial Reef Program currently has a buoy maintenance contract in place for other reef sites. This buoy would be added to the current contract. Monitoring and maintenance activities will be managed by the TPWD's Artificial Reef Program.

8.6.5 Offsets

The Early Restoration benefits provided by the project, also known as NRD Offsets, are $3,839,530[19] expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill. [20] This Offset is based on the use of a BCR ratio of 2.0, reflecting the value that users are expected to be provided by the implementation of the proposed project relative to the NRD Early Restoration portion of its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.6.6 Cost

The total estimated cost to implement the Ship Reef Project is estimated to be $4 million. The estimated cost for the NRD Early Restoration portion of this project is $1,919,765 which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements[21]. Additional funds would come from donations to the TPWD's Artificial Reef Program. This cost reflects estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

[19] The NRD Offset has been updated from the Draft Phase III ERP/PEIS to reflect the increased cost for completing the marine archaeological environmental compliance requirements.

[20] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

[21] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

8.7 Mid/Upper Texas Coast Artificial Reef - Ship Reef Project: Environmental Review

The proposed Ship Reef Project would create a new artificial reef site (Outer Continental Shelf Block High Island HI-A-424) in deep waters of the Gulf of Mexico, approximately 67 miles south-southeast of Galveston, Texas (Figure 8-13). The proposed project would create an artificial reef by sinking a ship that is at least 200 feet long within the 80-acre permitted reef site, in water about 135 feet deep. The ship would be cleaned of hazardous substances to meet EPA criteria, as well as pass all required Federal and State inspections, including EPA, TPWD, and USCG. The Ship Reef Project would enhance recreational fishing and diving opportunities. The total estimated cost to implement the Ship Reef Project is estimated to be $4 million. The estimated cost for the NRD Early Restoration portion of this project is $1,919,765 which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.[22] Additional funds would come from donations to the TPWD's Artificial Reef Program.

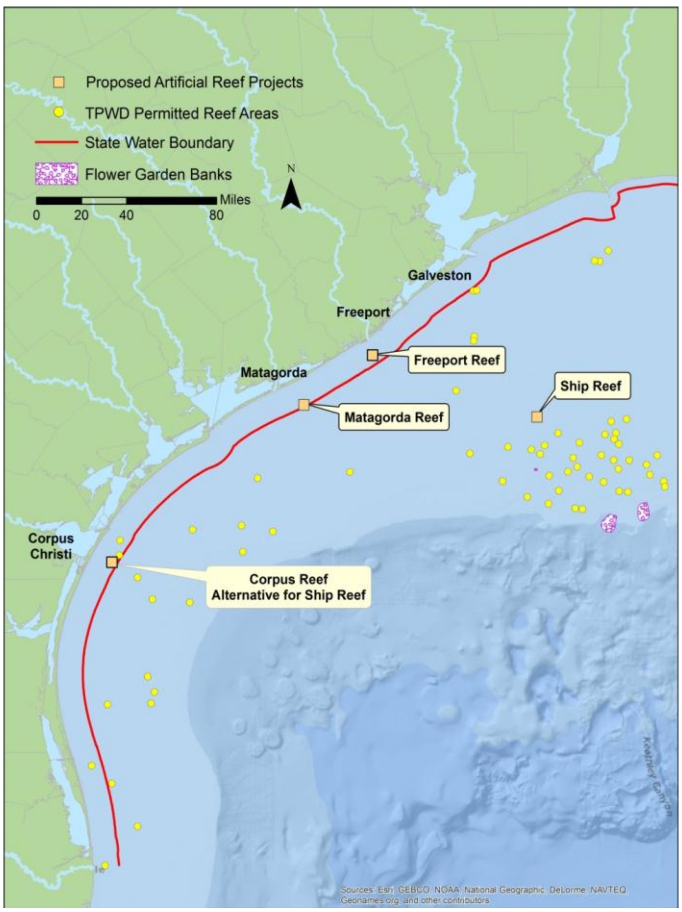

Figure 8-13. Location of the Ship Reef Project and other artificial reef locations along the Texas coast in the Gulf of Mexico.

[22] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

8.7.1 Introduction and Background

Texas experienced a loss of recreational use along the Texas coast during the spill, including recreational fishing and diving, beach use, camping, diving, and wildlife viewing. This project is intended to enhance recreational fishing and diving opportunities by creating artificial reef habitat through the sinking of a ship in clear offshore waters.

The diving community has expressed interested in a ship reef that is designed specifically for diving. Sinking a ship in clear offshore waters that are appropriate for diving would alleviate a need for additional reef diving and fishing activities by Texas patrons. This project would enhance the public's use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

The addition of a ship reef off of the northern coast of Texas has wide support from divers, anglers, fisheries managers, the public and local governments. Ships are constructed of durable and stable material and form complex habitats for attracting marine life, provide recreational opportunities for divers and anglers, and generate economic returns to local communities. The diving community has expressed interest in a ship reef that is designed specifically for diving. The TPWD's Artificial Reef Program recently received a petition of support for a ship reef project from the Texas Gulf Council of Diving Clubs with over 500 signatures. The Ship Reef Project was chosen to be appropriate, in part, because of public support for the site.

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including the Texas Coastal Management Program, and compliance with federal requirements including, but not limited to, the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a USACE permit (SWG-2013-00249) for the Ship Reef Project under Section 10 of the Rivers and Harbors Act in March 2014. The permit requires that the project meet the clearance and distance from shipping lanes, safety fairways, and anchorages requirements as established by the USACE and the USCG. The USCG has conducted a preliminary review of this project and has approved a 60-foot clearance. A lighted buoy would be required.

The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also adheres to the Guidelines for Marine Artificial Reef Materials (Atlantic and

Gulf States Marine Fisheries Commissions 2004), the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007), and National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs (EPA and MARAD 2006) when creating artificial reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best available scientific data in the decision-making process. The proposed Ship Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan. While the Trustees believe this to be a technically feasible project, should the Ship Reef Project become technically infeasible (e.g., due to a lack of appropriate ship options), the Trustees have also proposed an artificial reef project within Texas state waters (the Corpus Reef Project) in which predesigned pyramid reef structures would be deployed.

8.7.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Ship Reef Project or the Corpus Artificial Reef Project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.7.3 Project Location

The Ship Reef Project is located in the Outer Continental Shelf Block High Island (HI-A-424) of the Gulf of Mexico. The site is approximately 67 miles south-southeast of Galveston, Texas in federal waters at a center point of 28.444008° N, 94.285044° W (North American Datum of 1983). The reef site is 80 acres and the water depth is approximately 135 feet. The reef site is anticipated to be permitted for a 60-foot clearance (60 feet of clear water between the surface and the ship), which allows for a 75-foot profile of material off the ocean bottom.

The location for the Ship Reef Project was identified in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). Artificial reefs in Texas are designed to enhance existing marine habitat without compromising or adversely affecting bottoms that already have significant hard substrate (i. e. coral reefs, rock outcrops, etc.). Therefore, reefs would not be created on existing natural hard bottom substrates. The 80 acre Ship Reef Project area was selected after an evaluation of 35 permitted reef sites in the TPWD General Permit Zone in the High Island Outer Continental Shelf Block of the Gulf of Mexico. High Island 424 (HI-A-424) was selected after consideration of numerous factors, including water depth, proximity to other reef sites, proximity to shipping lanes, navigational concerns, buoy marking requirements, proximity to the Flower Garden Banks National Marine Sanctuary, potential user conflicts, interference with future petroleum operations, and constituency desires.

8.7.4 Construction and Installation

Artificial reefs in Texas are designed to enhance existing marine habitat without compromising or adversely affecting bottoms that already have significant hard substrate (i.e. coral reefs, rock outcrops, etc.). Surveys of the project area were conducted in November 2013 to identify potential hard bottom substrates and cultural resources.

TPWD would acquire a ship that is at least 200 feet long, visually complex and interesting for divers, and is able to be properly cleaned, modified and sunk. It is estimated that the surface area on the keel of the ship would be 12,500 square feet, which would cover less than 1% of the permitted 80 acres. That leaves sufficient space for other materials to be reefed at a later date if desired. Prior to sinking, the ship would be cleaned and would undergo modifications to meet clearance and safety requirements. Once the ship has been acquired, the exact method of cleanup, hull modification, and sinking would be determined. The final sinking plan would be adapted in coordination with the USCG to ensure safety of personnel participating and/or observing the sinking. The sinking plan details the explosives plan that would be used to overcome buoyancy and “drive” the ship to the bottom quickly and evenly. The use of explosives is necessary to avoid the effects of surface winds and uneven flooding which could cause the ship to list during sinking. The exact orientation and location of the ship would be determined during the adaptation of the final sinking plan. Small charges would be designed to provide just enough force to open pre-cut holes in the hull for flooding. The final sinking plan would be coordinated with the NMFS to minimize the overall noise impacts above and below the water line. Other plans, including safety plans (for both people and wildlife) would be developed and approved by regulatory agencies. In addition, a lighted buoy, as required by the USCG would be installed within the permitted reef area.

The ship would be modified for sinking in an upright position on the ocean floor and would have a 60-foot clearance between the surface and the highest point of the ship. Divers would descend from the surface to the top of the ship at 60 feet and proceed to the main deck to be located at a depth of approximately 80 feet. They would then have access to the inside of the vessel at selected points. Ship masts would be left standing, and their tops cut and welded onto the deck. The ship would be modified to leave as much of its overall appearance as possible for habitat and diver attraction.

A safety zone radius of approximately 2,000 feet would be established around the reef site during the sinking to exclude all ship and submarine traffic not participating in the sinking action. The specific radius would be determined by the USCG on site. Any traffic within this radius would be warned to alter course or would be escorted from the site. Notices to aviators and mariners would be published in advance of the sinking exercise as coordinated with the USCG. An immediate "STOP WORK" would be ordered if any unauthorized craft entered the safety zone and could not be contacted. The "STOP WORK" order would continue until the safety zone was clear of unauthorized vessels.

Request for Proposals (RFPs) to complete the artificial reef project would be developed and publicly noticed for bid when funds are secured. It may take 4 to 6 months to complete the request for proposals, bid review, and award of contracts. Once contracts for project implementation are awarded, construction, clean-up, inspections, and sinking are expected to take approximately 11 to 16 months to complete. The date the contract is awarded may impact the timing of the project. Contracts awarded towards the end of the year (August – December) may not be completed until the following spring or early summer, depending on weather conditions. Before and after sinking the ship, side scan sonar would be used to verify the correct placement of materials in the project area. The entire project is expected to take approximately 18 months to complete.

8.7.5 Operations and Maintenance

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A lighted buoy, as required by the USCG, would be installed within the permitted reef area. Regular maintenance of the buoy marker would include cleaning the chain, replacing the light, and replacing or repairing the buoy as needed. Monitoring and maintenance activities would be managed by the TPWD's Artificial Reef Program.

8.7.6 Affected Environment and Environmental Consequences

8.7.6.1 Physical Environment

The Gulf of Mexico is the ninth largest body of water in the world and consists of the intertidal zone, continental shelf, continental slope, and abyssal plain. The nearshore coastal environment extends from estuarine waters seaward to the continental shelf edge of the Gulf of Mexico, including the coastline and the inner continental shelf at depths from 0 to 600 feet. The northern Gulf of Mexico is dominated by inputs from the Mississippi River Basin, which drains 41% of the contiguous United States and contributes 90% of the freshwater entering the Gulf (EPA 2011a). Freshwater inflows to the Gulf provide nutrients and create hydrological conditions that create a wide range of ecosystems with unique features and habitats. The description of the physical environment of the Gulf of Mexico is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.7.6.1.1 Geology and Substrates

Affected Resources

The proposed Ship Reef Project is located on the outer continental shelf in the Gulf of Mexico approximately 67 miles off the coast of Galveston, Texas. The location within the project area for the ship would be selected such that any hard bottom substrates that may be identified in the pre-deployment surveys are avoided. In general, the substrate consists of flat to gently sloping soft, thick bottom with no vegetation such as seagrasses and no dynamic physical features or hard bottom outcrops that would support corals or habitats conducive for foraging or shelter.

Environmental Consequences

The Ship Reef Project site is located within the High Island Outer Continental Shelf Block (HI-A-424) in approximately 135 feet of water. Explosives would be used to sink the ship to quickly place the ship on the Gulf's floor rather than other types of flooding techniques. This would ensure correct orientation and placement. It is expected that some minor disturbance of the sediments would occur with the placement of the materials, but they would be short in duration and localized to the project area. There would be some localized compaction in the project site due to the placement of the ship, resulting in a minor long-term impact. However, this would not substantially change the substrate characteristics or local geology. Prior to sinking, a survey of the project area would be conducted. Any hard outcrops or uneven surfaces identified by the survey would be avoided during deployment of reef materials.

Therefore, any adverse impacts to geology and substrates would be minor both in the short-term due to site disturbance and in the long-term due to minimal substrate compaction.

8.7.6.1.2 Hydrology and Water Quality

Affected Resources

Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use. However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

Environmental Consequences

Creation of a ship reef would result in short-term, minor adverse impacts to water quality. Specifically, short-term increases in turbidity would occur as a result of the ship settling onto the ocean floor. BMPs would include minimizing the size of explosives used during deployment of the ship. Additionally, all hazardous materials will be removed from the ship before deployment per EPA and US Maritime Administration National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs (2006). This will insure that water quality is not compromised from substances leaching from the ship itself. These BMPs along with other avoidance and impact minimization measures required by state and federal regulatory agencies would be employed to minimize any water quality and sedimentation impacts. Given its location, the Ship Reef Project would not result in any impacts to wetlands or floodplains. In addition, the placement of reef structures would not alter the hydrology of the area. Therefore, any adverse impacts to water quality would be short-term and minor.

8.7.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The project area is located approximately 67 miles offshore and in an area that is not classified for NAAQS criteria pollutants under the Clean Air Act.

Implementation of the project would include transportation of the ship to the project area, which may include ship, barge, truck or other types of transportation.

Environmental Consequences

Project implementation would require the use of tugboats, support vessels and possibly aircraft. Available BMPs would be employed to prevent, minimize, and control potential air pollutants during project implementation. Any air quality impacts that would occur would be localized and short in duration. During the permit review, the USACE determined that exhaust from vessel engines used in the transportation of the reef materials would be released; however, the exhaust should not significantly raise the amount of criteria pollutants commonly released by other vessels in the area and are clearly *de minimis* (USACE 2014a). After project completion, impact to air quality would be limited to ambient pollutants from boat traffic. Increased boat traffic caused by anglers traveling to the reef could potentially increase air pollution in the vicinity; however, increases in air pollution would still be anticipated to be *de minimis*. Therefore, any adverse impacts to air quality would be short-term and minor.

Engine exhaust from vessels and aircraft would contribute to an increase in GHG emissions. Impact minimization measures would be employed to reduce the release of GHG during project implementation. The following minimization measures have been identified to reduce or eliminate GHG emissions from the project:

- Shut down idling construction equipment, if feasible;
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including trucks, excavators, barges, and tugboats, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Table 8-5. Estimated greenhouse gas impacts.

EQUIPMENT[23]	NUMBER OF 8-HOUR DAYS	CO_2 (METRIC TONS) [24]	CH_4 (CO_2e) (METRIC TONS) [25]	NO_X (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Tugboats[26]	4	64.00	0.12	0.48	64.60
Boats[27]	5	6.50	0.01	0.05	6.55
Pickup truck[28]	1	0.16	0.00	0.00	0.16
TOTAL		**70.66**	**0.13**	**0.53**	**71.31**

Based on the assumptions described in the table above, and the small scale and short duration of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

[23] Emissions assumptions for all equipment based on 8 hours of operation.

[24] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[25] CH_4 and NOx emissions assumptions and CO_2e calculations based on EPA 2011b.

[26] Fuel economy assumptions for a 3000 hp marine diesel tug based on Walsh 2008.

[27] Fuel economy assumptions for a 300 hp marine diesel powerboat and 1000 hp marine diesel passenger ferry based on Becker, no date.

[28] Emissions assumptions for an 8 cylinder, 6.2 liter gasoline engine Ford F150 pickup based on DOE 2013 and 18 gallon (half-tank) daily fuel consumption.

8.7.6.1.4 Noise

Affected Resources

Transportation and the use of explosives for sinking would produce noise both above the water surface and throughout the water column. The primary sources of ambient (background) noise in the project area are operation of vehicles, aircraft, commercial and recreational vessels, and natural sounds such as wind and wildlife.

Environmental Consequences[29]

During transportation, the levels of noise would be consistent with the existing background noise in the respective areas. The sinking of the ship would produce noise due to the use of explosives. A buffer area would be determined and the public would not be allowed in the area while the ship sinking activities are occurring.

Because noise due to project implementation is temporary, negative impacts to the human environment during construction activities would be short-term and minor, as only those in areas adjacent to the project area would be aware of the increase in noise; however, it would not affect their activities. After completion, the noise level should be limited to ambient noise from boat traffic. Increased boat traffic caused by anglers and divers traveling to the reef would increase the noise level in the vicinity; however, that noise level would be associated with the activity and not dissuade users of the area. Overall, long-term noise effects from boating, personal vehicle use, and other recreational activities would be minor. Therefore, any short-term or long-term noise impacts would be minor.

8.7.6.2 Biological Environment

The northern Gulf of Mexico contains a range of habitats that support diverse and productive ecosystems with both nursery and feeding grounds for ecologically and economically important species (GCERTF 2011). These habitats and species are connected through the movement of organisms (population and genetic connectivity) and the exchange of nutrients and organic matter (horizontally from nearshore to offshore, and vertically from the surface waters to the ocean floor). These habitats shelter 97% of all fish and shellfish harvested from the region during spawning or other parts of their life cycle (NOAA 2010). Habitats, resources, and their ecological connection are all part of the biological environment of the northern Gulf of Mexico. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

8.7.6.2.1 Living Coastal and Marine Resources

The Ship Reef Project consists of a permitted 80-acre artificial reef area, located approximately 67 miles off the coast of Galveston Island, Texas in a water depth of around 135 feet. The project area does not contain seagrass beds. An additional survey would be conducted prior to deployment of the ship to identify any hard substrates that would support corals or hard structure habitats. If any such substrates are identified, those areas would not be used to sink the ship. The primary living coastal and marine resources are marine and estuarine fauna (fish, shell beds, benthic organisms).

[29] Potential impacts to marine species are addressed in the Biological Environment (Section 8.6.5.5).

Affected Resources
Biological interactions as well as physiochemical factors such as substrate, temperature, salinity, water depth, currents, oxygen, nutrient availability, and turbidity are critical in determining the distribution, composition, and abundance of continental shelf soft bottom communities. Soft sediment infaunal communities on the continental shelf are generally dominated, in both number of species and individuals, by surface-deposit-feeding polychaete worms, followed by crustaceans and mollusks (Bureau of Ocean Energy Management 2012). Common species on the sediment surface include sea anemones, brittle stars, portunid crabs, and penaid shrimp. These animals are typically distributed on the basis of water depth and sediment composition or grain size, with seasonal components also being present in shallower water areas.

Benthic fauna include infauna (animals that live in the substrate, including mostly burrowing worms, crustaceans, and mollusks) and epifauna (animals that live on or are attached to the substrate, crustaceans, as well as echinoderms, mollusks, hydroids, sponges, and soft and hard corals). Shrimp and demersal fish are closely associated with the benthic community. Substrate is the single most important factor in the distribution of benthic fauna (densities of infaunal organisms increase with sediment particle size), although temperature and salinity are also important in determining the extent of faunal distribution. Depth and distance from shore also influence the benthic faunal distribution. Lesser important factors include illumination, food availability, currents, tides, and wave shock (Minerals Management Service 2005). In general, the vast majority of bottom substrate available to benthic communities in the Ship Reef Project area consists of soft, muddy bottoms; the benthos here is dominated by polychaetes.

Many fish species such as red snapper, grouper, ling, dorado, and black fin tuna can also be found in the project area.

Environmental Consequences
This project would affect marine and estuarine fauna. Many organisms would likely leave the area. However, those that do not leave the project area may be affected at different intensities as a result of primarily the explosives used in the sinking of the ship. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the sinking of the ship. However, these types of species are not typically numerous in these areas. The relative abundance of sessile organisms would not be significantly impacted since the footprint is small. The small overall surface impact (with potential impact to sessile organisms) of the ship is considered a trade-off to the overall habitat potential of the ship itself. The existing habitat is sand-silt with little to no vertical relief. The ship would provide for more surface area in the water column, thereby providing for additional areas for sessile organisms to attach. By providing food and shelter, artificial reefs can enhance overfished populations of resident reef fish like snapper and grouper. Transient species like mackerel, shark, and billfish can also benefit by feeding on the resident fish (USACE 2011).

Most impacts would be related to the techniques used to sink the ship. The final sinking plan would be coordinated with the NMFS to minimize underwater impacts from explosives. The explosive charges employed would be the smallest needed to puncture pre-cut plates in order to sink the ship. Detonations of explosives along the ship would be in a rapid series rather than simultaneous in order to minimize impacts to marine fauna.

The placement of reefing materials on the soft bottom may temporarily increase turbidity in localized areas as sediments are resuspended into the water column. Increased turbidity can affect the use of the project area by juvenile and adult fish as well as adult shrimp species, which are common in the project area throughout the year.   However, the resuspended sediments are expected to settle quickly after the ship has been deployed.

Non-native colonization is not within Trustee control and the materials used for this project would not be colonized any faster than any other materials in the Gulf (i.e. bridges, piers, ship wrecks, standing petroleum platforms, etc.). Lionfish, an invasive species, are already present in large numbers in the Gulf and have been seen on the TPWD artificial reef sites from the High Island area (near the National Flower Garden Banks Marine Sanctuary), south to the Texas Clipper site near Mexico in the last several years. Divers remove them during monitoring trips by the TPWD's Artificial Reef Program when they can.

This project would likely result in both short and long-term minor impacts related to disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. Benthic organisms that inhabited the footprint of the area upon which the ship comes to rest would be lost. However, it would provide overall long-term benefits to marine species providing additional reef fish habitat, increased benthic productivity, and enhanced recruitment and production of fish and mobile crustaceans.

8.7.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the FWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, essential fish habitat (EFH) protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act. The Ship Reef Project would be implemented several miles offshore in waters greater than 100 feet depth (where there is no bird nesting habitat), therefore the discussion that follows focuses on species protected by the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Marine Mammal Protection Act. The FWS concurred that the project would not affect federally listed and candidate species or critical habitats under the jurisdiction of the FWS, or result in take of bald eagles or migratory birds (FWS 2013).

Affected Resources

Endangered Species

Five species of endangered or threatened species of sea turtles were identified as possibly being present in the project area: loggerheads, green, hawksbill, Kemp's ridley, and leatherback turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. Since there are currently no artificial reef structures in the permitted area, no endangered or threatened species are likely to be utilizing the project area at the time of project implementation as habitat for foraging, breeding, or resting. This area has not been designated as critical habitat for any of the sea turtle species.

There is no designated or proposed critical habitat for any other federally-listed, proposed, or candidate species in the project area.

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 44 managed fish and shellfish (GMFMC 1998). The Ship Reef Project is located in an area that is designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish. No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified at the project location.

Table 8-6. EFH within the vicinity of the Ship Reef proposed area of effect.

Species	Life stage(s) Found at Location	Fisheries Management Plan
Highly Migratory Species (HMS)		
Scalloped Hammerhead Shark (*Sphyrna lewini*)	All	HMS
Great Hammerhead Shark (*Sphyrna mokarran)*	All	HMS
Bull Shark (*Carcharhinus leucas*)	All	HMS
Atlantic Sharpnose Shark (*Rhizopriondon terraenovae)*	All	HMS
Bonnethead Shark *(Sphyrna tiburo)*	All	HMS
Blacktip Shark (*Carcharhinus limbatus)*	All	HMS
Spinner Shark (*Carcharhinus brevipinna*)	Neonate, Juvenile	HMS
Lemon Shark (*Negaprion brevirostris*)	Neonate, Juvenile	HMS
Finetooth Shark (*Carcharhinus isodon*)	All	HMS
Dusky Shark (*Carcharhinus obscures*)	Adult, Juvenile	HMS
Tiger Shark (*Galeocerdo cuvier*)	Adult, Juvenile	HMS
Red Drum		
Red Drum (*Sciaenops ocellatus*)	Adult	Red Drum
Shrimp		
Brown Shrimp *(Farfantepenaeus aztecus)*	Eggs, Larvae, Adult, Spawning Adult	Shrimp
White shrimp (*Litopenaeus setiferus*)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Coastal Migratory Pelagics		
Cobia (*Rachycentron canadum*)	Larvae, Juvenile, Adult, Spawning Adult	Coastal Migratory Pelagics
King Mackerel (*Scomberomorus cavalla*)	Juveniles, Adults	Coastal Migratory Pelagics
Reef Fish (Triggerfish, Jacks, Snappers, Groupers)		
Gray triggerfish (*Balistes capriscus*)	Eggs, Adults, Spawning Adult	Reef
Greater amberjack (*Seriola dumerili*)	Eggs, Larvae, Spawning Adult	Reef
Almaco jack (*Seriola rivoliana*)	Eggs, Spawning Adult	Reef
Red snapper (*Lutjanus campechanus*)	All	Reef
Gray (mangrove) snapper (*Lutjanus griseus*)	Adult, Spawning Adult	Reef
Dog Snapper (*Lutjanus jocu*)	Eggs, Larvae, Spawning Adult	Reef
Lane snapper (*Lutjanus synagris)*	Eggs, Juvenile, Adult	Reef
Wenchman (*Pristipomoides aquilonaris*)	Adult	Reef
Vermilion snapper (*Rhomboplites aurorubens*)	Juvenile	Reef
Gag (*Mycteroperca microlepis*)	Adult	Reef

Marine Mammals

Marine mammals known to occur in the Gulf of Mexico include 21 species of cetaceans (whales and dolphins) plus the West Indian manatee. The project area is located within the NOAA-defined nearshore, estuarine waters to the continental shelf edge (depths of 0-656 feet). Typically whales do not occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Of the 22 species of marine mammals known to occur in the Gulf of Mexico, only three protected species of dolphins commonly occur in nearshore waters (bottlenose, Atlantic spotted, and Risso's). The bottlenose dolphin inhabits the Gulf of Mexico year round and is the most commonly observed dolphin in nearshore waters. The Atlantic spotted dolphins prefer warm-temperate waters over the continental shelf, edge, and upper reaches of the slope and are very active at the surface. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>328 feet in depth) (Davis 2002; NMFS 2008). Because of the relatively shallow depth of 73 feet at the project location and the established ranges and depths that the majority of the cetaceans occupy, it is not anticipated that these species would be encountered in the project area during construction.

Of the five listed endangered whale species (sperm whale, sei whale, fin whale, blue whale, humpback whale), only the sperm whale is considered to commonly occur in the Gulf of Mexico. The sperm whale is predominantly found in deep ocean waters, generally deeper than 3,280 feet, on the outer continental shelf. Due to the relatively shallow depth of 135 feet in the project area, the sperm whale, or any other endangered whale, is not likely to be present during the deployment of the materials.

The West Indian manatee has been observed in Texas waters; however, sightings are very rare and almost always occur in the coastal bays and estuaries. Manatees, which tend to stay near the shoreline, are not expected to be encountered in the project area, which is 67 miles offshore. Because the FWS concurred that the project would not affect West Indian manatee under the ESA, the Trustees determined that no take of manatee under the MMPA would occur.

Environmental Consequences

Project deployment would have minor short-term impacts to protected species and their habitats in the area where the ship would be placed. Short-term minor impacts may occur if species using the project area are temporarily disturbed. Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish. Overall, the addition of the artificial reef should have a positive impact on federally-listed sea turtles, such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, by enhancing their foraging habitat. The Trustees have started coordination and reviews with NMFS under the Endangered Species Act. The final sinking plan will include input from the NMFS to minimize the overall noise impacts above and below the water line.

Impacts to the water column can affect the use of the "potential effects area" by marine dependent, juvenile and adult fish and adult shrimp species, which are common in the project area throughout the year. The final sinking plan will be adapted with input from the NMFS to minimize underwater impacts from explosives. The lowest possible net explosive weight per detonation will be used to minimize impacts to marine life. In addition, devices will be used to create a delay between sections of the ship to minimize the high frequency energy from the charges that passes through the hull into the water. Any noise transmitted to the ocean environment as a result of the sinking will be of short duration (measured in seconds) and will be strategically deployed to minimize the effects. Any potential loss of species due to the use of explosives will be outweighed by the long-term net gains of increased hard bottom habitat, productivity, and increased bio-diversity within the project area.

While most motile fauna such as crab, shrimp, and finfish have the ability to avoid the area during the sinking process, this project will permanently displace a small portion of the existing natural soft bottom and sand habitat within the project area. This project would result in a minor long-term impact to marine soft bottom EFH by covering it with reef pyramid structures and effectively converting the naturally occurring soft bottom to artificial hard bottom substrate. Soft bottom habitat is very abundant in the Gulf of Mexico whereas hard bottom habitat acreage is much more limited. The relative abundance of soft bottom habitat within and surrounding the project area would not be significantly impacted due to the small footprint of the ship's keel.[30] The conversion from soft bottom habitat to hard bottom substrate would be considered a habitat trade off by providing new hard structures to be colonized by encrusting marine organisms.

NMFS concurred with the EFH assessment for the project, which determined that temporary and localized turbidity impacts and permanent impacts to soft bottom EFH would occur; however, the creation of new hard structure in the Gulf may also create benefits to some species managed under the Magnuson-Stevens Act by providing foraging habitat, cover, and conditions favorable for encrusting benthic colonization (NMFS 2014e).

The Ship Reef site is located at a depth of around 135 feet. Typically marine mammal species in the Gulf are found in deeper waters on the outer continental shelf or along the shelf break; therefore, they should not be impacted during the deployment of the material and no incidental take of marine mammals is anticipated. Sinking of the ship would only occur during daylight hours and should be completed within 1-2 days. Impacts to wildlife would be avoided via management guidelines and techniques. During deployment of the ship, a monitor would be present that would be able to halt work if sea turtles, smalltooth sawfish, whales, or other federally protected species are in the zone of influence. Work would be halted until such time as the area is deemed safe to continue the operation. Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006).

8.7.6.3 Human Uses and Socioeconomics

In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

[30] It is estimated that the surface area on the keel of the ship would be 12,500 square feet, which would cover less than 1% of the permitted 80 acres within the site.

8.7.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

Artificial reefs enhance the fishing and diving opportunities at reef sites. A study from 1995 found that over 58,000 individuals visited artificial reefs. This study also surveyed boat captains and found that a ship was a preferred structure for future artificial reefs (Ditton et al. 1995).

There are oil and gas pipelines within a 5-mile radius of the Ship Reef Project; there would be no negative impacts to the exploration and production of oil and gas. The project is not located near any Department of Defense danger zones. The Texas Artificial Reef Plan requires that artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline, nor in prohibited areas and danger zones designated by the U.S. Department of Defense. The reef area would be added to the NOAA navigation charts and a lighted buoy would be in the permitted reef area. Typically, fishermen avoid known hazards that can snag nets to reduce potential damage to equipment and vessels.

Environmental Consequences

Because this Ship Reef Project is located offshore, it would have no negative impacts on the socioeconomic status of the communities and counties adjacent to the project. There would be indirect beneficial effects to the local economy due to increased fishing and diving opportunities provided by the artificial reef. Artificial reefs enhance the fishing and diving opportunities at reef sites. Given the demand for fishing and diving on artificial structures, the construction of the Ship reef would increase recreational fishing and diving opportunities. In turn, this is anticipated to increase sales of bait and supplies, boat launch fee revenue, harbor occupancy, fuel, charter boats, diving equipment and more. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The project would benefit the local economies adjacent to the project site by increasing use of the harbors, boat ramps, bait camps, and private fishing charter and diving businesses. An economic impact evaluation conducted for the Texas Clipper artificial reef in Texas demonstrated that anglers' expenditures were over $3.2 million and divers expenditures were over $5.4 million locally over a 3-year period (2008-2010). It is expected the commercial fishermen notate obstructions on navigation charts or GPS waypoints to avoid snags and potential damage to equipment and vessels Overall, socioeconomics would be unaffected as a result of the proposed project. The proposed project is expected to have a positive beneficial impact to the local economy through indirect benefits associated with increased fishing opportunities and tourism.

Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.

- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There is not a minority or low-income population in the impact zone – the Gulf of Mexico, 67 miles offshore, is uninhabited. Furthermore, there are no adverse effects to low income or minority populations anticipated from the proposed project.

During the permit review, the USACE determined that the project would not directly, or through contractual or other arrangements, use criteria, methods, or practices that discriminate on the basis of race, color, or national origin nor would it have a disproportionate effect on minority low-income communities (USACE 2014b).

8.7.6.3.2 Cultural Resources

Affected Resources
Automated Wreck and Obstructions Information System data documents no sunken vessels in the immediate vicinity of the project area (HI-A-424). A high-resolution geophysical survey was conducted in November 2013 to ensure that no historically or culturally significant areas would be impacted during the deployment of the artificial reef materials. The data collected during the survey was assessed for evidence of high probability areas for prehistoric occupations and shipwrecks. Company and public files were reviewed in conjunction with the magnetometer, sonar, and pinger data for evidence of any human-made features within the project area. No evidence of existing human-made features within the survey was evident in company files, public files, or within the geophysical datasets. One unidentified magnetic anomaly was noted in the survey area. If the ship that is proposed for acquisition for this project is a historical resource, it would be evaluated for its cultural significance and suitability for this project before it is used.

Environmental Consequences
If any culturally or historically important resources are identified during project preparations or pre-deployment surveys, such areas would be avoided during deployment of the ship. If the ship itself is a historic resource, it would be evaluated and a determination would be made about its suitability for this project. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.7.6.3.3 Land and Marine Management

Affected Resources
TPWD obtained a USACE permit (SWG-2013-00249) for the Ship Reef Project under Section 10 of the Rivers and Harbors Act in March 2014. The permit requires that the Ship Reef Project meet the clearance and distance from shipping lanes, safety fairways, and anchorages requirements as

established by the USACE and the USCG. The USCG has conducted a preliminary review of this project and has approved a 60-foot clearance. A lighted buoy would be required.

The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The program establishes artificial reefs to create reef fishery habitat and enhance commercial and recreational fishing opportunities in state and nearby federal waters. Artificial reefs provide complex, durable and stable habitats for many fishes and marine invertebrates. From an economic standpoint, artificial reefs attract anglers and provide beneficial impacts to local economies. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also follows guidance in the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best available scientific data in the decision-making process. The proposed Ship Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

Environmental Consequences

The Ship Reef Project would be located offshore, and would not be subject to zoning, land use planning, or land developments plans. The Texas Artificial Reef Fisheries Management Plan requires that the project not be located within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline; therefore, it would not have any impacts to the oil and gas production facilities and pipelines in the area of the project. In addition, the project is located greater than 2 miles from the designated shipping fairway and would comply with the USACE and USCG clearance requirements above the reef. Thus, the project would not adversely impact shipping and navigation use in the project area, and would be consistent with current uses. Therefore, land and marine management would be unaffected by the Ship Reef Project.

8.7.6.3.4 Aesthetics and Visual Resources

Affected Resources

The ship would be towed offshore to the permitted reef area and sunk. The ship would be on the ocean floor and would not be visible from the surface. The reef would be identified by a lighted buoy and associated signs.

Environmental Consequences

The use of large equipment could have a temporary visual impact during the time of project implementation. The deployment time would be short and therefore any visual impacts would be short in duration as well. The artificial reef would be placed on the ocean floor and would not be visible above the surface. The lighted buoy and associated signs would introduce a new visual component to the area; however, these are common in the Gulf of Mexico and would not attract attention or detract from the view. After completion, visual impacts would be limited to boat traffic. Increased boat traffic caused by anglers traveling to the reef would be consistent with the surroundings or designated uses. The boats would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Therefore, the Ship Reef Project is expected to have only minor short-term impacts aesthetics and visual resources.

8.7.6.3.5 Tourism and Recreational Use

Currently an artificial reef does not exist in the area. Artificial reefs enhance the fishing and diving opportunities at reef sites. A study from 1995 found that over 58,000 individuals visited artificial reefs. This study also surveyed boat captains and found that a ship was a preferred structure for future artificial reefs (Ditton et al. 1995). An economic impact evaluation conducted for the Texas Clipper artificial reef in Texas demonstrated that anglers took over 13,000 trips and divers took over 11,000 trips during a 3-year period (2008-2010). Given the demand for fishing and diving on artificial structures, the construction of the Ship reef would increase recreational fishing and diving opportunities. In turn, this is anticipated to increase sales of bait and supplies, boat launch fee revenue, harbor occupancy, fuel, charter boats, diving equipment and more. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers.

Environmental Consequences

Because the Ship Reef Project is 67 miles offshore and is not placing materials near an existing reef, it would not have any impacts on recreational uses in the area. Commercial fishing boats may be in the area during deployment. Any boats in the area would be coordinated with prior to the deployment of any materials to ensure safety of everyone in the vicinity. The nearest access points from land include the Freeport Ship Channel to the west-northwest and Galveston Harbor/Bolivar Roads Channel to the north-northwest. Each channel has nearby public boat ramps, marinas, and harbors, which makes the project very accessible to the public. Therefore, any adverse impacts to tourism and recreational use would be short-term and minor occurring only during deployment of the ship when the area is temporarily closed to other uses. Given the demand for fishing and diving on artificial structures, the construction of the Ship Reef would increase recreational fishing and diving opportunities. In turn, this is anticipated to increase sales of bait and supplies, boat launch fee revenue, harbor occupancy, fuel, charter boats, diving equipment and more. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The project is expected to result in beneficial impacts to tourism and recreational uses over the long-term.

8.7.6.3.6 Infrastructure

Affected Resources

The project area is located approximately 67 miles off of Galveston, Texas and within approximately 7 miles of a shipping fairway, 3 miles of oil and gas pipelines, and 11 miles to the nearest oil and gas platform. The Texas Artificial Reef Fisheries Management Plan requires that all artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline. There would not be any adverse impacts to oil and gas platforms or pipelines. The Ship Reef Project area would be marked with a navigational buoy.

Environmental Consequences

The project would not impact the existing shipping lanes, fairways or oil and gas production facilities or pipelines. All navigation safety measures would be followed during the marine transport phase. Therefore, infrastructure will be unaffected from the proposed project.

8.7.6.3.7 Public Health and Safety and Shoreline Protection

Affected Resources

The project deployment would use mechanical equipment, boats, and barges that use oil, lubricants and fuels. The ship that would be acquired for use in this project may have oil and hazardous waste that would need to be disposed of. The ship would be cleaned in accordance with EPA's and U.S. Maritime Administration's *National Guidance: Best Management Practices for Preparing Vessels Intended to Create Artificial Reefs*. The hull would be modified to ensure safety for divers and meet requirements, inspections, and modifications stipulated by TPWD, EPA and the USCG. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. An explosives plan and associated safety procedures would be developed, reviewed, and approved by government agencies before project implementation.

Environmental Consequences

Because of the nature and location of the Ship Reef Project, no impacts to shoreline erosion are anticipated as a result of the implementation of this project.

The ship would be cleaned of debris, loose items, and hazardous substances to a level that meets or exceeds BMP guidelines and complies with health and safety statutes and regulations as set forth by the EPA, U.S. Department of Transportation Maritime Administration (MARAD), and Texas. All hazardous materials handled during ship cleaning would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. Pollution booms and any other required pollution response equipment would be staged at the facility, ready for deployment to guard against any pollution discharge. A Spill Prevention and Emergency Response Plan would be developed and approved. All federal and state regulations would be followed to clean, remove and dispose all hazardous materials generated from the cleaning of the ship. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into cleanup activities to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all ship cleaning and explosives personnel and authorized access zones would be established at the perimeter during ship cleaning and explosives use. In the event of a discharge of oil of release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) as required and all federal regulations would be followed during the cleanup. A safety zone radius of approximately 2,000 feet would be established around the reef site to exclude all ship and submarine traffic not participating in the sinking action. The specific radius would be determined by the USCG on site. Any traffic within this radius would be warned to alter course or would be escorted from the site. Therefore, public health and safety and shoreline protection will be unaffected from the Ship Reef Project.

8.7.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Ship Reef Project would create an artificial reef within an 80 acre reef site, through the sinking of a ship in water about 135 feet deep. Texas would acquire and sink a ship that is at least 200 feet long and that has been cleaned of hazardous substances. The project is considered to fall under Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. This restoration project would enhance recreational fishing and diving opportunities. The Trustees have started coordination and reviews under the Endangered Species Act, National Historic Preservation Act, and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Section 10 of the Rivers and Harbors Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.8 Mid/Upper Texas Coast Alternate Artificial Reef Project - Corpus Artificial Reef Project: Project Description

[The Corpus Artificial Reef Project would only be implemented in the event that the Ship Reef Project becomes technically infeasible (e.g. an appropriate ship cannot be acquired with available funding).]

8.8.1 Project Summary

The proposed Corpus Artificial Reef Project will increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Mustang Island MU-775) located within Texas state waters in the Gulf of Mexico and approximately 11 miles from Packery Channel (near Corpus Christi Bay, Texas) (Figure 8-14). Previous deployments at the reef site placed artificial reef materials into the northwest quadrant and in the center of the 160-acre reef site. The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre project area onto sandy substrate at a water depth of 73 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational fishing opportunities. The estimated cost for this project is $1,919,765, which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.[31] This project is an alternative to the Ship Reef Project, and is proposed for implementation only in the event that the Ship Reef Project proves to be technically infeasible.

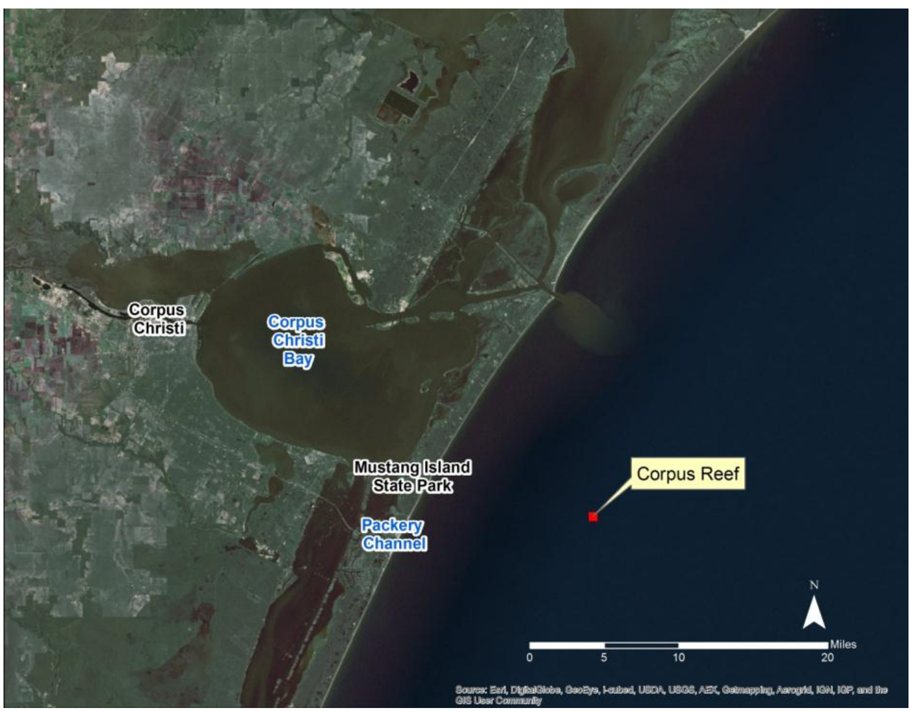

Figure 8-14. Location of the proposed Corpus Artificial Reef Project.

[31] In Texas, the estimated costs of artificial reef projects increased by $200,000, a less than 3% increase, to cover marine archaeological and environmental compliance requirements for three of the artificial reef sites.

8.8.2 Background and Project Description

The purpose of the Corpus Artificial Reef Project is to enhance recreational fishing opportunities (and limited diving opportunities since water clarity is not usually conducive for diving) for Texas. TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The Program establishes artificial reefs to create reef fishery habitat as well as enhance commercial and recreational fishing opportunities in state and nearby federal waters. Artificial reefs provide complex, durable and stable habitats for many fishes and marine invertebrates. From an economic standpoint, artificial reefs attract anglers and divers to provide a significant fiscal boost to local economies.

The proposed project will increase the amount of reef materials in a currently permitted artificial reef site, located within Texas state waters in the Gulf of Mexico in the Outer Continental Shelf Block Mustang Island (MU-775). The current reef site is permitted for 160 acres, but only has materials in northwest quadrant and in the center of the permitted area (Figure 8-15). The proposed project will place predesigned concrete pyramids in the remaining portions of the 160-acre permitted area onto sandy substrate at a water depth of 73 feet, about 11 miles east of Packery Channel and Mustang Island State Park (near Corpus Christi Bay, Texas).

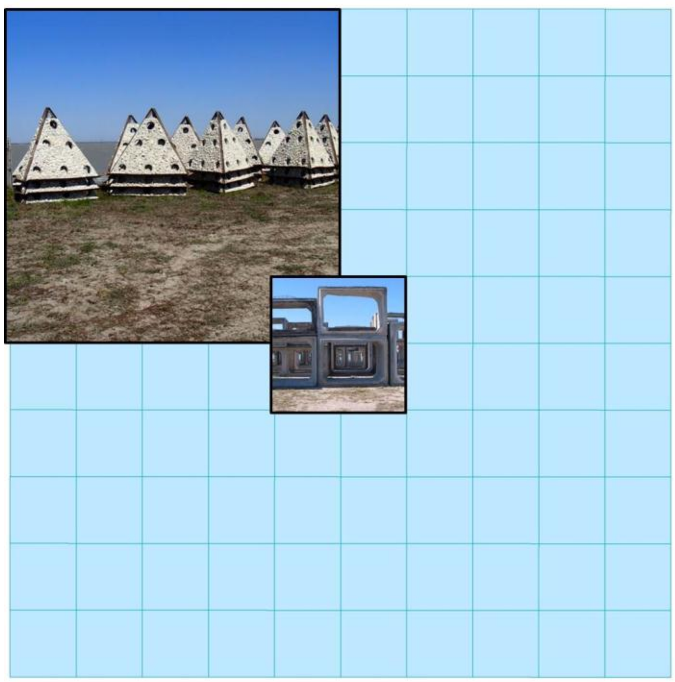

Figure 8-15. Diagram of the 160-acre Corpus Artificial Reef Project area. Areas designated by the pyramid and culvert images received artificial reef materials from a separate contract in fall 2013.

The location for the Corpus Artificial Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). TPWD's Artificial Reef Program also adheres to the Guidelines for Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National

Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs.

Consultations began with the Saltwater-Fisheries Enhancement Association and the City of Corpus Christi over the concept of reefs off Corpus Christi in Texas state waters in 2009. The MU-775 reef location was approved through several public city council meetings where numerous members of the public provided oral comments in support of the project. Consultation with the TGLO was completed as required to ensure that the site was consistent with the goals and policies of the Texas Coastal Management Plan. The TPWD Coastal Resource Advisory Committee (composed of individuals from relevant industries and groups appointed by the Chairman of the Texas Parks and Wildlife Commission) also provided input into the location of the reef site. The reef site is located in an area that provides easy access for the local population, does not encroach on existing natural hard substrate, and can be promoted by the local government to encourage tourism and spending to benefit the local economy.

Previous deployments at the permitted reef site placed artificial reef materials (predesigned pyramids and culverts) into the northwest quadrant and in the center of the 160-acre reef site. The Corpus Artificial Reef Project will randomly space 1,000 to 1,200 additional predesigned pyramids in the remaining portions of the permitted area.

Texas' artificial reefs are generally created and placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. The predesigned concrete pyramids will be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project will use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-16). This modification was required by NMFS in order to complete the ESA consultation (NMFS 2014a). Each pyramid structure should penetrate the substrate by no more than 2 feet.

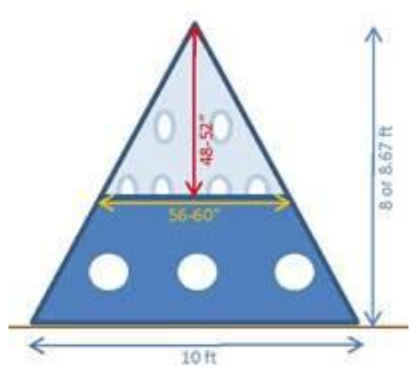

Figure 8-16. An example of the predesigned pyramid structures with the open side.

8.8.3 Evaluation Criteria

This proposed project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Corpus Artificial Reef Project is intended to enhance recreational fishing opportunities by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas which can be more than 30 miles offshore. Transportation to the structures within state waters can be accomplished with smaller boats as well as decreased travel time and cost. The project would enhance opportunities for public use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible and utilizes proven techniques with established methods and documented results and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement). Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. § 990.54(a)(1) and Section 6e of the Framework Agreement).

The project area was chosen to be appropriate for artificial reef placement, in part, because of public support for the site. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reef sites. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best scientific data available in the decision-making process. The proposed Corpus Artificial Reef Project meets the requirements of the Texas Artificial Reef Act and the goals of the Texas Artificial Reef Fishery Management Plan. There were several public city council meetings where numerous members of the public provided oral comments in support of the project. The proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3)).

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.8. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, BMPs and measures to avoid or minimize impacts described in Section 8.8 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation, operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.8.4 Performance Criteria, Monitoring and Maintenance

This project includes monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring has been designed around the project objective, which is to increase the amount of reef materials in a currently permitted artificial reef site (MU-775) through the placement of 1,000 to 1,200 predesigned concrete pyramids within the open portions of the permitted reef site.

Performance criteria for this project will include a determination of successful construction of the Corpus Artificial Reef Project according to design, and then monitoring and maintenance to confirm that the reef materials are in place and available for recreational fishing opportunities. In order to determine successful placement of the constructed pyramids in accordance with the design, multi-beam side-scan surveys will be used to document the location of the pyramid structures and ensure all materials are located within the deployment zone and meet all permit conditions, including USCG clearance restrictions. Monitoring using side-scan sonar will be conducted annually (for 2 years) and after major storm events to document any movement and settling of the structures. Recreational use of the reef observed during the side-scan monitoring will also be documented.

While not funded through Early Restoration, recreational use monitoring is being conducted through ongoing research. Currently Texas A&M University-College Station is studying the social and economic impacts of Texas artificial reefs. Also, as TPWD's Artificial Reef Program looks to expand existing reefs and identify locations for new permitted reef areas, TPWD's Artificial Reef Program will continue to receive feedback from user groups regarding placement and use of reefs in Texas.

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A USCG approved marker buoy is already installed at the Corpus reef site and will be maintained per USCG requirements. Regular maintenance of the buoy marker would include cleaning the chain, replacing the light, and replacing or repairing the buoy as needed. Monitoring and maintenance activities will be managed by the TPWD's Artificial Reef Program.

8.8.5 Offsets

The Early Restoration benefits provided by the project, also known as NRD Offsets, are $3,839,530[32] expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill. [33] This Offset is based on the use of a BCR ratio of 2.0,

[32] The NRD Offset has been updated from the Draft Phase III ERP/PEIS to reflect the increased cost for completing the marine archaeological environmental compliance requirements.

[33] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

reflecting the value that users are expected to be provided by the implementation of the proposed project relative to its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.8.6 Cost

The total estimated cost to implement this project is $1,919,765, which includes an increase of $134,000 over the original estimated cost to complete unanticipated marine archaeological environmental compliance requirements. This cost reflects current estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

8.9 Mid/Upper Texas Coast Alternate Artificial Reef Project - Corpus Artificial Reef Project: Environmental Review

[The Corpus Artificial Reef Project would only be implemented in the event that the Ship Reef Project becomes technically infeasible (e.g. an appropriate ship cannot be acquired with available funding).]

The proposed Corpus Artificial Reef Project would increase the amount of reef materials in a currently permitted artificial reef site (Outer Continental Shelf Block Mustang Island MU-775) located within Texas state waters in the Gulf of Mexico and approximately 11 miles east of Packery Channel (near Corpus Christi Bay, Texas). The current reef site is permitted for 160 acres, but already has materials in the northwest quadrant and in the center of the permitted area (Figure 8-17). The proposed project would place predesigned concrete pyramids in the remaining portions (about 115 acres) of the 160-acre permitted area onto sandy substrate at a water depth of 73 feet. As required by the ESA consultation with NMFS, the pyramid designs were modified so that one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure. These improvements would enhance recreational fishing opportunities. The estimated cost for this project is $1,919,765 which includes an increase of $134,000 over the original estimated cost to complete marine archaeological environmental compliance requirements.

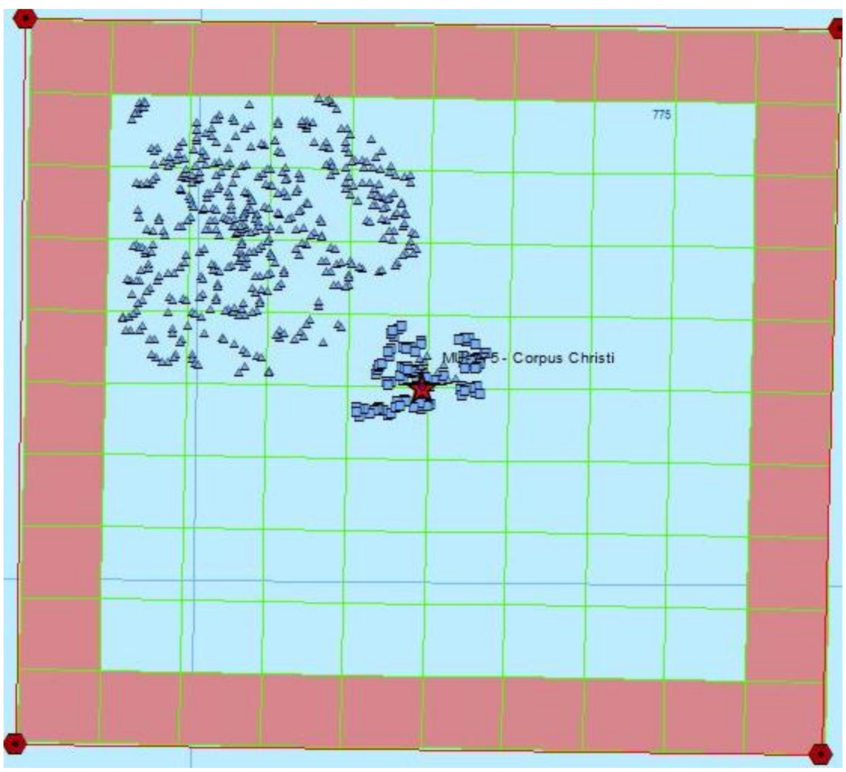

Figure 8-17. Pyramids designate areas that received pyramid structures and squares designate areas that received culvert reef materials under a separate contract in fall 2013.

8.9.1 Introduction and Background

Texas experienced a loss of recreational use along the Texas coast during the spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The Corpus Artificial Reef Project is intended to enhance recreational fishing opportunities by creating artificial reef habitat. Artificial reefs created in state waters benefit anglers by providing reefs that are more readily accessible than other natural areas which can be more than 30 miles offshore. Transportation to the reef sites within state waters can be accomplished with smaller boats and the short distance allows for a decreased travel time and cost when compared to other offshore options. This project would enhance the public's use and enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. Artificial reef creation and enhancement was suggested as a restoration measure during the Trustees' public scoping meetings in Texas for the PEIS as part of the damage assessment and restoration plan effort for the Spill and submitted as a restoration project on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

The project area was chosen to be appropriate for artificial reef placement, in part, because of public support for the site. There were several public city council meetings where numerous members of the public provided oral comments in support of the project. The TPWD developed the Texas Artificial Reef Fishery Management Plan (TPWD 1990) which guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reef sites. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts and impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best scientific data available in the decision-making process.

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including the Texas Coastal Management Program, and compliance with federal requirements including, but not limited to, the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a USACE permit (SWG-2010-01407) for the Corpus Artificial Reef Project under Section 10 of the Rivers and Harbors Act and under Section 404 of the Clean Water Act in May 2011.

TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and would avoid impacts to coastal waters. Additionally, the lease requires that the project meet the clearance and distance from shipping lanes, safety fairways, and anchorages requirements as established by the USACE and the USCG. A USCG approved marker buoy is already installed at the Corpus reef site and will be maintained per USCG requirements.

The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also adheres to the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. All reefs must be constructed, sited, monitored and maintained so that they enhance and conserve fishery resources, and facilitate easy access for Texas recreational and commercial use. Entities constructing artificial reefs must minimize conflicts among competing uses, avoid adverse environmental impacts to public health and property, ensure that the reef projects are consistent with all applicable laws and regulations, and use the best available scientific data in the decision-making process. The proposed Corpus Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

8.9.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Corpus Artificial Reef Project or the Ship Reef Project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.9.3 Project Location

The Corpus Artificial Reef Project is located within the Gulf of Mexico in the Outer Continental Shelf Mustang Island Block 775 (MU-775) offshore of Nueces County, Texas. It is located about 11 miles off Packery Channel and Mustang Island State Park (near Corpus Christi Bay, Texas) at a center point of 27.6464° N 97.0074° W (North American Datum of 1983). The permitted area is 160 acres of sandy substrate at a water depth of 73 feet. The reef site has been permitted for a 50-foot clearance (50 feet of clear water between the surface and any reef material), which allows for a 23-foot profile of material off the ocean bottom.

The location for the Corpus Artificial Reef Project was selected after request for and consideration of public input and in accordance with site selection guidelines set out in the Texas Artificial Reef Fishery Management Plan (TPWD 1990). Artificial reefs in Texas are designed to enhance existing marine habitat without compromising or adversely affecting bottoms that already have significant hard substrate (i. e. coral reefs, rock outcrops, etc.). Therefore, reefs would not be created on existing natural hard bottom substrates.

Consultations began with the Saltwater-Fisheries Enhancement Association and the government of the City of Corpus Christi over a nearshore reef concept in 2009. Several potential sites were determined and TPWD conducted bottom surveys with scientific divers to eliminate those sites whose bottom was too silty and areas whose bottom may not be hard enough to support the weight of artificial reefs. A "short list" of several reef sites was developed, with Corpus Reef providing the best alternative that would meet management goals. The Corpus Reef location was approved through several public city council meetings where numerous members of the public provided oral comments in support of the project. Consultation with the TGLO was completed as required to ensure that the site was consistent with the goals and policies of the Texas Coastal Management Plan.   The TPWD Coastal Advisory Committee (composed of individuals from relevant industries and groups appointed by the Chairman of the Texas Parks and Wildlife Commission) also provided input into the location of the reef site. The reef site is located in an area that provides easy access for locals, does not encroach on existing natural hard substrate, and can be promoted by the local government to encourage tourism and spending on the local economy.

8.9.4 Construction and Installation

Surveys of the project area were conducted in December 2013 to identify potential hard bottom substrates and cultural resources. This project would deploy approximately 1,000 to 1,200 predesigned concrete pyramids in the project area. The predesigned concrete pyramids would be complex and have a large surface area which would attract marine life. The predesigned concrete pyramids would be made of materials to match a natural reef in pH and substrate using concrete, limestone, and rebar or other similar materials. Pyramid structures that have been used previously for artificial reefs had a rebar frame inside of a 6,000-pound concrete structure built to withstand storm events. The structures were 8 feet high and also had a three-sided footprint (10-foot by 10-foot by 10-foot) designed to prevent settling and scouring. This project would use similarly structured pyramids, with one modification – one side of the constructed pyramids will be open on the top half to allow sea turtles to move freely in and out of the structure (Figure 8-18). This modification was required by NMFS in order to complete the Endangered Species Act consultation (NMFS 2014a). Each pyramid should penetrate the substrate by no more than 2 feet, and the structures would be randomly spaced over the remaining portions of the 160-acre permitted reef (areas without reef materials).

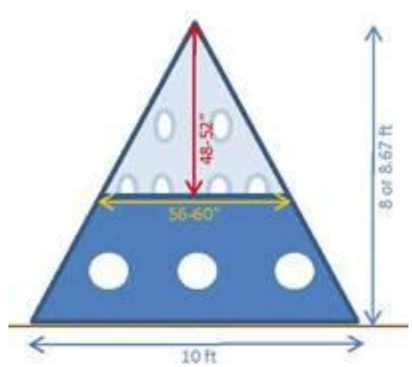

Figure 8-18. An example of the predesigned pyramid structures with the open side.

Texas' artificial reefs are generally placed by commercial marine contractors selected through a competitive bid process and contracted by TPWD, who holds the permit for the reef site. A vessel that would minimize its use of anchors or a dynamically positioned vessel (i.e. not anchored) would slowly lower the pyramids into specific position by crane or another method. During pyramid deployment, position is usually maintained visually by use of a temporary marker buoy attached to the first pyramid deployed. A GPS antenna would be positioned at the top of the crane boom to monitor the location of the pyramids as they are placed. As the crane cable lowers the pyramid into the water, a buoy attached to the release mechanism on the crane cable will be pushed upward by water pressure (the orange buoy can be seen at the top of the crane cable in Figure 8-19). When the pyramid nears 5 feet from ocean bottom, the buoy will trigger the release mechanism and the pyramid will drop to the bottom in an up-right position.

Figure 8-19. Photograph of previous artificial reef material deployment completed in Texas.

It is expected that the pyramids would be transported directly from the manufacturer, therefore a designated staging and stockpiling site is not anticipated. The contractor may choose to have the pyramids built locally, likely working with a local concrete company. Previously purchased pyramids were built in an empty lot at the Port of Corpus Christi.

Request for Proposals (RFPs) to complete the Corpus Artificial Reef Project would be developed and publicly noticed for bid when funds are secured. The process of requesting bid proposals, bid review, and award of contracts may take 4 to 6 months. Once contracts for project implementation are awarded, construction of the pyramids is expected to take 3 to 8 months to complete. If transportation is required, it is expected to take 1-2 weeks depending upon where the manufacturer is based and transportation method (type of vessel). Based on previous artificial reef projects completed in Texas, it is anticipated that one crane barge, one tugboat, one supply barge, two excavators, and two small trucks may be used during reef deployment. Deployment of the pyramids into the project area is expected to take 10 days, working 14 hours per day (daylight hours), but is dependent on weather conditions. The date the contract is awarded may impact the timing of the project. Contracts awarded towards the end of the year (August – December) may not be completed until the following spring or early summer, depending on weather conditions. Before and after reef construction, surveys would be used to verify the correct placement of materials in the project area.

8.9.5 Operations and Maintenance

No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated unless there is significant movement of artificial reef materials, which is not expected to occur. A USCG approved marker buoy is already installed at the Corpus reef site and will be maintained per USCG requirements. Regular maintenance of the buoy marker would include cleaning the chain, replacing the light, and replacing or repairing the buoy as needed. Monitoring and maintenance activities would be managed by the TPWD’s Artificial Reef Program.

8.9.6 Affected Environment and Environmental Consequences

The USACE prepared an Environmental Assessment and Statement of Findings (EA and SOF) in response to TPWD's application for a permit to create an artificial reef in the project area (USACE 2011).[34] The possible consequences of this proposed work were studied for environmental concerns, social well-being, and the public interest, in accordance with regulations published in 33 C.F.R. Parts 320-332. The following factors were considered by the USACE during the evaluation process but were determined to not be particularly relevant to the permit application: shoreline erosion and accretion, aesthetics, land use, general environmental concerns, conservation, floodplain values, safety, energy needs, flood hazards, water supply and conservation, food and fiber production, and mineral needs. The EA and SOF found that the Corpus Artificial Reef Project would result in the creation of an artificial reef that would augment natural fisheries habitat for juvenile reef fish and provide sport and recreational fishing benefits for the public.

When considering the overall impacts that would result from this project, in context with the overall impacts from similar past, present, and reasonably foreseeable future projects, the USACE concluded that their cumulative impacts are not considered to be significantly adverse. The USACE stated that it was likely they would receive similar projects in the future, which would go through a comparable review process.

The USACE stated that there have been no significant environmental effects identified resulting from the project and the impact of this proposed activity on aspects affecting the quality of the human environment was evaluated and determined that this action does not require an Environmental Impact Statement.

The USACE reviewed and evaluated, in light of the overall public interest, the documents and factors concerning the permit application, as well as the stated views of other interested Federal and non-Federal agencies and the concerned public, relative to the proposed work in navigable waters of the United States. Based on their review, the USACE found that the proposed project is not contrary to the public interest and that a permit should be issued. The permit was issued in May 2011 (SWG 2010-01047).

8.9.6.1 Physical Environment

The Gulf of Mexico is the ninth largest body of water in the world and consists of the intertidal zone, continental shelf, continental slope, and abyssal plain. The nearshore coastal environment extends from estuarine waters seaward to the continental shelf edge of the Gulf of Mexico, including the coastline and the inner continental shelf at depths from 0 to 600 feet. The northern Gulf of Mexico is dominated by inputs from the Mississippi River Basin, which drains 41% of the contiguous United States and contributes 90% of the freshwater entering the Gulf (EPA 2011a). Freshwater inflows to the Gulf provide nutrients and create hydrological conditions that create a wide range of ecosystems with unique

[34] For purposes of the proposed action under NRDA, the EA and SOF do not provide enough analysis to incorporate the findings by reference (per CEQ's NEPA regulations at 40 C.F.R. §1502.21). The Trustees therefore conducted the more detailed analysis documented here, and are not adopting the USACE EA or information from the SOF. As is appropriate, the Trustees will make an independent decision, and will not rely on the findings of the separate USACE NEPA process. The EA and SOF are discussed in this document for informational purposes only.

features and habitats. The description of the physical environment of the Gulf of Mexico is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.9.6.1.1 Geology and Substrates

Affected Resources

The Corpus Artificial Reef Project is located on the continental shelf in Texas waters approximately 11 miles east of Packery Channel off the coast of the Nueces County, Texas. The predominant sediment is clay overlain with deposits of sand and silt, mainly from the Mississippi River. Soft bottom habitat is not a unique habitat of concern like the hard bottom, deepwater coral, and deepwater community habitats. The nearshore deployment of artificial reef material would be implemented within the permitted area, avoiding areas where there are existing artificial reef materials (Figure 8-17). Except for the existing artificial reef structures, the substrate generally consists of flat to gently sloping soft, thick bottom with no vegetation such as seagrasses and no dynamic physical features or hard bottom outcrops that would support corals or habitats conducive for foraging or shelter.

Environmental Consequences

The proposed project would be placed on Gulf sediments approximately 73 feet below the surface of the water. Prior to reef construction, a survey of the project area would be conducted. Any hard outcrops or uneven surfaces identified by the survey would be avoided during deployment of reef materials. During the placement process, pyramids would slowly be lowered via crane, bobcat or front-end loader, or other mechanical means onto the Gulf's floor. Each of the 1,000 to 1,200 structures would weigh approximately 6,000 pounds and cover a 43-square foot area (10-foot by 10-foot by 10-foot). The installation of each structure would result in some short-term disturbance of the substrate, which would resettle after each construction day. There would be some substrate compaction associated with weight of each structure resulting in a minor long-term impact. However, the substrate itself is very common in the coastal waters. Overall the disturbances to soils or substrates would likely be minor as the impacts would not result in changes to the character of the sediments, geologic features would be avoided and the level of compaction would occur over the local project area.

8.9.6.1.2 Hydrology and Water Quality

Affected Resources

The water quality in this area is highly influenced by input of sediment and nutrients from the Mississippi and Atchafalaya Rivers. A turbid surface layer of suspended particles is associated with the freshwater plume from these rivers. The river system supplies nitrate, phosphate, and silicate to the shelf (Minerals Management Service 2005).

Water quality in the Gulf of Mexico is sufficient to support aquatic life use, recreation use, and general use. However, there are restricted consumption advisories due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

There are no significant currents in the project area. There may be some surface currents during storm events, but these would be temporary ant not expected to impact the reefs, which would be at least 63 feet below the water surface.

Environmental Consequences

Short-term increases in turbidity would result from the in-water construction work. The installation of each structure would result in some short-term disturbance of the substrate and locally increased turbidity, which would likely resettle after each construction day. BMPs would include minimizing anchors/anchor spread during deployment and lowering materials slowly. These BMPs along with other avoidance and impact minimization measures required by state and federal regulatory agencies would be employed to minimize any water quality and sedimentation impacts. Given its location, the Corpus Artificial Reef Project would not result in any impacts to wetlands or floodplains. In addition, the placement of reef structures would not alter the hydrology of the area. Water quality would not be affected by reef materials as these materials are non-hazardous. Any associated sedimentation (turbidity plume) would quickly dissipate after the material hits the bottom. There would likely be short-term minor adverse impacts to water quality as there would be localized turbidity issues associated with structure placement, though water quality would quickly be restored after construction ends.

8.9.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The proposed project area is 11 miles east of Packery Channel in offshore waters and is not classified for NAAQS criteria pollutants under the Clean Air Act. The nearest county, Nueces County, is not listed as a nonattainment area for any pollutant by the EPA.

Implementation of the Corpus Artificial Reef Project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation.

Environmental Consequences

Project implementation would require the use of heavy equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Fine particulate matter associated with the concrete reef materials may become airborne during transportation and deployment. Any air quality impacts that would occur would be localized and short in duration. After project completion, impact to air quality would be limited to ambient pollutants from boat traffic. Increased boat traffic caused by anglers traveling to the reef could potentially increase air pollution in the vicinity; however, increases in air pollution would still be anticipated to be *de minimis*. Therefore, any adverse impacts to air quality would be short-term and minor.

Engine exhaust from barges, tugboats, excavators, and trucks would contribute to an increase in GHG emissions. Impact minimization measures would be employed to reduce the release of GHG during project implementation. The following minimization measures have been identified to reduce or eliminate GHG emissions from the Corpus Artificial Reef Project:

- Shut down idling construction equipment, if feasible;

- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including trucks, excavators, barges, and tugboats, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Based on the assumptions described in the table above, and the small scale and short duration of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

8.9.6.1.4 Noise

Affected Resources

Implementation of the Corpus Artificial Reef Project would include transportation of the reef materials to the project area, which may include, ship, barge, truck or other types of transportation. The heavy equipment, vehicles, and boats would produce noise both above the water surface and throughout the water column. The primary sources of ambient (background) noise in the project area are operation of vehicles, aircraft, commercial and recreational vessels, and natural sounds such as wind and wildlife.

Table 8-7. Estimated greenhouse gas impacts.

EQUIPMENT	NUMBER OF 8-HOUR DAYS	CO_2 (METRIC TONS)[35]	CH_4 (CO_2e) (METRIC TONS)[36]	NO_X (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Pickup truck[37]	10	1.60	0.001	0.01	1.60
Excavator	10	3.80	0.002	0.02	3.80
Boats (x2)	10	26.00	0.040	0.20	26.20
Tugboat[38]	10	160.00	0.300	1.20	161.50
Crane Barge	10	15.90	0.021	0.11	16.00
Supply Barge	10	13.00	0.020	0.10	13.100
TOTAL		**220.30**	**0.384**	**1.640**	**222.20**

[35] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[36] CH_4 and NO_x emissions assumptions and CO_2e calculations based on EPA 2011b.

[37] Emissions assumptions for an 8 cylinder, 6.2 liter gasoline engine Ford F150 pickup based on DOE 2013 and 18 gallon (half-tank) daily fuel consumption.

[38] Fuel economy assumptions for a 3000 hp marine diesel tug based on Walsh 2008.

Environmental Consequences
The construction and transport of the reef materials and the actual deployment would all produce noise. However, the levels of noise would be consistent with the existing background noise in the respective areas. Because construction noise is temporary, negative impacts to the human environment during construction activities would be short-term and minor, as only those in the immediate project area would be affected by the increase in noise; however, it would not affect their activities.

After completion, the noise level should be limited to ambient noise from boat traffic. Increased boat traffic caused by anglers traveling to the reef would increase the noise level in the vicinity; however, that noise level would be associated with the activity and not dissuade users of the area. Overall, long-term noise effects from boating and other recreational activities would be minor. Therefore, any short-term or long-term noise impacts would be minor.

8.9.6.2 Biological Environment
The northern Gulf of Mexico contains a range of habitats that support diverse and productive ecosystems with both nursery and feeding grounds for ecologically and economically important species (GCERTF 2011). These habitats and species are connected through the movement of organisms (population and genetic connectivity) and the exchange of nutrients and organic matter (horizontally from nearshore to offshore, and vertically from the surface waters to the ocean floor). These habitats shelter 97% of all fish and shellfish harvested from the region during spawning or other parts of their life cycle (NOAA 2010). Habitats, resources, and their ecological connection are all part of the biological environment of the northern Gulf of Mexico. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

8.9.6.2.1 Living Coastal and Marine Resources

The Corpus Artificial Reef Project consists of a permitted 160-acre artificial reef area, located approximately 11 miles east of Packery Channel off the coast of Nueces County in a water depth of around 73 feet. The project area does not contain seagrass beds or hard substrates that would support corals or hard structure habitats. There are existing artificial reef materials in the project site. The location of existing reef materials is known and they would be avoided during reef deployments associated with this project. The primary living coastal and marine resources are marine and estuarine fauna (fish, shell beds, benthic organisms).

Affected Resources
Biological interactions as well as physiochemical factors such as substrate, temperature, salinity, water depth, currents, oxygen, nutrient availability, and turbidity are critical in determining the distribution, composition, and abundance of continental shelf soft bottom communities. Soft sediment infaunal communities on the continental shelf are generally dominated, in both number of species and individuals, by surface-deposit-feeding polychaete worms, followed by crustaceans and mollusks (Bureau of Ocean Energy Management 2012). Common species on the sediment surface include sea anemones, brittle stars, portunid crabs, and penaid shrimp. These animals are typically distributed on the basis of water depth and sediment composition or grain size, with seasonal components also being present in shallower water areas.

Benthic fauna include infauna (animals that live in the substrate, including mostly burrowing worms, crustaceans, and mollusks) and epifauna (animals that live on or are attached to the substrate, crustaceans, as well as echinoderms, mollusks, hydroids, sponges, and soft and hard corals). Shrimp and demersal fish are closely associated with the benthic community. Substrate is the single most important factor in the distribution of benthic fauna (densities of infaunal organisms increase with sediment particle size), although temperature and salinity are also important in determining the extent of faunal distribution. Depth and distance from shore also influence the benthic faunal distribution. Lesser important factors include illumination, food availability, currents, tides, and wave shock (Minerals Management Service 2005). In general, the vast majority of bottom substrate available to benthic communities in the project Area consists of soft, muddy bottoms; the benthos here is dominated by polychaetes.

Many fish species including sharks, snapper, grouper, and mackerel can also be found in the project area.

Environmental Consequences

Fauna in the project area may be affected by the Corpus Artificial Reef Project. Some species may leave the area during deployment activities, but they would likely return after activities cease. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the placement of the reef structures. However, these types of species are not typically numerous in these areas and the footprint of the reef structures is small (10-foot by 10-foot by 10-foot). The relative abundance of sessile organisms would not be significantly impacted since the footprint is small and spacing between pyramids, although random, would be greater than 20 feet apart. The small overall surface impact (with potential impact to sessile organisms) of the reef material is considered a trade-off to the overall habitat potential of the reef material itself. The existing habitat is sand-silt with little to no vertical relief. The artificial reef materials would provide for more surface area in the water column, thereby providing for additional areas for sessile organisms to attach. By providing food and shelter, artificial reefs can enhance overfished populations of resident reef fish like snapper and grouper. Transient species like mackerel, shark, and billfish can also benefit by feeding on the resident fish (USACE 2011).

The placement of reef materials on the soft bottom may temporarily increase turbidity in localized areas as sediments are resuspended into the water column. Increased turbidity can affect the use of the project area by juvenile and adult fish as well as adult shrimp species, which are common in the project area throughout the year. However, the resuspended sediments are expected to settle after each construction day.

Non-native colonization is not within Trustee control and the materials used for this project would not be colonized any faster than any other materials in the Gulf (i.e. bridges, piers, ship wrecks, standing petroleum platforms, etc.). Lionfish, an invasive species, are already present in large numbers in the Gulf and have been seen on the TPWD artificial reef sites from the High Island area (near the National Flower Banks Marine Sanctuary), south to the Texas Clipper artificial reef site near Mexico in the last several years. Divers remove them during monitoring trips by the TPWD's Artificial Reef Program when they can.

This project would likely result in short-term minor adverse impacts due to construction-related disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. The reef project would provide overall long-term benefits to marine species providing additional reef fish habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans.

8.9.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the FWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, essential fish habitat (EFH) protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act. The Corpus Artificial Reef Project would be implemented several miles offshore in waters greater than 50 feet depth (where there is no bird nesting habitat), therefore the discussion that follows focuses on species protected by the Endangered Species Act, Magnuson-Stevens Fishery Conservation and Management Act, and Marine Mammal Protection Act. The FWS concurred that the project would not affect federally listed and candidate species or critical habitats under the jurisdiction of the FWS, or result in take of bald eagles or migratory birds (FWS 2013).

Affected Resources

Endangered Species

Five species of endangered or threatened species of sea turtles were identified as possibly being present in the project area: loggerheads, green, hawksbill, Kemp’s ridley, and leatherback turtles. Sea turtles nest on beaches, and most species use nearshore hard bottom reef complexes, shallow water habitat (including seagrasses), or other coastal areas with rocky bottoms to forage for food. Due to the already existing reef structures in the permitted area, endangered or threatened species may utilize the project area as habitat for foraging, breeding, or resting. This area has not been designated as critical habitat for any of the sea turtle species.

There is no designated or proposed critical habitat for any other federally-listed, proposed, or candidate species in the project area.

Essential Fish Habitat

EFH in the project's area of effect is identified and described for various life stages of 55 managed fish and shellfish (GMFMC 1998). The Corpus Artificial Reef Project is located in an area that is designated as EFH under the Magnuson-Stevens Fishery Conservation and Management Act for several species of shark, shrimp, coastal migratory pelagic species, and reef fish. No Habitat Areas of Particular Concern or EFH Areas Protected from Fishing were identified at the project location.

Table 8-8. EFH within the vicinity of the Corpus Artificial Reef proposed area of effect.

Species	Life stage(s) Found at Location	Fisheries Management Plan
Highly Migratory Species (HMS)		
Scalloped Hammerhead Shark (*Sphyrna lewini*)	All	HMS
Great Hammerhead Shark (*Sphyrna mokarran)*	All	HMS
Bull Shark (*Carcharhinus leucas*)	All	HMS
Atlantic Sharpnose Shark (*Rhizopriondon terraenovae)*	All	HMS
Bonnethead Shark *(Sphyrna tiburo)*	All	HMS
Blacktip Shark (*Carcharhinus limbatus)*	All	HMS
Spinner Shark (*Carcharhinus brevipinna*)	Neonate, Juvenile	HMS
Lemon Shark (*Negaprion brevirostris*)	Neonate, Juvenile	HMS
Finetooth Shark (*Carcharhinus isodon*)	All	HMS
Dusky Shark (*Carcharhinus obscures*)	Adult, Juvenile	HMS
Tiger Shark (*Galeocerdo cuvier*)	Adult, Juvenile	HMS
Red Drum		
Red Drum (*Sciaenops ocellatus*)	Adult	Red Drum
Shrimp		
Brown Shrimp *(Farfantepenaeus aztecus)*	Eggs, Larvae, Adult, Spawning Adult	Shrimp
White shrimp (*Litopenaeus setiferus*)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Pink shrimp (*Litopenaeus duararum*)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Coastal Migratory Pelagics		
Cobia (*Rachycentron canadum*)	Larvae, Juvenile, Adult, Spawning Adult	Coastal Migratory Pelagics
Reef Fish (Triggerfish, Jacks, Snappers, Groupers)		
Gray triggerfish (*Balistes capriscus*)	Eggs, Adults, Spawning Adult	Reef
Greater amberjack (*Seriola dumerili*)	Eggs, Larvae, Spawning Adult	Reef
Almaco jack (*Seriola rivoliana*)	Eggs, Spawning Adult	Reef
Red snapper (*Lutjanus campechanus*)	All	Reef
Gray (mangrove) snapper (*Lutjanus griseus*)	Adult, Spawning Adult	Reef
Lane snapper (*Lutjanus synagris)*	Eggs, Adult	Reef
Wenchman (*Pristipomoides aquilonaris*)	Adult	Reef
Vermilion snapper (*Rhomboplites aurorubens*)	Juvenile	Reef
Goliath grouper (*Epinephelus itajara*)	Adult	Reef
Yellowmouth grouper(*Mycteroperca interstitialis*)	Eggs, Larvae, Adult	Reef
Gag (*Mycteroperca microlepis*)	Adult	Reef

Marine Mammals

Marine mammals known to occur in the Gulf of Mexico include 21 species of cetaceans (whales and dolphins) plus the West Indian manatee. The project area is located within the NOAA-defined nearshore, estuarine waters to the continental shelf edge (depths of 0-656 feet). Typically whales do not occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Of the 22 species of marine mammals known to occur in the Gulf of Mexico, only three protected species of dolphins commonly occur in nearshore waters (bottlenose, Atlantic spotted, and Risso's). The bottlenose dolphin inhabits the Gulf of Mexico year round and are the most commonly observed dolphin in nearshore waters. The Atlantic spotted dolphins prefer warm-temperate waters over the continental shelf, edge, and upper reaches of the slope and are very active at the surface. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>328 feet in depth) (Davis et al. 2002; NMFS 2008). Because of the relatively shallow depth of 73 feet at the project location and the established ranges and depths that the majority of the cetaceans occupy, it is not anticipated that these species would be encountered in the project area during construction.

Of the five listed endangered whale species (sperm whale, sei whale, fin whale, blue whale, humpback whale), only the sperm whale is considered to commonly occur in the Gulf of Mexico. The sperm whale is predominantly found in deep ocean waters, generally deeper than 3,280 feet, on the outer continental shelf. Due to the relatively shallow depth of 73 feet in the project area, the sperm whale, or any other endangered whale, is not likely to be present during the deployment of the materials.

The West Indian manatee has been observed in Texas waters; however, sightings are very rare and almost always occur in the coastal bays and estuaries. Manatees, which tend to stay near the shoreline, are not expected to be encountered in the project area, which is 9 miles offshore. Because the FWS concurred that the project would not affect West Indian manatee under the ESA, the Trustees determined that no take of manatee under the MMPA would occur.

Environmental Consequences

Project deployment would have minor short-term impacts to protected species and their habitats in the areas where the reef materials would be placed. Short-term minor impacts may occur if species using the project area are temporarily disturbed. Long-term impacts would be beneficial with the addition of hard substrate that would support a more diverse community of benthic organisms and fish. The avoidance of artificial reefs areas by the commercial shrimp trawling industry should have a positive impact to sea turtles by providing habitat in which turtles can avoid entanglement in trawls. Overall, the addition of the artificial reef should have a positive impact on federally-listed sea turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, by enhancing their foraging habitat.

At the conclusion of the ESA consultation, NMFS concurred that the project is not likely to adversely affect federally-listed sea turtles (NMFS 2014a). The project area is not located within designated Gulf sturgeon critical habitat (68 FR 13370, March 19, 2003), nor proposed loggerhead sea turtle critical habitat (78 FR 43005, July 18, 2013). As part of the Endangered Species Act consultation, no best management practices were identified. However, project implementation will adhere to NMFS's Sea Turtle and Smalltooth Sawfish Construction Conditions (2006), The Texas Artificial Reef Fishery Management Plan (TPWD 1990), the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NOAA Fisheries 2007).

While most motile fauna such as crab, shrimp, and finfish have the ability to avoid the area during the sinking process, this project will permanently displace a small portion of the existing natural soft bottom and sand habitat within the project area. This project would result in a minor long-term impact to marine soft bottom EFH by covering it with reef pyramid structures and effectively converting the naturally occurring soft bottom to artificial hard bottom substrate. Soft bottom habitat is very abundant in the Gulf of Mexico whereas hard bottom habitat acreage is much more limited. The relative abundance of soft bottom habitat within and surrounding the project area would not be significantly impacted due to the small footprint of each pyramid (10-foot by 10-foot by 10-foot) and the anticipated 20-foot spacing between the pyramids. The conversion from soft bottom habitat to hard bottom substrate would be considered a habitat trade off by providing new hard structures to be colonized by encrusting marine organisms.

NMFS concurred with the EFH assessment for the project, which determined that temporary and localized turbidity impacts and permanent impacts to soft bottom EFH would occur; however, the creation of new hard structure in the Gulf may also create benefits to some species managed under the Magnuson-Stevens Act by providing foraging habitat, cover, and conditions favorable for encrusting benthic colonization (NMFS 2014d).

The Corpus Artificial Reef site is located at a depth of around 73 feet. Typically marine mammal species in the Gulf are found in deeper waters on the outer continental shelf or along the shelf break; therefore, they would not be impacted during the deployment of the material and no incidental take of marine mammals is anticipated. Deployment of the reef materials would be short in duration (10 days) and materials would be lowered slowly, providing fish and wildlife opportunity to leave the reef deployment area. Impacts to would be avoided via management guidelines and techniques as appropriate. During reef deployment, a monitor would be present that would be able to halt work if sea turtles, smalltooth sawfish, whales, or other federally protected species are in the project area. Work would be halted until such time as the area is deemed safe to continue the operation (i.e., species have left the area). Additionally, the Sea Turtle and Smalltooth Sawfish Construction Conditions would be followed (NMFS 2006).

8.9.6.3 Human Uses and Socioeconomics

In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

8.9.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

There are over 1.2 million saltwater recreational anglers in Texas. A 1995 study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs (Ditton et al. 1995). Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs each year. Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Commercial shrimping is a highly productive industry within the Gulf of Mexico. The Texas shrimp fishery is one of the most valuable and one of the largest seafood industries in the United States. TPWD sells about 3,500 commercial shrimp boat licenses and about 600 non-commercial shrimp trawl licenses each year. Texas commercial landings exceeded 27.7 million pounds of shrimp in 2010, worth more than $91 million to the commercial fishermen (http://www.tpwd.state.tx.us/fishboat/fish/commercial/comland.phtml). Preliminary data on shrimping frequency indicates a high level of shrimping occurs in the Gulf of Mexico waters in the vicinity of the proposed area (Culbertson et al. 2004). One study reported that shrimping intensities in the western Gulf of Mexico were highest near shore and tapered off gradually at deeper depths (McDaniel et al. 2000).

There are oil and gas platforms, leases, pipelines, and a shipping fairway within a 5-mile radius of the Corpus Artificial Reef Project; however, there would be no negative impacts to the exploration and production of oil and gas. The project is not located near any Department of Defense danger zones. The Texas Artificial Reef Plan requires that artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline, nor in prohibited areas and danger zones designated by the U.S. Department of Defense. The reef area would be added to the NOAA navigation charts and a lighted buoy is already in the permitted reef area. Typically, fishermen avoid known hazards that can snag nets to reduce potential damage to equipment and vessels.

Environmental Consequences

Because this project is located offshore, it would have no negative impacts on the socioeconomic status of the communities and counties adjacent to the Corpus Artificial Reef Project. There would be indirect beneficial effects to the local economy due to increased fishing opportunities provided by the artificial reef. Artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. Given the demand for fishing on artificial structures, the creation of Corpus Reef would help increase recreational opportunities. In turn, this is anticipated to increase sales of bait and supplies, boat launch fee revenue, harbor occupancy, fuel, charter boats, diving equipment and more. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The project would benefit the local economies adjacent to the project site by increasing use of the harbors, boat ramps, bait camps, and private fishing charter businesses. Commercial fishermen notate obstructions on navigation charts or GPS waypoints to avoid snags and potential damage to equipment and vessels. Overall, socioeconomics would not be adversely impacted as a result of the proposed project. The project is expected to have a positive beneficial impact to the local economy through indirect benefits associated with increased fishing opportunities and tourism.

Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There is not a minority or low-income population in the impact zone – the Gulf of Mexico, 11 miles offshore, is uninhabited. Furthermore, there are no adverse effects to low income or minority populations anticipated from the proposed project.

8.9.6.3.2 Cultural Resources

Affected Resources

There are no known historic or prehistoric sites in the permitted reef area. A high-resolution geophysical survey was conducted in December 2013 to ensure that no historically or culturally significant areas would be impacted during the deployment of the artificial reef materials. The data collected during the survey was assessed for evidence of high probability areas for prehistoric occupations and shipwrecks. The evaluation of the high-resolution geophysical survey data from a survey conducted within the project area indicates that there were no landforms identified within the survey area that could be considered as high probability areas for prehistoric occupations. There were no other unusual depressions, scours, sediment changes, unidentified magnetic anomalies or unidentified seafloor targets observed within the survey area that could represent unidentified shipwreck remains.

Environmental Consequences

It is possible that historic shipwreck materials may not be detected by the geophysical instruments or may be obscured by modern debris. If wooden planking or other cultural materials that could represent shipwreck remains are encountered, field operations would cease and a representative from the Texas Historical Commission would be contacted to provide further guidance. If any culturally or historically important resources are identified during project preparations or pre-deployment surveys, such areas would be avoided during deployment of the pyramid structures. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.9.6.3.3 Land and Marine Management

Affected Resources

The project area is located approximately 9 miles offshore of Nueces County, Texas on state-owned submerged lands. TPWD obtained a USACE permit (SWG-2010-01407) for the Corpus Artificial Reef Project under Section 10 of the Rivers and Harbors Act and under Section 404 of the Clean Water Act in May 2011. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

TPWD obtained a lease for the use of state owned submerged lands from TGLO and would follow the requirements of the lease to avoid impacts to critical areas, not interfere with public navigation channels, and would avoid impacts to coastal waters. Additionally, the lease requires that the project meet the clearance and distance from shipping lanes, safety fairways, and anchorages requirements as established by the USACE and the USCG. A USCG approved marker buoy is already installed at the Corpus reef site and will be maintained per USCG requirements.

TPWD created the Artificial Reef Program in 1990 after the Texas Legislature passed the Texas Artificial Reef Act in 1989. The program establishes artificial reefs to create reef fishery habitat and enhance commercial and recreational fishing opportunities in state and nearby federal waters. The Texas Artificial Reef Fishery Management Plan (TPWD 1990) guides the decision-making process for selecting reef sites and materials, and defines parameters for prioritizing areas for reefs. TPWD's Artificial Reef Program also follows guidance in the Guidelines for Marine Artificial Reef Materials (Atlantic and Gulf States Marine Fisheries Commissions 2004), The Texas Public Reef Building Program Standard Operating Protocol and Guidelines (TPWD 2012b), and the National Artificial Reef Plan (as Amended): Guidelines for Siting, Construction, Development, and Assessment of Artificial Reefs (NMFS 2007) when constructing artificial reefs. The proposed Corpus Artificial Reef Project meets the requirements of the Texas Artificial Reef Act as well as the goals and priorities of the Texas Artificial Reef Fishery Management Plan as well as the National Artificial Reef Plan.

Environmental Consequences
The Corpus Artificial Reef Project would be located offshore, and would not be subject to zoning, land use planning, or land developments plans. The Texas Artificial Reef Fisheries Management Plan requires that the project not be located within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline; therefore, it would not have any impacts to the oil and gas production facilities and pipelines in the area of the project. In addition, the project is located greater than 2 miles from the designated shipping fairway and would comply with the USACE and USCG requirement of a minimum of 50 feet clearance above the reef. Therefore, land and marine management would be unaffected by the Corpus Reef Project.

8.9.6.3.4 Aesthetics and Visual Resources

Affected Resources
Reef materials would be loaded onto a boat or barge and transported offshore. The artificial reef materials would be placed on the ocean floor and would not be visible from the surface or shore. The reef is already identified by a yellow 10-foot spar buoy with a flashing light and TPWD decals.

Environmental Consequences
The use of barges and large equipment could have a temporary visual impact during the time of project implementation. The deployment time would be short and therefore any visual impacts would be short in duration as well. The artificial reef would be placed on the ocean floor and would not be visible above the surface. The lighted buoy is already in place and therefore would not introduce a new visual component to the area. After completion, visual impacts would be limited to boat traffic. Increased boat traffic caused by anglers traveling to the reef would be consistent with the surroundings or designated uses. The boats would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Therefore, the Corpus Artificial Reef Project is expected to have only minor short-term impacts on aesthetics and visual resources.

8.9.6.3.5 Tourism and Recreational Use

Artificial reefs enhance the fishing opportunities for hook-and-line anglers targeting fish associated with artificial reefs. There are over 1.2 million saltwater recreational anglers in Texas. One study found that of all Texas saltwater fishermen, 47% (564,000) fish within the Gulf of Mexico from a boat and approximately 300,000 - 400,000 anglers fish at offshore platforms or artificial reefs. Party boats take about 10,335 customers offshore to local Texas reefs and 35,724 offshore to all artificial reefs (Ditton et al. 1995). Trips to artificial reefs accounted for 40% of the total number of offshore trips.

Environmental Consequences

The size of the Corpus Artificial Reef Project and the ability to only work in a small portion of the reef site at a time should help to minimize impacts to any recreational activities occurring nearby. Recreational and commercial fishing boats may be in the area during deployment. Any boats in the area would be coordinated with prior to the deployment of any materials to ensure safety of everyone in the vicinity. The nearest access point is Packery Channel which is 11 miles to the west. Each channel is serviced by public boat ramps, marinas, and harbors, which makes the project very accessible to the public. In addition, during the scoping meetings conducted by TPWD, numerous constituents related the need for more artificial reefs in Texas waters to enhance offshore fishing for smaller vessels. Given the demand for fishing on artificial structures, the expansion of the Corpus reef would increase recreational fishing opportunities. In turn, this project is anticipated to increase sales of bait and supplies, boat launch fee revenue, and harbor occupancy. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. Anglers would be able to fish around the area during deployment of the pyramids. Therefore, no adverse impacts to tourism and recreational use are anticipated. The project should result in beneficial impacts to tourism and recreational uses over the long-term.

8.9.6.3.6 Infrastructure

Affected Resources

The project area is located approximately 9 miles offshore of Nueces County. The project area is located in around 73 feet of water and is permitted for a 50-foot clearance to ensure that it would not impede boat traffic. The Corpus Artificial Reef Project is located about 7 miles from the Aransas Pass Anchorage area. The reef area is about 3 miles to the closest shipping fairway, approximately 0.63 miles to the nearest oil and gas pipelines, and about 13 miles to the nearest platform.

The Texas Artificial Reef Fisheries Management Plan requires that all artificial reefs not be placed within 1,640 feet of an existing oil or gas production platform or within 774 feet of a pipeline.

Environmental Consequences

The Corpus Artificial Reef Project would not impact the existing shipping lanes, fairways or oil and gas production facilities or pipelines. All navigation safety measures would be followed. Therefore, infrastructure would be unaffected by this project.

8.9.6.3.7 Public Health and Safety and Shoreline Protection

Affected Resources

The Corpus Artificial Reef Project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. During construction of the predesigned concrete pyramids, the Guidelines for Marine Artificial Reef Materials would be followed and the materials would be stable, durable, and complex, and would be clean and free of any hazardous substances. The permitted reef area is located approximately 9 miles offshore and not in an area that would impact shoreline erosion. The project deployment would use mechanical equipment boats, and barges that use oil, lubricants, and fuels.

Environmental Consequences

Because of the nature and location of the Corpus Artificial Reef Project, no impacts to public health and safety, or shoreline erosion are anticipated as a result of the construction of the reef or the reef itself. No hazardous waste would be created during construction of the improvements. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. No adverse effects to public health and safety and shoreline projection are expected as a result of this project.

8.9.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Corpus Artificial Reef Project would increase the amount of reef materials in an artificial reef site which is permitted for 160 acres, but only has materials in the northwest quadrant and in the center of the permitted area. The project would place predesigned concrete pyramids in the about 115 acres of the remaining portions of the 160-acre permitted area. The project is consistent with Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. This restoration project would enhance recreational fishing opportunities. The Trustees have started coordination and reviews under the National Historic Preservation Act and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Endangered Species Act, Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Section 10 of the Rivers and Harbors Act, Section 404 of the Clean Water Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.10 Sea Rim State Park Improvements: Project Description

8.10.1 Project Summary

Sea Rim State Park is located along the upper Texas coast in Jefferson County, Texas, southwest of Port Arthur, Texas. The proposed Sea Rim State Park Improvements project would construct two wildlife viewing platforms (Fence Lake and Willow Pond), one comfort station, and one fish cleaning shelter in the Park (Figure 8-20). These improvements would enhance visitor use and enjoyment of Park resources. The estimated cost for this project is $210,100.

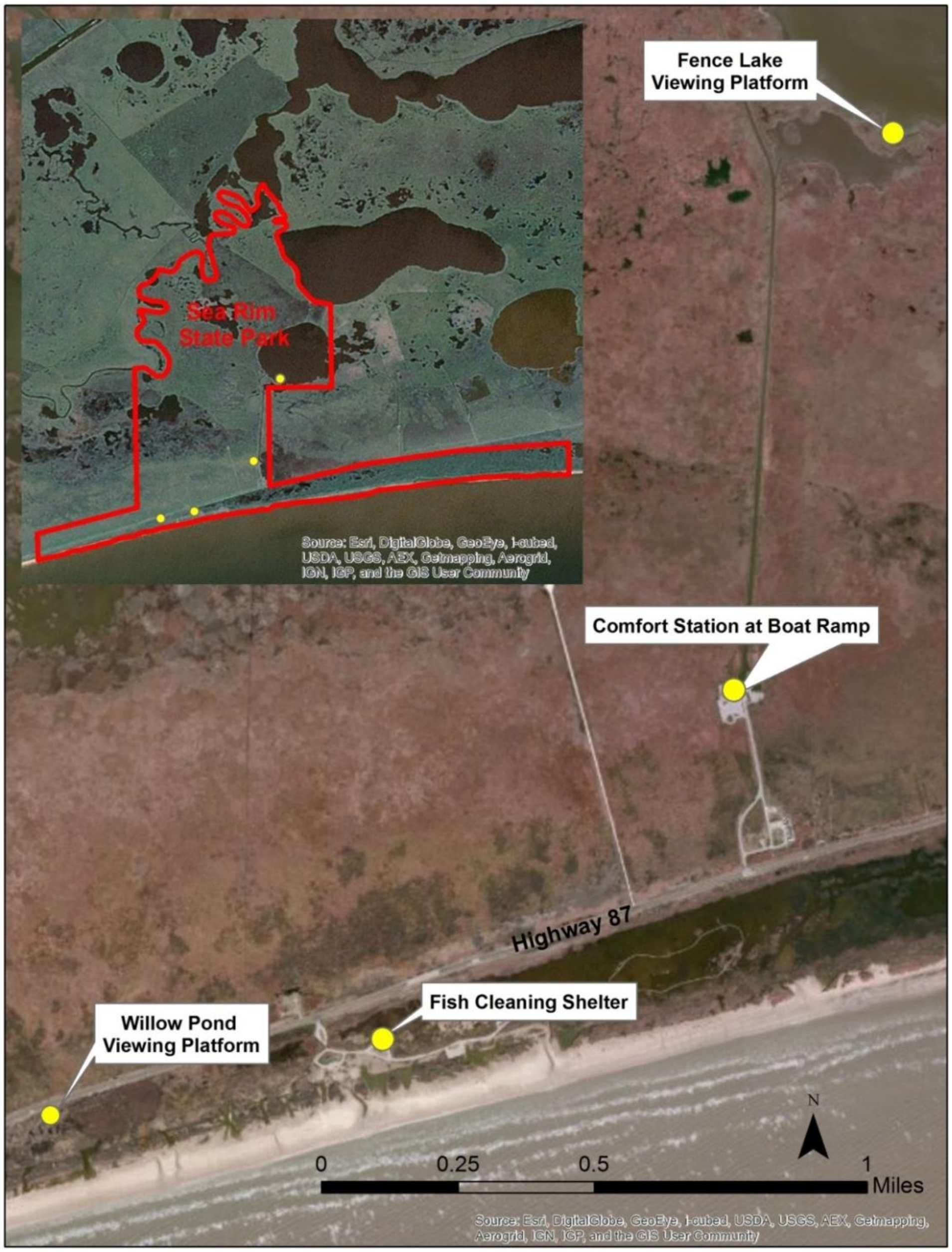

Figure 8-20. Location of the proposed improvements within Sea Rim State Park.

8.10.2 Background and Project Description

The proposed Sea Rim State Park project will restore and improve recreational facility infrastructure to enhance recreational access and opportunities on the Texas coast. Sea Rim State Park, which includes 4,141 acres of marshland with 5 miles of beach shoreline, is located in Jefferson County, Texas, southwest of Port Arthur (Figure 8-21). Located along the Greater Texas Coastal Birding Trail, Sea Rim State Park serves as a rest stop for many species of migratory birds traveling the Central Flyway. White and brown shrimp, crabs, and various sport fishes, such as red drum, speckled trout, and flounder, thrive in the park's lakes and bayous. It is in an excellent location for recreational activities involving natural resources, including bird/wildlife watching, fishing, boating, camping, beach going, etc. Currently, visitors to Sea Rim State Park are required to be self-sufficient because much of the Park's infrastructure was damaged by Hurricanes Rita (2005) and Ike (2008). To guide the restoration process, TPWD started a master planning process in 2010 to identify appropriate restoration efforts for the Park. Amenities proposed by this project are consistent with the goals identified during the planning process and will help improve and enhance recreational opportunities along the Texas coast. Specifically, the Sea Rim State Park project includes construction of two wildlife viewing platforms (Fence Lake and Willow Pond), one comfort station (vault toilet), and one fish cleaning shelter in the Park. The goals of biological conservation balanced with recreation opportunity will be supported by:

- Producing a new development footprint no larger than the original;
- Minimizing the losses of wetlands that experience surface inundation;
- Minimizing the losses of dunes over 6 feet in elevation; and
- Using sustainable construction methods to create energy efficient structures.

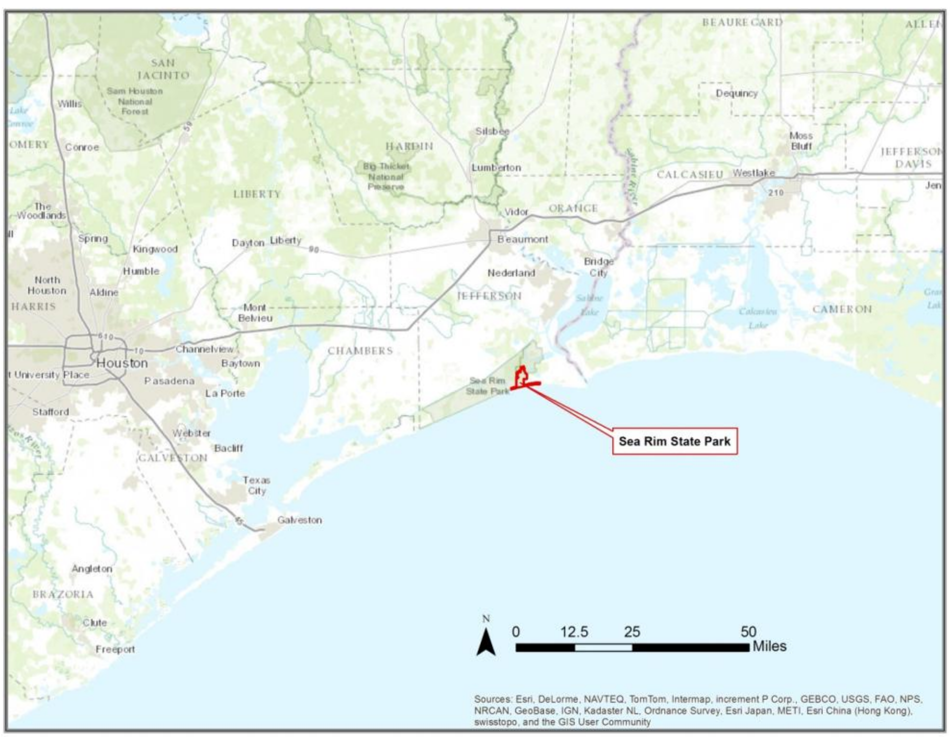

Figure 8-21. Location of Sea Rim State Park.

The Fence Lake viewing platform will provide wildlife viewing opportunities accessible by kayaks and other shallow draft boats. The platform, located in open water in Fence Lake, will have a vessel docking area and a raised platform to provide visitors a high vantage point to see above the nearby tall shoreline vegetation.

The Willow Pond viewing platform and associated boardwalk will provide access to existing infrastructure to help improve viewing opportunities in coastal vegetation and wetland habitats. The new boardwalk will connect to a previously constructed section of boardwalk that is currently isolated and not accessible due to damage from recent hurricanes.

The comfort station will be constructed near the Park's boat ramp and will be similar to other pre-fabricated comfort stations used in Texas State Parks. The comfort station will have two restrooms and is intended to serve day-use visitors who are accessing the trails and/or using the boat ramp (Figure 8-22).

Figure 8-22. Example of a comfort station (vault toilet).

The fish cleaning shelter will be located on the beach side of the Park within and adjacent to the equestrian parking lot. This facility will improve experiences for anglers by allowing them to process their catch on site (Figure 8-23).

Figure 8-23. Example of a fish cleaning station.

8.10.3 Evaluation Criteria

This proposed Sea Rim State Park project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The project would enhance the public's use and enjoyment of natural resources, helping to offset a portion of the adverse impacts to such uses caused by the Spill. Creating the proposed infrastructure (viewing platforms, comfort station, and a fish cleaning shelter) will provide visitors increased opportunities for viewing wildlife while also maintaining sanitary conditions during the users' fishing and personal activities. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible and utilizes proven techniques with established methods and documented results and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement).

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.10. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, the BMPs and measures to avoid or minimize impacts described in Section 8.10 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation, operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. §990.54(a)(1)). Developments proposed by this project are consistent with the goals identified during the master planning process and will help improve and enhance recreational opportunities along the Texas coast. As a result, the proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3) and Sections 6e of the Framework Agreement).

To ensure the opportunity for community participation, public comments were acquired during the master planning process through a public meeting (held in April 2010 in Port Arthur, Texas), personal conversations, and emailed letters. All comments received were reviewed and evaluated by the planning team in the context of the redevelopment plans at Sea Rim State Park.

Recreational use projects in general and this specific project were submitted as restoration projects on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.10.4 Performance Criteria, Monitoring and Maintenance

This Sea Rim State Park project includes monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring has been designed around the project objective, which is to construct two wildlife viewing platforms (Fence Lake and Willow Pond), one comfort station, and one fish cleaning shelter in Sea Rim State Park to enhance recreational use of the Park.

Performance criteria for this project will include a determination of successful construction of the project according to design to ensure that the opportunity for recreational use of the Park will be enhanced. Monitoring efforts will also be implemented to ensure that the project is constructed in accordance with construction documents. The State Park currently has visitation monitoring procedures to capture the number of daytime visitors, overnight visitors, and participants in interpretive programs. This information will be collected and shared annually to document performance monitoring of the project for 5 years after construction completion.

Ongoing maintenance of the constructed facilities would be the responsibility of Sea Rim State Park, which is owned and managed by the TPWD.

8.10.5 **Offsets**

The Early Restoration benefits provided by the project, also known as NRD Offsets, are $420,200 expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill. [39] This Offset is based on the use of a BCR ratio of 2.0, reflecting the value that users are expected to be provided by the implementation of the proposed project relative to its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.10.6 **Cost**

The total estimated cost to implement this project is $210,100. This cost reflects estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

[39] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

8.11 Sea Rim State Park Improvements: Environmental Review

Sea Rim State Park is located along the upper Texas coast in Jefferson County, Texas, southwest of Port Arthur, Texas. The proposed Sea Rim State Park Improvements project would build two viewing platforms, a comfort station (vault toilet), and a fish cleaning shelter. These improvements would enhance opportunities for visitor use and enjoyment of Park resources. The estimated cost for this project is $210,100.

8.11.1 Introduction and Background

Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing and diving, beach use, camping, and wildlife viewing. Creating the proposed infrastructure (viewing platforms, comfort station, and a fish cleaning shelter) would provide visitors increased opportunities for a portion of these recreational activities while also maintaining sanitary conditions during the users' fishing and personal activities.

To guide the restoration process for the Park, TPWD started a master planning process in 2010 to identify appropriate restoration efforts. To ensure the opportunity for community participation, public comments were acquired during the master planning process through a public meeting (held in April 2010 in Port Arthur, Texas), personal conversations, and e-mailed letters. All comments received were reviewed and evaluated by the planning team in the context of the redevelopment plans at Sea Rim State Park. Amenities proposed by this project are consistent with the goals identified during the master planning process and would help improve and enhance recreational opportunities along the Texas coast.

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including, but not limited to, the Texas Coastal Management Program, and compliance with federal requirements, including the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act, would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

The permit application (SWG-2013-00686) for the Fence Lake viewing platform was approved by the USACE in a letter of permission pursuant to Section 10 of the Rivers and Harbors Act on January 22, 2014. TPWD submitted a permit application for the Willow Pond viewing platform and boardwalk to the USACE in April 2014.

Sea Rim State Park is operated by the TPWD, whose mission includes protecting, enhancing and increasing recreational opportunities throughout the state. The Sea Rim State Park Improvements project meets TPWD's objectives by increasing access to and participation in outdoor recreational opportunities. The agency's mission and objectives are described in detail in TPWD's Land and Water

Resources Conservation and Recreation Plan (2013b). In addition, Sea Rim State Park will follow guidance described in the State Parks Division Operating Plan (TPWD 2012a).

The TPWD regulations at Title 31, Texas Administrative Code (TAC) Chapter 59 govern the health, safety and protection of persons and property in state parks, historic sites, scientific areas, or forts, including encompassed waters, under the control of the TPWD. Implementation of the proposed project would follow the TPWD regulations, including the State Park Operational Rules at 31 TAC Chapter 59, Subpart F (Sections 59.131 to 59.136). The TPWD State Park Division also follows Division procedures established in 2010 and revised in 2012 for exotic, feral, and nuisance animal control.

All improvements would comply with Americans with Disabilities Act Accessibility Guidelines and Texas Accessibility Standards as well as federal, state, and local law concerning construction standards and building codes to protect public health, safety, and welfare.

8.11.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Sea Rim State Park project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.11.3 Project Location

Sea Rim State Park is located along the northern Texas coast in Jefferson County, Texas, southwest of Port Arthur, Texas (Figure 8-24). The Park consists of 4,141 acres of marshland and 5 miles of beach shoreline in the western portion of the Chenier Plain. The Park is surrounded by state and federal wildlife management areas and refuges (J.D. Murphee Wildlife Management Area, McFaddin National Wildlife Refuge, and Texas Point National Wildlife Refuge). Highway 87 divides the beachfront portion of the Park from much of the marshland areas and lakes, including Fence Lake. The dominant habitat type is tidally influenced brackish water marshes and lakes. In addition, the Park contains a stretch of sandy beach, dunes, and dune swale wetlands that abut the Gulf of Mexico.

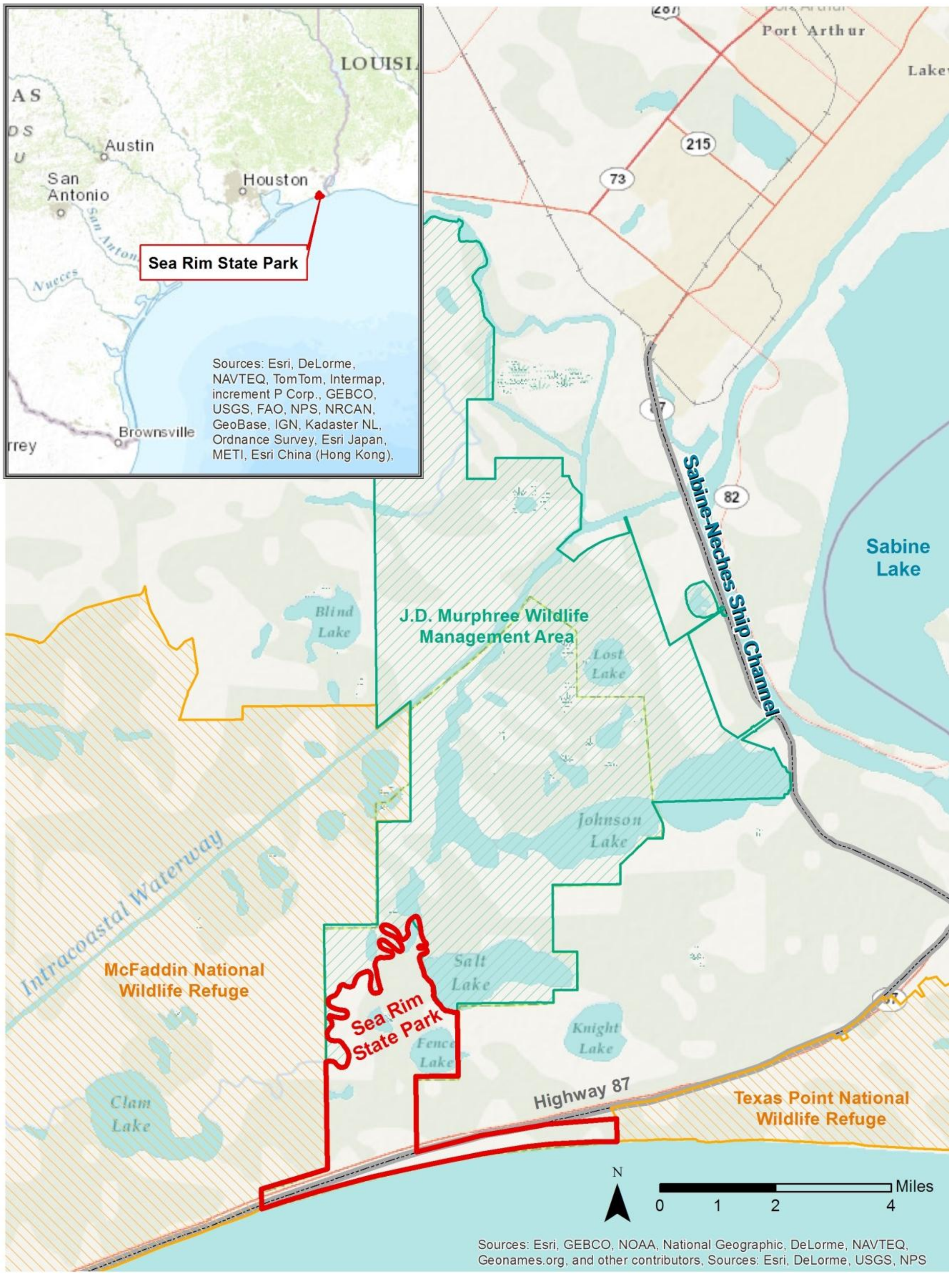

Figure 8-24. Location of Sea Rim State Park, chain of local canals and lakes, J.D. Murphee Wildlife Management Area, McFaddin National Wildlife Refuge, and Texas Point National Wildlife Refuge.

Fence Lake, a tidally influenced shallow lake, is located on the northeast section of the Park, north of Highway 87 (Figure 8-24). Fence Lake is shallow (2-3 feet deep) and is connected to the Sabine-Neches Ship Chanel and Sabine Lake (a major bay) through an 11-mile chain of canals and smaller lakes. The proposed viewing platform would be located on the southern end of Fence Lake.

The proposed Willow Pond viewing platform and associated boardwalk would be located on the Gulf (southern) side of Highway 87 within in the beach/dune system that consists of saline prairie and isolated small wetland habitats (Figure 8-20 and Figure 8-24).

The proposed comfort station would be located in an existing parking area near a boat ramp north of Highway 87 (Figure 8-20 and Figure 8-24).

The proposed fish cleaning shelter is also located on the Gulf (southern) side of Highway 87 within the beach/dune area and is adjacent to existing infrastructure and a parking lot (Figure 8-20 and Figure 8-24). The construction area abuts a small wetland area.

8.11.4 Construction and Installation

The proposed improvements are located in different places within the Park. The combined improvement footprint and construction limit for all four improvements would impact less than 0.5 acres of the existing Park (400 sq. feet at Fence Lake, 6,300 sq. feet at Willow Pond, 2,300 sq. feet at the comfort station, and 2,700 sq. feet at the fish cleaning shelter). To the extent feasible, new facilities would be located within the pre-existing Park footprint. This project is still in the design phase and modifications may occur as the engineering designs become finalized.

8.11.4.1 Fence Lake Viewing Platform

Fence Lake is located to the north of Highway 87 and is connected to an existing boat ramp via a canal. The viewing platform, to be sited in a small cove on the southern shore of Fence Lake, would consist of a 10-foot by 14-foot raised, fixed platform and an adjacent 6-foot by 4-foot floating platform. The smaller floating platform would be equipped with cleats to tie off boats and would serve to facilitate passengers exiting boats and accessing the raised platform. Users would reach the fixed platform via a ladder adjacent to the floating platform. The additional height on the fixed platform would provide visitors a high vantage point to see above the nearby tall shoreline vegetation. The preliminary engineering design is shown below (Figure 8-25). Conceptually, there would be six pilings supporting the fixed platform. Pilings would likely be steel pipes or treated wood and they would measure approximately 12 inches and be spaced 5 feet lengthwise and 7 feet crosswise. Platform materials would likely consist of composite decking, fiberglass reinforced polypropylene, or a grate decking system from a manufacturer. Spacing of the decking would comply with Americans with Disabilities Act Accessibility Guidelines and Texas Accessibility Standards and would allow for light penetration.

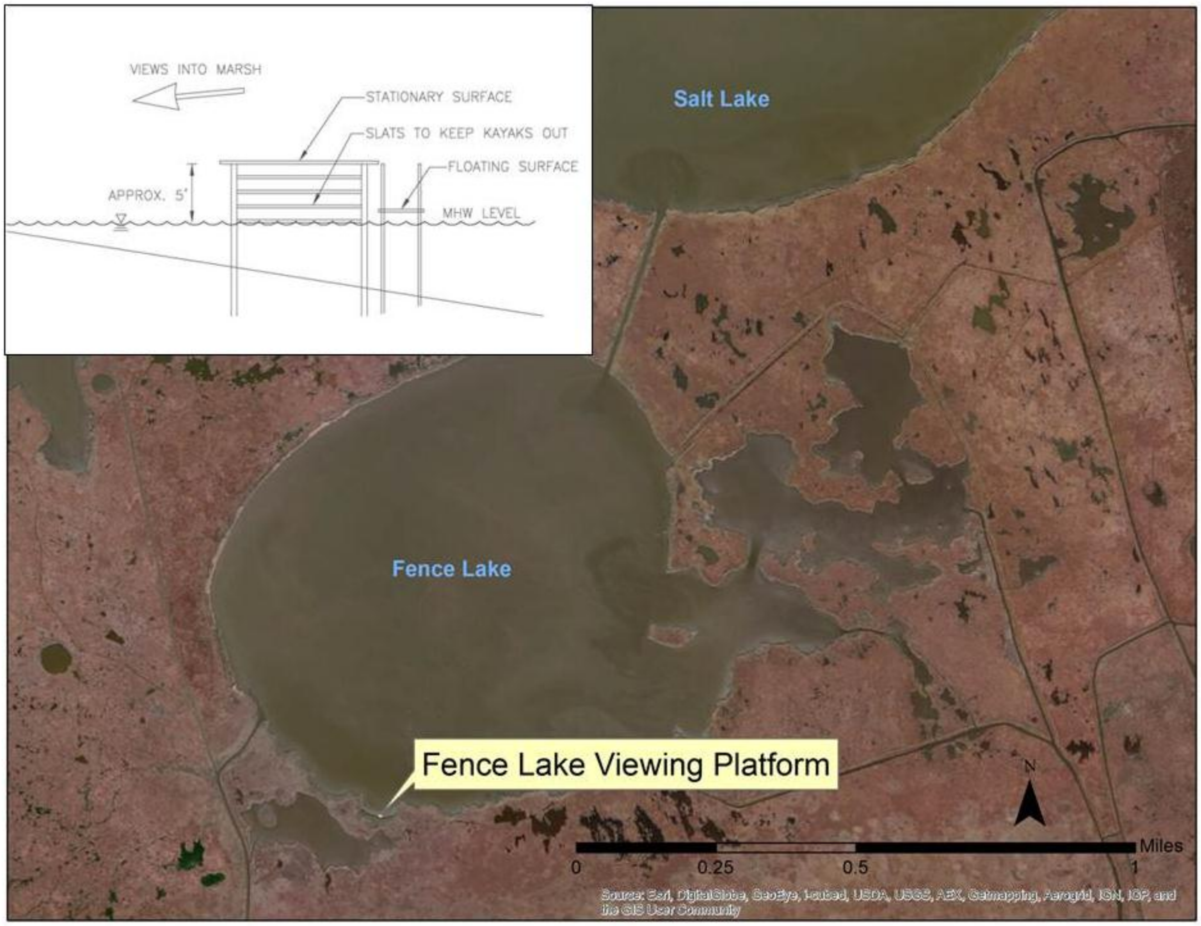

Figure 8-25. Location of the viewing platform on Fence Lake and the preliminary platform design.

Grading and Ground Disturbance

A 20-foot by 20-foot construction zone would be established around the worksite, which would be on the water of Fence Lake (Figure 8-26). About six 12-inch by 12-inch pilings, depending on the final design, would be driven into the sediments of Fence Lake with the aid of moderate sized excavation equipment or pile drivers. The platform would be constructed on the pilings and a floating platform would be attached to the structure.

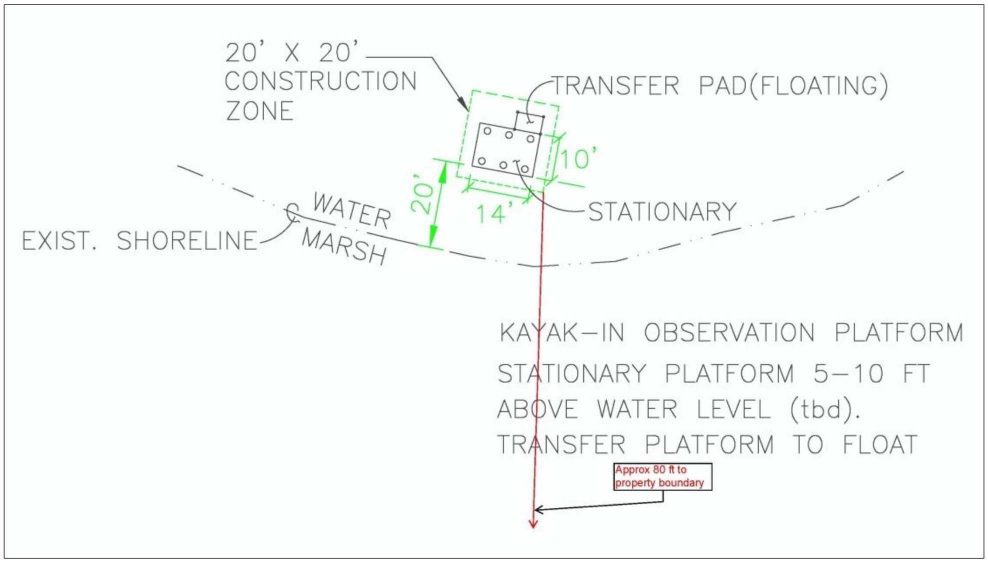

Figure 8-26. Site plan for the Fence Lake viewing platform.

Mobilization, Staging, and Stockpiling

Materials would be transported to the worksite using an airboat or other marine vessel. Most materials would be transported in and out of the site daily. However, a small barge or other vessel would likely stay at the site adjacent to the work area. From the boat, equipment would be used to drive the pilings into the lake bed. After the pilings are set and stabilized, the platform would be constructed on top of the pilings.

8.11.4.2 Willow Pond Viewing Platform

The Willow Pond boardwalk and viewing platform would be located on the Gulf side (south) of Highway 87. The viewing platform would consist of a 16-foot by 8-foot observation platform which would be connected to a 5-foot wide, 235-foot long boardwalk. The boardwalk will be connected to an adjacent road and nearby parking area (Figure 8-27). Additionally, the boardwalk would also connect to a previously constructed section of boardwalk that is currently inaccessible.

Figure 8-27. Location of the viewing platform and boardwalk on Willow Pond with an image of a boardwalk.

Grading and Ground Disturbance

The Willow Pond viewing platform would cause ground disturbance by placing support structures into the substrate. The maximum footprint of the construction area is anticipated to be 6,300 sq. feet (0.14 acres). A 20-foot construction zone (15 feet on one side and 5 feet on the other) around the boardwalk and platform would be established to allow access for construction personnel and equipment, and to limit the geographic scope of the impacts. Construction activities would include ingress and egress of construction equipment and workers, driving of pilings, and construction of the decking and associated structures.

Mobilization, Staging, and Stockpiling

Existing roads and/or parking areas would be used to stage and stockpile materials for the Willow Pond platform and boardwalk. Materials can also be staged at the existing parking lot at the camping loop restroom until they are needed for construction. Equipment would include all-terrain vehicles, shredders, and a moderate sized rubber track compact radius excavator to drive the pilings for the boardwalk.

8.11.4.3 Comfort Station

The comfort station would be constructed north of Highway 87 near the boat ramp and would be similar to other pre-fabricated comfort stations in Texas State Parks. The comfort station would have separate men's and women's restrooms and is intended to serve day-use visitors who are accessing the trails and/or using the boat ramp.

Grading and Ground Disturbance

Construction activities would occur on an existing asphalt parking lot and a grassy median which overlays approximately 4 feet of fill material (Figure 8-28). The construction area would extend approximately 10 feet from the walls of the structure and 5 feet from the sidewalks. Installation of the comfort station would include excavation of a 14-foot long by 6-foot wide by 8-foot deep hole to accommodate the pre-constructed sub-surface waste vaults.

Mobilization, Staging, and Stockpiling

The existing parking lot would be used to stage construction materials. Construction equipment would consist of a backhoe, tractor trailer, and crane to prepare the site and place the station.

Figure 8-28. Location of the comfort station.

8.11.4.4 Fish Cleaning Shelter

The fish cleaning shelter would be constructed north of an existing parking lot on the Gulf side (south) of Highway 87. The fish cleaning shelter would be located adjacent to the equestrian parking lot and is near the beach (Figure 8-29). The building slab would be designed so that water would drain into an adjacent gravel area to aid in cleaning the area (Figure 8-30). Solids would be captured by the perforated garbage hole in the cleaning table and then disposed of in the dumpster. Although this shelter would be replacing a temporary rinse shower that was built in 2011, it would still provide access to potable water for patrons on the beach side of the Park.

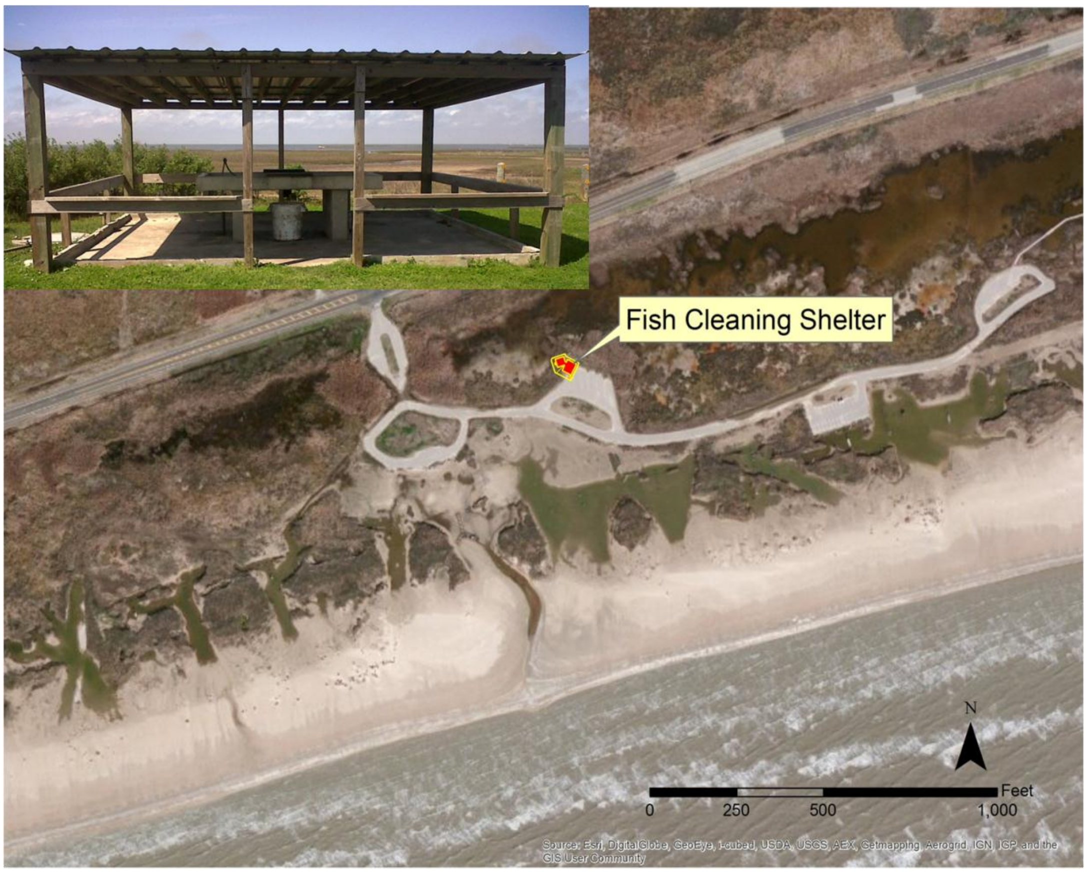

Figure 8-29. Location of the fishing cleaning shelter with an example of a fish cleaning shelter.

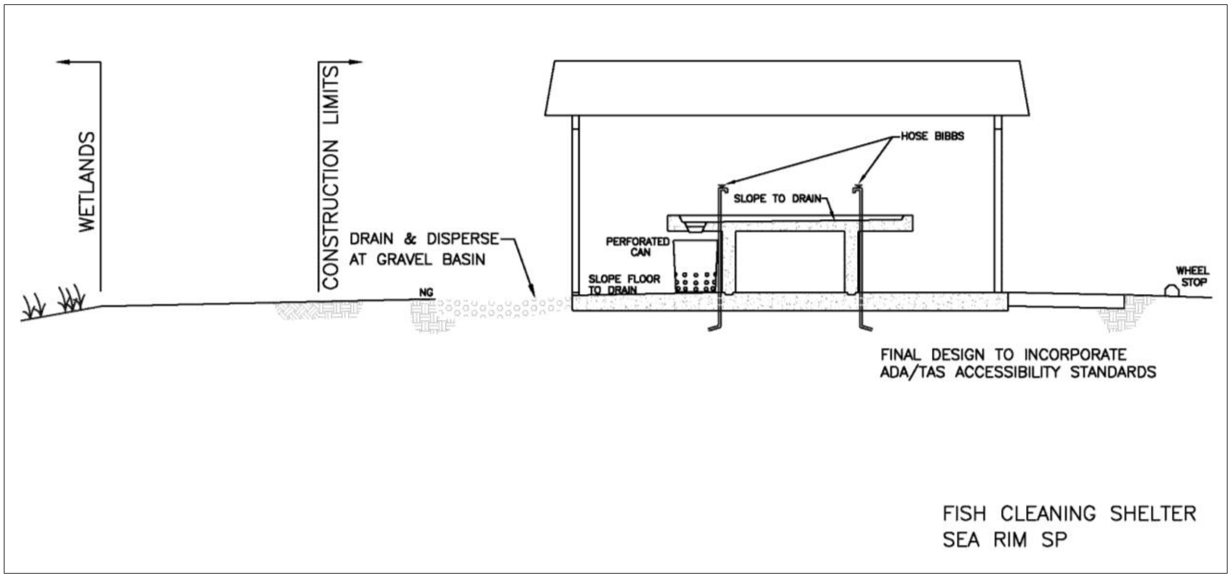

Figure 8-30. Preliminary design for the fish cleaning shelter.

Utilities

The fish cleaning shelter would connect to the existing water supply that is currently being used for the temporary rinse shower.

Grading and Ground Disturbance

The fish cleaning shelter would disturb both an area currently covered with asphalt and adjacent vegetation in order to construct proper flooring for the facility. The shelter would be about 15 feet by 17.5 feet (**Error! Reference source not found.**). The construction limits would be about 10 feet around the building and 5 feet surrounding the sidewalks.

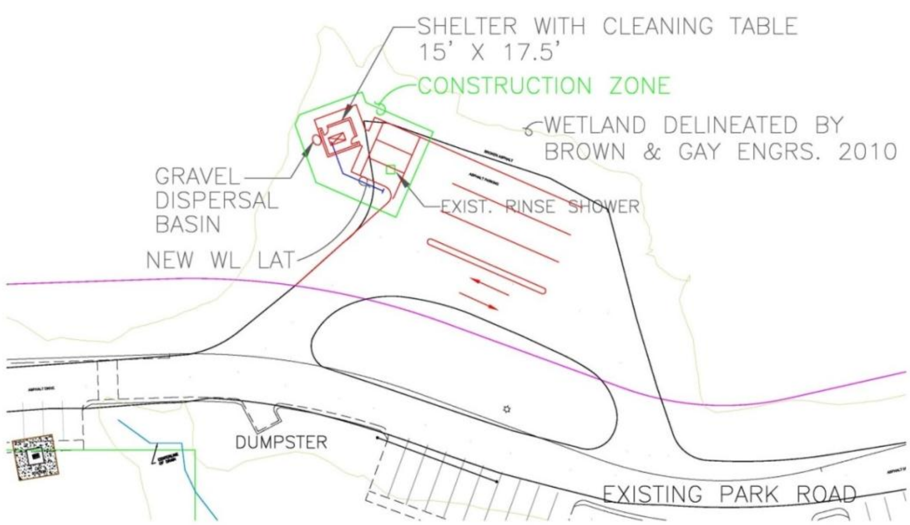

Figure 8-31. Site plan for the fish cleaning shelter and the location of existing development and environmental features.

Mobilization, Staging, and Stockpiling

Adjacent roads and/or parking areas would be used to stage and stockpile materials for the shelter.

8.11.4.5 Construction Schedule for all Improvements

Although a construction schedule has not yet been finalized, each improvement is expected to take fewer than 30 days to complete (30 days for Fence Lake, 25 days for Willow Pond, 20 days for the comfort station, and 25 days for the fish cleaning shelter). All construction would occur during daylight hours, Monday through Friday. The date the contract is awarded may impact the timing of the Sea Rim State Park project. Contracts awarded towards the end of the year (August – December) may not be completed until the following spring or early summer, depending on weather conditions.

8.11.5 Operations and Maintenance

Sea Rim State Park is open 7 days a week year-round. Recreational activities available at the park include camping, wildlife observation, birding, beach combing, walking nature trails, canoeing, kayaking, beach swimming, fishing and waterfowl hunting. During hunting season, hunters are allowed in the Park no earlier than 4:30 a.m. Ongoing maintenance of the constructed facilities would be the responsibility of Sea Rim State Park, which is owned and managed by the TPWD. During construction, there would be monitoring efforts to ensure that wildlife and habitat is protected and that the Sea Rim State Park project designs are correctly implemented. Maintenance and other activities at the Park follow all guidance provided by the TPWD State Park Division Operating Plan (TPWD 2012a).

8.11.6 Affected Environment and Environmental Consequences

The proposed Sea Rim State Park project has a small footprint and three of the items (comfort station, Willow Pond viewing platform, and fish cleaning shelter) are either being developed within the footprint of existing infrastructure or would be connected to existing infrastructure. BMPs would be used during construction to minimize impacts.

8.11.6.1 Physical Environment

Sea Rim State Park has lakes, bayous, canals, water control structures, emergent marshes, beaches and coastal uplands and is located within the Coastal Prairies physiographic region. Specifically, the project area is located within the Chenier Plain which formed over thousands of years from the reworking of Mississippi River delta sediments. The description of the physical environment of the project area is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.11.6.1.1 Geology and Substrates

Affected Resources

Within the project area there are two geological zones: the gulf shore beach/dune zone and the brackish water wetlands and lakes zone. The gulf shore beach/dune zone consists of a thin layer of sand over clay deposits from the Sabine and Mississippi Rivers. The brackish water wetlands and lakes zone consist of clays overlaid with mucky peat formations which is consistent with backwater marsh deposits of silt and detritus that are common with tidally influenced wetlands. The Gulf shore on the upper coast of Texas has retreated several miles inland over the past millennia. In addition, the geology of the site continues to be altered by tropical storms and hurricanes. In the past 10 years, two major hurricanes, Hurricanes Rita (2005) and Ike (2008), significantly impacted the project area's geology. The dunes and dune swale wetlands were severely impacted during Hurricane Ike, which altered the protective function of the beach/dune system and exposed the clay ridge to erosion.

Soils present throughout the project area have been characterized as being frequently flooded. However, the soil in the comfort station construction area was previously altered by the addition of fill. As a result, the area only floods during large storm events. Soils in the fish cleaning shelter construction area may flood, but the area is not considered a wetland. The Fence Lake viewing platform is located on submerged lands and the sediment consists of a soft, muddy bottom. Soils throughout the project area may have received a recent deposit of sand resulting from the over washing of the coastal dunes during Hurricanes Rita and Ike.

Environmental Consequences

Alterations to substrates through fill, compaction, grading, and earth moving activities would be limited to the local project areas and would not change the local geologic features or characteristics of the soil. There would likely be grading of the substrate in the comfort station and fish cleaning stations project area. Substrate at the comfort station is comprised of fill (up to 4 feet below the surface) and the surface mainly covered with exotic grasses and asphalt present as a result of previous developments. Both viewing platforms would have minimal disturbances associated with the installation of the structures. There may be minor impacts associated with the equipment used during the construction of the Willow Pond viewing platform. As a result, project implementation would likely have short-term and long-term minor adverse impacts to affected soils.

Specific impact minimization measures would be implemented during construction. These would include following established BMPs such as the implementation of an erosion control and storm water management plan, the installation of sediment traps prior to commencement of construction activities, operating outside of set-backs from wetland areas, and ongoing construction monitoring to ensure compliance.

8.11.6.1.2 Hydrology and Water Quality

Affected Resources

Hydrology

The specific project area is comprised of brackish lakes, emergent marshes and coastal uplands. The beach/dune system consists of small coastal dunes and dune swale wetlands that are supported by a hydrologic freshwater lens which is recharged by rainfall. Generally, the water in Fence Lake is turbid due to unconsolidated muddy bottom substrates and salinity averages around 10 parts per thousand or lower. In years where rainfall is high, salinity decreases which allows for the colonization by freshwater aquatic plants. The plants are able to stabilize the sediments and reduce turbidity in the lake. Recent storms have breached the beach ridge enabling saltwater intrusion and siltation into the adjacent brackish wetlands. Altered hydrology from such activities as construction of the Gulf Intracoastal Waterway and navigational channels has also caused significant increases in salinity which has caused land loss in marsh areas.

The proposed comfort station located at the boat ramp is surrounded by marsh that is tidally connected via a boat channel to Fence Lake. The Fence Lake viewing platform is located within the tidally influenced Fence Lake. Fence Lake is then connected via tidal channels to Salt Lake, Salt Bayou, Johnson Lake, Keith Lake and finally to the Sabine-Neches Ship Channel, Sabine Pass and the Gulf of Mexico. Heavy rainfall in the vicinity of these projects could cause the water level to rise above normal elevations until the rainfall drains out of the system, which may take a week or more. Likewise, storm tides may inundate the area with gulf waters which would slowly drain away over a similar period of time.

The Willow Pond viewing platform and the fish cleaning station are surrounded by freshwater and brackish marshes that are hydraulically connected to the Gulf of Mexico. The Willow Pond viewing platform is located within a marshy low area between the beach dunes and an older dune ridge further inland upon which Highway 87 was built. Rainfall can build up enough to overflow directly into the Gulf of Mexico. Freshwater can also seep into the Willow Pond area from the surrounding landscape. Rainfall on the dunes soaks into the sand and into a freshwater lens that sits on top of a permanently saline water table. This fresh groundwater then seeps into Willow Pond which in turn seeps out into the Gulf or occasionally during storm events, opens directly into the Gulf and drains via a temporary surface connection.

The fish cleaning shelter is located on an upland dune ridge surrounded by brackish marsh. Rainfall quickly percolates into the sand of the dune ridge at and around the project site and then seeps out into the marsh similar to the manner described above. However, this marsh has a much larger watershed and it is connected to the Gulf of Mexico via a permanent tidal channel. This channel is blocked at its mouth during prolonged dry periods and most summer seasons when there is neither the freshwater drainage nor high enough tides to maintain water exchange over a low beach berm. During these times the marsh may become fresh, hyper saline, or completely dry dependent upon the amount of rainfall.

Water Quality

Surface waters that flow into the project area meet their assigned water quality standards, except for bacteria. There are restricted consumption advisories in the Gulf of Mexico due to elevated levels of mercury in edible tissues of some tuna, jack, mackerel, shark, and bill fish species. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

Environmental Consequences

Sea Rim State Park project activities must comply with local, state, and federal hydrology and water quality requirements. The permit application (SWG-2013-00686) for the Fence Lake viewing platform was approved by the USACE in a letter of permission pursuant to Section 10 of the Rivers and Harbors Act on January 22, 2014. During the permit application review for the Fence Lake viewing platform, the USACE determined the activity will not result in any change to the base elevation within the floodplain (USACE 2014b). TPWD submitted the permit application for the Willow Pond viewing platform and boardwalk to the USACE in April 2014.

Construction may result in modifications to hydrology at the site. Natural hydrologic flows would be altered to some degree by the introduction of an impermeable surface for the comfort station and fish cleaning shelter. The impermeable surfaces could increase rates of runoff during storm events.

However, the increase in impervious surface area is small and therefore, any adverse impacts to hydrology would be short-term or long-term but minor.

Construction of the Fence Lake viewing platform may temporarily increase turbidity. However, the effects would be minor and localized, and expected to be short-term. Construction of the platform would not cause long-term adverse water quality impacts, nor would it alter the hydrology in the project area. Disturbance to the water quality and hydrology, if any, caused by construction of the Willow Pond platform and boardwalk would be small and localized, and short in duration. A permit application for the Willow Pond viewing platform and boardwalk was submitted to the USACE in April 2014. The fish cleaning shelter would be designed to collect all refuse and waste from the shelter, which would be disposed of in the waste collection system within the Park. The comfort station would have minor long-term beneficial impacts on water quality by containing waste in the vaults, which would be pumped out on a regular schedule. Where necessary, all runoff would be controlled with sediment fencing around the construction zone to reduce impacts to the adjacent wetlands. No other negative effects to water quality are expected. Therefore, any adverse impacts to water quality would be short-term and minor.

8.11.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The project area is located within Jefferson County, Texas, which is currently in attainment with NAAQS for all criteria pollutants (EPA 2013).

Implementation of the Sea Rim State Park project would include transportation and heavy construction equipment, which may include airboats, tugboats/barges, trucks, forklifts, backhoes, semi-tractor trailer, front-end loaders, and a crane.

Environmental Consequences

Project implementation would require the use of heavy equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Excavation associated with construction of portions of the improvements may produce fine particulate matter. However, this impact would be short-term, only occurring during active construction activities. Any air quality impacts that would occur would be localized and short in duration. Therefore, any adverse impacts to air quality would be short-term and minor.

Available impact minimization measures would be employed to reduce the release of GHG during project implementation. The following minimization measures have been identified to reduce or eliminate GHG emissions from the Sea Rim State Park project:

- Shut down idling construction equipment, if feasible;
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including airboats, trucks, front-end loaders, forklifts, cranes, backhoes, and tugboats/barges, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Based on the assumptions described in the table above, and the small-scale and short duration of the construction portion of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

Table 8-9. Estimated greenhouse gas impacts.

EQUIPMENT[40]	NUMBER OF 8-HOUR DAYS	CO_2e (METRIC TONS) [41]	CH_4 (CO_2e) (METRIC TONS) [42]	NO_X (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Sea Rim - Fence Lake Platform- 30 days					
Airboat	30	39.00	0.06	0.30	39.03
Barge/tugboat[43]	15	240.00	0.45	1.80	242.25
Pickup truck	30	4.80	0.00	0.03	4.80
Semi-tractor trailer	10	3.40	0.00	0.02	3.40
Sea Rim - Willow Pond Boardwalk & Platform - 25 days					
Pickup truck[44]	25	4.00	0.00	0.03	4.00
Semi-tractor trailer	5	1.70	0.00	0.01	1.70
Front-end loader	15	5.25	0.00	0.03	5.25
Rough terrain forklift	15	5.25	0.00	0.03	5.25
Sea Rim - Comfort Station - 20 days					
Pickup truck	20	3.20	0.00	0.02	3.20
Semi-tractor trailer	5	1.70	0.00	0.01	1.70
Front-end loader	15	5.25	0.00	0.03	5.25
Crane	1	0.29	0.00	0.00	0.29
Sea Rim - Fish Cleaning - 25 days					
Pickup truck	25	4.00	0.00	0.03	4.00
Backhoe	25	8.75	0.01	0.05	8.75
Semi-tractor trailer	15	1.70	0.00	0.01	5.10
Front-end loader	25	8.75	0.01	0.05	8.75
Crane	1	0.29	0.00	0.00	0.29
TOTAL		**337.04**	**0.53**	**2.45**	**343.01**

[40] Emissions assumptions for all equipment based on 8 hours of operation.

[41] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[42] CH_4 and NO_x emissions assumptions and CO_2e calculations based on EPA 2011b.

[43] Fuel economy assumptions for a 3000 hp marine diesel tug based on Walsh 2008.

[44] Emissions assumptions for an 8 cylinder, 6.2 liter gasoline engine Ford F150 pickup based on DOE 2013 and 18 gallon (half-tank) daily fuel consumption.

8.11.6.1.4 Noise

Affected Resources

The primary sources of ambient (background) noise in the project area are operation of vehicles, humans, recreational vessels, and natural sounds such as wind and wildlife. The levels of noise in the project area varies, depending on the season, and/or the time of day, the number and types of sources of noise, and distance from the sources of noise. Noise-sensitive land users in the project area include Park users.

Environmental Consequences

Implementation of the Sea Rim State Park project would include transportation of construction materials to the project area, which may include boats and a semi-tractor trailer truck or other types of transportation. The heavy equipment used for transportation and construction would produce noise. Construction equipment and pile driving noise is known to disturb fish and nesting shorebirds. Construction noise can also be a nuisance to visitors using the Park. Recreational users in the vicinity of the Fence Lake viewing platform and the fish cleaning platform would have the opportunity to relocate to other areas of the Park during construction activities. Noise should not inhibit recreation use in the vicinity of the comfort station project area since it is a parking area and boat launch. Few visitors are expected in the Willow Pond project area because there are currently no trails or walkways that provide access into the area. Although there are boardwalks in part of the project area, they do not connect to any existing infrastructure and a park patron would have to walk through the grasses and bushes to reach the boardwalk. Because construction noise is temporary and unlikely to result in users changing their activities, any negative impacts to the human environment during construction activities would be short-term and minor.

Once facilities are constructed, noise would be generated from facility operations, vehicles associated with these facilities, and recreational users. Overall, long-term noise effects from increased recreational activities and users would be minor, but consistent with the overall type and decibel level of a state park experience.

8.11.6.2 Biological Environment

The Park includes 4,141 acres of marshland with 5 miles of beach shoreline in the western portion of the Chenier Plain. The dominant habitat type is tidally influenced brackish water marshes and lakes. In addition, the Park contains a stretch of sandy beach, dunes and dune swale wetlands abutting the shore of the Gulf of Mexico. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

8.11.6.2.1 Living Coastal and Marine Resources

The Park includes 4,141 acres of marshland with 5 miles of beach shoreline in the western portion of the Chenier Plain. The dominant habitat type is tidally influenced brackish water marshes and lakes. In addition, the Park contains a stretch of sandy beach, dunes and dune swale wetlands abutting the shore of the Gulf of Mexico. Located along the Greater Texas Coastal Birding Trail, Sea Rim State Park serves as a rest stop for many species of migratory birds traveling the Central Flyway.

Affected Resources

Flora

The Sea Rim State Park project consists of four separate improvements, located in different areas of the Park. The Fence Lake viewing platform site does not contain seagrass beds or hard substrates that would support corals or hard structure habitats. There is shallow lake bottom consisting of unconsolidated silts and clays. The shoreline vegetation of the lake is dominated by common reed. The Willow Pond boardwalk and viewing platform project area is within saline prairie and marsh habitat. Dominant vegetation at the Willow Pond viewing platform includes salt bush, high tide bush, American bulrush, saltmarsh mallow, salt cedar, and marsh hay cordgrass. A boardwalk and viewing platform is being built in the project area to minimize impacts to vegetation. Vegetation at the comfort station includes non-native turf grasses which are mostly comprised of Bermuda grass. Development of the comfort station would eliminate all vegetation in that project area. The fish cleaning shelter project area consists of a mix of non-native and native grasses and sedges. Plant species are dominated by Bermuda grass, bitter panicum, and American bulrush. A portion of the project footprint would be in an area with existing vegetation.

Fauna

Wildlife that have been observed in Sea Rim State Park include but are not limited to the following: alligators, mink, nutria, raccoon, rabbit, opossum, skunk, river otter, muskrat, warblers, swallows, vireos, grosbeaks, buntings, and flycatchers. At dawn and dusk, bobcats and coyotes can sometimes be seen. White and brown shrimp, crabs, and various sport fishes, such as red drum, speckled trout and flounder, thrive in the Park's lakes and bayous. Rich with plankton and organic matter, the marshland waters serve as a nursery for various species of aquatic life, supporting marine fisheries and migratory waterfowl. Fish commonly found in Fence Lake includes striped mullet, mud minnows, pinfish, hardhead catfish, red drum, and sheepshead. Common crustaceans include blue crab, white shrimp, and grass shrimp.

Environmental Consequences

In order to minimize environmental impacts, the Willow Pond viewing platform, comfort station, and fish cleaning shelter would be located within previously disturbed/developed areas of the Park. The Willow Pond viewing platform would be connected to an existing boardwalk that was damaged from recent hurricanes. The fish cleaning shelter and comfort station would be built, in part, on an existing parking lot. In addition, all project areas are small and vegetation types to be impacted are common to the area. Therefore any short-term and long-term adverse impacts to vegetation would be minor.

To prevent any invasive species from becoming established during project construction, equipment, materials, and disturbed areas would be monitored for invasive species. If invasive species are observed, appropriate treatment methods will be used to remove them. In addition, if there is any revegetation following construction activities, only native species would be used. Currently, Sea Rim State Park does not anticipate any impacts from invasive species. However, the area would be monitored after construction activities have finished as part of the normal operations for State Parks. During the permit application review for the Fence Lake viewing platform, the USACE determined that the activity should not result in the introduction of invasive species (USACE 2014b).

Many mobile wildlife species would avoid areas near or within construction areas but would likely return to the area after construction activities cease. All project areas are small in size and construction activities would be short in duration (estimated to be less than 30 days per improvement). Any adverse effects to fauna would be short-term and minor.

8.11.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the FWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, essential fish habitat (EFH) protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act.

Affected Resources

Endangered Species

No federally-listed species or other species of concern under the NMFS' jurisdiction are expected to be in the project area due to the Sea Rim State Park project location and habitat conditions. There is no designated or proposed critical habitat for federally-listed, proposed, or candidate species in the project area. None of the improvements would be constructed on the beach; therefore appropriate habitat for sea turtles does not exist in the project area.

The red knot and piping plover are the only proposed or federally-listed species that may be in the project area. Although piping plover (listed) and red knot (proposed) occur in the Park, habitat present in or adjacent to the project areas is considered marginal at best. Typically, red knots and piping plovers only use beach or shoreline habitat. Marginal habitat for the piping plover does exist near the fish cleaning shelter, which is located next to an existing parking lot that is already in use. The red knot has rarely been observed within the Park and is only known to be found on the beach. There are no improvements planned for the beach. Based on local knowledge and best professional judgment, appropriate habitat for the red knot does not exist in the project area.

Bald and Golden Eagles

There are no golden eagles present within Sea Rim State Park. On rare occasions bald eagles may nest within the Park; however, their nests would not be within or near the project area.

Migratory Birds

Located along the Greater Texas Coastal Birding Trail, Sea Rim State Park serves as a rest stop for many species of migratory birds traveling the Central Flyway. Migratory birds are also protected under the Migratory Bird Treaty Act. Nesting of migratory birds is not known within the project area, but is possible. Bird rookeries are not within or near the project area.

There are over 270 species of migratory birds that are present during at least part of the year at Sea Rim State Park. Of these species, only a few have the potential to nest within or near the proposed Sea Rim State Park Improvements project.

Essential Fish Habitat
NMFS confirmed that no EFH as described by the Magnuson-Stevens Fishery Conservation and Management Act occurs in the project area.

Marine Mammals
The Fence Lake viewing platform is the only development which would occur in open water. The Lake is extremely shallow (2-3 feet deep), isolated from direct access to adjacent bays, and is not known to be used by any marine mammals. No marine mammals are expected in the project area.

Environmental Consequences
It is possible that migratory birds may nest in the Sea Rim State Park project area. There is no mechanical clearing of vegetation with this project, but there would be enough disturbances to displace or destroy nests, eggs or chicks. Therefore, at least the initial site access, clearing, and construction effort would be conducted outside of the spring nesting season (March 15 to July 1). Once the site has been cleared and construction commenced, nesting birds would avoid the construction area and further work can occur throughout the year. Construction activities would produce enough noise and disturbance to prevent birds from nesting in the area, thereby preventing impacts to nesting birds.

The fish cleaning shelter is the only proposed improvement close to the beach. Therefore actions to minimize potential impacts to piping plovers will be taken during construction of the fish cleaning shelter. Actions to minimize impacts include having an onsite monitor, avoiding work after dark, maintaining a speed limit of 10 mph, and stopping work if the birds are observed foraging within 100 feet of the work site. The onsite monitor would have stop work authority and would be present at the site when construction is occurring near the fish cleaning shelter. The trained monitor would survey the area daily prior to the initiation of any construction activity and periodically throughout the day. If vehicles or equipment are left in the project area, the areas around the tires would be surveyed before moving the vehicle. The monitor would keep a daily log documenting all surveys conducted during the fish cleaning shelter construction project.

The ESA consultation has been completed. FWS concurred that the proposed project may affect, but is not likely to adversely affect piping plover and no effects to red knot are anticipated. The project was also reviewed for impacts to bald eagles and migratory birds in accordance with the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Actions to minimize impacts will be implemented during project construction to prevent take of migratory birds or bald eagles (FWS 2014a).

Any impacts to protected species if they occur at all would be expected to be short-term and minor.

8.11.6.3 Human Uses and Socioeconomics
In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

8.11.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

In 2012 the population in Jefferson County was estimated to be over 250,000 which accounted for 1% of the Texas population. Approximately 43% of the population in Jefferson County is white (not Hispanic or Latino), 18% is Hispanic or Latino, 34% is black or African American, and 4% is Asian. Almost 18% of the county population speaks a language other than English at home. Median household income (2007-2011) in Jefferson County and the state is $42,883 and $50,920, respectively, with 19% of the county and 17% of the state living below the poverty level (U.S. Census Bureau 2013). Local and out of town visitors frequent Sea Rim State Park.

Environmental Consequences

No residential communities are located adjacent to the proposed Sea Rim State Park project. As a result, there would be no potential for short-term impacts from construction of the new facility. Construction materials are generally purchased from the local area. If a local contractor is awarded the bid, this would provide stimulus to local businesses. Any contractor mobilization to the area would provide stimulus to local service industries. Indirect beneficial effects to the local economy may be anticipated as a result of increased recreational and tourism opportunities. These economic benefits would likely be concentrated in the service and retail industry sectors. Sea Rim State Park would also see increases in revenue. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. Overall, socioeconomics would not be adversely impacted as a result of the proposed project. The project is expected to have a positive beneficial impact to the local economy through indirect benefits associated with visitation to the Park and tourism.

8.11.6.3.2 Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. Although Jefferson County could be considered to meet the criteria above for a minority population, the project would not result in a high and adverse impact to any of the analyzed resource categories, including environmental and economic categories.

8.11.6.3.3 Cultural Resources

Affected Resources

The area of potential effect for reviews under Section 106 of the National Historic Preservation Act includes areas of direct and indirect impact. It is believed that the discovery of and/or the disturbance of intact cultural resources is highly unlikely at any of the proposed construction project locations. The Texas State Historic Preservation Officer provided concurrence on July 3, 2013 to a letter submitted by TPWD's Cultural Resources Program. The letter is summarized below:

TPWD believes that the discovery of, and/or the disturbance of intact cultural resources is highly unlikely at any of the proposed construction project locations. All proposed construction sites are greater than 1 kilometer away from any known archeological sites or high probability areas. Physical inspections at three locations (Fence Lake, comfort station and fish cleaning shelter) have shown that no cultural resources exist. During 1978, the Fence Lake shoreline was intensely searched from above and no new archeological sites were discovered. An additional investigation was conducted at Fence Lake in 2013 and no shell middens or other cultural features were found at that location. A subsurface investigation in the comfort station project area found there is over 4 feet of fill in the area. In the fish cleaning shelter location, a subsurface investigation observed approximately 2 feet of fill. The fourth location (Willow Pond), even though there is little chance of encountering any cultural resources, will be monitored during construction of the boardwalk extension and wildlife viewing platform.

As part of the USACE permit application process for Fence Lake, the USACE interagency coordination notice initiated coordination with local Indian tribes, specifically the Alabama-Coushatta Tribe of Texas. No response was received from any federally recognized Native American Tribes or affiliated groups. Also the USACE staff archaeologist reviewed the project site for cultural resources and found that there are no previously recorded historic properties known to exist within the proposed permit area for Fence Lake. In addition, the proposed work and/or structures are of such limited nature and scope that little likelihood exists for the proposed project to impinge upon a historic property, even if present within the affected area (USACE 2014b).

Environmental Consequences

No cultural resources are expected to be impacted by the Sea Rim Park project. Since only an above-ground survey of the Willow Pond worksite was completed, the area would be monitored during construction to ensure that no archaeological sites are disturbed. The Texas State Historic Preservation Office has provided concurrence that discovery of, and/or the disturbance of intact cultural resources is highly unlikely as a result of this project. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.11.6.3.4 Land and Marine Management

Affected Resources

The Sea Rim State Park project is located within Sea Rim State Park on state-owned lands. The majority of the Park is undeveloped and consists of marsh, beach, dune, and lake habitats. The addition of these improvements to the Park is in accordance with the Sea Rim State Park master planning process and will meet several objectives of TPWD's Land and Water Resources Conservation and Recreation Plan (2013b). Additionally, Sea Rim State Park operates under the guidance of TPWD's State Park Division Operating Plan (TPWD 2012a). All standards and provisions of these plans and relative regulations would be adhered to, including Texas State Park Operational Rules (Title 31, Texas Administrative Code Chapter 59) and Texas Accessibility Standards issued under the authority of the Texas Government Code, Chapter 469. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

Environmental Consequences

The Sea Rim State Park project would not change the current land use, zoning, or cause any amendments to management plans that relate to the project area. The area would remain designated for open space recreational use, which allows for developed camping facilities and other structures related to outdoor activities such as boating and fishing. Land use and management authority at the Park would remain under the purview of the TPWD, and development at the Park would comply with the guidance established for coastal recreational land uses and the requirements of the Coastal Zone Management Act. Thus, no impacts would occur to Land and Marine Management under the proposed project.

8.11.6.3.5 Aesthetics and Visual Resources

Affected Resources

The general character of the area can be described as a rural park with few developments on site. Most recreational activities on site involve the use of the natural setting. For example, activities such as bird watching and fishing benefit from the natural settings to enhance experiences. Improvements proposed in this project provide enhanced opportunities for recreational experiences while maintaining a small footprint, which is an objective identified during the Sea Rim State Park master planning process. During the construction of the improvements, the materials, and equipment would be staged adjacent to the worksites. The proposed construction is consistent with the surrounding structures and typical of amenities located within Texas coastal state parks.

Environmental Consequences

Temporary impacts to visual resources would result from construction of the improvements. Large construction equipment would temporarily reduce the aesthetic values of the project area. The footprint of each improvement is small and construction duration for each improvement is short (less than 30 days). The addition of the structures would change the view shed, but the construction would be consistent with the other amenities located in the Park. The structures would not negatively attract attention, dominate the view, or detract from user activities or experiences. Any adverse impacts to aesthetic and visual resources would be short-term and minor.

8.11.6.3.6 Tourism and Recreational Use

Affected Resources

Numerous recreational opportunities are available to local residents and visitors within Sea Rim State Park. Visitors generally come to the Park to access the beach, fish, hunt, use the public boat ramp, and view wildlife. Recreational fishing and hunting activities are managed according to federal, state, and park regulations.

The Park has historically averaged 6,800 to 9,100 visitors per year, but since the Park was severely damaged by Hurricanes Rita and Ike, visitation has dropped significantly due to the lack of facilities. The Park is a stop on the Great Texas Coastal Birding Trail and remains a popular destination for birdwatchers in southeastern Texas despite the lack of facilities. The adjacent wildlife management area and refuges (J.D. Murphee Wildlife Management Area, McFaddin National Wildlife Refuge, and Texas Point National Wildlife Refuge) are popular waterfowl hunting areas. Having these other natural areas in the vicinity of the Park enhances the ecological value for wildlife species by improving habitat connectivity. There are three paddling trails and three foot trails located in the Park (Figure 8-32). The shoreline itself is popular for walking and horseback riding is allowed on the beach. Primitive camping is allowed in designated areas.

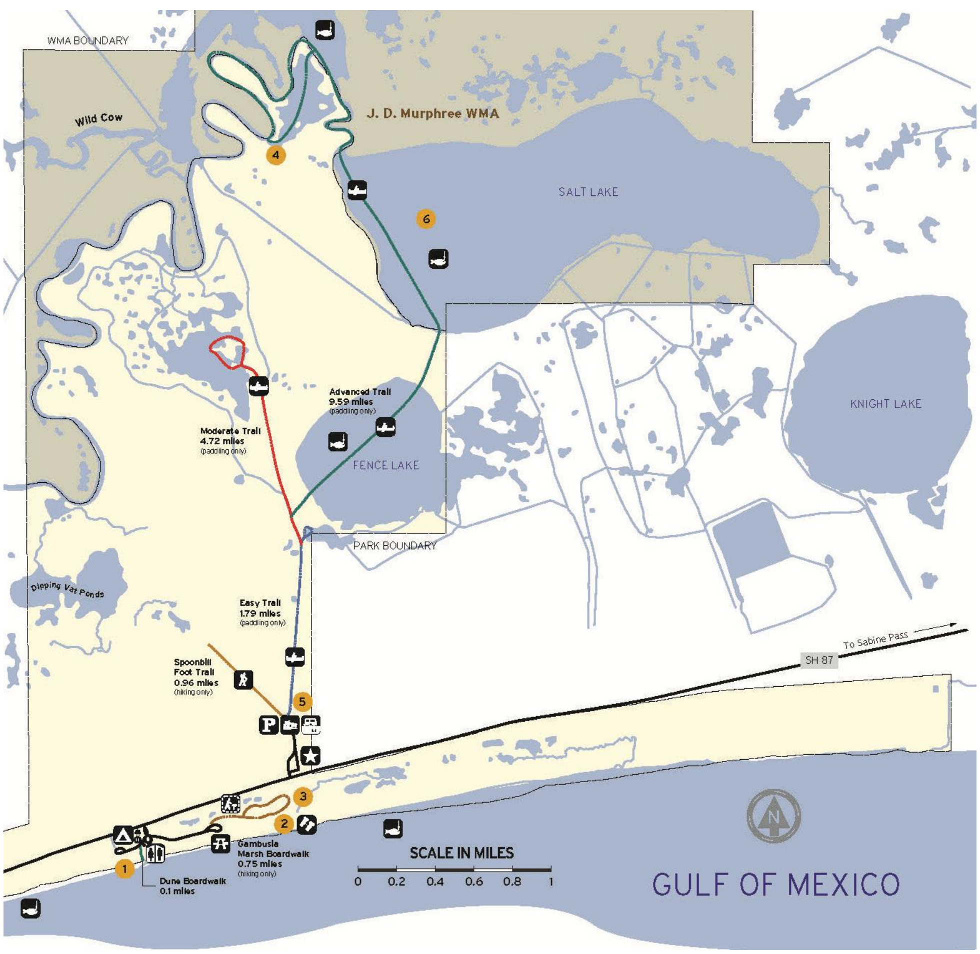

Figure 8-32. Locations of trails within Sea Rim State Park.

Environmental Consequences

The addition of the proposed improvements would support the current use of the Park and are expected to increase the visitation and enhance the users' experience. Because the Park is included on the Great Texas Coastal Birding Trail, the viewing platforms would enhance birding opportunities within the Park. The viewing platforms would also enhance other wildlife viewing opportunities within the Park. The fish cleaning station and comfort station would enhance Park resources for both the beach users and anglers. This suite of improvements would complement the ongoing restoration in the Park and is consistent with the goal of balancing biological conservation with recreational opportunities. During the construction period, recreational experience would be impacted from noise and visual disturbances associated with the use of heavy equipment. Access to certain areas could also be restricted or impacted to some degree during construction activities. During construction of the comfort station, it may be necessary to close a portion of the parking lot for staging. However, this would be short in duration and would not have significant impacts to public access or use of the boat ramp. The construction of the Fence Lake and Willow pond viewing platforms would not alter existing public access points. The construction of the fish cleaning station may interrupt the use of the parking area and rinse station adjacent to the construction area, but this would be temporary. The fish cleaning shelter would replace the temporary rinse shower. While these temporary inconveniences would result in minor short-term impacts on tourism and recreational use during the construction, over the long term, improved access and enhanced facilities are anticipated to benefit tourism and recreational use. Overall, implementation of the Sea Rim State Park project would contribute positively to visitor experience and public access. Any adverse impacts to tourism and recreational use would be short-term and minor.

8.11.6.3.7 Infrastructure

Affected Resources

No additional infrastructure would be needed to implement the project. The viewing platforms and comfort station would not need any utilities. Water for the fish cleaning station is currently onsite. Road access and parking for all improvements are currently present.

Highway 87 is not a major thoroughfare and use is limited to local Park and Wildlife Refuge/Area traffic. West of the Park Highway 87 runs into and ends in the McFaddin National Wildlife Refuge. Heading east Highway 87 connects to the Texas Point National Wildlife Refuge, J.D. Murphee Wildlife Management Area and then to Port Arthur, Texas.

Environmental Consequences

The Sea Rim State Park project would not impact any existing public infrastructure or road, but it may temporary impact Park facilities during the alteration of water and staging of materials. During the construction activities, there would be short-term localized disruptions of parking and facilities within the Park. No additional utilities would be needed to implement and/or maintain the project. Construction activities should not alter the operational capacities of the Park. The addition of the fish cleaning shelter and comfort station would provide a long-term benefit to recreational users. Any adverse impacts would be short-term and minor.

8.11.6.3.8 Public Health and Safety and Shoreline Protection

Affected Resources

The Sea Rim State Park project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All waste generated during construction of the improvements would be disposed in the appropriate waste or recycle collection receptacles in the Park. All occupational and safety regulations and laws would be followed to ensure safety of all workers and the public. The addition of the comfort station would help improve environmental health within the Park. Shoreline protection and stabilization efforts are managed by the State.

Environmental Consequences

No hazardous waste would be created during construction of the improvements. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Soil and sediment stabilization measures would be incorporated into the Sea Rim State Park project design as needed in areas where the potential exists for erosion to occur in order to protect resources and ensure public health and safety. No adverse effects to public health and safety and shoreline protection are expected as a result of this project.

8.11.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Sea Rim State Park project would build two viewing platforms, a comfort station (vault toilet), and a fish cleaning shelter in the Sea Rim State Park. The project is considered to fall under Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. This restoration project would enhance visitor use and enjoyment of Park resources. The Trustees have started coordination and reviews under the National Historic Preservation Act, Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Endangered Species Act, Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.12 Galveston Island State Park Beach Redevelopment: Project Description

8.12.1 Project Summary

Galveston Island State Park is a 2,000-acre park in the middle of Galveston Island, southwest of the City of Galveston in Galveston County, Texas (Figure 8-33). The proposed Galveston Island State Park Beach Redevelopment project includes the building of multi-use campsites, tent campsites, dune access boardwalks, equestrian facilities, as well as restroom and shower facilities on the beach side of the Park. These improvements would enhance visitor use and enjoyment of Park resources. The estimated cost for this project is $10,745,060.

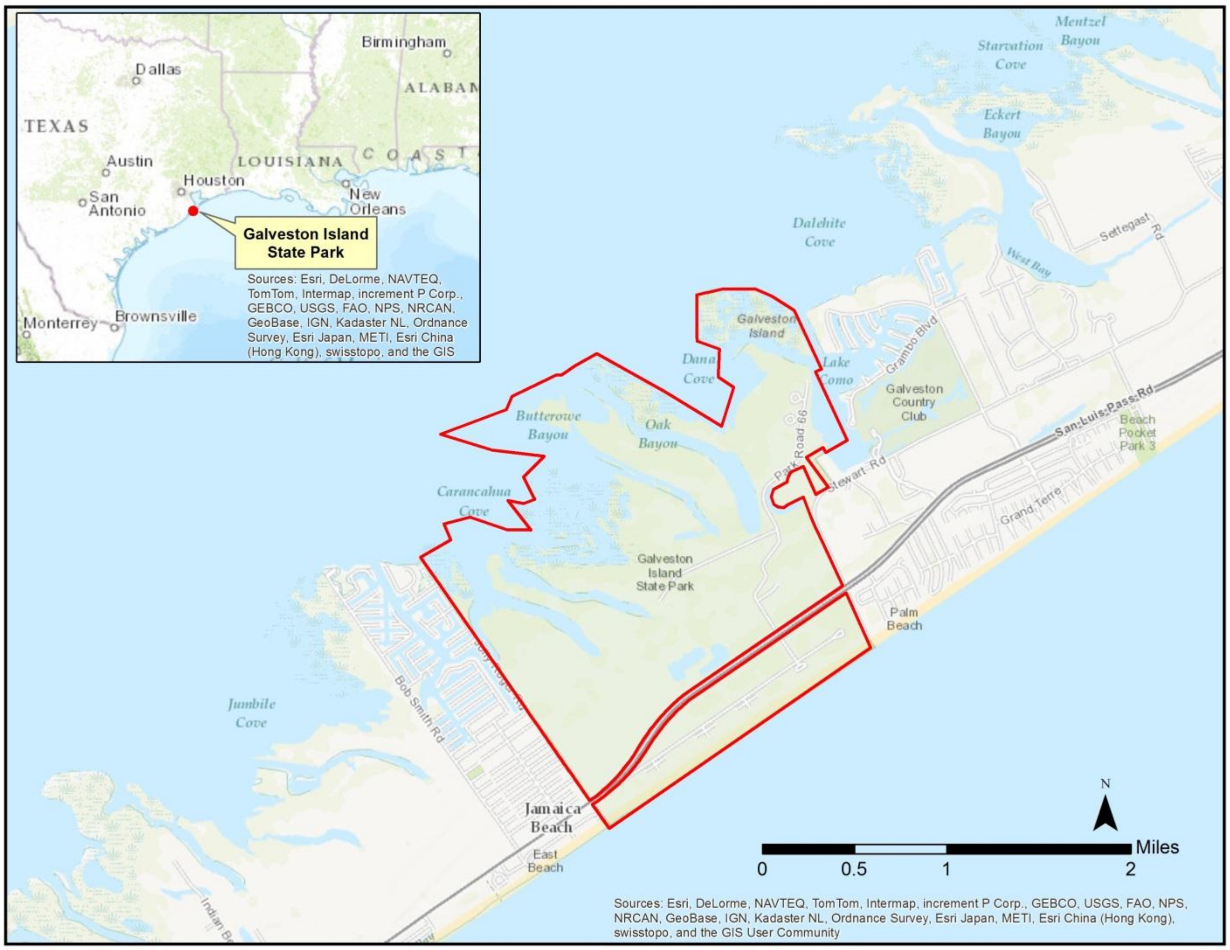

Figure 8-33. Location of Galveston Island State Park.

8.12.2 Background and Project Description

The proposed Galveston Island State Park project will restore infrastructure for recreational facilities to enhance recreational access and opportunities on the Texas coast. Galveston Island State Park is located on the west end of Galveston Island, south of Houston, Texas, along the upper Texas coast. The Park features 2,000 acres of upper Gulf Coast barrier island ecosystem. The Park contains an array of coastal habitats that host a surprising variety of wildlife and is visited by birds from throughout the eastern hemisphere during the spring and fall migration seasons. Wading and shore birds, mottled and mallard ducks, raccoons, armadillos and marsh rabbits are found in the park, which is ideal for wildlife observation and photography. Bay and surf fishing for spotted seatrout, sandtrout, redfish, black drum, croaker and flounder is also popular.

Historically, the Park provided camping facilities and associated amenities that were accessible to day- and overnight-visitors. However, in 2008 Hurricane Ike caused severe devastation and destroyed much of the Park's infrastructure (Figure 8-34). To guide the restoration process, TPWD developed the Galveston Island State Park Master Plan in 2011 to identify appropriate restoration efforts for the Park (TPWD 2011). Developments proposed by this project are consistent with the Master Plan and will help improve and enhance recreational opportunities along the Texas coast. Specifically, the proposed Galveston Island State Park project includes the building of multi-use campsites, tent campsites, dune access boardwalks, equestrian facilities, as well as restroom and shower facilities on the beach side of the Park.

Figure 8-34. Destruction caused by Hurricane Ike at Galveston Island State Park.

The Galveston Island State Park project will provide greater access to visitors and enhance their recreational experiences. At the campsite facilities (Figure 8-35), comfort stations with associated parking spots are paired with rinse showers. The beach access boardwalks will provide access to the beach from multi-use campsites and tent campsite areas across the dunes (Figure 8-35). The multi-use campsites are currently designed to be RV accessible and equipped with water and electric hook-ups. Each site would also have a picnic shelter and grill within close proximity. Native trees and shrubs will be planted to provide a screen between the campsites. The location of the campsites has been designed to account for future dune migration. An RV septic dump station is planned for the Park. Additionally, this project proposes to build multiple tent campsites with associated amenities, which may include boardwalks and parking spaces. The equestrian facilities will include limited trailer parking and access to horse corral pens as well as the beach.

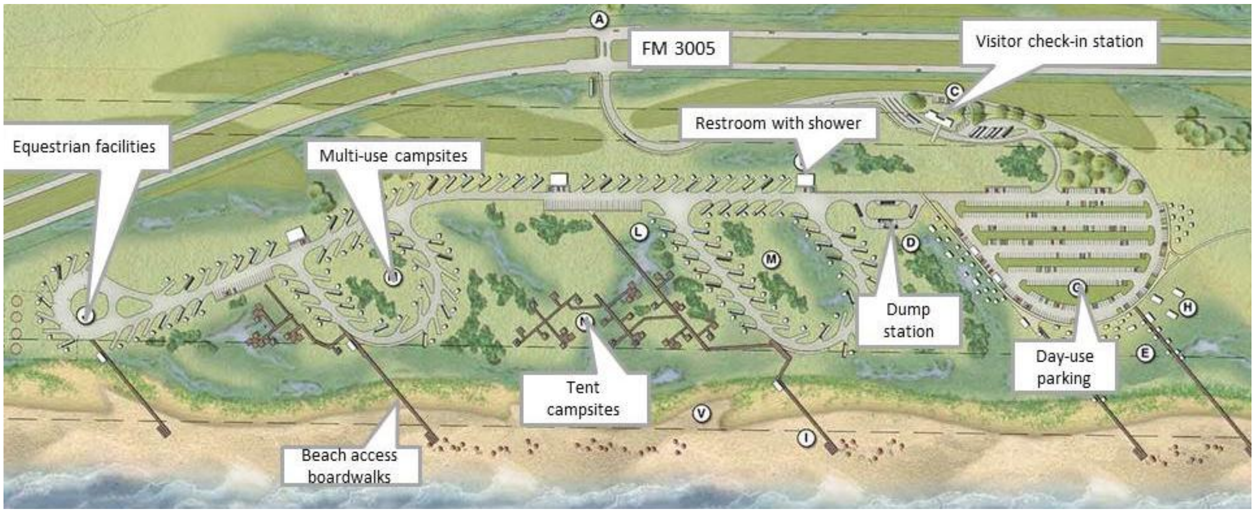

Figure 8-35. Artist rendering of Galveston Island State Park beach development highlighting camping loops, tent platforms and beach access boardwalks. The artist rendering is developed by studioOutside; however it has been modified for this figure.

8.12.3 Evaluation Criteria

This proposed Galveston Island State Park project meets the evaluation criteria established by OPA and the Framework Agreement. Texas experienced a loss of recreational use along the Texas coast during the Spill, including recreational fishing, beach use, camping, diving, and wildlife viewing. The project would enhance opportunities for public use and enjoyment of natural resources, helping to offset a portion of the adverse impacts to such uses caused by the Spill. Creating the proposed infrastructure will provide facilities for over-night and day-use visitors as well as access and facilities for equestrian use. Thus, the nexus to resources injured by the Spill is clear (See 15 C.F.R. § 990.54(a)(2) and Sections 6a-6c of the Framework Agreement).

The project is technically feasible and utilizes proven techniques with established methods and documented results and can be implemented with minimal delay. Government agencies have successfully implemented similar projects in the region. For these reasons, the project has a high likelihood of success (See 15 C.F.R. § 990.54(a)(3) and Section 6e of the Framework Agreement).

A thorough environmental review, including review under applicable environmental regulations, is described in Section 8.12. It indicates that adverse effects from the project would largely be minor, localized, and often of short duration. In addition, the BMPs and measures to avoid or minimize impacts described in Section 8.12 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction, installation, operations, and maintenance) (15 C.F.R. § 990.54(a)(4)).

Cost estimates are based on similar past projects, and demonstrate that the project can be conducted at a reasonable cost (See 15 C.F.R. § 990.54(a)(1)). Developments proposed by this project are consistent with the Park Master Plan and will help improve and enhance recreational opportunities along the Texas coast. As a result, the proposed project is considered feasible and cost effective (See 15 C.F.R. § 990.54(a)(1) and (3)).

Public comments were acquired prior to the development of the Galveston Island State Park Master Plan through stakeholder meetings/workshops, public meetings, and surveys. The planning team designed a multi-faceted public engagement strategy that canvassed a local, state, and national audience. Emphasis was placed on reaching out to not only past visitors, but to connect with those audiences that have never been served by Galveston Island State Park or even the state park system in general. All comments received were reviewed and evaluated by the planning team in the context of the redevelopment plans at Galveston Island State Park.

Recreational use projects in general and this specific project were submitted as restoration projects on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

8.12.4 Performance Criteria, Monitoring and Maintenance

This project includes monitoring efforts to ensure project designs are correctly implemented during construction. Monitoring has been designed around the project objective, which is to construct multi-use campsites, tent campsites, dune access boardwalks, equestrian facilities, as well as restroom and shower facilities on the beach side of Galveston Island State Park to enhance recreational use of the Park.

Performance criteria for this project will include a determination of successful construction of the project according to design to ensure that the opportunity for recreational use of the Park will be enhanced. Monitoring efforts will also be implemented to ensure that the project is constructed in accordance with construction documents and the Master Plan for the Park. The State Park currently has visitation monitoring procedures to capture the number of daytime visitors, overnight visitors, and participants in interpretive programs. This information will be collected and shared annually to document performance monitoring of the project for 5 years after construction completion.

Ongoing maintenance of the constructed facilities would be the responsibility of Galveston Island State Park, which is owned and managed by the TPWD.

8.12.5 Offsets

The Early Restoration benefits provided by the project, also known as NRD Offsets, are $21,490,120 expressed in present value 2013 dollars to be applied against the monetized value of lost recreational use provided by natural resources injured in Texas, which will be determined by the Trustees' assessment of lost recreational use for the Spill.[45] This Offset is based on the use of a BCR ratio of 2.0, reflecting the value that users are expected to be provided by the implementation of the proposed

[45] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

project relative to its cost. Please see Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.

8.12.6 Cost

The total estimated cost to implement this project is $10,745,060. This cost reflects estimates developed from the most current information available to the Trustees at the time of the Galveston Island State Park project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

8.13 Galveston Island State Park Beach Redevelopment: Environmental Review

Galveston Island State Park is a 2,000-acre park in the middle of Galveston Island, which is located on the upper Texas coast, near Houston, Texas. The park is located southwest of the City of Galveston in Galveston County, Texas (Figure 8-33). The proposed Galveston Island State Park Beach Redevelopment project (Galveston Island State Park project) includes the building of multi-use campsites, tent campsites, beach access boardwalks, equestrian facilities, visitor check-in station, and restroom and shower facilities on the beach side of the Park. At the campsite facilities, comfort stations with associated parking spots are paired with rinse showers. The proposed beach access boardwalks would provide access to the beach from multi-use campsites and tent campsite areas across the dunes. The multi-use campsites are currently designed to be RV accessible and equipped with water and electric hook-ups and a dump station. Each site would also have a picnic shelter and grill within close proximity. This redevelopment would enhance visitor use and enjoyment of Park resources. The estimated cost for this project is $10,745,060.

8.13.1 Introduction and Background

The proposed Galveston Island State Park project would restore infrastructure for recreational facilities to enhance recreational access and opportunities on the Texas coast. In 2008 Hurricane Ike caused severe devastation and destroyed much of the Park's infrastructure (Figure 8-34). The Park lost approximately 80 feet of beach and two-thirds of its camping facilities. Utilities and structures were destroyed, and the entire Park was inundated with salt water. After Hurricane Ike, the TPWD worked with the Texas Department of Transportation to remove debris. Prior to the debris cleanup, TPWD consulted with the Texas Historical Commission under Section 106 of the National Historic Preservation Act, and the Texas Historical Commission concurred with the cleanup plan. Large heavy equipment was used to bulldoze, scrape, and level the beach, pushing all asphalt, concrete, posts, and other park structures into debris piles. Large items of debris were removed from the piles and the remaining sand was returned to the beach. New plumbing, lift stations, electric and water hookups were installed. Park recovery efforts were focused within the footprint of pre-existing facilities. Part of the recovery efforts also included replanting areas near the camping loop.

To guide the restoration process, TPWD developed the Galveston Island State Park Master Plan in 2011 to identify appropriate restoration efforts for the Park (TPWD 2011). Park amenities proposed by this project are consistent with the Master Plan and would help improve and enhance recreational opportunities along the Texas coast. Specifically, the proposed Galveston Island State Park project includes the building of multi-use campsites, tent campsites, visitor check-in station, beach access boardwalks, equestrian facilities, and restroom and shower facilities on the Gulf side of the Park (Figure 8-35). In efforts to restore the presence of recreational resources within the Park and retain them for future generations, a dune field buffer would be preserved, which extends 250 feet from the current beginning of the dune line at the beach. This area would be specifically reserved for dune field and wetland swale restoration, and allow for the natural migration of these systems. No development outside of beach access boardwalks would be permitted in this buffer area. In addition to the creation of this dune field buffer, the Master Plan aggregated recreation amenities such as multi-use campsites and day-use facilities into the smallest development footprint attainable. This would allow for a greater area of undisturbed and restored natural area located on the eastern edge of the property.

The Galveston Island State Park project would provide greater access to visitors and enhance their recreational experiences. Prior to Hurricane Ike, there were 150 multi-use campsites, no campsites designated for tents only, and no horse corrals. Currently only 33 camping facilities continue to function at the GISP beachside following the destruction by Hurricane Ike. These camping facilities are insufficient to meet public demand. Post-Ike public input has consistently shown an interest in greater capacity. This project would replace the existing campsites and bring the total number of campsites closer to pre-Ike capacity with about 10 tent campsites and over 100 multi-use campsites. Currently, the beach-side day use area has parking for approximately 205 cars. The proposed project would result in a total of about 520 parking spaces (exact numbers to be determined after construction documents have been completed).[46]

Public comments were acquired prior to the development of the Galveston Island State Park Master Plan through stakeholder meetings/workshops, public meetings, and surveys. The planning team designed a multi-faceted public engagement strategy that canvassed a local, state, and national audience. Emphasis was placed on reaching out to not only past visitors, but also those audiences that have never been served by Galveston Island State Park or the state park system in general. All comments received were reviewed and evaluated by the planning team in the context of the redevelopment plans at Galveston Island State Park. Recreational use projects in general and this specific project were submitted as restoration projects on the NOAA website (http://www.gulfspillrestoration.noaa.gov).

All federal, state, and local required permits would be secured prior to project implementation. Compliance with state requirements, including the Texas Coastal Management Program, and compliance with federal requirements including, but not limited to, the Endangered Species Act, Clean Water Act, National Historic Preservation Act, and the Coastal Zone Management Act would be fulfilled prior to implementation. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees' consistency determination that the project would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014). In addition,

TPWD obtained a permit (SWG-2012-00631) from the USACE for the Galveston Island State Park beach development project under Section 404 of the Clean Water Act in December 2013. The permit includes all of the redevelopment improvements proposed for the Gulf beachside of Galveston Island State Park.[47] The redevelopment of the beachside day-use and overnight camping facilities in Galveston Island State Park would include multi-use campsites, a visitor check-in station, picnic shelters, restrooms, dump stations, parking, connecting drives, and beach access boardwalks. A preliminary jurisdictional wetland

[46] While the permit specifies the number of each improvement (campsites, boardwalks, etc.) that is planned and approved by the USACE, DWH Early Restoration funds will only fund a portion of the total number.

[47] While the permit specifies the number of each improvement (campsites, boardwalks, etc.) that is planned and approved by the USACE, DWH Early Restoration funds will only fund a portion of the total number.

determination was competed and accepted by the USACE (SWG-2012-00631) on October 30, 2012 and will remain valid for 5 years (until 2017). The permit also approved the mitigation plan to address 2.67 acres of permanent impacts and 0.41-acres of secondary impacts to wetlands due to construction (TPWD 2013a). The mitigation plan for these impacts would create, restore, and enhance over 12 acres of wetlands. This wetland mitigation would not be funded through DWH Early Restoration. Additional portions of the permit ***not*** paid for by DWH Early Restoration funds include:

- Access road and day use parking
- Tent parking areas
- RV Dump Station
- Camp Loop Roads and Spurs

In September 2012, TCEQ stated that Section 401 water quality certification for this individual Section 404 permit application could be assumed if the work meets conditions of the TCEQ best management checklist (TPWD 2013a, Section 3). The checklist includes BMPs for erosion control, post construction total suspended solids control, and sedimentation control, which are summarized below.

Disturbed areas must be stabilized to prevent the introduction of sediment to adjacent wetlands or water bodies during wet weather conditions (erosion). Mulch filter berms and socks will be maintained and remain in place until the area has been stabilized. After construction has been completed and the site is stabilized, total suspended solids loadings shall be controlled through the use of vegetative filter strips. Dredged material shall be placed in such a manner that prevents sediment runoff into water in the state, including wetlands. Prior to project initiation, the project area must be isolated from adjacent wetlands and water bodies by the use of BMPs to confine sediment. Compost filter berms and socks as well as mulch filter berms and socks will be maintained and remain in place until project completion.

All facilities and boardwalks would comply with Texas Accessibility Standards and Americans with Disabilities Act Guidelines as well as federal, state, and local law concerning construction standards and building codes to protect public health, safety, and welfare. The project would also comply with the standards in the TGLO's Dune Protection and Improvement Manual for the Texas Gulf Coast (TGLO 2005).

Galveston Island State Park is operated by the TPWD whose mission includes protecting, enhancing and increasing recreational opportunities throughout the state. The Galveston Island State Park project meets TPWD's objectives by increasing access to and participation in the outdoor recreational opportunities. The agency's mission and objectives are described in detail in TPWD's Land and Water Resources Conservation and Recreation Plan (2013b). In addition, Galveston Island State Park would follow guidance described in the State Parks Division Operating Plan (TPWD 2012a).

The TPWD regulations at Title 31, Texas Administrative Code (TAC) Chapter 59 govern the health, safety and protection of persons and property in state parks, historic sites, scientific areas, or forts, including encompassed waters, under the control of the TPWD. Implementation of the proposed project would follow the TPWD regulations, including the State Park Operational Rules at 31 TAC Chapter 59, Subpart F (Sections 59.131 to 59.136). The TPWD State Park Division also follows Division procedures established in 2010 and revised in 2012 for exotic, feral, and nuisance animal control.

The environmental review, including cumulative impacts, considered all improvements that are part of this project including those not paid for by the DWH Early Restoration Funds unless otherwise stated.

8.13.2 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Draft Phase III ERP proposed project, the No Action alternative assumes that the Trustees would not pursue the Galveston Island State Park project as part of Phase III Early Restoration.

Under No Action, the existing conditions described for the project site in the affected environment subsections would prevail. Restoration benefits associated with this project would not be achieved at this time.

8.13.3 Project Location

Galveston Island State Park is a 2,000-acre park in the middle of Galveston Island, southwest of the City of Galveston and northeast of and adjacent to the community of Jamaica Beach in Galveston County, Texas (Figure 8-33). Galveston Island is part of a series of barrier islands and bay-lagoon systems that separate much of the Texas coastal mainland from the Gulf of Mexico. Most undeveloped parts of the island are characterized by coastal prairies and marshlands with some areas containing coastal dunes. Because barrier islands serve as transition zones between land and ocean, they support a variety of distinct eco-regions, including beaches, prairies and wetlands. Each supports a diverse array of life. The barrier island also protects the mainland from storms, while the lagoons, bay and salt marshes serve crucial functions in the life cycles of many fish, birds, and other wildlife.

The proposed Galveston Island State Park project is located entirely within Galveston Island State Park, which is bound by 13 Mile Road to the east, Jolly Roger Road to the west, Gulf of Mexico to the south, and West Bay to the north. Residential and commercial properties occur on both sides of Galveston Island State Park with the Village of Jamaica Beach serving as a primary residential area to the west of the site. Within the Park, the proposed campground area is bordered to the northwest by Farm to Market (FM) 3005 (Figure 8-36).

8.13.4 Construction and Installation

Construction activities are described in detail in the Individual Permit Application (SWG-2012-00631, TPWD 2013a), which was approved by the USACE in December 2013. The current design plans for the Galveston Island State Park project place the beach redevelopment back from the Gulf beachfront to account for future beach migration. The height at which the beach access boardwalks are built would also take dune migration and growth into account. This project is in the design phase and adjustments would be made as the construction documents are finalized.

Construction on the beach redevelopment being funded outside of DWH Early Restorations has already begun. Portions of the proposed redevelopment would occur in an area where existing campgrounds are being used. Overnight beach camping would be suspended during construction of the new campsite facilities. The improvement details below include portions of the plan approved by the permit that will not be paid for by the DWH Early Restoration Funds. The permit specifies the number of each improvement (campsites, boardwalks, etc.) that is planned and approved by the USACE; however, the exact number to be funded by DWH Early Restoration Funds may be modified as building designs are finalized.

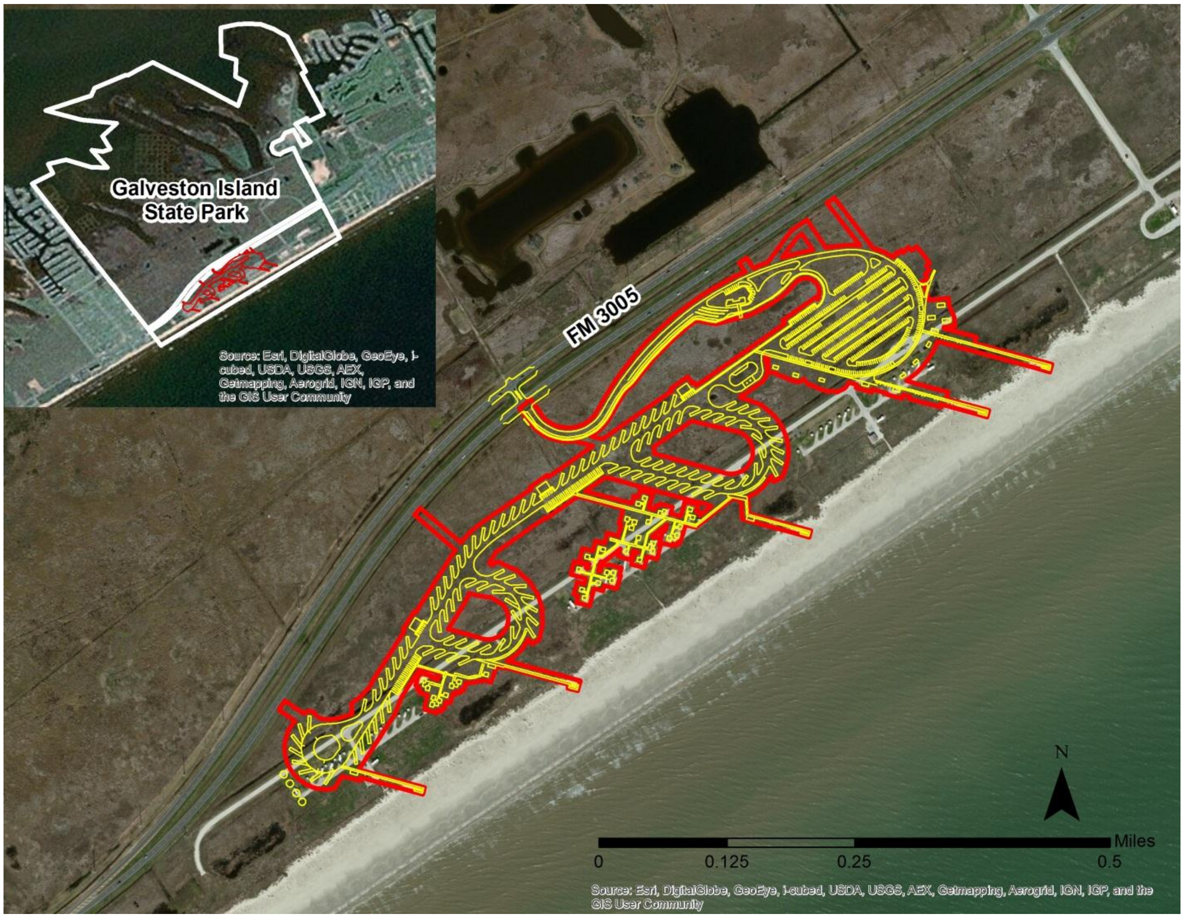

Figure 8-36. Location of proposed developments within Galveston Island State Park. The red line outlines the entire 37 acres of the construction footprint.

8.13.4.1 Visitor Check-in Station

The check-in process, and resulting queuing, would be minimized by the addition of three vehicles lanes. Temporary short-term parking for cars and recreational vehicles would also provide for a better traffic flow into the Park.

8.13.4.2 Day-Use Facilities

The beach-side day-use area currently has parking for approximately 205 cars. It is estimated that approximately 520 day-use parking spaces would be created. However, the exact number of parking spaces would be determined after construction documents have been generated. Day-use parking and facilities would reside directly southeast of the Park check-in station, and would be organized into a loop drive that surrounds an open field designated for events. Restrooms would be provided in this area to support beach day-use activities. A pedestrian trail would surround the parking loop and transition into beach access boardwalks that would crossover the preserved dune fields to the beach beyond.

8.13.4.3 Multi-Use Campsites

A series of multi-use campsites[48] would be located between the highway and dune field buffer to facilitate overnight lodging in close proximity to the beach (Figure 8-37). The multi-use campsites would incorporate a series of loop drives that orient views toward the dunes and beach, while positioning the facility for future dune field migration. In order to maximize primary capacity within the multi-use area, campsites would be offset from one another approximately 50 feet on center, with loops approximately 220 feet apart. The natural areas created between loops would be reserved for native grasses and swales to incorporate storm water collection. There would be comfort stations located for multi-use and tent campsites with limited parking at each location. Each multi-use campsite would be equipped with electric and water hook-ups and have a picnic shelter and grill located nearby. A dump station would be located to serve the entire site. Beach access boardwalks would be located at the southern end of each loop and crossover the dune field to the beach. Parking and trail connections to tent campsites would converge at the connection of loop road to the beach access boardwalk.

Figure 8-37. Example of multi-use campsites.

8.13.4.4 Beach Access Boardwalks

Beach access boardwalks would provide access to the beach from the multi-use campsites, equestrian facilities, and day-use facilities area (**Error! Reference source not found.**). These boardwalks would span the dune field buffer. The primary purpose of building the boardwalks would be to facilitate access from parking areas to the beach while protecting the dunes and surrounding habitat. The boardwalks would be angled to deter wind erosion of dunes.

[48] The permit is for the entire Galveston Island State Park Beach Redevelopment Plan, which specifies 112 multi-use campsites. Phase III Early Restoration Funds will only pay for a portion of the entire Plan.

Figure 8-38. Example of proposed boardwalks.

Current designs plan for five beach access boardwalks and boardwalks to access the tent platforms for a total of approximately 2,700 linear feet of elevated boardwalk[49]. Boardwalks would be about 10 feet wide and constructed with wood. There would be 12-inch x 12-inch wooden piles, approximately 24 feet long, driven into the ground approximately 8 feet on center. The total boardwalk footprint is anticipated to be approximately 21,600 square feet.

Boardwalks are generally constructed so that there is no removal of vegetation and there are no cuts in the dunes. All facilities and boardwalks would comply with Texas Accessibility Standards and Americans with Disabilities Act guidelines, they would meet the standards in TGLO's Dune Protection and Improvement Manual for the Texas Gulf Coast (TGLO 2005) as well as federal, state, and local laws concerning construction standards and building codes to protect public health, safety, and welfare.

8.13.4.5 Tent Campsites

Tent campsites[50] would be located between the multi-use campsite loops behind the dune field buffer. Campers would access these sites from small parking bays that would be located at the intersection of multi-use loop drives and beach access boardwalks. Tent campsites would provide elevated tent platforms for overnight camping along the beach (Figure 8-39). The current design anticipates the tent platforms to be 20 feet by 20 feet. However, construction documents have not been developed and these dimensions are preliminary.

8.13.4.6 Picnic Shelters

Similar to the tent campsites, picnic shelters would provide platforms slightly elevated above the ground. The shelters would be covered with a roof and open to admit breezes from all directions. Picnic shelters adjacent to multi-use campsites may contain a grill.

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[49] The permit is for the entire Galveston Island State Park Beach Redevelopment Plan, which specifies about 2,700 linear feet of boardwalk. Phase III Early Restoration Funds will only pay for a portion of the entire Plan.

[50] The permit is for the entire Galveston Island State Park Beach Redevelopment Plan, which specifies 35 tent campsites. Phase III Early Restoration Funds will only pay for a portion of the entire Plan.

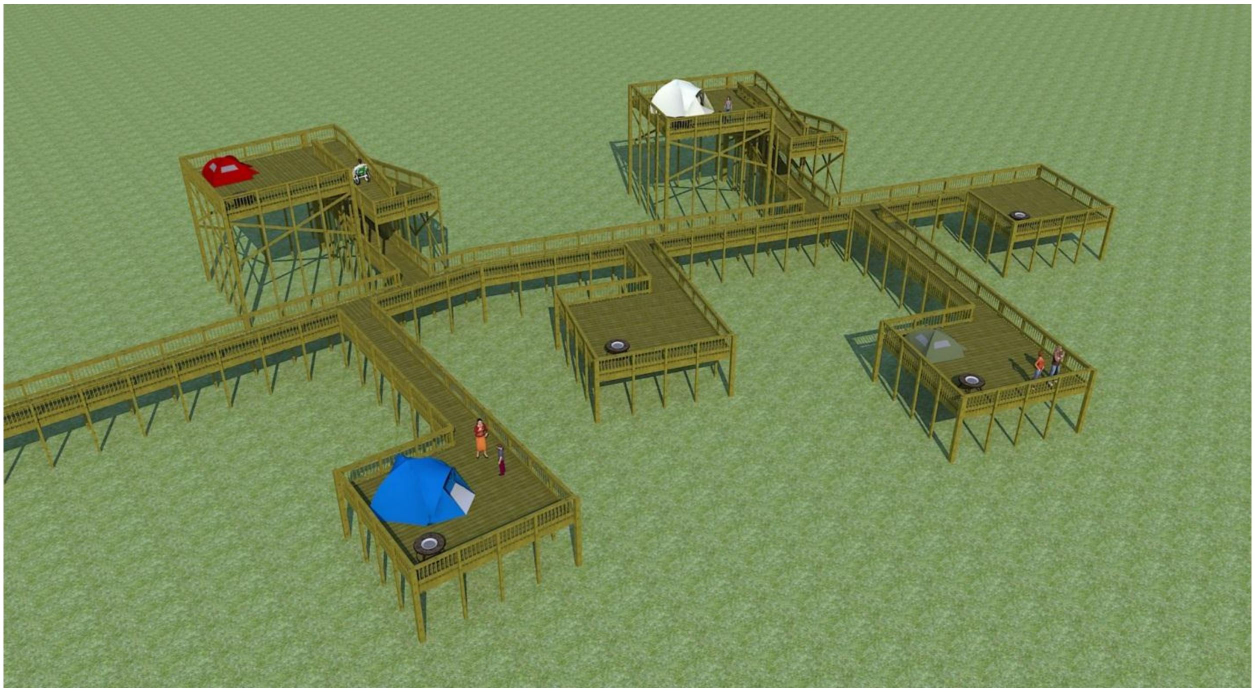

Figure 8-39. Artist's vision of a possible design for tent camping platforms at Galveston Island State Park. Graphic created by Richard Garcia, TPWD Infrastructure Division, Planning and Design Branch.

8.13.4.7 Equestrian Facilities

Currently there are no equestrian facilities located in the Park although horses can access the beach from adjacent city-owned areas on either end of the Park. Horses are allowed on the beach from November 1 through February 28. The equestrian facilities would include eight overnight equestrian trailer parking spaces and access to four horse corral pens. A small equestrian trail head would be located at the end of the multi-use campsites that links to the beach for seasonal (winter) use. The trail would be fenced and signed designating its use.

8.13.4.8 Utilities

Proposed utilities would be replacing those lost from Hurricane Ike. New utilities would be installed below ground would include water, sanitary sewer, and electrical. All new utilities lines are encompassed within the 37-acre construction footprint. The new utility lines would be connected to existing service lines at the edge of the construction footprint. The location of the wastewater lines, water lines, electric lines and their connection points as well as dump station as currently designed can be seen in in the Galveston Island State Park Individual Permit Application (TPWD 2013a). No capacity upgrade to the utility connections (including water services) would be needed. Engineering designs for this project have not been fully developed. However, all new utility lines would be installed in accordance with federal, state, and local laws concerning construction standards and building codes to protect public health, safety, and welfare.

Electrical demands would exceed what is currently being used but are not expected to exceed the capabilities of existing feeder lines. Center Point Energy supplies electricity to the site and anticipates the capacity required for the redevelopment. Current elevated electrical lines running through the proposed Park construction areas would be relocated to the main highway by the power company (Center Point Energy) at their expense.

Park sewer lines are connected to City of Galveston via pressure lines. A dump station is planned to be included on the northeast side of the development as part of the campground improvements. However, it will be paid for by a separate funding source.

Storm water would be directed to constructed wetlands and/or ditches. It is anticipated that storm water impacts would be similar to or less than the impacts before the Hurricane.

8.13.4.9 Lighting

Standards for new construction implemented by TPWD include the use downward facing lights. Other lights would be directed away from the beach. Park construction work would be conducted during daylight hours so additional lighting should not be necessary.

8.13.4.10 Grading and Ground Disturbance

Over 200 structures including concrete picnic shelters, restrooms and the visitor center were previously demolished after Hurricane Ike as specified in the permit application (TPWD 2013a). Remaining pavement and buried utility lines within the demolition zone were excavated and removed. The proposed redevelopment, including new utilities, would require grading within the project area which has a construction footprint of 37 acres. It has been anticipated that there would be approximately 15.61 acres of impervious surface cover from this project. The footprint of impervious cover includes the roads, parking areas, day-use area, multi-use campsites, tent campsites, visitor check-in station, picnic shelters, restrooms, a dump station, and beach access boardwalks. The size of impervious area in the Park redevelopment is 2.7 acres less than the original pre-Ike development (Figure 8-40). This is a conservative approximation. Items such as the boardwalks and campsites may have surfaces which allow water to pass through. For additional details and maps, see the Galveston Island State Park Individual Permit Application (TPWD 2013a).

8.13.4.11 Mobilization, Staging, and Stockpiling

Temporary staging areas for material, supplies, and equipment during construction would be located within disturbed areas of the former campground and adjacent parking lots on Park property. Heavy equipment such as large excavators, dump trucks, bulldozers, graders, pavers, concrete trucks, and semi-trailers may be used during construction. Equipment usage would be determined by the contractor.

Construction waste would be removed by the contractor to an appropriate landfill of their choice using dump trucks and roll-off dumpsters or as specified by TPWD Infrastructure.

8.13.4.12 Construction Schedule

Although a construction schedule has not yet been finalized, construction is anticipated to take approximately 19 months to complete unless severe weather delays construction. Work hours, in general, would be during daylight hours for 5-6 days per week. The construction schedule would be managed so as to avoid impacts to protected species. Construction of beach access boardwalks would only occur from October 2 to March 31 to avoid sea turtle nesting season.

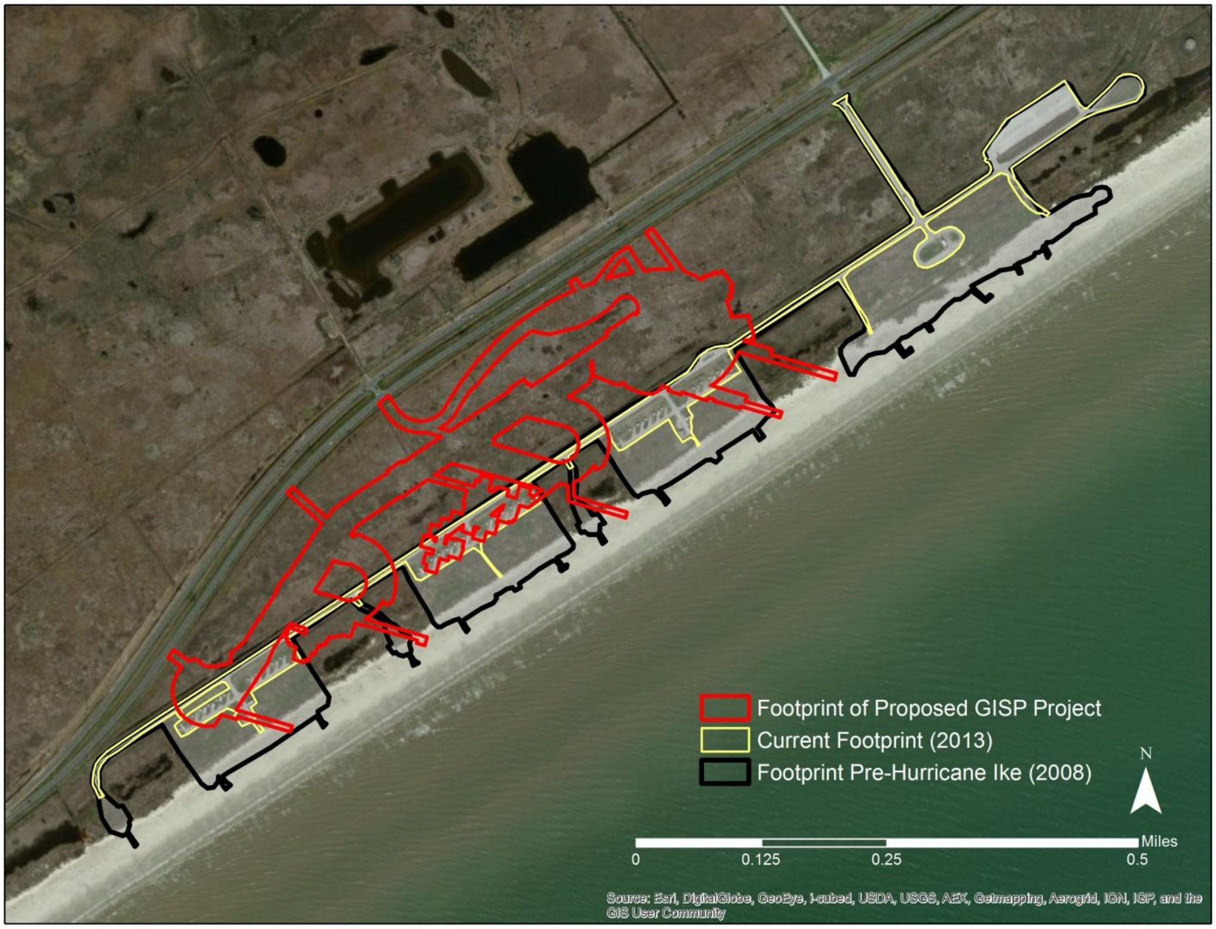

Figure 8-40. Location of proposed Galveston Island State Park Project footprint in comparison to the footprint of the Park facilities present pre-Hurricane Ike (2008).

8.13.5 Operations and Maintenance

Galveston Island State Park is open 7 days a week year-round. Recreational activities at this park include camping, wildlife observation, birding, beach combing, walking nature trails, kayaking, fishing, and beach swimming. Ongoing maintenance of the constructed facilities would be the responsibility of Galveston Island State Park, which is owned and managed by the TPWD. During construction, there would be monitoring efforts to ensure that wildlife and habitat is protected and that Galveston Island State Park project designs are correctly implemented. (For specific monitoring efforts, see Section 3.2 Biological Environment.) Staffing levels at the Park prior to Hurricane Ike included 16 full-time personnel and 5 seasonal positions. In comparison, current staff levels are 10 full-time personnel and four seasonal positions. It is anticipated that staffing levels would return to pre-Ike levels after completion of the Galveston Island State Park project. The only new maintenance activity required would be possible periodic cleaning of the new horse corrals when facility users did not adequately complete this task themselves. Maintenance and other activities at the Park follow all guidance provided by the TPWD State Park Division Operating Plan (TPWD 2012a).

8.13.6 Affected Environment and Environmental Consequences

The USACE Individual Permit Application (SWG-2012-00631) included background information about the project, preliminary design plans and an assessment of impacts to wetlands (Section 1), a preliminary jurisdictional determination approval letter (Section 2), the Texas Commission on Environmental Quality (TCEQ) Tier I Water Quality Checklist Certification (Section 3)[51], a coastal zone consistency determination application (Section 4), a cultural resources report (Section 5), a threatened, endangered, and rare species habitat assessment (Section 6), an alternatives analysis (Section 7), and a wetland mitigation plan (Section 8) (TPWD 2013a). All of the alternatives related to the design and configuration of the new facilities attempted to minimize impacts to the surrounding environment and reduce external effects resulting from weather events. The preferred alternative, which is consistent with the redevelopment project proposed here, would rebuild camping facilities with access to the beach; protect facilities from weather, beach erosion, and subsidence; provide sufficient facilities to meet public demand; rebuild facilities with safe direct access to the beach; preserve the contiguous natural beach environment and habitat; and minimize wetland impacts by limiting the development footprint. The Individual Permit Application and its analysis are therefore incorporated by reference (per CEQ's NEPA regulations at 40 C.F.R. §1502.21) as applicable. This summation is not fully inclusive of the extensive information found in the Individual Permit Application. Readers should reference the Individual Permit Application for complete information.

The permit (SWG-2012-00631) for the Galveston Island State Park Beach Redevelopment project was approved by the USACE in December 2013. The USACE prepared an Environmental Assessment and Statement of Findings (EA and SOF) in response to TPWD's application for the Galveston Island State Park beach redevelopment permit. The EA and SOF did not identify any significant environmental effects resulting from the proposed work. The USACE evaluated the impact of this proposed activity on aspects affecting the quality of the human environment and determined that this action does not require an Environmental Impact Statement (USACE 2013).

The Trustees and TPWD State Parks considered risks from erosion and hurricane damage during evaluation of the Galveston Island State Park Beach Redevelopment project. In order to protect the redeveloped beach site from future weather events, beach erosion or subsidence, the proposed project would be set back from the shoreline, further inland than the original beachside camping facilities, which are now largely underwater due to Hurricane Ike and beach migration.

According to the Galveston Island State Park Master Plan, site planning along the beach would respond to a 50-year time horizon with elevated structures and transitional elements to respond to a changing coastal morphology. In response to subsidence, sea-level rise and beach migration anticipated at the Gulf beach over the coming decades, many of the beachside facilities would be elevated in order to protect these facilities from future flooding events and beach migration. Transitional facilities between elevated structures and at-grade recreation areas include dune walkovers, viewing platforms, picnic shelters, screened shelters and pavilions.

[51] Tier I projects are those which will result in a direct impact of 3 acres or less of waters in the state or 1,500 linear feet of streams. The checklist includes BMPs for erosion control, post construction total suspended solids control, and sedimentation control.

The location and configuration of these beachside day and overnight facilities were evaluated in an alternatives analysis as part of the USACE permit application process. Their location relative to the beach and the existing Farm-to-Market (FM) 3005 (San Luis Pass Road) were evaluated in the report with the goal of building back beach facilities to minimize impact to natural and cultural features, preserve and enhance contiguous habitat (prevent habitat fragmentation), provide safe public access to the beach to meet public demand, and create facilities which are adaptive to future weather events and beach erosion. Design considerations included rising sea levels, beach subsidence, dune migration, habitat shifts, and beach erosion. The project design and location presented in this Phase III restoration plan is the preferred alternative selected in the permit application.

8.13.6.1 Physical Environment

Galveston Island is part of a series of barrier islands and bay-lagoon systems that separate much of the Texas coastal mainland from the Gulf of Mexico. Most undeveloped parts of Galveston Island are characterized by coastal prairies and marshlands with some areas containing coastal dunes. Habitats in the Galveston Island State Park project area include wetlands, bayous, coastal uplands and the beach/dune system.

The project area is located in remnant dune swale wetlands and bordered along the south by the beaches associated with the Gulf of Mexico. Current site conditions include of remnant camping facilities, including a road, and parking areas that were partially destroyed during Hurricane Ike. Most of the undeveloped areas within the project boundary are characterized by coastal prairies, marshlands and coastal dune swales. The county soil survey depicts the area as Mustang soils, which are deep, very poorly drained, very slow permeable soils formed in sandy sediments on barrier flats subject to occasional flooding due to high storm surge and are ponded after every rainfall. This general area has a bay to beach barrier island profile (USACE 2013).

The description of the physical environment of the project area is divided into geology and substrates, hydrology and water quality, air quality and greenhouse gas emissions, as well as noise characteristics of the area.

8.13.6.1.1 Geology and Substrates

Affected Resources

The project area geology consists of recent barrier island deposits containing mostly sandy soils with limited silts and clays. The project area is generally flat to lightly rolling. The project area is subject to occasional flooding by high storm surges associated with tropical weather systems and is prone to ponding after heavy rainfall. Approximately 25 acres of palustrine wetlands exist within the project area.

The area between the Galveston Island State Park project and the Gulf waters consists of beaches composed of mainly sandy marine substrates with varied amounts of shell fragments. Beach sand is on the land area immediately adjacent to the Gulf from the median tide line to the back of the coastal dunes. It is reworked by tide and wind. The lower areas are inundated daily by high tides. Moving away from the Gulf and into the project area are soils on a series of old, abandoned beach ridges and wet swales that parallel the Gulf. The soil along the ridges tends to be nonsaline to moderately saline and moderately alkaline fine sand. These soils are rapidly permeable above the high water table and therefore, there is little surface runoff. The soil in the wet swales is slightly to moderately saline and moderately alkaline very fine sand. Surface water on these soils is very slow to pond. These soils occasionally flood from storm tides and frequently flood from heavy rains. The majority of the project area has nonsaline and moderately alkaline, fine sand. These soils are rapidly permeable above the high water table with very slow surface runoff. This soil is occasionally flooded by storm tides and is susceptible to wind erosion if left unprotected after being disturbed.

The project area is located seaward of FM 3005 within the coastal prairie and beach/dune system that abuts the Gulf shore. Dunes approximately 80 to 120 feet in width were lost during Hurricane Ike, but some recovery of the frontal dune ridge has occurred do to the implementation dune restoration methods including sand-fencing. A dune field buffer which is approximately 250-feet wide would be preserved. This area would be specifically reserved for dune field and wetland swale restoration, and allow for the natural migration of these systems. No development outside of the elevated beach access boardwalks and trails would be permitted in this buffer area. The construction of the boardwalks would help prevent human impacts to the vegetation. A designated, fenced horse-only trail would be installed to help prevent impacts to vegetation. Signs would be used to keep people and horses off of the dunes. If significant disturbance of dunes is identified anywhere in the buffer zone, fencing would be used to prevent access to affected areas of the dunes. Currently there is intermittent fencing present in the area. The boardwalks would be oriented at an angle to the shoreline face to deter wind erosion of dunes.

Environmental Consequences

Construction of all developments including those not paid for with Early Restoration funds would impact approximately 37 acres. A portion of the 37 acres is within the footprint of the campground area that was damaged as a result of Hurricane Ike. Soil in this area is not expected to be impacted more than it was in the original development.

During construction, contractors would remove soils and bring in fill materials to support the driveways, structures, and parking areas. Large equipment including front end loaders and bulldozers would be used to fill in low areas and level the sites before construction. Backhoes and trenching equipment would be used to install new water, electric, and sewer lines to connect to the existing public infrastructure. The beach access boardwalks would be constructed at a minimum of 3 feet above the dunes, and all impacts to dune vegetation would be minimized to ensure stability of the dune system. The height at which the beach access boardwalks are built would also take dune migration and growth into account. The construction of the boardwalks would help prevent human impacts to the vegetation. A designated horse-only trail would be fenced and would help prevent impacts to vegetation. The boardwalks from the campsites and facilities to the Gulf beach would condense foot traffic through designated pathways. This would reduce impacts to sensitive dune vegetation that lead to blowouts and weaknesses in the dunes that impact their protective function against storm surges. BMPs regarding erosion control would be employed which includes the planting of native vegetation near the campsites.

Alterations to soil through fill, compaction, grading, and earth moving activities would result in short-term and long-term minor adverse impacts to affected soils. However, the Galveston Island State Park project is reducing the area impacted compared to the facilities that were present pre-Hurricane Ike.

Specific impact minimization measures would be implemented during campground construction. These would include following established BMPs such as the implementation of an erosion control and storm water management plan, the installation of sediment traps prior to commencement of construction activities; and ongoing construction monitoring to ensure compliance. Project implementation will also adhere to the TCEQ Tier 1 checklist, which includes BMPs for erosion control, post construction total suspended solids control, and sedimentation control. The beach access boardwalks would provide long-term benefits to the dune habitats by minimizing human traffic through the dunes and limiting development within the dune buffer. The implementation of the proposed project would therefore result in short-term and long-term minor impacts to soils similar to what existed prior to Hurricane Ike.

8.13.6.1.2 Hydrology and Water Quality

Affected Resources

Hydrology

The project area is located on Galveston Island, Texas, which is a barrier island that separates the Gulf of Mexico from West Bay. The project area habitats include wetlands, bayous, coastal uplands and the beach/dune system. The Gulf Coast Aquifer underlies the island and is the main source of groundwater. In addition to the aquifer, the beach/dune system is supported by a hydrologic freshwater lens which is recharged by rainfall.

Wetlands within the project site are hydrologically associated with the Gulf of Mexico by groundwater connection. There are no streams within the project area and the flow of water is mostly subsurface. A beachside topographic survey and soil pit examination showed that the seasonal (winter and spring) high water table parallels the surface elevation. Based on prior studies was it surmised that groundwater movement follows the slope of the land's surface.

Floodplain

The project area is directly impacted by storms and storm surges which continue to alter the landscape and the adjacent wetlands. The existing campground facilities and proposed project area are within the 100-Year Floodplain.

Water Quality

Galveston Island, Texas has become extensively developed over the past decade with only a few pockets of undeveloped land left. This has led to more storm water runoff into the adjacent bays which sometimes exceed TMDL for bacterial content. There are restricted consumption advisories in West Bay for all species of catfish due to elevated levels of polychlorinated biphenyls (PCBs) and dioxin. In addition, there are restricted consumption advisories for tuna, jack, mackerel, shark, and bill fish species on the Gulf side of the project area due to elevated levels of mercury. Information regarding the recommended level of consumption for fish that could contain high mercury levels is described on the TPWD's website (http://www.tpwd.state.tx.us/regulations/outdoor-annual/fishing/general-rules-regulations/fish-consumption-bans-and-advisories).

Onsite water quality is expected to improve by using wetlands to filter nutrients and metals from storm water. Existing impervious development would be deconstructed and removed. Runoff and rainfall is expected to filter through the sandy soils and enter into the groundwater. The existing and constructed wetlands would likely be connected to the groundwater and would be able to naturally treat the water through natural wetland processes such as denitrification. It would help return the site's hydrology to a more natural state by both dampening runoff, and increasing the duration of wetland discharge to the water table and subsequent slow seepage of these cleaner waters into the Gulf and Bay.

Environmental Consequences
This project would alter hydrology at the site. Construction of the facilities, driveways, and parking areas would result in adverse modifications to the hydrology of the site over the long-term due the addition of impermeable surfaces. It has been anticipated that there would be approximately 15.61 acres of impervious surface cover from this project. However, this project is smaller than the original campground as it was designed pre-Hurricane Ike. The size of impervious area in the Park redevelopment is 2.7 acres less than the original pre-Ike development. This is a conservative approximation. Items such as the boardwalks and campsites may have surfaces which allow water to pass through. For additional details and maps, see the Galveston Island State Park Individual Permit Application (TPWD 2013a). Overall, the Galveston Island State project is expected to cause minor, short-term and long-term adverse impacts to the localized hydrology.

Executive Order 11988, Floodplain Management, requires that federal agencies avoid activities that directly or indirectly result in the development of a floodplain area. The required wetland mitigation is compensation for the lost floodplain values and may increase the floodplain storage for the project area. In addition, the Galveston Island State Park project is designed with beach access boardwalks, elevated structures, and transitional elements to reduce the amount of development within the floodplain as well as respond to a changing coastal morphology which is anticipated at the Gulf beach over the coming decades. Overall, the Galveston Island State project is expected to provide long-term benefits to the floodplain area.

Storm water runoff during construction may result in short-term, minor impact to surface water quality. The implementation of mitigation measures, including development of a comprehensive storm water pollution prevention plan, should reduce the intensity of the construction-related impacts to negligible. Additionally, horses and runoff from cars and other vehicles have the potential to impact water quality. Although this project does propose to create equestrian facilities, horses may currently use the Park. Impacts from horses could potentially have a long-term, minor effect on water quality. Overall, the Galveston Island State project is expected to cause minor, short-term and long-term adverse impacts to water quality.

8.13.6.1.3 Air Quality and Greenhouse Gas Emissions

Affected Resources
The project area is located in Galveston County, Texas and falls within an area the EPA designates as the Houston-Galveston-Brazoria Intrastate Air Quality Control Region (HGB). The HGB is in attainment or unclassified with the NAAQS for all criteria pollutants except ozone. The EPA currently lists the HGB as nonattainment for existing ozone standards.

Implementation of the Galveston Island State Park project would include transportation and heavy construction equipment, which may include bulldozer, barge, truck, backhoe, tractor trailer, front-end loaders, and crane.

Environmental Consequences
Project implementation would require the use of heavy equipment which would temporarily affect air quality in the project vicinity due to construction vehicle emissions. Excavation associated with construction of portions of the Galveston Island State Park project may produce fine particulate matter. However, this impact would be short-term, only occurring during active construction activities. Any air quality impacts that would occur would be localized and short in duration. During the permit review, the USACE determined the Galveston Island State Park project is of a small size, with minimal equipment used for construction and therefore, it clearly does not exceed the *de minimis* level for any criteria pollutant (USACE 2013). Therefore, any adverse impacts to air quality would be short-term and minor.

Available minimization practices would be employed to reduce the release of GHG during project implementation. The following measures have been identified to reduce or eliminate GHG emissions from the project:

- Shut down idling construction equipment, if feasible;
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites;
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency; and
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

The use of gasoline and diesel-powered construction vehicles and equipment, including trucks, front-end loaders, forklifts, bulldozers, backhoes, and skid steers, would contribute to an increase in GHG emissions. Although it is difficult to develop an accurate estimation of total fuel consumption associated with construction vehicle and equipment operation, the following table describes the likely GHG emission scenario for the implementation of this project.

Based on the assumptions described in the table above, and the small scale and short duration of the project, predicted GHG emissions would be short-term and minor and would not exceed 25,000 metric tons per year, the threshold for triggering additional requirements for GHG emissions.

8.13.6.1.4 Noise

Affected Resources
The primary sources of ambient (background) noise in the project area are operation of vehicles, humans, recreational vessels, and natural sounds such as wind and wildlife. City noise is mainly from vehicles and also occasional human activities. The levels of noise in the project area varies, depending on the season, and/or the time of day, the number and types of sources of noise, and distance from the sources of noise.

Table 8-10. Estimated greenhouse gas impacts.

EQUIPMENT[52]	NUMBER OF 8-HOUR DAYS	CO_2 (METRIC TONS) [53]	CH_4 (CO_2e) (METRIC TONS) [54]	NO_X (CO_2e) (METRIC TONS)	TOTAL CO_2e (METRIC TONS)
Bulldozer	200	76.00	0.04	0.40	76.00
Front-end loader	280	98.00	0.06	0.56	98.00
Semi-tractor trailer	320	108.80	0.06	0.64	108.80
Rough terrain forklift	100	35.00	0.02	0.20	35.00
Ditch Witch boring unit	120	42.00	0.02	0.24	42.00
Pickup truck[55]	760	121.60	0.08	0.76	121.60
Backhoe	280	98.00	0.06	0.56	98.00
Skid steer	150	52.50	0.03	0.30	52.50
TOTAL		**631.90**	**0.37**	**3.66**	**631.90**

Environmental Consequences

Park visitors and wildlife may be sensitive to changes in noise sources or levels due to the Galveston Island State Park project. During the construction activity, there would be additional noise. However, it is expected that the activities would be performed during daylight hours, be temporary, and be within normal ranges for construction. Construction equipment and pile driving noise is known to disturb nesting shorebirds. Construction noise can also be a nuisance to residents living on the shorelines adjacent to project construction activities or to Park visitors.

Minimization measures that serve to limit noise during construction include: limiting activity at project sites to daytime hours; limiting truck traffic ingress/egress to the site to daytime hours; promoting awareness that producing prominent discrete tones and periodic noises (e.g., excessive dump truck gate banging) should be avoided as much as possible; and requiring that work crews seek pre-approval for any weekend activities, or activities outside of daytime hours. Because construction noise is temporary, any negative impacts to the human environment during construction activities would be short-term and minor.

Once facilities are constructed, noise can be generated from facility operations and the vehicles associated with these facilities. However, these noise levels would be representative of a campground

[52] Emissions assumptions for all equipment based on 8 hours of operation.

[53] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.

[54] CH_4 and NO_x emissions assumptions and CO_2e calculations based on EPA 2011b.

[55] Emissions assumptions for an 8 cylinder, 6.2 liter gasoline engine Ford F150 pickup based on DOE 2013 and 18 gallon (half-tank) daily fuel consumption.

and similar in nature to those generated prior to the hurricanes. Overall, long-term noise effects from personal vehicle use, swimming and other recreational activities would be minor.

8.13.6.2 Biological Environment

The park features 2,000 acres of upper Gulf Coast barrier island ecosystem. Barrier Islands move and change constantly through the action of waves, wind and tides. Because barrier islands serve as transition zones between land and ocean, they support a variety of distinct eco-regions, including beaches, prairies and wetlands. Each supports a diverse array of life. The biological environment is divided into two sections: living coastal and marine resources, and protected species.

A threatened, endangered, and rare species habitat assessment as well as an alternatives analysis were prepared and submitted to the USACE for review as part of the Individual Permit Application (TPWD 2013a). This summation is not fully inclusive of the extensive information found in the Individual Permit Application (SWG-2012-00631). Readers should reference the Environment Assessment for complete information.

8.13.6.2.1 Living Coastal and Marine Resources

Affected Resources

Flora

The project area contains beach, dune, and grassland prairie habitats that have interspersed wetlands. The grassland prairie contains mixed shrub and grass sites and/or woody plant dominated areas. Although there are many plant species in the area, the Park was historically over grazed and still has not fully recovered. The uplands at Galveston Island State Park, especially those on the beach side, is now dominated by early successional species such as western ragweed, bushy goldentop, dewberry, rosette grass, and witch grass with little or none of the tall grasses needed as cover by nesting mottled ducks or migratory grassland birds and other wildlife. The beach/dune habitat is constantly changing as a result of sand transport from winds and storms. The Galveston Island State Park project lies within the Marsh/Barrier Island vegetation type. This area is distributed in the barrier islands along the Gulf Coast, with Seaoats-Seacoast Bluestem Grassland distributed from high tide mark to leeward marshes on sandy coastal barrier islands. These habitat types support a unique array of plant and animal communities. Some commonly associated plants within this area include: croton, single-spike paspalum, Pan American balsamscale, flat sedge, sea purslane and cenicilla, bulrush, beach morning glory, goat foot morning glory, sea rocket, and lime pricklyash.

Fauna

Galveston Island State Park contains a mosaic of coastal habitats that host a variety of wildlife and is visited by birds from throughout the eastern hemisphere during the spring and fall migration seasons. Wading and shore birds, mottled and mallard ducks, raccoons, armadillos and marsh rabbits are found in the Park, which is ideal for wildlife observation and photography. Beach or surf fishing for spotted seatrout, sandtrout, redfish, black drum, croaker and flounder is also popular.

Environmental Consequences

Campground development would likely adversely impact native vegetation. Efforts would be made to limit the removal of native vegetation. The construction of the boardwalks would help prevent human impacts to the vegetation. A designated horse-only trail would be fenced and would help prevent impacts to vegetation. Signs would be used to keep people and horses off of the dunes. Currently, there are about 40 signs planned along the dunes facing the beach. If significant disturbance of dunes is identified, fencing would be used to prevent access to the dunes. Currently there is intermittent fencing present in the area. Horses are restricted to the winter months and to the beach. Due to the saline environment of the beach front, the chances of invasive species being introduced through hay is greatly reduced. Although Bermudagrass is saline-tolerant, it is already pervasive in the dune area.

Native vegetation would be managed as part of the campground maintenance plan. Efforts to identify and eliminate any non-native plant species would be implemented. The management of Galveston Island State Park natural resources includes restoring native plant communities to their Pre-European settlement condition. Native strand prairie will be restored on the existing dune ridges that lie between the swales containing the existing and proposed mitigation wetlands. Strand prairie is a made up of a subset of tall-grass prairie species tolerant of somewhat salty soil resulting from salt spray and hurricane storm surge. The species to be used include: little bluestem, Gulf muhly, Gulf dunes paspalum, and brown seed paspalum. The remaining roadway, parking lots, and temporary buildings not overlain by the new facility footprint will be restored to native plant communities, mostly upland strand prairie, once replacement facilities are constructed. Although some vegetation would be removed, the short-term and long-term impacts overall would be minor given the area affected.

During construction activities, there would be short-term adverse impacts to wildlife species in the project vicinity associated with increased noise, land clearing activities, and the presence of construction equipment. Sufficient habitat is present near the project area for wildlife to relocate during construction activities. Many mobile wildlife species would avoid areas near or within construction areas. However, species would likely return to the area after activities cease. There is sufficient suitable feeding and resting habitat available along the Gulf beaches to support additional bird use. The increase in human activities at the Park is not expected to exceed the effect that was present pre-Hurricane Ike. Overall campground construction would be expected to have short-term minor impacts on wildlife species, as well as beneficial long-term impacts to dune habitat from the beach access boardwalks.

To prevent any invasive species from becoming established during project construction, equipment, materials, and disturbed areas would be monitored for invasive species. If invasive species are observed, appropriate treatment methods will be used to remove them. In addition, if there is any revegetation following construction activities, only native species would be used. An invasive species of particular concern at Galveston Island State Park is Guinea grass, which State Park is already treating and eradicating when observed. The USACE determined during their review of the permit application that the construction methods proposed for the Galveston Island State Park project would not introduce any new or additional invasive species within the project area (USACE 2013). In addition, the wetland mitigation plan contains invasive species eradication and monitoring (TPWD 2013a).

8.13.6.2.2 Protected Species

Protected species and their habitats include ESA-listed species and designated critical habitats, which are regulated by either the FWS or the NMFS. Protected species and habitat also include marine mammals protected under the Marine Mammal Protection Act, essential fish habitat (EFH) protected under the Magnuson-Stevens Fishery Conservation and Management Act, migratory birds protected under the Migratory Bird Treaty Act and eagles protected under the Bald and Golden Eagle Protection Act. The Galveston Island State Park project would be developed approximately 200 feet inland from the Gulf shoreline (mean high water), therefore the no EFH as described by the Magnuson-Stevens Fishery Conservation and Management Act occurs in the project area. The discussion that follows focuses on species protected by the Endangered Species Act, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act.

Endangered Species

Section 6 of the Individual Permit Application (SWG-2012-00631) addresses Threatened, Endangered, and Rare Species that may be impacted by the Galveston Island State Park project (TPWD 2013a). No federally-listed species or other species of concern under the NMFS's jurisdiction are expected to be in the project area due to the Galveston Island State Park project location and habitat conditions. The project area contains suitable habitat for the following federally-listed and proposed species: Eskimo curlew, green sea turtle, hawksbill sea turtle, Kemp's ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, piping plover, and red knot. There is no designated or proposed critical habitat for federally-listed, proposed, or candidate species in the project area.

Eskimo curlews are presumed to be extinct because they have not been observed since the 1960s. If by happenstance this species is identified in the project area during construction of the project, construction would cease and FWS would be contacted to determine protective measures for this species.

Beach areas that could be used for sea turtle nesting activities are located within the project footprint. Although nesting habitat for the five sea turtle species is present, only the Kemp's ridley is known to nest on Galveston Island. Sea turtle nest detection patrols occur on the entire Texas Gulf of Mexico beachfront during the sea turtle nesting season in coordination with the National Park Service's Sea Turtle Recovery Project. Any sea turtle nests located are excavated and the eggs are relocated to Padre Island National Seashore, on the southern Texas coast, for incubation.

Only the beach access boardwalks are proposed for construction in potential beach nesting area. TPWD directives and standard operating procedures ensure project construction in potential nesting areas would be completed outside of the nesting season. Therefore, the construction of beach access boardwalks (the only proposed development that would affect sea turtle nesting) has been scheduled to avoid nesting season, which extends from April 1 until October 1. In addition, equestrian use is not anticipated to impact sea turtles since horses are only permitted on the Park beach during the winter months (outside of turtle nesting season).

Piping plovers do not nest at Galveston Island State Park, but could occasionally use the sandy areas near the dunes and the beach during the non-breeding season. Only beach access boardwalks are proposed for construction in these habitats. Wintering habitat preferred by piping plovers in Texas includes very sparsely vegetated tidal mudflats, sand flats, or algal flats. Although Galveston Island does contain piping plover critical habitat, no designated critical habitat for piping plover exists within the project area. Red knots (proposed for listing) are primarily found in intertidal marine habitats in Texas. They rely on shoreline habitat for feeding and resting.

Bald and Golden Eagles
There are no golden eagles present within Galveston Island State Park. On rare occasions bald eagles may fly over the Park.

Migratory Birds
Located along the Greater Texas Coastal Birding Trail, Galveston Island State Park serves as a rest stop for many species of migratory birds traveling the Central Flyway. Migratory birds are also protected under the Migratory Bird Treaty Act. Nesting of migratory birds is not known within the project area, but is possible. Bird rookeries are not within or near the project area.

There are over 270 species of migratory birds that are present during at least part of the year at Galveston Island State Park. Of these species, only a few have the potential to nest within or near the proposed Galveston Island State Park Beach Redevelopment project.

Environmental Consequences
Impacts to protected species and their habitats may occur during construction of portions of the Galveston Island State Park project, but would be localized. Disturbance to individual species would occur in the construction areas; however, there would be no change in the diversity or local populations of protected species.

The redevelopment would have no effects on nesting sea turtles. Only Kemp's ridley sea turtles are known to nest on Galveston Island. Park lights are not a concern for these sea turtles because they nest during the day and eggs from any sea turtle nests observed would be relocated in coordination with the National Park Service's Sea Turtle Recovery project. Additionally, construction of the beach access boardwalks within the nesting area would be conducted outside the nesting season.

Piping plovers and red knots could be in the project area, therefore actions to minimize potential impacts to these species will be taken during construction.[56] Actions to minimize impacts include having an onsite monitor, avoiding work after dark, maintaining a speed limit of 10 miles per hour, and stopping work if the birds are observed foraging within 100 feet of the work site. The onsite monitor would have stop work authority and would be present at the site when construction is occurring. The trained monitor would survey the area daily prior to the initiation of any construction activity and periodically throughout the day. If vehicles or equipment are left in the project area, the areas around the tires would be surveyed before moving the vehicle. The monitor would keep a daily log documenting all surveys conducted.

It is possible that migratory birds may nest in the project area. There would be enough disturbances to displace or destroy nests, eggs or chicks. Therefore, at least the initial site access, clearing, and construction effort would be conducted outside of the spring nesting season (March 15 to July 1). Once the site has been cleared and construction commenced, nesting birds would avoid the construction area

[56] Since the Red Knot is a proposed species (not federally-listed), these recommendations are discretionary. If this species becomes listed prior to completion of the proposed project, then the special management practices would apply to the red knot. Regardless, the special management practices will be implemented in areas that may have piping plovers.

and further work can occur throughout the year. Construction activities would produce enough noise and disturbance to prevent birds from nesting in the area, thereby preventing impacts to nesting birds.

The designated paths to the beach (boardwalks) would concentrate visitors to the south side of the beach and minimize effects to wildlife and habitats by protecting the dunes and reducing the area of impacts. The camping facilities are proposed to house fewer sites than what was present pre-Hurricane Ike. Therefore, this development is not expected to increase impacts beyond what was previously present. Any impacts to protected species if they occur at all would be expected to be short-term and minor.

The ESA consultation has been completed. FWS concurred that the proposed Galveston Island State Park project may affect, but is not likely to adversely affect piping plover or red knot (if listed). The project was also reviewed for impacts to bald eagles and migratory birds in accordance with the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Actions to minimize impacts will be implemented during project construction to prevent take of migratory birds or bald eagles (FWS 2014a).

8.13.6.3 Human Uses and Socioeconomics

In addition to the ecological significance of its natural resources, and the diversity of its habitats, the Gulf of Mexico ecosystem is also culturally and socioeconomically important to the people of the Gulf coast and the United States. This section includes discussions of socioeconomics and environmental justice conditions, cultural resources, land and marine management activities that are pertinent to Early Restoration, aesthetic and visual resources of the region, tourism and recreational use in the area, infrastructure, and a general characterization of public health and safety issues as well as shoreline protection.

8.13.6.3.1 Socioeconomics and Environmental Justice

Affected Resources

In 2012 the population in Galveston County was estimated to be over 300,000 which accounted for just over 1% of the Texas population. Approximately 59% of the population in Galveston County is white (not Hispanic or Latino), 23% is Hispanic or Latino, 14% is black or African American, and 3% is Asian. Around 18% of the county population speaks a language other than English at home. Median household income (2007-2011) in Galveston County and the state is $59,645 and $50,920, respectively, with 13% of the county and 17% of the state living below the poverty level (U.S. Census Bureau 2013).

Tourism is an important socioeconomic component of Galveston, Texas and Galveston Island State Park averaged 250,000 visitors per year prior to Hurricane Ike. Due to the destruction of the facilities in 2008, visitation to the Park has dropped off substantially. Galveston Island State Park is an important component to the recreation and social value of the island. The Park is a stop on the Great Texas Coastal Birding Trail and a popular destination for birders. Reconstruction of the Park's visitor check-in station, camping facilities, amenities, and day use parking should increase visitation and expenditures at local restaurants, shops, and convenience stores. Staffing levels at the Park prior to Hurricane Ike included 16 full-time personnel and 5 seasonal positions. In comparison, current staff levels are 10 full-time personnel and four seasonal positions. It is anticipated that staffing levels would return to pre-Ike levels after completion of the Galveston Island State Park project.

Environmental Consequences

Construction materials are generally purchased from the local area. If a local contractor is awarded the bid, this would provide stimulus to local businesses. Any contractor mobilization to the area would provide stimulus to local service industries. TPWD has predicted that there would be an increase in recreational use of the Park as a result of this project. Increased visitation would benefit the local economy and could lead to the need for additional staff at the Park. It is anticipated that six new full-time positions and one new seasonal position would be created after completion of the Galveston Island State Park project. Galveston Island State Park would also see increases in revenue. There would be indirect beneficial effects to the local economy due to increased recreational and tourist activity in response to campground and other recreational improvements at the Park. These economic benefits would be concentrated in the service and retail industry sectors. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. Overall, socioeconomics would not be adversely impacted as a result of the proposed project. The project is expected to have a positive beneficial impact to the local economy through indirect benefits associated with visitation to the Park and tourism.

8.13.6.3.2 Environmental Justice Analysis

In this analysis, a county is considered to have a minority population if its nonwhite population is greater than 50% or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as counties in which the percentage of the population below poverty status exceeds 50%, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. Galveston County is not considered to be minority and low income. There are no adverse effects to low income or minority populations anticipated from the proposed project.

As part of the permit application review process, the USACE determined there is no adverse human health or environmental effects from the project upon minority and low income populations of the United States (USACE 2013).

8.13.6.3.3 Cultural Resources

Affected Resources

Galveston Island State Park was severely impacted by Hurricane Ike in 2008. TPWD worked with the Texas Department of Transportation to remove debris. Prior to the debris cleanup project, TPWD consulted with the Texas Historical Commission under Section 106 of the National Historic Preservation Act, and the Texas Historical Commission concurred with the cleanup plan. Two archeological surveys were conducted within the project area, covering of 103 acres in Galveston Island State Park. The area surveyed is on the Gulf beach side of the Park, southeast of FM 3005. Pedestrian survey and intensive shovel testing found no archeological sites in the 103-acre survey area (which includes the proposed project area) on the Gulf beach front of the Park. A comprehensive cultural resources report was submitted with the USACE permit application. The results of the investigation were coordinated with the Texas State Historic Preservation Officer, who then provided concurrence that there would be no effect to cultural resources as a result of this project. In addition, the National Register of Historic Places has been consulted and no properties are listed in the permit area.

As part of the permit application review process, the USACE initiated coordination with the appropriate Indian Tribes. No response was received from any federally recognized Native American Tribes and/or affiliated groups (USACE 2013).

A complete review of this project under Section 106 of the National Historic Preservation Act would be completed as environmental review continues. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of the cultural and historic resources.

Environmental Consequences
No cultural resources are expected to be impacted by this project. The development of the part of the Park southeast of FM 3005 would not affect any cultural resources that are eligible for listing in the National Register of Historic Places or designation as State Archeological Landmarks. No further cultural resources work is recommended for this part of the Park. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

8.13.6.3.4 **Land and Marine Management**

Affected Resources
The Galveston Island State Park project is located within Galveston Island State Park on state-owned lands. Surrounding land uses include residential neighborhoods with mixed retail northeast and southwest of the Park. FM 3005 runs through the Park connecting residential areas of Galveston Island. The addition of these amenities to the Park is in accordance with the Galveston Island State Park Master Plan (TPWD 2011) and would meet several objectives of TPWD’s Land and Water Resources Conservation and Recreation Plan (TPWD 2013b). Additionally, Galveston Island State Park operates under the guidance of TPWD’s State Park Division Plan (TPWD 2012a). All standards and provisions of these plans and relative regulations would be adhered to, including Texas State Park Operational Rules (Title 31, Texas Administrative Code Chapter 59) and Texas Accessibility Standards issued under the authority of the Texas Government Code, Chapter 469. The Federal Trustees reviewed the Texas projects for consistency with the Texas Coastal Management Program and found that, as best as can be determined at this level of planning, these proposed restoration actions are, and will be undertaken in a manner that is, consistent with the applicable, enforceable policies of the State's program (Federal Trustees 2013). TGLO concurred with the Federal Trustees’ consistency determination that the project

would be implemented in a manner that is consistent with the applicable, enforceable policies of the Texas Coastal Management Program (TGLO 2014).

Environmental Consequences

The Galveston Island State Park project would not change the current land use, zoning, or cause any amendments to management plans that relate to the project area. The area would remain designated for open space recreational use, which allows for developed camping facilities and other structures related to outdoor activities such as boating and fishing. Land use and management authority at the Park would remain under the purview of the TPWD, and development at the Park would comply with the guidance established for coastal recreational land uses and the requirements of the Coastal Zone Management Act. Thus, no impacts would occur to Land and Marine Management under the proposed project.

8.13.6.3.5 Aesthetics and Visual Resources

Affected Resources

The general visual character of this region can be described as semi-urban, with surrounding areas maintaining a low-density residential quality representative of current and historic land uses. Residential communities in this region are interspersed with commercial developments located along major roadways, with some larger areas remaining in agricultural use or as undeveloped open space. The topography is flat to gently sloping. Most recreational activities on site involve the use of the natural setting. For example, activities such as bird watching and fishing benefit from the natural settings to enhance experiences. The redevelopment proposed in this project enhances recreational experiences while maintaining a small footprint, which is an objective in the Galveston Island State Park Master Plan. During the redevelopment construction, the materials, workers, and equipment would be staged adjacent to the worksites. The proposed construction is consistent with the surrounding structures and typical of amenities located within Texas coastal state parks.

Environmental Consequences

Temporary impacts to visual resources would result from construction of the proposed Galveston Island State Park project. Large construction equipment such as backhoes for campground construction would temporarily obstruct the shoreline views for visitors and recreational users at the site. The addition of the structures would change the viewshed, but the construction would be consistent with the other amenities located in the Park. The structures would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Any adverse impacts to aesthetic and visual resources would be short-term and minor.

8.13.6.3.6 Tourism and Recreational Use

Affected Resources

Galveston Island State Park averages 250,000 visitors per year, but since the Park was severely damaged by Hurricanes Ike visitation dropped significantly due to the lack of available facilities. The Park is a stop on the Great Texas Coastal Birding Trail and remains popular destination for birders. The Park is also a popular day use and Gulf beach access point for visitors from the Houston/Galveston metro areas. In addition, visitors come to fish, kayak, and view wildlife. There are three paddling trails and ten foot trails located in the Park (Figure 8-41). The shoreline itself is popular for walking and horseback riding is allowed on the beach. The Park transects the island and provides visitors with a complete view of the habitats that exist from the Gulf beach to the bays on barrier islands. Galveston Island State Park is a popular destination for local schools and education programs that use the Park as an outdoor laboratory and learning venue.

Galveston Island State Park has historically been one of the most visited state parks in Texas. It serves local and national tourists, especially residents of nearby Houston and Galveston. Redevelopment of the Gulf beachside facilities is necessary to meet the public demand for visitors of the Gulf Beach on Galveston Island. Development of the proposed Galveston Island State Park project is expected to generate economic benefits throughout Galveston County as visitor expenditures, including food service, lodging, fuel, retail, and recreation purchases, would increase with additional tourism. The redevelopment of the Galveston Island State Park beach-side, and the subsequent increase in number of visitors, would serve to benefit the economy of TPWD, Galveston Island, and the county as a whole.

Figure 8-41. Map of trails within Galveston island State Park.

Only 33 camping facilities continue to function at the Galveston Island State Park beachside following the destruction by Hurricane Ike. These camping facilities are insufficient to meet public demand, which, prior to Hurricane Ike, numbered 150 multi-use campsites. Post-Ike public input has consistently shown an interest in greater capacity. In order to meet the objective of the TPWD for Galveston Island State

Park, the Gulf beachside recreation facilities would have to provide public access to the beach in a way that is safe, convenient, and sufficient to accommodate the beach-going public.

There are no equestrian facilities located in the Park at this time though horses can access the beach from adjacent city-owned access areas on either end of the Park. Horses are allowed on the beach from November 1 through February 28. Equestrian corrals and facilities would be part of the new construction.

Environmental Consequences

During the construction period, recreational experience would be impacted from noise and visual disturbances associated with the use of heavy equipment. Access to certain areas could also be restricted or impacted to some degree during construction activities. During construction, it would be necessary to close portions of the Park to public access to ensure public safety. However, this would be limited to the amount of time necessary to complete the construction and would be reopened after completion. Day use parking lots would remain open to allow for public beach use during construction until the new parking areas are completed. The construction may have moderate impacts to public access and use of the beach. While these temporary inconveniences would result in moderate short-term impacts on tourism and recreational use during the construction and rehabilitation activities at the shoreline, over the long-term improved access and enhanced facilities would result in substantial benefits to tourism and recreational use. Opportunities for recreational activity at the shoreline would be enhanced over the long-term as a result of the construction of the campground, resulting in beneficial effects to tourism. Overall, the implementation of the proposed Galveston Island State Park project would contribute positively to visitor experience and public access. Any adverse impacts to tourism and recreational use would be short-term and moderate.

8.13.6.3.7 Infrastructure

Affected Resources

Current facilities at Galveston Island State Park include 33 Gulf beach-side campsites with water and electricity for recreational vehicles or tents, 20 bay-side recreational vehicle sites with water and electricity and 10 bay-side tent sites with water only. There are two restroom buildings with showers located in the beach camping areas and one restroom building with showers in the bay tent camping loop. The Gulf beach-side day use area has parking for approximately 205 cars. Also included are 29 picnic tables with shade covers, 4 changing rooms, and 1 restroom building. [57]

The new beach side entrance to the Park would be located 400 yards to the west of its current entrance on FM 3005. The new design allows for more space to cue RV's and vehicles entering the Park. Current conditions often allow for vehicles to back up to the highway during busy days. It is anticipated that new turn lanes and acceleration and deceleration lanes would be added to FM 3005. These improvements would not be funded through DWH Early Restoration funds.

[57] While the permit specifies the number of each improvement (campsites, boardwalks, etc.) that is planned and approved by the USACE, DWH Early Restoration funds will only fund a portion of the total number.

The Park was initially planned to use utilities at a capacity that would not exceed pre-Ike demands. Storm water would be directed to constructed wetlands. There are plans as part of a Texas Department of Transportation Project to redirect overflow from the wetlands to the ditches on the bay side of Galveston Island State Park. Proposed utilities would be replacing those lost from Hurricane Ike. Center Point Energy supplies electricity to the site and anticipates the redevelopment and would be providing power.

Utilities for the new developments would include water, sanitary sewer, and electrical. These utilities would be installed below ground. Current electrical lines running through the proposed construction areas would be relocated to the main highway by the power company at their expense. Park sewer lines are connected to City of Galveston via pressure lines. Although dump stations are planned as part of the campground improvements, they would be paid for by a separate funding source. Storm water would be routed to in wetlands and/or ditches.

Environmental Consequences
The Galveston Island State Park project would not impact any existing public infrastructure or road, but it may temporary impact Park facilities during the alteration of water and power lines, and staging of materials. Aside from improvements to basic sanitation facilities and the extension of electrical utility lines at the proposed campground, there would be no changes to infrastructure or additional public utility requirements under the proposed project. Electrical demands would exceed what is currently being used but are not expected to exceed the capabilities of feeder lines that were used previously. Current electrical lines running through the proposed construction areas would be relocated to the main highway by the power company at their expense. Park sewer lines are connected to City of Galveston via pressure lines. No capacity upgrade to the utility connections (including water services) would be needed.

Construction waste would be removed by the contractor to an appropriate landfill using dump trucks and roll-off dumpsters or as specified by TPWD Infrastructure contracts. The current closest landfill is located in Santa Fe, Texas, 26 miles away. The landfill is utilized by Galveston County residents. The landfill capacity has not been reached. The impacts to parking, roads, and facilities would be localized and within the Park. Construction activities may temporarily alter the operational capacities of the Park. While there would be no impact to day-use visitation, overnight beach-side camping would be suspended during construction. These facilities would be torn down to make room for the new campsites.

The new design of the beachside Park entrance and modifications to FM 3005 would allow more space for cars to line up and remain off the highway. During the construction activities, there would be short-term disruptions of parking and public access to facilities within the Park, but over the long-term the project would enhance public access and recreational opportunities. Any adverse impacts would be short-term and minor.

8.13.6.3.8 **Public Health and Safety and Shoreline Protection**

Affected Resources
The Galveston Island State Park project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. All waste generated during the construction of the

amenities would be disposed in the appropriate waste or recycle collection receptacles in the Park or hauled off to an approved waste disposal site. All occupational and safety regulations and laws would be followed to ensure safety of all workers and the public.

In order to protect the redeveloped Gulf beach site from future weather events, beach erosion or subsidence, the proposed project would be set back from the shoreline, further inland than the original beachside camping facilities, which are now largely underwater due to Hurricane Ike and beach migration. According to the Galveston Island State Park Master Plan (TPWD 2011), site planning along the beach would respond to a 50-year time horizon with elevated structures and transitional elements to respond to a changing coastal morphology. In response to subsidence, sea-level rise and beach migration anticipated at the Gulf beach over the coming decades, many of the beachside facilities would be elevated in order to protect these facilities from future flooding events and beach migration. Transitional facilities between elevated structures and at-grade recreation areas include beach access boardwalks, tent campsites, and picnic shelters.

Environmental Consequences

Providing safe beach access was established as a project goal in considering alternatives for the project (TPWD 2013a).

The Galveston Island State Park project is designed with elevated structures and transitional elements to respond to a changing coastal morphology, in response to subsidence, sea-level rise, and beach migration anticipated at the Gulf beach over the coming decades.

No hazardous waste would be created during construction of the redevelopment. All hazardous materials handled during construction would be contained and appropriate barriers would be in place to ensure the protection of adjacent water resources from potential spills and leaks. In the event of a discharge of oil or release of hazardous substances, the release would be reported to the National Response Center (800-424-8802) and Texas Emergency Oil Spill and Hazardous Substance Reporting line (800-832-8224) as required. BMPs in accordance with Occupational Safety and Health Administration and state and local requirements would be incorporated into construction activities on site to ensure the proper handling, storage, transport and disposal of all hazardous materials. Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the worksite during construction. Soil and sediment stabilization measures would be incorporated into the Galveston Island State Park project design as needed in areas where the potential exists for erosion to occur in order to protect resources and ensure public health and safety. No adverse effects to public health and safety and shoreline projection are expected as a result of this project.

8.13.7 Summary and Next Steps

Per the Purpose and Need of the Phase III ERP/PEIS, four programmatic alternatives are considered, including a no action (Alternative 1), project types emphasizing habitat and living coastal and marine resources (Alternative 2), project types emphasizing recreational opportunities (Alternative 3), or a combination of both habitat and living coastal and marine resources and recreational opportunities (Alternative 4).

The proposed Galveston Island State Park project would redevelop the beach side of Galveston Island State Park by building new facilities, including multi-use campsites, tent campsites, beach access boardwalks, equestrian facilities, a visitor check-in station, and restroom and shower facilities. The project is consistent with Alternatives 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (the Preferred Alternative).

The NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories, moderate short-term impacts to tourism and recreational use, and no major adverse impacts are anticipated to result. This restoration project would enhance visitor use and enjoyment of Park resources. The Trustees have started coordination and reviews under the National Historic Preservation Act and other federal statutes, where appropriate. The Trustees have completed consultations and reviews under the Endangered Species Act, Magnuson-Stevens Fishery and Conservation Act, Marine Mammal Protection Act, Migratory Bird Treaty Act, Bald and Golden Eagle Protection Act, Section 404 of the Clean Water Act, and Coastal Zone Management Act. Implementing Trustees will adopt and are required to implement project-specific mitigation measures (including BMPs) identified in the Final Phase III Record of Decision and completed consultations/permits. Oversight will be provided by the implementing Trustees. If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would initiate (if no effect originally concluded) or re-initiate (for completed consultations) consultations with the regulatory agencies. Trustees would conduct due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Final determination on this project will be included in the Record of Decision.

8.14 Cumulative Impacts

The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. The regulations (40 C.F.R. §1508.7) define cumulative impacts as the:

> *impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.*

In the context of the Phase III Early Restoration Program, cumulative impacts assessment requires the Trustees to (1) define appropriate spatial and temporal boundaries for the analysis; (2) describe baseline environmental and/or socioeconomic conditions for affected resources within the spatial and temporal boundaries; (3) identify past, present and reasonably foreseeable future government and private actions that could have or contribute to potentially significant impacts on the affected resources; and (4) characterize the cumulative impacts of the proposed project assuming implementation of the other present and reasonably foreseeable future actions.

Although Early Restoration encompasses projects located across hundreds of miles of Gulf of Mexico coastline, a cumulative analysis of all impacts across the Gulf is not practically feasible. Given the broad geographic scope of the Phase III program, the requirement for cumulative impacts analysis poses unique challenges. In addition to the programmatic cumulative impacts analysis (See Chapter 6), the Trustees have developed a cumulative impacts analysis around discrete, state-by-state, spatially-based or temporally-based project groupings that focus the analysis on areas where projects would occur (e.g., watersheds, estuaries or counties). The analysis focuses on those affected resources for which proposed projects have a potential contribution to cumulative impacts. This state-by-state analysis is designed to supplement the programmatic cumulative impact analysis found in Chapter 6. Following the CEQ guidance for scoping cumulative analyses, the goal is not to capture every theoretically possible impact, but instead 'to count what counts.' Defining spatial boundaries in this manner also facilitates identification and analysis of existing environmental and socioeconomic conditions.

The cumulative impacts analysis depends heavily on the availability of information and data about past, present, and likely future actions. For the analysis of the Phase III projects, the Trustees identified past, present, and potentially significant future actions through consultations with local, state and federal environmental experts familiar with major environmental and development initiatives that have a potential to contribute substantially to cumulative impacts. In some cases, environmental analyses of reasonably foreseeable future actions are available to inform the Trustees' analyses. But in the absence of such completed analyses, the Trustees generally had to rely on expert judgments, primarily qualitative, about the potential for impacts, using publicly available information about the likely design and location of these actions.

For the Texas Early Restoration projects, the Trustees believe the cumulative impact analyses discussed here represent best estimates of how current environmental and socioeconomic conditions may be changed by the proposed actions when their impacts are combined with other past, present, and reasonably foreseeable future actions. However, cumulative effects analysis remains subject to uncertainties and data limitations. Nonetheless, because the proposed Texas Phase III Early Restoration projects are all designed to increase public access and/or enjoyment of natural resources, the Trustees concluded that although some of the projects may have an incremental contribution to adverse cumulative impacts, the contribution would not be substantial over the long-term. The reasons for this conclusion are detailed in the remainder of this chapter.

8.14.1 Spatial and Temporal Boundaries for Texas Projects

In order to identify the past, present, and reasonably foreseeable future actions to consider in the cumulative impact analysis, affected resource-specific spatial and temporal boundaries must be identified. The spatial boundary is the area where past, present, and reasonably foreseeable future actions have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the alternatives being considered. The temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. Appropriate spatial and temporal boundaries for the Texas projects are described in the following sections.

8.14.1.1 Spatial Boundaries

In developing the following cumulative impact analysis, the cumulative actions discussed in Chapter 6 were considered (e.g. marine transportation, oil and gas, etc.). As part of the cumulative analysis, past, present, and reasonably foreseeable future actions were identified (past actions are considered part of the existing conditions which were analyzed in the individual environmental reviews). This analysis considers the incremental contribution of proposed Phase III early restoration projects to potential cumulative impacts to resources discussed in Chapter 3. The analysis includes resources that are relevant to the concerns identified on the regional scale.

The Phase III Early Restoration projects proposed in Texas are physically separated from each other, with distinct habitat types and functionally different. The projects were grouped by habitat type and function. Groups were analyzed for past, present, and reasonably foreseeable future actions which have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the projects being considered. Texas projects have been grouped based on the similarity of habitat and function (Figure 8-42):

- Group 1: Artificial Reef Projects;
- Group 2: State Park Projects.

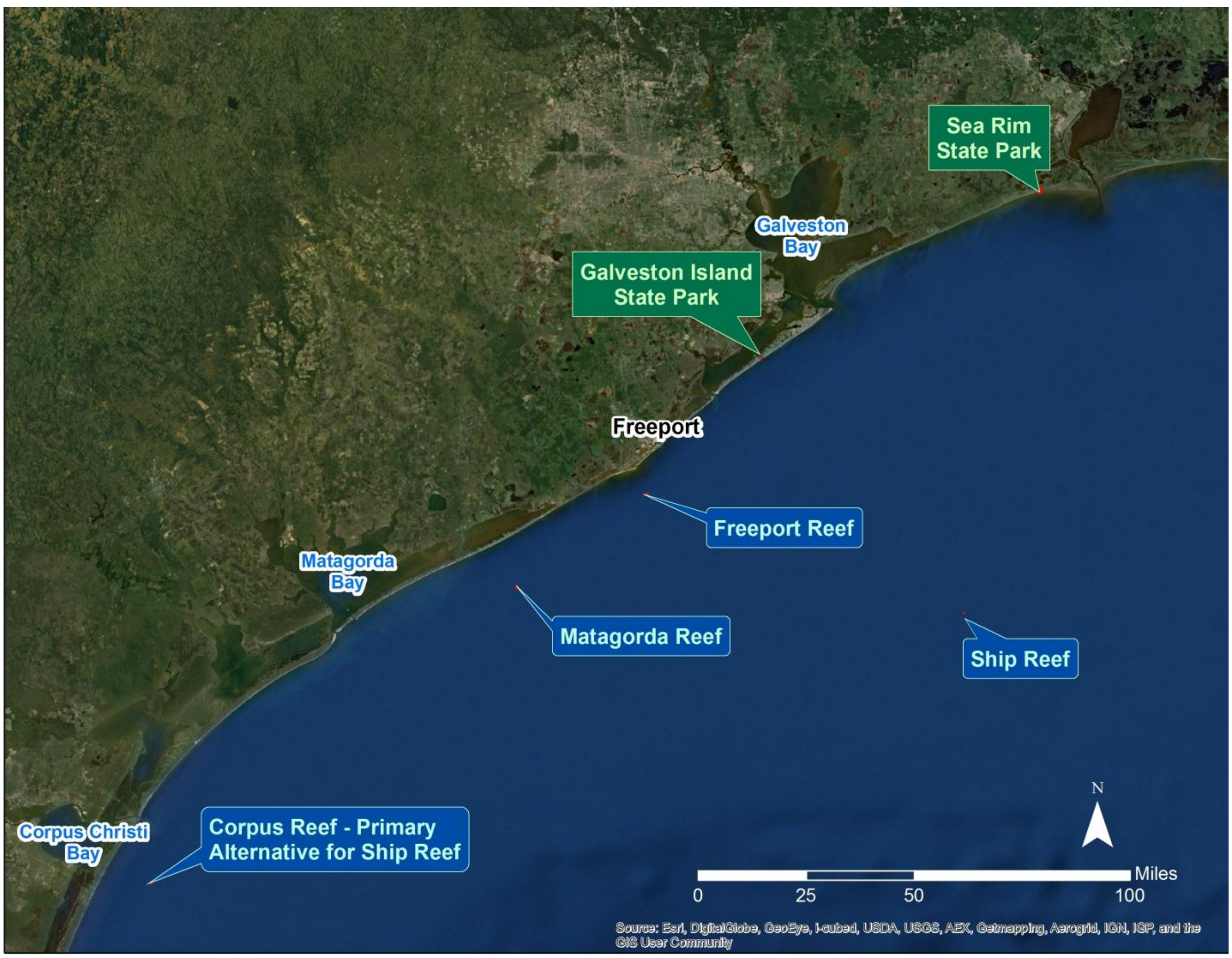

Figure 8-42. Location of all Phase III Early Restoration projects proposed in Texas. Group 1 (Artificial Reef Projects) is labeled in blue and Group 2 (State Park Projects) is labeled in green.

The proposed artificial reef projects (Matagorda Artificial Reef, Freeport Artificial Reef, and Ship Reef or Corpus Artificial Reef[58]) would all be placed in similar nearshore habitats in the Gulf of Mexico off the coast of Texas. All of the projects are under the purview of the same TPWD regulatory codes, as well as TPWD's Artificial Reef Program management objectives, operating plans, and senior staff. Additionally, all of the proposed reef projects would be or have been subject to the same decision-making process for selecting reef sites and materials as well as for prioritizing sites. The proposed reef projects would also be subject to the same standard operating protocols and guidelines for construction, development, and assessment. Due to the similarity of construction guidelines, and habitats where the artificial reefs would be located, all reef projects are combined for purposes of an analysis of cumulative effects.

The proposed state park projects (Sea Rim State Park Improvements Project and Galveston Island State Park Beach Redevelopment Project) are located along the northern Texas coast on coastal lands managed by the TPWD. Both projects are under the purview of the same TPWD regulatory codes, as well as State Park Division management objectives, operating plans, and senior staff. Due to the similarity of habitat types affected, park operations and management, as well as construction methods, both state park projects are combined for purposes of an analysis of cumulative effects.

8.14.1.2 Temporal Boundaries

As detailed in Chapter 6 of the FERP/PEIS, the temporal boundary describes how far into the past and forward into the future actions should be considered in the impact analysis. The temporal boundaries may vary for each resource. Once the impacts of the proposed actions are no longer experienced by the affected resource, the cumulative impacts of the other past, present, and reasonably foreseeable future actions need no longer be considered. For the most part, actions considered in this cumulative impacts assessment are those actions that are anticipated to persist beyond the construction period for Phase III proposed projects and those actions that are ongoing.

8.14.2 Identify Resources Affected

Table 8-11 summarizes the impacts to resources, as discussed in the Environmental Consequences sections for the proposed Texas projects, for both Groups (Artificial Reef Projects and State Park Projects).

[58] The Corpus Artificial Reef Project would only be implemented in the event that the Ship Reef Project becomes technically infeasible (e.g. an appropriate ship cannot be acquired with available funding).

Table 8-11. Summary of Impacts of Proposed Phase III Early Restoration Projects in Texas.

	Geology and Substrates	Hydrology, Floodplain, and Water Quality	Air Quality and GHGs	Noise	Living Coastal and Marine Resources	Protected Species	Socioeconomics and Environmental Justice	Cultural Resources	Land and Marine Management	Aesthetics and Visual Resources	Tourism and Recreational Use	Infrastructure	Public Health and Safety and Shoreline Protection
	Group 1: Artificial Reef Projects												
Freeport Artificial Reef	-	s	s	-	s/+	NE/+	+	NE	NE	s	+	NE	NE
Matagorda Artificial Reef	-	s	s	-	s/+	NE/+	+	NE	NE	s	+	NE	NE
Ship Reef	-	s	s	-	-/+	s/+	+	NE	NE	s	s/+	NE	NE
Corpus Artificial Reef	-	s	s	-	s/+	NE/+	+	NE	NE	s	+	NE	NE
	Group 2: State Park Projects												
Sea Rim State Park Improvements	-	-/+	s	-	-	NE	+	NE	NE	s	s/+	s/+	NE
Galveston Island State Park Beach Redevelopment	-/+	-/+	s	-	-/+	NE	+	NE	NE	s	s/+	s/+	NE

Table notes:

-	Adverse effect
+	Beneficial effect
s	Short-term adverse effect
NE	No effect

Cultural resource investigations have been completed for all Texas proposed projects and consultations are in process. Although the consultation process has not been completed, no cumulative impacts to cultural resources are anticipated. If cultural resources would be impacted, mitigation identified during the consultation process would be implemented.

8.14.3 Identify Cumulative Action Scenarios

In this step, the past, present, and reasonably foreseeable future actions to be included in the impact analysis for each specific affected resource are identified. These actions fall within the spatial and temporal boundaries established above.

For purposes of the cumulative impacts analyses in this Chapter, past actions are assumed to already be represented in the state of the affected environment, as discussed in the Environmental Consequences sections for the proposed Texas projects. Current actions are those that are occurring now and result in ongoing impacts to the same resources that the proposed projects will impact.

Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resource as the proposed projects. The determination of what future actions should be considered requires a level of certainty that they will occur to ensure that the consideration of future actions is not overly speculative. This level of certainty could be met by a number of factors such as the completion of permit applications, the subject of approved proposals or planning documents, or other similar evidence. The temporal boundaries may vary for each resource. Once the impacts of the proposed actions are no longer experienced by the affected resource, the cumulative impacts of the other past, present, and reasonably foreseeable future actions need no longer be considered. For the most part, actions considered in this cumulative impacts assessment are those actions that are anticipated to persist beyond the construction period for Phase III proposed projects and those actions that are ongoing.

8.14.4 Group 1: Artificial Reef Projects

Table 8-11 summarizes the impacts to resources associated with proposed Texas projects in the nearshore habitats in the Gulf of Mexico off the coast of Texas, comprising recreational use projects. Projects are evaluated together to determine if they have any cumulative effects that, when combined with other past, present, and reasonably foreseeable future actions in nearshore habitats in the Gulf of Mexico off the coast of Texas, may result in cumulative effects to resources.

8.14.4.1 Existing Conditions

Existing environmental and socioeconomic conditions in and around the permitted artificial reef sites in nearshore waters near Texas are represented by the current state of the affected environment, as described above in the Environmental Consequences sections for the proposed Texas projects. These conditions reflect the environmental impacts of past projects in the area and therefore are the assumed starting point for the cumulative analysis of impacts for past, present, and reasonably foreseeable future actions.

8.14.4.2 Identification of Present and Reasonably Foreseeable Future Actions and Impacts

Table 8-12 identifies present and reasonably foreseeable future actions in each of the areas described in Chapter 6. For each of the actions, the table provides (1) a brief description of the action and (2) a listing of NEPA resource areas that are the most likely areas of concern for cumulative impacts when the action is considered in conjunction with implementation of the Texas Group 1 Phase III early restoration projects. In most cases, detailed environmental impact data are not available for these actions. Consequently, the analyses generally reflect qualitative best professional judgment about potential impacts. Also, as noted previously, the focus of the cumulative impacts analysis is on the resource areas that are deemed most likely to exhibit cumulative impacts; hence the analysis does not include in the listing those resources where impacts have been judged to be *de minimis*.

Table 8-12. Other Activities Identified in Group 1.

Actions[59]	Action Description	Key Resource Areas with Potential for Cumulative Impacts
Ship channel maintenance dredging	Ship channels leading to Texas Ports as well as the Gulf Intracoastal Waterway are routinely dredged to maintain designated depths in order to facilitate waterborne cargo transportation. Current ongoing maintenance dredging projects along the Texas coast include: • approximately 19.5 mile of the Corpus Christi Ship Channel between the Corpus Christi Harbor entrance and Aransas Pass scheduled to be complete in May 2014 • approximately 9 mile segment of the Houston Ship channel between Redfish Island and the Bayport Channel as well as the Bayport Channel itself scheduled to be complete in October 2014 • approximately 25.5 mile section of the Gulf Intracoastal Waterway (GIWW) between High Island and the Bolivar Flare scheduled to be completed in March 2014 • approximately 18.6 mile portion of the Neches River Channel in Jefferson and Orange counties scheduled for completion in May 2014.	• Geology and substrates • Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Ongoing oil and gas exploration and production	The coastal region off the coast of Texas is among the most productive for oil and gas exploration and production. During 2013, wells in Texas state waters produced over 470,000 bbls of crude oil and almost 14,000,000 MCF of natural gas (RRC). Federal waters off the Texas coast generated another 51 million bbls of crude oil and 172,000,000 MCF of natural Gas (BOEM). Transport of staff, equipment and supplies necessary to support this exploration and production effort requires a large number of surface vessels and helicopters.	• Geology and substrates • Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources
Seismic exploration	Seismic exploration activities will continue in order to explore and extract belowground mineral resources. These activities help support the economic well-being of Texas and the United states by providing products that are used by other industries and individuals.	• Geology and substrates • Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources
Oil rigs as habitats	Existing oil rigs off the Texas coast provide valuable habitat for diverse sessile marine invertebrate communities and attract pelagic fish that provide increased opportunity for recreational fishing and diving. The number of rigs present is in a constant state of flux as well sites go into and out of production, however the current trend appears to be decreasing as a backlog of no longer needed structures are being removed faster than new rigs are being added.	• Geology and substrates • Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Tourism and recreational use

[59] Note: Texas does not have any ERP Phase I or Phase II projects, and therefore did not include them in the state-level cumulative analysis

Actions[59]	Action Description	Key Resource Areas with Potential for Cumulative Impacts
TPWD's Artificial Reef Program	The Artificial Reef Program manages a network of approximately 45 artificial reef sites off the coast of Texas consisting of specially designed structures, former rigs, concrete culverts and rubble and ships. Reef sites support diverse sessile marine invertebrate communities and attract pelagic fish all of which provides increased opportunity for recreational fishing and diving. Future plans call for the expansion of the network through the addition of additional reef sites.	• Geology and substrates • Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Recreational fishing	The Texas coast is a popular destination for bay, beachfront and offshore fishing. The most recent completed nationwide survey indicates that approximately 751,000 anglers took over 5.2 million fishing trips to the coastal waters of Texas. Direct economic impact of these fishing trips is estimated at over $890 million.	• Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Charter fishing	Charter fishing is a practical way for an individual who may not own a boat to enjoy the bounties of the inshore and offshore waters of Texas. Charter captains have years of experience fishing in the local area which will provide a pleasurable experience and should make any fishing trip more relaxing.	• Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Commercial fishing	The Texas coast supports a fleet of commercial fishing vessels that target primarily demersal bay species as well as offshore reef fish and pelagic species. During 2012, 107 licensed fishermen landed 1.7 million pounds of finfish valued at $1.6 million.	• Water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources

The resources listed in Table 8-11 would be affected by the Texas Group 1 Phase III early restoration projects (with the exception of Cultural Resources, Land and Marine Management, Infrastructure, and Public Health and Safety). Most of these effects would not be anticipated to extend beyond the construction period. Some resource areas would be affected long-term, some beneficially and some adversely. However, none of the projects proposed in Group 1 would result in any long-term adverse effects that rise above minor effects. All projects proposed under Group 1 would provide long-term benefits to certain resources. Overall, long-term benefits from projects proposed in the Group 1 are expected to outweigh the short-term adverse impacts necessary for project implementation as well as long-term minor adverse effects.

8.14.4.3 Cumulative Impacts Analysis for Group 1: Artificial Reef Projects

Table 8-12 identifies the following resource areas where there is a possibility that impacts of past, present, and reasonably foreseeable future actions might result in interactions or additive effects when combined with Texas Group 1 Phase III early restoration projects. The following resource areas are identified for further cumulative impacts analysis:

- Geology and substrates,
- Water quality,
- Air quality and GHGs,
- Noise,
- Living coastal and marine resources,
- Protected species,
- Socioeconomics and environmental justice,
- Aesthetics and visual resources, and
- Tourism and recreational use.

Cumulative impacts for each of these areas are discussed below.

Geology and Substrates

Five actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, and TPWD's Artificial Reef Program) are identified as potential contributors to cumulative impacts on geology and substrates when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect geology and substrates by disturbing sediments during the short-term (dredging, seismic exploration, placement of artificial reef materials, etc.). Actions that have or would continue to result in permanent or long-term conversion of submerged substrates includes oil and gas activities, oil rigs as habitats, and TPWD's Artificial Reef Program.

Texas Group 1 Phase III early restoration projects would have minor short-term and long-term impacts to geology and substrates (Table 8-11). Placement of artificial reef materials unto the ocean substrates would result in a short-term disturbance of the substrate caused by suspension of sediment in the water column during project implementation. Long-term there would be some substrate compaction associated with weight of each structure. Overall the disturbances to substrates would be minor and isolated to the area immediately under or near the reef structure. Overall, the proposed Group 1 projects would not result in changes to the character of the substrates or geologic features beyond the footprint of structure itself.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to geology and substrates would likely occur. Based on the relatively small footprint of projects proposed in Group 1 and the availability of other soft sediment and substrates in the project areas, Group 1 Phase III early restoration projects would not contribute substantially to cumulative adverse impacts to geology and substrates.

Water Quality

All eight actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) are identified as potential contributors to cumulative impacts on water quality when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect water quality in the short-term and long-term. Ship channel maintenance dredging, oil and gas exploration and production, offshore fishing, and seismic exploration can all adversely affect water quality from vessel operation, oil or other fluid spills, ship collisions (such as the recent Texas City Y spill), and turbidity associated with in-water activities. Other water quality impacts include pollutants from construction or those carried in runoff from marine transportation, coastal development, and tourism, and recreation facility operations after construction.

Texas Group 1 Phase III early restoration projects would have minor short-term impacts to water quality (Table 8-11). The majority of impacts from the projects would be related to temporary increases of turbidity during project implementation. The artificial reefs would not result long-term impacts to water quality and nor are they expected to be a source of pollutants.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to water quality would likely occur. Based on the depth of the reef structures and the distance from past, present, and reasonably foreseeable future actions, Group 1 Phase III early restoration projects would not contribute substantially to cumulative adverse impacts to water quality.

Air Quality and GHGs

All eight actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) would affect air quality and produce GHG emissions when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect air quality and produce GHG emissions in the short-term and long-term. Oil and gas exploration, commercial and recreational fishing, and seismic exploration all require vehicles, other equipment, or procedures activities that produce emissions. The impacts would occur mainly during construction with limited long-term operational impacts. Construction and operations impacts of each action would be short to long-term in nature, would constitute a very small portion of the overall inventory of air emissions in the region, and would not be expected to violate state or federal standards. For operations, all facilities, would follow applicable federal and state regulations, and would not be expected to change the air quality attainment status of the region.

The Texas Group 1 Phase III early restoration projects would also impact air quality and produce GHG emissions. The projects in Group 1 would not violate any state or federal standards. After project completion, impact to air quality would be limited to ambient pollutants from boat traffic. Increased boat traffic caused by anglers traveling to the reef would potentially increase air pollution in the vicinity; however, levels would still be anticipated to be *de minimis*. Therefore, any adverse impacts to air quality would be short-term and minor.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse air quality impacts would likely occur. However, Group 1 Phase III early restoration projects would not contribute substantially to cumulative adverse air quality impacts.

Noise

All eight actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) would produce noise. Many actions described in Table 8-12 may affect noise in the short-term and long-term. Oil and gas exploration, commercial and recreational fishing, and seismic exploration all use motorized equipment that can produce sound and some activities such as seismic exploration may result in major noise effects in the short-term. In most cases, the noise impacts would be of relatively short duration, ending upon completion of construction activities, and are projected to result in only minor adverse impacts. Noise levels for normal operations and use will be increased but not at an excessive level given surrounding land use.

The proposed Texas Group 1 Phase III early restoration projects would have short-term construction related noise impacts and only minimal increases in noise that would persist beyond construction. After completion, the noise level should be limited to ambient noise from boat traffic. Increased boat traffic caused by anglers and divers traveling to the reef would increase the noise level in the vicinity; however, that noise level would be associated with the activity and not dissuade users of the area.

When Texas Group 1 Phase III projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse noise impacts would likely occur. Group 1 Phase III early restoration projects would not contribute substantially to cumulative adverse noise impacts.

Living Coastal and Marine Resources

All eight actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) are identified as potential contributors to cumulative impacts (adverse and beneficial) to living coastal and marine resources when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect living and coastal marine resources in the short-term and long-term. Oil and gas exploration, offshore fishing, and seismic exploration have disturbed habitats via habitat conversion (converting soft sediment to active drilling operation facilities) or by disturbance of the water column or substrate from the use of equipment and/or the use of vessels. In contrast, oil rigs as habitat and TPWD's artificial reef program have provided long-term benefits to certain habitats by providing more surface area to create habitat for sessile organisms, which can then benefit a multitude of other aquatic and marine species. Activities such as oil and gas exploration and production, commercial fishing, and ship channel maintenance dredging have contributed to habitat alterations in areas that living and coastal marine resources rely on for breeding, foraging and other uses. The majority of adverse impacts potentially caused by the actions listed in Table 8-12 would be localized in nature and would not spatially overlap with the proposed Group 1 Phase III early restoration projects.

Texas Group 1 Phase III early restoration projects would have minor short-term adverse impacts to benthic fauna and long-term beneficial impacts to living coastal and marine resources resulting from the construction of artificial reefs. The projects would adversely impact benthics and soft bottom habitat by the placement of reef materials and conversion from naturally occurring soft bottom to artificial hard bottom substrate. These impacts would provide long-term benefits to species that use reef habitat.

Long-term, Group 1 projects are not expected to substantially contribute to increasing pressure on marine fish populations. While, the Trustees will not be conducting any additional project-specific monitoring to assess fisheries impacts, the TPWD routinely collects information to assess marine fish populations. These data collection efforts include on-site, end-of-trip interviews of recreational anglers at coastal boat-access sites; rove counts at boat ramps to determine the number of boating parties using each boat-access site; a Statewide Angler Survey every 3 years to monitor basic trends in fishing activity; and license sales.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, Group 1 projects would not contribute substantially to cumulative adverse impacts to living coastal and marine resources. Group 1 Phase III early restoration projects, carried out in conjunction with other restoration efforts have the potential to provide some long-term beneficial cumulative impacts to living coastal and marine resources.

Protected Species

All eight actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) are identified as potential contributors to cumulative adverse and beneficial impacts on protected species when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect protected species in the short-term and long-term. Ship channel maintenance dredging, oil and gas exploration, fishing, and seismic exploration may result in adverse impacts to protected species. These ongoing activities have all contributed to habitat alterations in areas that protected species rely on for breeding, foraging and other uses. However, oil rigs as habitat and TPWD's artificial reef program have provided long-term benefits to certain protected species by providing additional hard substrate that supports a more diverse community of benthic organisms and fish.

Texas Group 1 Phase III early restoration projects are not likely to adversely affect protected species. All projects are subject to environmental reviews and employ best management practices and follow all applicable guidelines to prevent adverse effects to protected species. NMFS concurred that the pyramid artificial reef projects are not likely to adversely affect federally listed and candidate species or critical habitats (NMFS 2014a). The EFH assessment and NMFS concurrence determined that temporary and localized turbidity impacts and permanent impacts to soft bottom EFH would occur during implementation of the artificial reef projects. However, the creation of new hard structure in the Gulf may also create benefits to some species managed under the Magnuson-Stevens Act by providing foraging habitat, cover, and conditions favorable for encrusting benthic colonization (NMFS 2014d). The explosives plan that would be used to deploy the ship would include input from the NMFS to minimize the overall noise impacts above and below the water line and prevent any disturbance to protected species.

Following project implementation, long-term impacts from Group 1 projects would be beneficial. The addition of hard substrate would support a more diverse community of benthic organisms and fish. In addition, the avoidance of artificial reefs areas by the commercial shrimp trawling industry should have a positive impact to sea turtles by providing habitat in which turtles can avoid entanglement in trawls. Overall, the addition of the artificial reef should have a positive impact on federally-listed sea turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, by enhancing their foraging habitat.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to protected species are not likely to occur. Group 1 projects would not contribute to cumulative adverse impacts to protected species. Group 1 Phase III early restoration projects, carried out in conjunction with other restoration efforts have the potential to provide some long-term beneficial cumulative impacts to protected species.

Socioeconomics and Environmental Justice

Seven of the actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) are identified as potential contributors to cumulative beneficial impacts when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect socioeconomics and environmental justice in the short-term and long-term. Actions such as oil and gas exploration, commercial fishing, and seismic exploration would contribute to socioeconomic benefit along the Texas coast through job creation, increased local sales, and potential increased demand for local business services. Additionally, the increase in workers and tourism related activities would increase revenues in local communities. No adverse impacts are anticipated from any of these actions.

Texas Group 1 Phase III early restoration projects would have short and long-term beneficial socioeconomic impacts related to construction and on-going operations. There would be no adverse socioeconomic impacts from the Group 1 projects. However, these projects would benefit the local economies adjacent to the project site by increasing use of the harbors, boat ramps, bait camps, and private fishing charter businesses. The Group 1 projects would contribute to socioeconomic benefit along the Texas coast from job creation and spending resulting from enhanced tourism and recreation activities in the area.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, there would be no adverse socioeconomic impact. Group 1 projects would not contribute substantially to cumulative adverse socioeconomic impacts. Group 1 Phase III early restoration projects, carried out in conjunction with other actions have the potential to provide some long-term beneficial cumulative socioeconomic impacts.

Aesthetics and Visual Resources

Seven of the actions (ship channel maintenance dredging, ongoing oil and gas exploration and production, seismic exploration, TPWD's Artificial Reef Program, recreational fishing, charter fishing, and commercial fishing) are identified as potential contributors to adverse cumulative impacts to aesthetics and visual resources when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect aesthetics and visual resources in the short-term and long-term. For the majority of actions, impacts would be minor and limited to the visual impacts of additional vessels on the landscape. For projects such as channel maintenance dredging and ongoing oil and gas exploration and production, impacts would be related to the additional infrastructure needed to conduct the respective activities. These actions would be offshore and have minimal adverse impact on the experiences of others.

The Texas Group 1 Phase III early restoration projects would have short-term adverse impacts, which would occur only during deployment of the artificial reef materials. Similarly the Group 1 projects are aimed at benefitting recreational experiences. After completion, visual impacts would be limited to boat traffic. Increased boat traffic caused by anglers traveling to the reef would be consistent with the surroundings or designated uses. The boats would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Thus, implementation of Group 1 projects may result in additional vessel traffic, but this would not substantially contribute to cumulative effects to aesthetic and visual resources.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to aesthetics and visual resources would likely occur. Group 1 Phase III early restoration projects would not contribute substantially to cumulative adverse impacts.

Tourism and Recreational Use

Five actions (ship channel maintenance dredging, oil rigs as habitats, TPWD's Artificial Reef Program, recreational fishing, and charter fishing) are identified as potential contributors to cumulative adverse and beneficial impacts (primarily beneficial) to tourism and recreation when their impacts are combined with those of the Texas Group 1 Phase III early restoration projects. Many actions described in Table 8-12 may affect tourism and recreational use in the short-term and long-term. Projects such as TPWD's artificial reef program, recreational fishing, etc., provide beneficial impacts to tourism and recreational use. Oil and gas exploration and seismic exploration may adversely impact tourism and recreational use long-term by discouraging recreational uses in areas immediately surrounding the specified action but these actions do not intersect heavily with areas that are generally used for recreation. Dredging activities may affect recreational fishing, however, this would be only a short-term and localized impact. Oil rigs as habitat and placement of artificial reefs have provided long-term benefits to certain recreational activities such as fishing and diving due to the created reef habitat.

The Texas Group 1 Phase III early restoration projects are aimed at benefitting recreational experiences and would provide benefit to tourism and recreation. Visitation to the artificial reefs are expected to provide long-term beneficial impacts to tourism are and recreation.

When Texas Group 1 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, there are no short-term cumulative adverse impacts to tourism and recreation. Group 1 projects would therefore not contribute substantially to cumulative adverse impacts to tourism and recreation. Group 1 Phase III early restoration projects, carried out in conjunction with other actions have the potential to provide some long-term beneficial cumulative impacts to tourism and recreation.

8.14.4.4 Summary of Impacts for Group 1: Artificial Reef Projects

Based on the above analysis of present and reasonably foreseeable future actions and the anticipated resources to be impacted for these actions, Texas Group 1 Phase III early restoration projects would not substantially contribute to adverse cumulative effects to resources. Group 1 projects, carried out in conjunction with other actions, have the potential to provide long-term beneficial cumulative impacts to living coastal and marine resources, protected species, socioeconomics, tourism and recreational use.

8.14.5 Group 2: State Park Projects

Table 8-11 summarizes the impacts to resources associated with proposed Texas state park projects located along the northern Texas coast on coastal lands managed by the TPWD. Projects are evaluated together to determine if they have any cumulative effects that, when combined with other past, present, and reasonably foreseeable future actions along the northern Texas coast on managed coastal lands, may result in cumulative effects to resources.

8.14.5.1 Existing Conditions

Existing environmental and socioeconomic conditions in and around the state park projects along the upper Texas coast are represented by the current state of the affected environment, as described above in the Environmental Consequences sections for the proposed Texas projects. These conditions reflect the environmental impacts of past projects in the area and therefore are the assumed starting point for the cumulative analysis of impacts for past, present, and reasonably foreseeable future actions.

8.14.5.2 Identification of Present and Reasonably Foreseeable Future Actions and Impacts

Table 8-13 identifies present and reasonably foreseeable future actions in each of the areas described in Chapter 6. For each of the actions, the table provides (1) a brief description of the action and (2) a listing of NEPA resource areas that are the most likely areas of concern for cumulative impacts when the action is considered in conjunction with implementation of the Texas Group 2 Phase III early restoration projects. In most cases, detailed environmental impact data are not available for these actions. Consequently, the analyses generally reflect qualitative best professional judgment about potential impacts. Also, as noted previously, the focus of the cumulative impacts analysis is on the resource areas that are deemed most likely to exhibit cumulative impacts; hence the analysis does not include in the listing those resources where impacts have been judged to be *de minimis*.

Table 8-13. Other Activities Identified in Group 2.

Actions[60]	Action Description	Key Resource Areas with Potential for Cumulative Impacts
*Sea Rim State Park dune restoration**	The sand dunes on the upper Texas Coast have been severely impacted by several major storm events over the past decade and are almost nonexistent today. The goal is to reestablish the dunes to allow the dunes and beaches to dissipate wave energy from storm events. The Sea Rim State Park dune restoration will restore 5.3 miles of dune habitat by placing sand fencing and planting native dune vegetation to trap wind-blown sand and accelerate natural dune recovery.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
*Galveston Island State Park marsh restoration and protection**	The project includes two components: creating 30 acres of marsh via dedicated dredging and placement of appropriate sediments within the Carancahua Cove area and engineering and design of rock breakwaters within the Carancahua and Dana Cove areas.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
*West Galveston Bay conservation corridor habitat preservation**	This project proposes to acquire a permanent conservation easement on a contiguous 3,200 acre tract(s) of estuarine emergent marsh, open water, prairie depressional wetlands and upland prairie habitat. This tract is located within the West Bay Conservation Corridor in close proximity to 6,500 acres of conserved habitat.	• Hydrology, floodplain, and water quality • Living coastal and marine resources • Protected species
JD Murphree Wildlife Management Area/ McFaddin National Wildlife Refuge beach ridge	On McFaddin National Wildlife Refuge a clay and sand berm has been partially constructed with the remainder of the project to be completed at a later date. The berm will help restore ecological functions altered by recent hurricanes by keeping gulf waters from regularly overwashing the beach and entering interior marshes.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use

[60] Note: Texas does not have any ERP Phase I or Phase II projects, and therefore did not include them in the state-level cumulative analysis

Actions[60]	Action Description	Key Resource Areas with Potential for Cumulative Impacts
McFaddin National Wildlife Refuge terracing	Earthen terraces are planned for installation at McFaddin NWR within the Willow Lake complex area. Planting intertidal and high-marsh plants on the terraces will help reduce wave-fetch generated erosion, increase shoreline to water transitional areas for fisheries, increase fisheries production, provide potential bird nesting habitat, and create habitat more suitable for submerged aquatic vegetation.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Beach nourishment	Beach nourishment, as envisioned for these projects, will be a process of placing sand onto an eroding shoreline to enhance or widen existing beaches. While the source of the supply of beach nourishment sand may come from many sources the ultimate goal is to enhance beaches that will continue to be used for recreation purposes.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
West Bay coastal marsh restoration	Restoration of costal marsh in areas where relative elevations have decreased. Methods to increase elevation include the use of geo-textile tubes or dredged sediments.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources
Farm to Market Road (FM) 3005 improvements	Improvements to FM 3005 will be made in order to facilitate access to the proposed campground facilities in Galveston Island State Park. The improvements would be adjacent to the campground and would occur in conjunction with the Galveston Island State Park Beach Redevelopment Project. The Texas Department of Transportation has plans to repair and resurface significant portions of FM 3005 from the west end of Galveston's Seawall to San Louis Pass over the next few years. The 9 mile length of FM 3005 between San Louis Pass and Jamaica Beach will be repaired. The 10 miles of FM 3005 from a point approximately 3 miles west of Jamaica Beach to the west end of Galveston's seawall will be resurfaced.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use • Infrastructure

Actions[60]	Action Description	Key Resource Areas with Potential for Cumulative Impacts
State wildlife management areas and federal wildlife refuges	Texas wildlife management areas and federal wildlife refuges will continue to manage lands for recreational activities including but not limited to public hunting, hiking, camping while conserving wildlife, plants, and their habitats.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Tourism and recreational use
Great Texas Coastal Birding Trail	The Great Texas Coastal Birding Trail is a state-designated system of trails, bird sanctuaries, and nature preserves along the entire length of the Texas Gulf Coast. The trail system is managed by the Texas Parks and Wildlife Department and one can observer many varieties of bird species, animals, plants and habitats as part of the Great Texas Coastal Birding Trail.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use • Infrastructure
Recreational fishing	The Texas coast is a popular destination for bay, beachfront and offshore fishing. The most recent completed nationwide survey indicates that approximately 751,000 anglers took over 5.2 million fishing trips to the coastal waters of Texas. Direct economic impact of these fishing trips is estimated at over $890 million.	• Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreational use
Ongoing oil and gas exploration and production	The coastal region off the coast of Texas is among the most productive for oil and gas exploration and production. During 2013, wells in Texas state waters produced over 470,000 bbls of crude oil and almost 14,000,000 MCF of natural gas (RRC). Federal waters off the Texas coast generated another 51 million bbls of crude oil and 172,000,000 MCF of natural Gas (BOEM). Transport of staff, equipment and supplies necessary to support this exploration and production effort requires a large number of surface vessels and helicopters.	• Geology and substrates • Hydrology, floodplain, and water quality • Air quality and GHGs • Noise • Living coastal and marine resources • Protected species • Socioeconomics and environmental justice • Aesthetics and visual resources • Infrastructure

Table notes:

* These restoration projects will be funded through the National Fish and Wildlife Foundation Gulf Environmental Benefit Fund, which will create 5.3 miles of dunes, construct 30 acres of estuarine wetlands and 30 acres of oyster reef, conserve 3,200 acres of coastal habitat and create 3,000 acres of freshwater wetlands primarily on the upper Texas coast.

The resource areas listed in Table 8-13 would be affected by at least one of the projects proposed under Texas Group 2 Phase III early restoration projects (with the exception of Cultural Resources, Land and Marine Management, and Public Health and Safety). Most of these effects would not be anticipated to extend beyond the construction period. Some resource areas would be affected long-term, some beneficially, and some adversely. However, none of the projects proposed under Group 2 would result in any long-term adverse effects that rise above a minor status. All projects proposed under Group 2 would provide long-term benefits to certain resources. Overall, long-term benefits from projects proposed in the Group 2 region are expected to outweigh the short-term adverse impacts necessary for project implementation as well as long-term minor adverse effects.

8.14.5.3 Cumulative Impacts Analysis for Group 2: State Park Projects

Table 8-13 identifies the following resource areas where there is a possibility that impacts of past, present, and reasonably foreseeable future actions might result in interactions or additive effects when combined with Texas Group 2 Phase III early restoration projects. The following resource areas are identified for further cumulative impacts analysis:

- Geology and substrates
- Hydrology, floodplain, and water quality,
- Air quality and GHGs,
- Noise,
- Living coastal and marine resources,
- Protected species,
- Socioeconomics and environmental justice,
- Aesthetics and visual resources,
- Tourism and recreational use, and
- Infrastructure.

Cumulative impacts for each of these areas are discussed below.

Geology and Substrates

Ten actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, Farm to Market Road (FM) 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts on geology and substrates when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect geology and substrates by disturbing sediments on, during, or as a result of construction activities. Activities identified above that have resulted in or would continue to result in permanent or long-term adverse impacts to geology and substrates include FM 3005 improvements as well as oil and gas exploration and production. West Bay coastal marsh restoration, beach nourishment, Sea Rim State Park dune restoration, and McFaddin National Wildlife Refuge terracing are all restoration activities that would provide a positive benefit to geology and substrates. It is anticipated that these types of activities will continue into the future.

The proposed projects in Group 2 would contribute to long-term impacts to geology and substrates by adding infrastructure in the state parks. Impacts would be minor and where possible activities would be confined to previously disturbed areas. In order to minimize impacts, established BMPs such as an erosion control and storm water management plan, the installation of sediment traps prior to commencement of construction activities, and ongoing construction monitoring would be implemented.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to geology and substrates would likely occur. Overall, the proposed Group 2 projects would not result in changes to the character of the sediments or geologic features beyond the footprint of the project area. Based on the relatively small footprint of projects proposed in Group 2 Phase III early restoration projects, they would not contribute substantially to cumulative adverse impacts to geology and substrates.

Hydrology, Floodplain, and Water Quality

All twelve actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, West Galveston Bay conservation corridor habitat preservation, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts on hydrology, floodplain, and water quality when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect hydrology, floodplain, and water quality in the short-term and long-term. Projects such as the FM 3005 improvements and Texas Coastal Birding Trail could alter the flow of water and have a minor adverse effect on hydrology and water resources. Other projects such as the Sea Rim State Park dune restoration, McFaddin Wildlife Refuge terracing, West Bay coastal marsh restoration, and the State Wildlife Management Areas and Federal Wildlife Refuges Projects will have a beneficial effect by restoring functions that were previously altered in order to improve water resources and hydrology.

Storm water runoff during construction of the Texas Group 2 Phase III early restoration projects may result in short-term, minor impact to surface water quality. The implementation of mitigation measures, including development of a comprehensive storm water pollution prevention plan, would make the intensity of the construction-related impacts negligible. The required wetland mitigation is compensation for the lost floodplain values and may increase the floodplain storage for the Galveston Island State Park Project. In addition, the project is designed with beach access boardwalks, elevated structures, and transitional elements to reduce the amount of development within the floodplain as well as respond to a changing coastal morphology which is anticipated at the Gulf beach over the coming decades. Overall, Group 2 projects provide long-term benefits to the floodplain area. Due to the loss of impervious areas, there would be minor, short-term and long-term adverse impacts to the localized hydrology.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short and long-term cumulative adverse impacts to hydrology, floodplain, and water quality would likely occur. Based small-scale and localized nature, the

Group 2 projects would not contribute substantially to cumulative adverse impacts to hydrology, floodplain, and water quality. Group 2 Phase III early restoration projects, carried out in conjunction with other restoration efforts have the potential to provide some long-term beneficial cumulative impacts to hydrology, floodplain, and water quality.

Air Quality and GHGs

Eleven actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts to air quality and produce GHG emissions when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect air quality and produce GHG emissions in the short-term and long-term. The impacts would occur mainly during construction with limited long-term operational impacts. Construction and operations impacts of each action would be short to long-term in nature, would constitute a very small portion of the overall inventory of air emissions in the region, and would not be expected to violate state or federal standards. For operations, all facilities, would follow applicable federal and state regulations, and would not be expected to change the air quality attainment status of the region.

The Texas Group 2 Phase III early restoration projects would also cause impacts to air quality and produce GHG emissions in the short-term during construction activities. All projects identified in Group 2 are anticipated meet state or federal standards and would not exceed the *de minimis* level for any criteria pollutants. Air emissions during the construction phase of the Group 2 projects are anticipated to be minor, short-term and would not contribute to cumulative air quality effects. Therefore, any adverse impacts to air quality would be short-term and minor.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse air quality impacts would likely occur. However, Group 2 Phase III early restoration projects would not contribute substantially to cumulative adverse air quality impacts.

Noise

Eleven actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) would produce noise. Many actions described in Table 8-13 may affect noise in the short-term and long-term. In most cases, the noise impacts would be of relatively short duration, ending upon completion of construction activities, and are projected to result in only minor adverse impacts. Noise levels for normal operations and use will be increased but not at an excessive level given surrounding land use. Increases in noise long-term from the Texas Birding Trail and recreational fishing would be minor and related to recreational use of the resources.

Adverse effects from the Texas Group 2 Phase III early restoration projects would be related to construction activities in the short-term and recreational use in the long-term. Minimization measures to limit noise would be used during construction of Group 2 projects. Once facilities are constructed, noise can be generated from facility operations and the vehicles associated with these facilities. However, these noise levels would be representative of a campground and similar in nature to those generated prior to the hurricanes. Overall, long-term noise effects from personal vehicle use, swimming and other recreational activities would be minor.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse noise impacts would likely occur. Group 2 Phase III early restoration projects would not contribute substantially to cumulative adverse noise impacts.

Living Coastal and Marine Resources

All twelve actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, West Galveston Bay conservation corridor habitat preservation, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts living coastal and marine resources when their impacts when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect living coastal and marine resources when their impacts in the short-term and long-term. Projects such as beach nourishment, McFaddin Wildlife Refuge terracing, West Bay coastal marsh restoration, and the Sea Rim State Park dune restoration would cause adverse impacts by displacing wildlife and flora during the construction activities and converting habitat types. The Texas Birding Trail, the State Wildlife Management Areas and Federal Wildlife Refuges and recreational fishing would cause minor impacts to wildlife during maintenance and recreational activities. Other projects such as the Sea Rim State Park dune restoration, McFaddin Wildlife Refuge terracing, West Bay coastal marsh restoration, and the State Wildlife Management Areas and Federal Wildlife Refuges Projects will have a beneficial impact on living coastal marine resources by restoring functions that were previously altered in order to improve water resources and hydrology.

Texas Group 2 Phase III early restoration projects would also cause living marine resources to be displaced as a result of the construction activities. Conversely, the projects would also provide a benefit by building infrastructure and signage that would help prevent impacts to the coastal resources from the recreational users. Project impacts from increased visitor use could include littering and noise from visitors utilizing the new facilities. Group 2 projects will be, in part, replacing and/or enhancing recreational facilities that were damaged or destroyed by Hurricane Ike. These projects are intended to increase user traffic to numbers similar to those pre-hurricane. Long-term adverse impacts due to increased visitation levels higher than pre-hurricane levels will be monitored and addressed as necessary by the state park using existing TPWD procedures.

Long-term, Group 2 projects are not expected to contribute substantially to increasing pressure on marine fish populations. While, the Trustees will not be conducting any additional project-specific monitoring to assess fisheries impacts, the TPWD routinely collects information to assess marine fish populations. These data collection efforts include on-site, end-of-trip interviews of recreational anglers at coastal boat-access sites; rove counts at boat ramps to determine the number of boating parties using each boat-access site; a Statewide Angler Survey every 3 years to monitor basic trends in fishing activity; and license sales.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, Group 2 projects would not contribute substantially to cumulative adverse impacts to living coastal and marine resources. Group 2 Phase III early restoration projects, carried out in conjunction with other restoration efforts have the potential to provide some long-term beneficial cumulative impacts to living coastal and marine resources.

Protected Species

All twelve actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, West Galveston Bay conservation corridor habitat preservation, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts to protected species when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect protected in the short-term and long-term. Projects such as the FM 3005 improvements and oil and gas exploration and production would impact protected species by displacing species during construction and for the duration of the project. In contrast projects such as the West Bay coastal marsh restoration, state wildlife management areas and federal wildlife refuges would benefit protected species by preserving or enhancing habitat.

Texas Group 2 Phase III early restoration projects are not likely to adversely affect protected species. All projects are subject to environmental reviews and employ best management practices and follow all applicable guidelines to prevent adverse effects to protected species. Impacts to protected species and their habitats may occur during construction of portions of the Group 2 projects, but would be localized and temporary. Disturbance to individual species would occur in the construction areas; however, there would be no change in the diversity or local populations of protected species.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to protected species are not likely to occur. Group 2 projects would not contribute to cumulative adverse impacts to protected species. Group 2 Phase III early restoration projects, carried out in conjunction with other restoration efforts have the potential to provide some long-term beneficial cumulative impacts to protected species.

Socioeconomics and Environmental Justice

Eleven actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative beneficial impacts when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 would provide a socioeconomic benefit through job creation, increased local sales, and potential increased demand for local business services. Additionally, the increase in workers and tourism related activities would increase revenues in local communities. No adverse impacts are anticipated from any of these actions.

Texas Group 2 Phase III early restoration projects would have a short and long-term beneficial socioeconomic impacts related to construction and on-going operations. There would be no adverse socioeconomic impacts from the Group 2 projects. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers. The Group 2 projects would contribute to socioeconomic benefit along the Texas coast from job creation and spending resulting from enhanced tourism and recreation activities in the area.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, there would be no adverse socioeconomic impact. Group 2 projects would not contribute substantially to cumulative adverse socioeconomic impacts. Group 2 Phase III early restoration projects, carried out in conjunction with other actions have the potential to provide some long-term beneficial cumulative socioeconomic impacts.

Aesthetics and Visual Resources

Ten actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, West Bay coastal marsh restoration, FM 3005 improvements, Texas Coastal Birding Trail, recreational fishing, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts to aesthetics and visual resources when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect aesthetics and visual resources in the short-term and long-term. Temporary impacts to visual resources would result from restoration, construction, maintenance, recreational use, or oil and gas exploration and production activities. For projects such as ongoing oil and gas exploration and production and FM 3005 improvements, impacts would be related to the additional infrastructure provided by the respective activities.

Temporary impacts to visual resources would result from construction of the proposed Texas Group 2 Phase III early restoration projects. Large construction equipment such as backhoes for campground construction would temporarily obstruct the shoreline views for visitors and recreational users at the sites. Construction from the Group 2 projects would change the view shed, but the construction would be consistent with the other amenities located in the parks. The structures would not negatively attract attention, dominate the view, or detract from the current user activities or experiences. Any adverse impacts to aesthetic and visual resources would be short-term and minor.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to aesthetics and visual resources would likely occur. Group 2 Phase III early restoration projects would not contribute substantially to cumulative adverse impacts.

Tourism and Recreational Use

Eight actions (Sea Rim State Park dune restoration, Galveston Island State Park marsh restoration and protection, JD Murphree Wildlife Management Area/McFaddin National Wildlife Refuge beach ridge, McFaddin National Wildlife Refuge terracing, beach nourishment, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, Texas Coastal Birding Trail, are recreational fishing) are identified as potential contributors to cumulative impacts to tourism and recreation when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. Many actions described in Table 8-13 may affect tourism and recreational use in the short-term and long-term. The actions would cause minor adverse effects to tourism and recreational use during construction, maintenance activities, or oil and gas exploration and production activities. Projects such as beach nourishment, FM 3005 improvements, state wildlife management areas and federal wildlife refuges, and the Great Texas Coastal Birding Trail would provide long-term benefits by increasing or enhancing recreational facilities, infrastructure, and/or habitat which could increase tourism or improve recreational experiences.

Texas Group 2 Phase III early restoration projects would have a short-term adverse effect on tourism and recreational use during the construction phase of the projects. Access to certain areas may be restricted or impacted to some degree during construction activities. The construction may have moderate impacts to public access and use of the beach. While these temporary inconveniences would result in moderate short-term impacts on tourism and recreational use during the construction activities, over the long-term improved access and enhanced facilities would provide substantial benefits to tourism and recreational use. Any adverse impacts from Group 2 projects to tourism and recreational use would be short-term and no greater than moderate.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to tourism and recreational use would likely occur. However, Group 2 projects would not contribute substantially to cumulative adverse impacts to tourism and recreation. Group 2 Phase III early restoration projects, carried out in conjunction with other actions have the potential to provide some long-term beneficial cumulative impacts to tourism and recreation.

Infrastructure

Three actions (FM 3005 improvements, Great Texas Coastal Birding Trail, and ongoing oil and gas exploration and production) are identified as potential contributors to cumulative impacts on infrastructure when their impacts are combined with those of the Texas Group 2 Phase III early restoration projects. FM 3005 improvements and the Great Texas Coastal Birding Trail would provide infrastructure to improve recreational experiences. Ongoing oil and gas activities would increase infrastructure needed for fuel exploration and production.

Group 2 projects would also provide additional infrastructure such as a campground, comfort station, fish cleaning shelter, etc., which would enhance recreational experiences. During construction activities, there would be minor short-term disruptions of public access to some facilities. Infrastructure benefits resulting from these projects are anticipated to be long-term.

When Texas Group 2 Phase III early restoration projects are analyzed in combination with other past, present, and reasonably foreseeable future actions, short-term cumulative adverse impacts to infrastructure would likely occur. However, Group 2 projects would not contribute substantially to cumulative adverse impacts to infrastructure. Group 2 Phase III early restoration projects, carried out in conjunction with other actions have the potential to provide some long-term beneficial cumulative impacts to infrastructure.

Summary of Impacts of Group 2: State Park Projects

Based on the above analysis of present and reasonably foreseeable future actions and the anticipated resources to be impacted for these actions, Texas Group 2 Phase III early restoration projects would not substantially contribute to adverse cumulative effects to resources. Group 2 projects, carried out in conjunction with other actions, have the potential to provide long-term beneficial cumulative impacts to living coastal and marine resources, protected species, socioeconomics, tourism and recreational use, and infrastructure.

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CHAPTER 9: PROPOSED PHASE III EARLY RESTORATION PROJECTS: LOUISIANA

9.1 Introduction

For many years, public input regarding the types of restoration projects that could best compensate the public for natural resource damages caused by oil spills in Louisiana has been actively solicited and integrated into planning activities through Louisiana's Regional Restoration Planning (RRP) Program.[1] Following the Spill, the Trustees engaged coastal stakeholders in Louisiana through a variety of public outreach and coordination efforts to discuss the NRDA, the restoration planning process, and potential restoration projects specifically related to the Spill. In addition to the meetings discussed in Chapter 2 of this document, additional meetings with stakeholders have been held to convey information and solicit suggestions. For example, the Coastal Protection and Restoration Authority of Louisiana and the Governor's Oyster Advisory Committee have held public meetings in which restoration planning issues have been, and continue to be, discussed.

From these outreach efforts, and the State's existing RRP Program, the Trustees compiled a list of potential projects for restoration of natural resources in Louisiana injured as a result of the Spill. Project ideas received were, and will continue to be, considered for this and future phases of Early Restoration, as well as for comprehensive NRDA restoration planning. The Trustees continue to accept restoration project ideas.

Based on project evaluation standards and criteria set forth in the OPA regulations, the Framework Agreement, additional RRP Program-specific criteria (below), and additional screening considerations applied by NOAA and DOI (see Chapter 2), the Trustees propose two projects for Phase III of Early Restoration that would be implemented in Louisiana: 1) the Louisiana Outer Coast Restoration; and 2) the Louisiana Marine Fisheries Enhancement, Research, and Science Center (Figure 9-1). These projects satisfy evaluation criteria outlined in the OPA regulations, the Framework Agreement, and the RRP Program, and are consistent with the goal of compensating the public for natural resource injuries resulting from the Spill.

[1] Louisiana's RRP Program identifies the statewide Program structure, defines those trust resources and services in Louisiana that are likely to be or are anticipated to be injured (*i.e.,* at risk) by oil spill incidents, establishes a decision-making process, and sets forth criteria that are used to select restoration project(s) that may be implemented to restore the trust resources and services injured by a given spill. The RRP Program's Final Programmatic Environmental Impact Statement (FPEIS), which may be viewed in its entirety at http://www.losco.state.la.us/LOSCOuploads/RRPAR/la2395.pdf, is hereby incorporated by reference into this document.

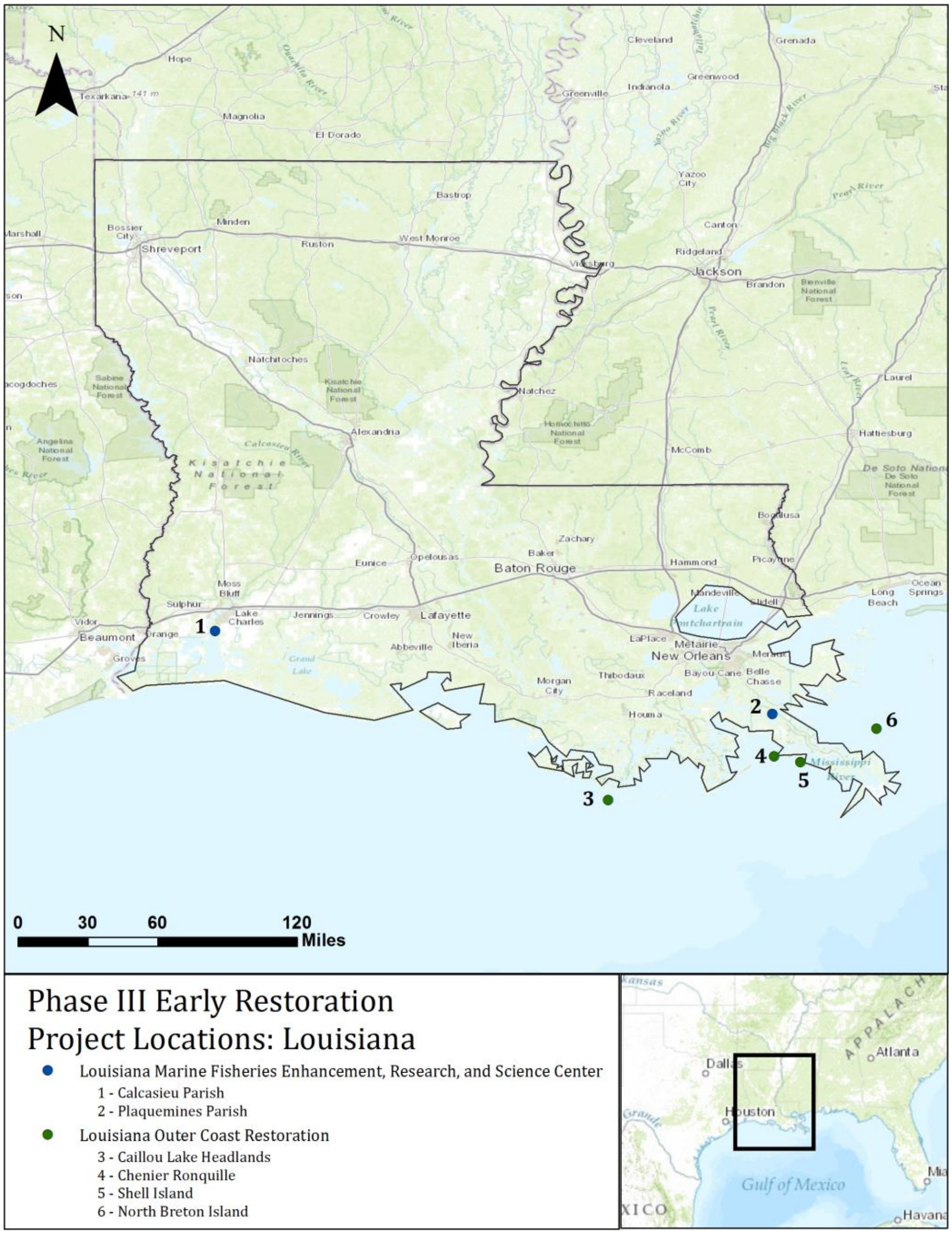

Figure 9-1. Phase III Early Restoration Project Locations in Louisiana.

Additional Louisiana RRP Program criteria include:

- Ability to Implement Project with Minimal Delay;
- Degree to Which Project Supports Existing Strategies/Plans;[2]

[2] *E.g.,* Louisiana's 2012 Comprehensive Master Plan for a Sustainable Coast ("Master Plan").

- Project Urgency; and
- Other Factors as Appropriate.

The remainder of this chapter contains a subsection for each proposed Phase III project in Louisiana. Each project-specific subsection begins with a general description of the project and relevant background information, followed by: 1) a discussion of the project's consistency with project evaluation criteria; 2) a description of planned performance criteria, monitoring and maintenance; 3) a description of the type and quantity of Offsets BP would receive if the project is selected for implementation; and 4) information about estimated project costs.

Following this project information is a project-specific environmental review, which provides information and analysis about anticipated environmental consequences of each proposed project. Although each of the proposed projects falls within and is consistent with the Trustees' preferred Programmatic Alternative (Alternative 4) identified and evaluated in previous sections of this document (Chapters 5 and 6), the Trustees also have undertaken project-specific environmental reviews to help ensure proposed project locations, methods, timing and other factors reasonably maximize project benefits, minimize potential adverse consequences, and otherwise address environmental compliance needs.

In order to determine whether an action has the potential to result in significant impacts, the context and intensity of the action must be considered. Context refers to area of impacts (local, state-wide, etc.) and their duration (e.g., whether they are short- or long-term impacts). Intensity refers to the severity of impact and could include the timing of the action (e.g., more intense impacts would occur during critical periods like high visitation or wildlife breeding/rearing, etc.). Intensity is also described in terms of whether the impact would be beneficial or adverse. Both context and intensity were considered in the project-specific environmental reviews.

9.2 Louisiana Outer Coast Restoration: Project Description

9.2.1 Project Summary

The Trustees propose to restore beach, dune, and back-barrier marsh habitats at four barrier island locations in Louisiana. From west to east, the four locations are Caillou Lake Headlands (also known as Whiskey Island), Chenier Ronquille, Shell Island (West Lobe and portions of East Lobe), and North Breton Island (Figure 9-2). The total estimated cost to implement Louisiana Outer Coast Restoration is $318,363,000.

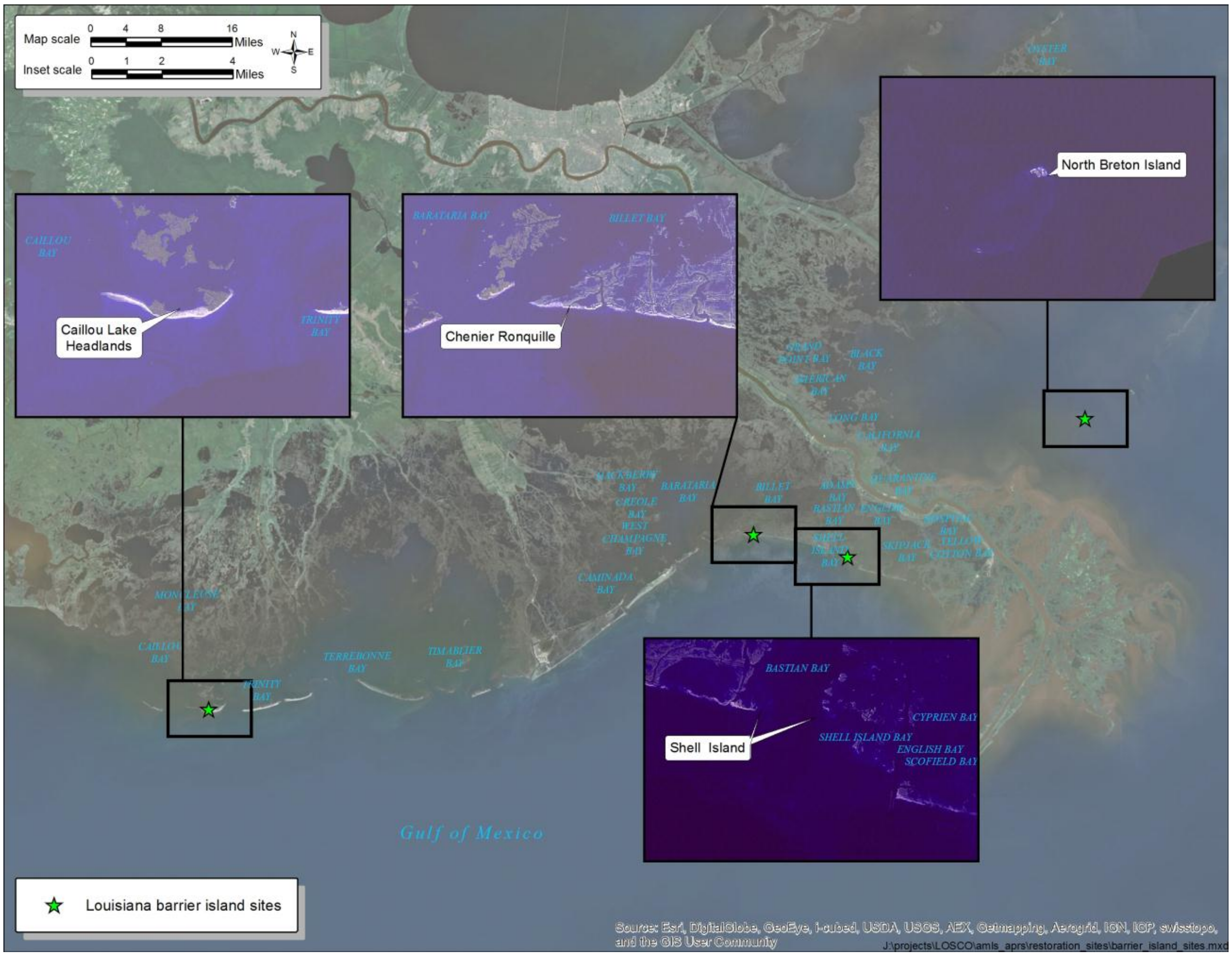

Figure 9-2. Louisiana Outer Coast Restoration locations. From west to east: Caillou Lake Headlands (also known as Whiskey Island), Chenier Ronquille, the West Lobe and portions of the East Lobe of Shell Island, and North Breton Island.

9.2.2 Background and Project Description

The goal of Louisiana Outer Coast Restoration is to restore beach, dune, and back-barrier marsh habitats in Louisiana, as well as brown pelicans, terns, skimmers, and gulls to help compensate the public for Spill-related injuries to these habitats and species. The restoration work proposed at each island involves placement of appropriately sized sediments to create beach, dune, and back-barrier marsh areas; installation of sand fencing to trap and retain wind-blown sediments and foster dune development; and revegetation of appropriate native species in dune and back-barrier marsh habitat. Sediment will be pumped from appropriate borrow area locations specific to each island and conveyed to the restoration sites through temporary pipeline corridors. The restoration methods proposed here are established methods for this type of restoration activity.

Restoration at Louisiana Outer Coast Restoration locations has a history of support and project development; NRDA funding is necessary, however, for construction at these locations to move forward. Construction of the Caillou Lake Headlands was the selected restoration alternative for that location in the Terrebonne Basin Barrier Shoreline Restoration (TBBSR) Integrated Feasibility Study and Final Environmental Impact Statement (USACE 2010). The Chenier Ronquille barrier island restoration was authorized in 2010 as a candidate project under the 1990 Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) and received design phase funding under CWPPRA. Plans and proposals to restore Shell Island have been developed in multiple documents since 1998 (LCWCRTF and WCRA 1998), including the Barataria Basin Barrier Shoreline Restoration Project (USACE 2012). Caillou Lake Headlands, Chenier Ronquille, and Shell Island are included in Louisiana's Master Plan (CPRA 2012). North Breton Island, part of the Breton National Wildlife Refuge (Breton NWR), is recognized as an important bird area due to the resources it provides to birds. However, erosion from storms constitutes a major and ongoing threat to the island, its habitats, and the breeding bird colonies it supports (Martinez et al. 2009; Lavoie 2009). Several alternatives to restore North Breton Island have been discussed, including those evaluated as part of the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Final Feasibility Report (Thomson et al. 2010).

More detailed descriptions of proposed restoration activities at each of the four island locations, including the anticipated spatial extent of the different habitat types, are provided below:

Caillou Lake Headlands Barrier Island Restoration
Restoration of beach, dune, and back-barrier marsh habitats at the Caillou Lake Headlands location would occur on Whiskey Island, a barrier island in the Isle Dernieres reach of the Terrebonne Basin barrier system. Louisiana would be the lead Trustee for the design and construction of this project, working cooperatively with NOAA and DOI. The project was federally authorized under the Water Resources Development Act of 2007 and selected as a preferred alternative in the TBBSR Integrated Feasibility Study and Final Environmental Impact Statement (USACE 2010), and included in the state's Master Plan (CPRA 2012).

The Isle Dernieres chain of barrier islands has undergone significant fragmentation and reduction in size because of natural processes and human activities. Based on data from historical maps, satellite imagery, and aerial photography, long-term shoreline retreat rates at Whiskey Island have been estimated to be about 57 feet/year (Martinez et al. 2009). To slow these loss rates, portions of Whiskey Island have been restored over the past 15 years using funds received through CWPPRA (LCWCRTF 2002 2010). This NRDA-funded project would continue restoration work on Whiskey Island and include the reestablishment of a beach and dune platform along the length of the shoreline and the construction of a marsh platform along the western end of the island on the landward side of the dune.

Restoration at this location would require approximately 8.9 million cubic yards (CY) of beach/dune fill (i.e., sand-sized sediments) that would be pumped through temporary pipeline corridors to the project site from an offshore borrow area at Ship Shoal (Figure 9-3). The dune would be constructed to an elevation of approximately +6.4 feet NAVD 88. The slopes of the beach and dune would be set at 60:1 and 30:1 (horizontal to vertical), respectively. Sand fencing would be installed to trap and retain wind-blown sediments and help foster dune development.

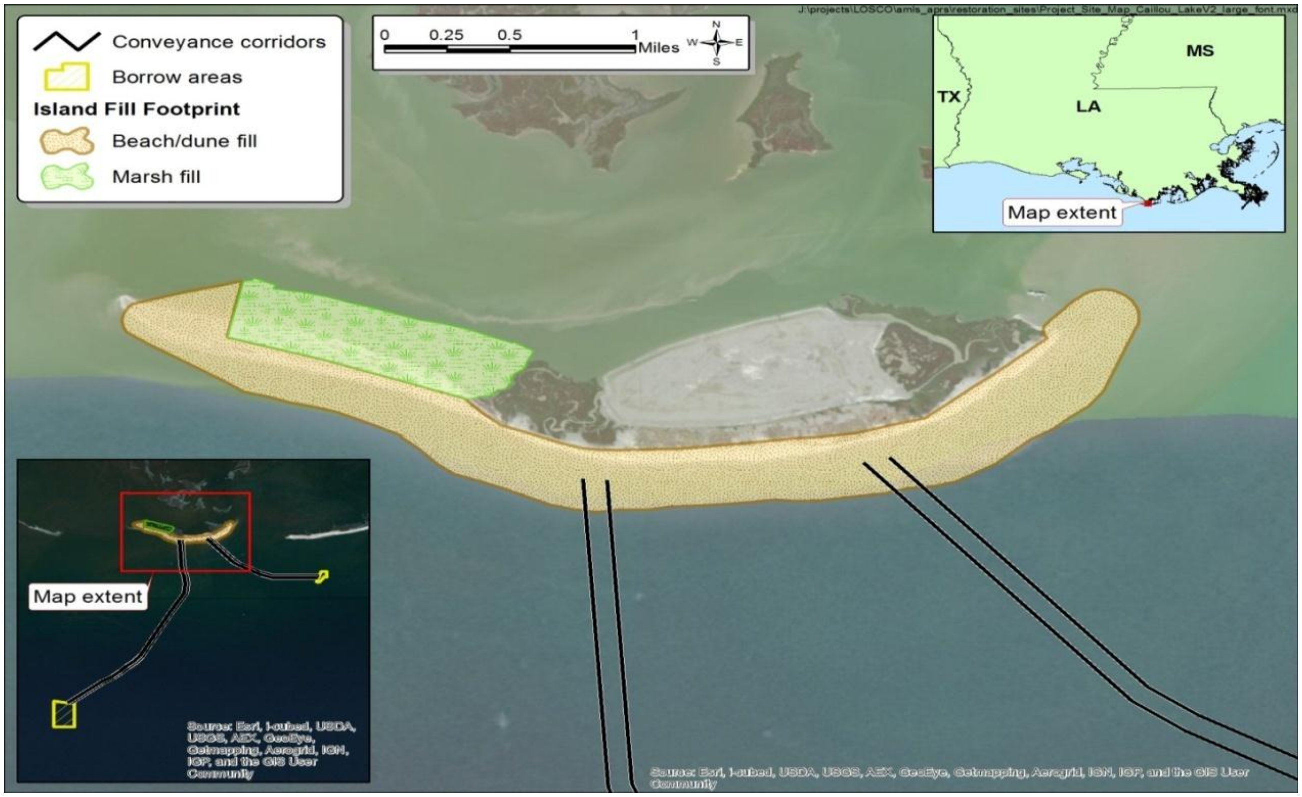

Figure 9-3. Conceptual design for Caillou Lake Headlands Barrier Island Restoration. Marsh and beach/dune fill areas are approximate. Imagery of Whiskey Island is from 2010.

Restoration at this location would also require approximately 1 million CY of marsh fill (i.e., mixed sand-, silt-, and clay-sized sediments) that would be pumped through temporary pipeline corridors from a nearshore borrow area to the project site (Figure 9-3). This marsh fill is proposed for the landward side of the dune at an elevation of +2.4 feet NAVD88. The dune platform and other supratidal areas as well as the back-barrier marsh would be planted with the appropriate native species by seeding and/or installing approved nursery stock. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies.

Approximately 1,000 acres of barrier island habitat, including beaches, dunes, and back-barrier marsh, would be constructed. The project was designed to avoid disturbing approximately 286 acres of existing mangroves on the island to minimize the ecological impact during construction. The estimated cost for the restoration work at the Caillou Lake Headlands location is approximately $110 million.

Chenier Ronquille Barrier Island Restoration

Chenier Ronquille is located along the Plaquemines/Barataria Bay barrier shoreline, eight miles east of Grand Isle. Chenier Ronquille serves as the western anchor of the Plaquemines/Barataria shoreline and forms the eastern boundary of Quatre Bayou Pass (Figure 9-4). NOAA would be the lead Trustee for the design and construction of this project, working cooperatively with Louisiana and DOI. The Chenier Ronquille barrier island restoration was authorized in 2010 as a candidate project under CWPPRA. Although it received design phase funding, it did not receive construction funding under CWPPRA. Chenier Ronquille barrier island restoration is also included in the state's Master Plan (CPRA 2012).

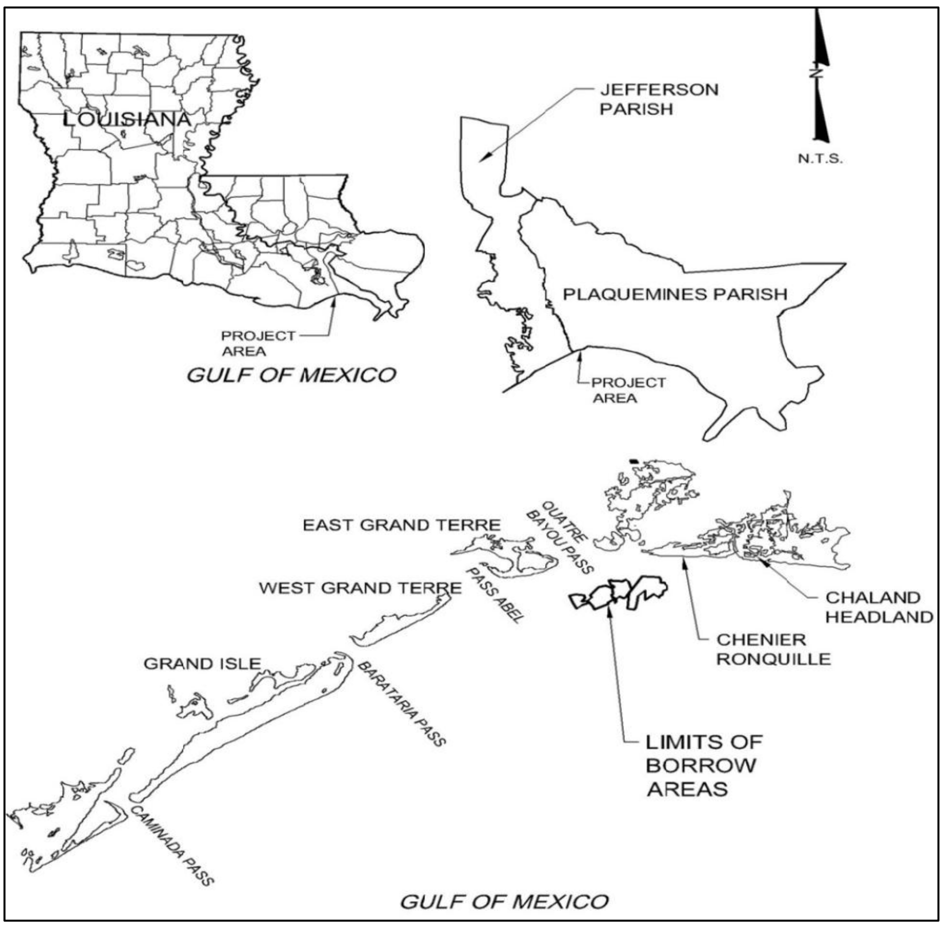

Figure 9-4. Location of Chenier Ronquille Barrier Island and proposed borrow areas. Source: Thomson et al. 2011.

Chenier Ronquille Island suffers from high shoreline retreat rates. Recent shoreline change measurements suggest an average shoreline retreat rate of approximately 44 feet/year, although retreat rates of 108 feet/year have been measured. The barrier island has been breached, which is increasing the shoreline retreat rate of the island (Thomson et al. 2011). This project aims to increase island longevity by restoring beach, dune, and back-barrier marsh habitats. Restoration work would repair the breaches in the shoreline and prevent the creation of new breaches over the project life, while reestablishing dune and marsh platforms. The Chenier Ronquille restoration would tie into two recently constructed projects to the east and restore one of the remaining reaches of the Plaquemines/Barataria shoreline.

Restoration at this location would require the excavation of approximately 2.0 million CY of beach/dune fill. The dune would be constructed with a dune crest at +8 feet NAVD88. Sand fencing would be installed to trap and retain wind-blown sediments and help foster dune development. Restoration at this location would also require excavation of approximately 2.4 million CY of marsh fill for the back-barrier marsh (using a design elevation of +2.5 feet NAVD88 and 240,000 CY of fill for the primary dikes and access channels). The beach and marsh fill borrow areas are located approximately 1.7 to 2.8 miles southwest of the project area and were initially developed for the now-completed East Grand Terre Island and Chaland Headland Restoration Projects.

Sediment for this project would be pumped through temporary pipeline corridors from the borrow areas to the restoration site. Dune and back-barrier marsh areas would be planted with the appropriate native species by seeding and/or installing approved nursery stock. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. The conceptual design for Chenier Ronquille Barrier Island Restoration is shown in Figure 9-5.

Approximately 500 acres of barrier island habitat, including beaches, dunes, and back-barrier marsh, would be constructed. The estimated cost for the restoration work at the Chenier Ronquille location is approximately $35 million.

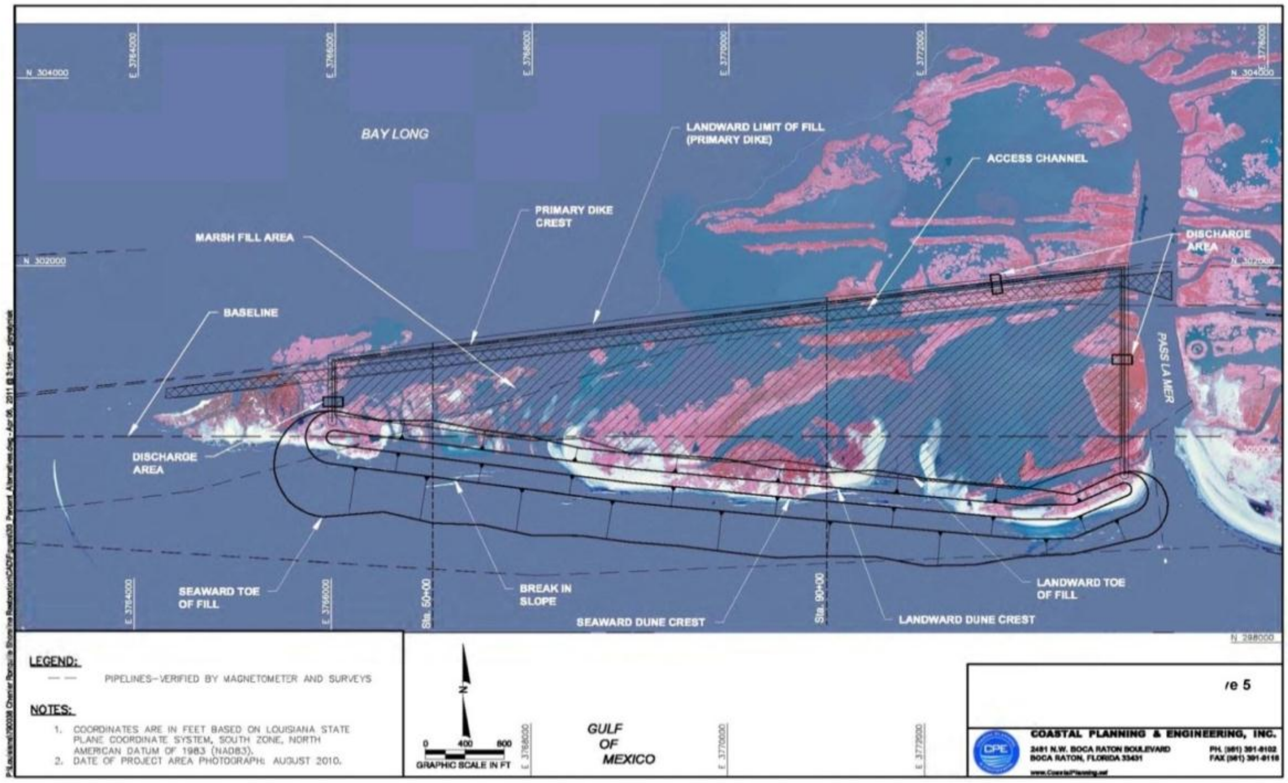

Figure 9-5. Conceptual design for Chenier Ronquille Barrier Island Restoration. Source: Thomson et al. 2011.

Shell Island (East and West Lobes) Barrier Island Restoration

Shell Island (East and West Lobes) is located approximately 49 miles south-southeast of New Orleans, along the southern margin of the Barataria Basin in Plaquemines Parish. It comprises a portion of the Plaquemines barrier shoreline (Figure 9-6). Plans and proposals to restore Shell Island have been developed in multiple documents, including Coast 2050: Toward a Sustainable Coastal Louisiana (LCWCRTF and WCRA 1998), the Barataria Basin Barrier Shoreline Restoration Project (USACE 2012), and the state's Master Plan (CPRA 2012). Louisiana would be the lead Trustee for the design and construction of this project, working cooperatively with NOAA and DOI.

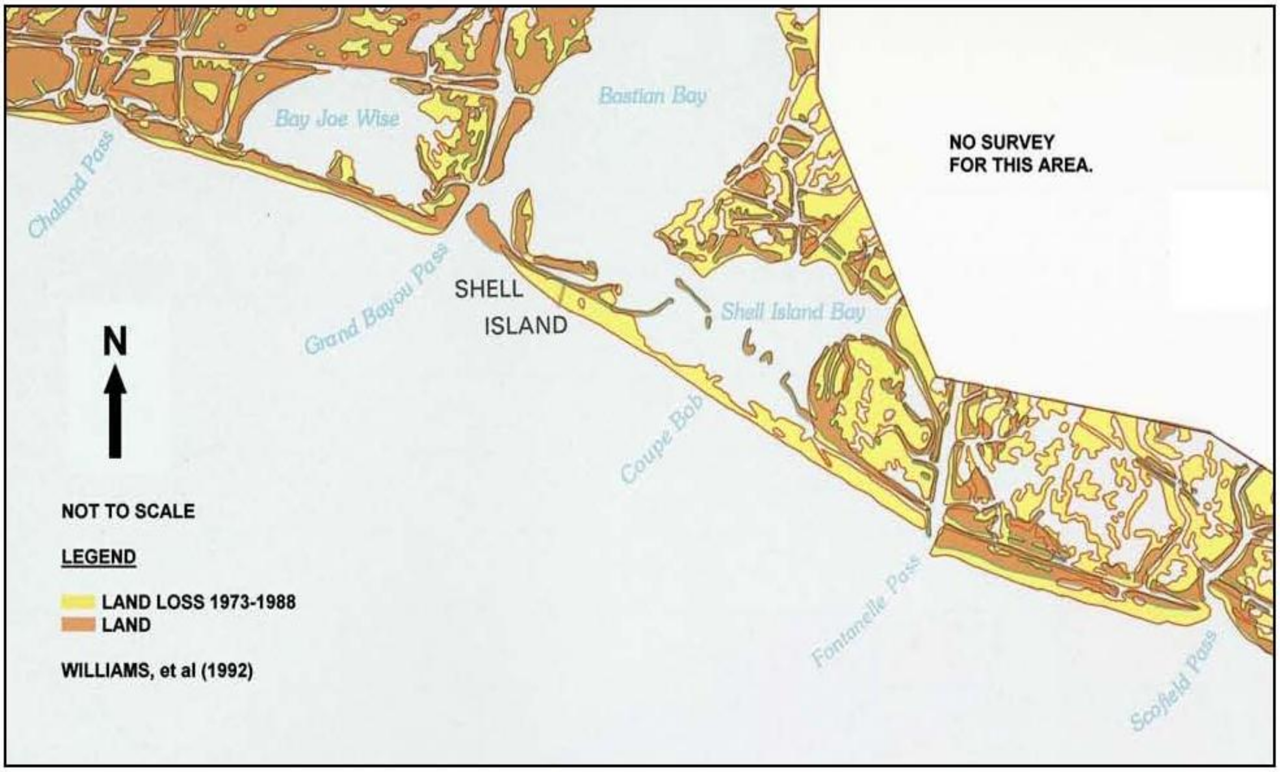

Figure 9-6. Shoreline change of Shell Island between 1973 and 1988. Source: Thomson et al. 2008.

Shell Island was originally a single barrier island spit, but the passage of Hurricane Bob in 1979 breached the center of the island, resulting in its fragmentation into a series of smaller islands, referred to as Shell Island East and Shell Island West (Thomson et al. 2008; Figure 9-6). Shell Island East has continued to disintegrate and includes several smaller islands. Shell Island West has continued to undergo shoreline retreat and migration to the west (Thomson et al. 2008).

Based on shoreline change analysis, the short-term shoreline retreat rates of Shell Island have been estimated at approximately 157 feet/year (Martinez et al. 2009). This project aims to increase island longevity by restoring beach, dune, and back-barrier marsh habitats on Shell Island West and the western portion of Shell Island East. Restoration work would repair breaches in the shoreline, reestablish a primary dune along the length of the shoreline, and construct a back-barrier marsh platform. In addition to this proposed NRDA Early Restoration work, another restoration project, the "Shell Island East Berm Barrier Island Restoration Project (BA-110)" (Figure 9-7), was constructed in 2013 using other sources of funding.

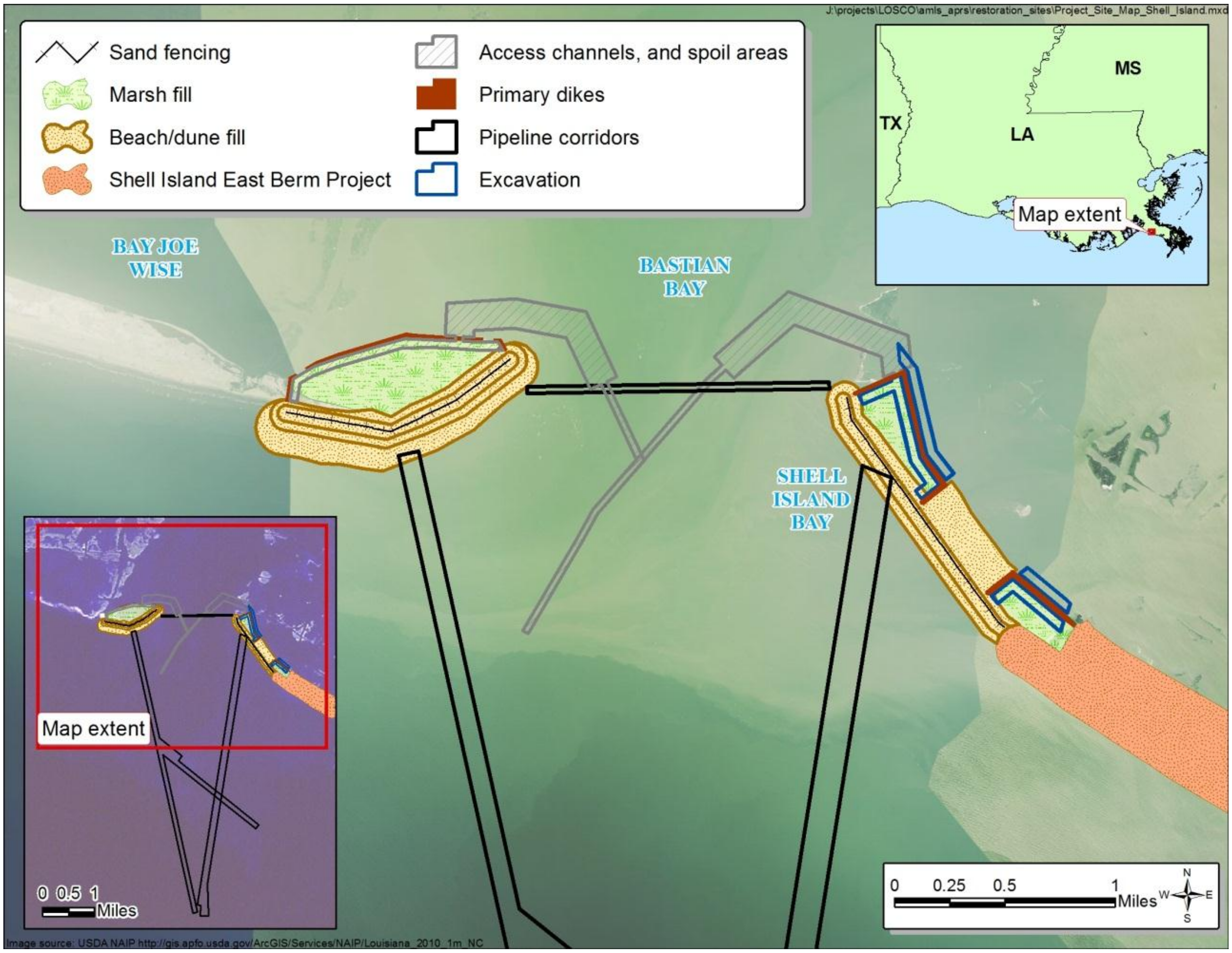

Figure 9-7. Conceptual design for Shell Island (East and West Lobes) Barrier Island Restoration. Access channel and spoil areas include excavation and disposal areas. The Shell Island East Berm Barrier Island Restoration Project (BA-110) is constructed.

The proposed NRDA restoration at this location would require approximately 4.5 million CY of beach/dune fill, including approximately 2.2 million CY for Shell Island East Lobe and approximately 2.3 million CY of beach/dune fill for Shell Island West Lobe. The beach/dune fill borrow site options in the Mississippi River have been identified and the sediment would be pumped through a pipeline along a conveyance corridor on the Empire waterway permitted for the Scofield Island Restoration Project (BA-40; LCWCRTF 2012). The dune would be constructed to an elevation of approximately +8.0 feet NAVD 88. Sand fencing would be installed to trap and retain wind-blown sediments and help foster dune development. Restoration at this location would also require approximately 1.9 million CY of marsh fill, including approximately 1.1 million CY of marsh fill for Shell Island East and approximately 0.8 million CY of marsh fill for Shell Island West. The marsh fill borrow site has been identified south of the project site in Louisiana state waters of the Gulf of Mexico, and sediment would be pumped through the temporary conveyance pipeline within permitted corridors to the restoration site. The marsh would be located on the landward side of the dune and would be constructed to +2.5 feet NAVD 88. Beach/dune and back-barrier marsh areas would be planted with the appropriate native species by installing approved nursery stock. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. The conceptual design for Shell Island (East and West Lobes) Barrier Island Restoration is shown in Figure 9-7.

Approximately 680 acres of barrier island habitat, including beaches, dunes, and back-barrier marsh, would be constructed. The estimated cost for the restoration work at the Shell Island (East and West Lobes) location is approximately $101 million.

North Breton Island Barrier Island Restoration

North Breton Island, located at the southern end of the Chandeleur Island chain in Louisiana, is part of the Breton NWR established in 1904 by Theodore Roosevelt. Breton NWR is recognized by the National Audubon Society as a globally important bird area because of the resources it provides to birds. North Breton Island hosts one of Louisiana's largest historical brown pelican nesting colonies. However, surveys by Breton NWR staff indicate that this colony declined from over 15,000 pairs before 1998 to fewer than several thousand pairs in 2012, including a reduction of approximately 50% of breeding pelicans between 2008 and 2012. Erosion from tides and storms constitutes a major and ongoing threat to North Breton Island, its habitats, and the breeding bird colonies it supports (Lavoie 2009; Martinez et al. 2009; Kindinger et al. 2013). Without actions to restore sand into the North Breton Island system, the island is expected to be completely submerged sometime between 2014 and 2037, depending on the frequency and magnitude of future storms (Lavoie 2009). This project aims to increase island longevity by restoring beach, dune, and back-barrier marsh habitats on the island, providing nesting and foraging habitat for brown pelicans, terns, skimmers and gulls injured by the Spill. Restoration work would reestablish a dune platform along the length of the shoreline and construct a marsh platform on the landward side of the dune.

North Breton Island restoration will be guided by the data analyses presented in Lavoie (2009), Visser et al. (2005), Hingtgen et al. (1985), and other related documents. Commissioned by the USFWS, Lavoie (2009) represents the latest and most comprehensive investigation of sand resources, physical and environmental factors, and feasibility of restoration of the Chandeleur Islands. As recommended by Lavoie (2009), restoration would be designed to mimic the natural processes of barrier island evolution, including erosion and longshore transport of sand. Work would reestablish a dune platform along the length of the shoreline and construct a marsh platform on the landward side of the dune. The conceptual design for the placement of sand and back-barrier marsh sediment (Figure 9-8) mimics the pre-Hurricane Katrina island coverage and expected island evolution pattern. DOI would be the lead Trustee for the design and construction of this project, working cooperatively with Louisiana and NOAA.

Figure 9-8. Conceptual design for North Breton Island Restoration.

Restoration at this location would use approximately 3.7 million CY of sand, silt, and clay sized material dredged from one or more borrow sites within a nearby source area and placed on the existing island platform to create the desired island configuration. Preliminary review of oil and gas pipeline infrastructure and available geotechnical data suggests that a nearby shoal complex (Figure 9-9) has the potential for providing an appropriate and cost efficient sediment source for the proposed restoration. Geophysical and geotechnical surveys conducted as part of project engineering and design will help delineate specific borrow sites within the shoal complex for acquiring sand-sized sediments for dune and beach restoration and finer mixed sand-silt-clay sized sediments for back-barrier marsh restoration.

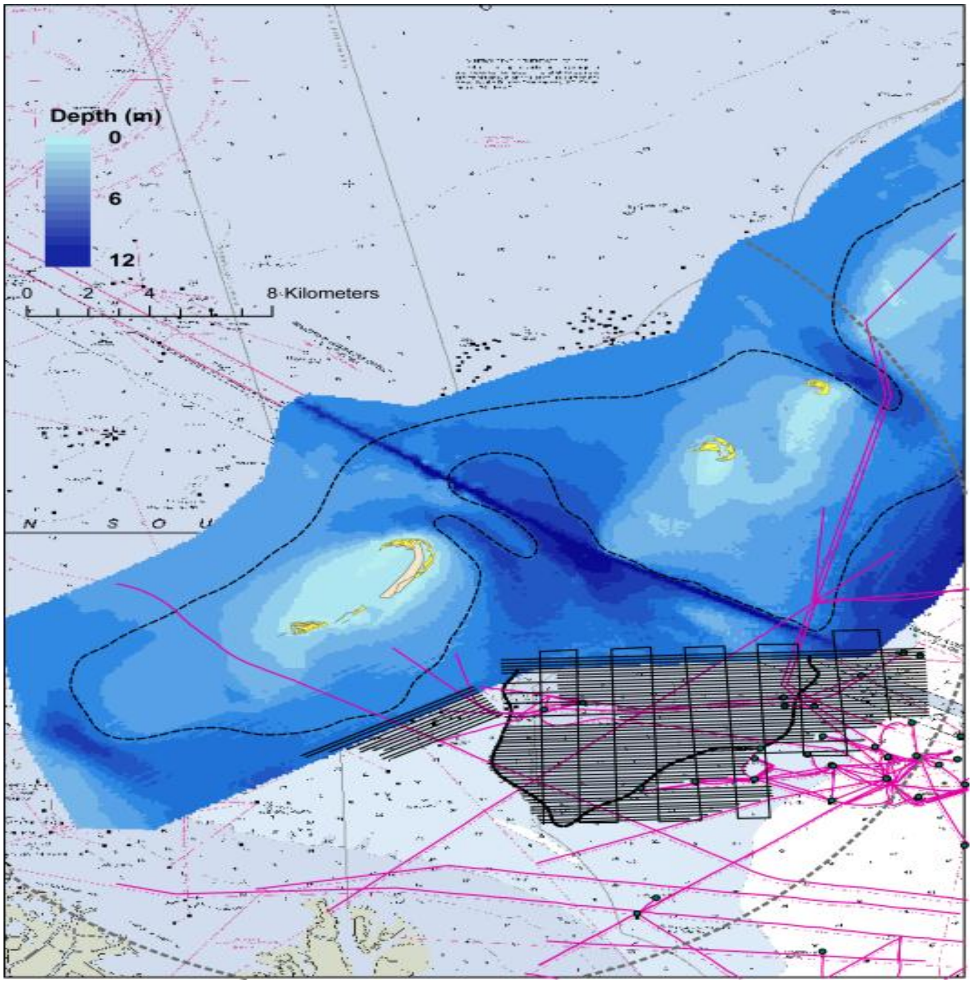

Figure 9-9. Proposed North Breton Island restoration borrow area (black hatch lines). Pipeline infrastructure designated with pink lines.

The restoration design is expected to include: a dune platform with a crest elevation of approximately 8–10 feet above mean sea level (optimum elevation to be determined); a gulf side beach that is approximately 200-feet wide and constructed to an elevation of approximately 3 feet above mean sea level; and a sound side back-barrier marsh platform that is approximately 500-feet wide and constructed to an elevation of approximately 3 feet above mean sea level. Sand fencing would be installed to trap and retain wind-blown sediments and build dune habitats. Sediment would be pumped through temporary pipeline corridors from the borrow site(s) to the restoration site. Dune and back-barrier marsh areas would be planted with the appropriate native species by seeding and/or installing approved nursery stock. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies.

Initial designs for the island suggest that more than 300 acres of barrier island habitat, including beaches, dunes, and back-barrier marsh, would be constructed. The estimated cost for the restoration work at the Breton Island location is approximately $72 million.

9.2.3 Evaluation Criteria

The Trustees evaluated the Louisiana Outer Coast Restoration project based on the evaluation criteria described in Chapter 2 and the additional RRP Program-specific criteria described in the introduction to this chapter. First, the proposed restoration has a clear nexus to resources injured by the Spill. See 15 C.F.R. § 990.54 (a)(2); and 6(a)-(c) of the Framework Agreement. Louisiana's barrier islands, especially the islands located in the Barataria Hydrologic Basin, were heavily impacted by the Spill. Numerous dead and oiled brown pelicans, terns, skimmers, and gulls were collected during and following the Spill. The ecological resources and services that would be gained by this restoration are anticipated to help compensate the public for Spill-related injuries to beach/dune and back-barrier marsh in Louisiana, as well as for injuries to brown pelicans, terns, skimmers, and gulls. The project, thus, also benefits more than one resource and/or service. See 15 C.F.R. § 990.54 (a)(5).

A thorough review of this project, including review under applicable environmental laws and regulations, is described in this Chapter and the cited existing NEPA analyses, and indicates that adverse effects from the project would largely be minor to moderate, localized, and temporary. In addition, the best management practices and measures to avoid or minimize adverse effects described in Sections 9.3 - 9.6 would be implemented where applicable. As a result, collateral injury would be avoided and minimized during project implementation (construction) See 15 C.F.R. § 990.54(a)(4).

Project restoration designs are technically feasible and based on proven techniques and established methods used in other Louisiana barrier island restoration projects. See 15 C.F.R. § 990.54 (a)(3); and 6(e) of the Framework Agreement. The proposed restoration has a high likelihood of success given the use of established methods and construction techniques designed to facilitate natural processes supporting barrier island habitats. USGS (2013) noted that renourishment is a cost-effective method for increasing the longevity of Louisiana's barrier islands. Also, restoration would be conducted at a reasonable cost for this type of action, and could be expected to be implemented with minimal delay given the previous planning already completed. See 15 C.F.R. § 990.54 (a)(1); RRP Program FPEIS (NOAA et al. 2007, p. 104); and 6(e) of the Framework Agreement. In addition, several of the components of Louisiana Outer Coast Restoration have already been publicly vetted through CWPPRA, Louisiana Coastal Area – Ecosystem Restoration (LCA), and/or Louisiana's Master Plan development processes. Proposed restoration supports existing restoration strategies and is consistent with anticipated long-term restoration needs and the Gulf Coast Ecosystem Restoration Task Force recommendations (GCERTF 2011). See RRP Program FPEIS (NOAA et al. 2007, p.104); and 6(d) of the Framework Agreement. Finally, the high rates of shoreline retreat and land loss on these islands indicate that there is an urgency to complete these projects. See RRP Program FPEIS (NOAA et al. 2007, p.104). Proposals to conduct restoration activities at these islands were submitted to the Trustees as part of the Trustees' Early Restoration project solicitation process.

9.2.4 Performance Criteria, Monitoring, and Maintenance

Monitoring activities at the Louisiana Outer Coast Restoration island locations are expected to take place over several years. Available data sets from pre-implementation, implementation, and post-implementation time periods are expected to be utilized. Successful implementation of this project would be measured using a combination of quantitative and qualitative monitoring efforts designed to evaluate whether the following restoration goals and objectives are met, and to determine whether corrective actions are necessary:

- Restore beach, dune, and back-barrier marsh habitats in Louisiana; and
- Presence of nesting pelicans, terns/skimmers and gulls, within restored habitat areas.

The Trustees would evaluate the stability and function of the restored islands and marsh habitat characteristics. Performance criteria would be established to determine whether the restored areas are functioning as healthy barrier islands and supporting nesting birds. Components of monitoring may include collecting data on the following parameters:

- Barrier island structure and function, potentially including metrics such as shoreline position, stability (e.g., frequency of overwash, number and status of breaches), area, elevation, and/or volume.
- Bird habitat use and nesting activity, potentially including metrics such as habitat occupancy surveys, colony size, and nest densities.
- Marsh habitat characteristics, potentially including metrics such as species composition vegetation cover, nekton and invertebrate population densities, and habitat areal coverage.

Updates and additional details concerning the performance measures and monitoring for this project will be made available to the public as they are developed.

9.2.5 Offsets

For purposes of negotiating Offsets with BP in accordance with the Framework Agreement, the Trustees used a Habitat Equivalency Analysis and Resource Equivalency Analysis to estimate habitat and bird Offsets, respectively. Habitat Offsets (expressed in DSAYs) were estimated for a portion of the back-barrier marsh and beach/dune acreage that would be created by this restoration, based on the expected extent and function of the newly created barrier island habitats. Bird Offsets were estimated for a separate portion of the created area by calculating additional pelican, tern/skimmer and gull productivity expected in certain areas over time compared to a no-action scenario.

The Trustees and BP agreed that if this restoration is selected for implementation, BP would receive Offsets of 2,576 DSAYs of back-barrier marsh habitat and 3,820 DSAYs of beach/dune habitat, applicable to back-barrier marsh and beach/dune habitat injuries in Louisiana, as determined by the Trustees' total assessment of injury for the Spill.

The Trustees and BP further agreed that if this restoration is selected for implementation, BP would receive Offsets of 11,000 discounted pelican fledglings, 28,000 discounted tern and skimmer fledglings, and 20,000 discounted gull fledglings. The unit of "discounted fledglings" uses a discounting rate to convert the number of fledglings expected to be produced each year to a common base year for comparison. Discounted pelican, tern/skimmer and gull fledgling Offsets were estimated because these species, in particular, are expected to benefit from the proposed restoration actions. Several life history, project, and local stochastic factors were used to develop bird Offsets, including nest densities, fledglings per nest, longevity of the project, influence of storms on nesting success, and the spatial extent expected to be utilized for nesting. If Louisiana Outer Coast Restoration is selected for implementation, these Offsets will be used against BP's liability for injuries to these bird species, as determined by the Trustees' total assessment of injury for the Spill.

Figure 9-10. Nesting brown pelicans, North Breton Island. Photo credit: Brian Spears, USFWS.

The Trustees further recognize that barrier islands provide important habitat for fish, shellfish, and other aquatic species that utilize estuaries during their lifecycles, including fish and shellfish that use back-barrier marsh as nurseries as juveniles before they migrate out to open water (Condrey et al. 1996; O'Connell et al. 2005). The Trustees have agreed with BP that additional Offsets for aquatic biomass will be provided to BP for this restoration *only* if back-barrier marsh habitat Offsets provided in exchange for funding this restoration exceed the calculated injury to Louisiana back-barrier marsh habitat, as determined by the Trustees' total assessment of injury for the Spill. Because the Trustees have not yet completed their assessment of injury, neither the Trustees nor BP know whether the proposed habitat Offsets will exceed this injury. If the Offsets do exceed the injury, the "excess" Offsets would be applied to offset injuries to aquatic organisms that were injured in offshore waters of the Gulf of Mexico but are estuarine-dependent at some point in their lifecycle. Offsets for estuarine-dependent aquatic biomass injuries would be applied at a rate of 1,000 discounted kilogram years per DSAY. This value was negotiated with BP for purposes of advancing this project in Early Restoration based on the Trustees' review of published literature on the productivity of marsh (primary, secondary and tertiary) and the trophic transfer of estuarine-dependent aquatic biomass per acre of marsh, and then standardized in units of "secondary productivity." The Trustees have further specified that this Offset – if utilized – would apply only to estuarine-dependent aquatic biomass injuries in Louisiana and federal waters of the Continental Shelf; it would not apply to aquatic biomass injuries in waters of Texas, Mississippi, Alabama, or Florida.

9.2.6 Cost

The total estimated cost to implement Louisiana Outer Coast Restoration is $318,363,000. This cost reflects current cost estimates developed from the most current designs for each island available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

9.2.7 Summary and Next Steps

The proposed Louisiana Outer Coast Restoration would restore beach, dune, and back-barrier marsh habitats at four barrier island locations in Louisiana. From west to east, the four locations are Caillou Lake Headlands (also known as Whiskey Island), Chenier Ronquille, Shell Island (West Lobe and portions of East Lobe), and North Breton Island. Approximately 2,480 acres of barrier island habitat, including beaches, dunes, and back-barrier marsh, would be constructed. The project is consistent with the programmatic Alternative 2 (Contribute to Restoring Habitats and Living Coastal and Marine Resources) and the programmatic Alternative 4 (Preferred Alternative).

Sections 9.3 – 9.6 provide the environmental reviews for the four barrier island locations.

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9.3 Louisiana Outer Coast Restoration: Environmental Review A (Caillou Lake Headlands)

DOI has independently evaluated the Louisiana Coastal Area (LCA) Integrated Feasibility Study and Final Environmental Impact Statement (EIS) for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010) and finds that it complies with CEQ and DOI requirements for adopting NEPA analyses prepared by other agencies (See Section 7.8 for information on DOI NEPA adoption regulations and criteria). This document can be found in its entirety at (http://losco-dwh.com).

Accordingly, DOI has adopted the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration to fulfill DOI's NEPA requirements for analysis of the Caillou Lake Headlands restoration location of the Louisiana Outer Coast Restoration project. Below is a brief summary of the portions of the LCA EIS that are relevant to this proposed project.

9.3.1 Proposed Action

Restoration at the Caillou Lake Headlands location would occur on Whiskey Island, a barrier island in the Isle Dernieres reach of the Terrebonne Basin barrier shoreline (Figure 9-11). Construction of Whiskey Island would utilize hydraulically dredged sediments to create beach, dune, and back-barrier marsh habitats. The back-barrier marsh platform would be constructed to an elevation of +2.4 ft. NAVD88. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. The dune platform would be constructed to an elevation of approximately +6.4 ft. NAVD88, and sand fencing would be erected to capture windblown sand and foster dune development. The dune platform and other supratidal areas would be planted with native vegetation shortly after construction. The back-barrier marsh platform would be planted after a period of compaction and dewatering has occurred and the platform is stable enough for planting activities.

9.3.2 Background

Plans and proposals to restore Whiskey Island have been developed over time in multiple documents, including Coast 2050: Toward a Sustainable Coastal Louisiana (LCWCRTF and WCRA 1998), the LCA Ecosystem Restoration Study (USACE 2004a), and the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010).

The LCA Ecosystem Restoration Study (USACE 2004a) recommended the Terrebonne Basin Barrier Shoreline Restoration as a near-term critical restoration feature for further study. The restoration of the Timbalier and Isles Dernieres barrier island chains (including Whiskey Island) was specifically proposed as part of the Terrebonne Basin Barrier Shoreline Restoration plan. General information on the need for this project type, the affected environment, and the environmental consequences were presented in the Final Programmatic EIS for the Louisiana Coastal Area (LCA) Ecosystem Restoration Study (USACE 2004b).

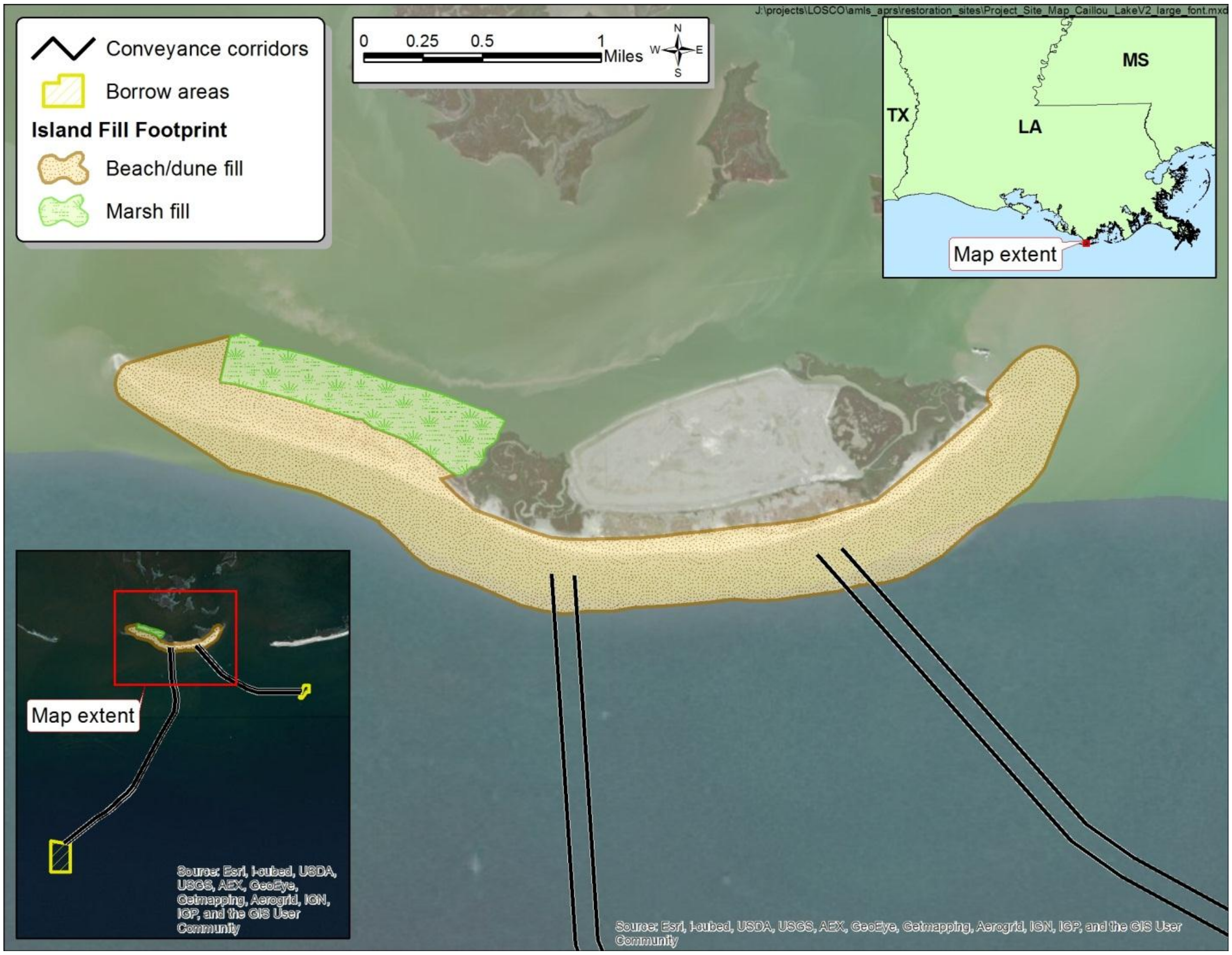

Figure 9-11. Conceptual design for Caillou Lake Headlands Barrier Island Restoration. Back-barrier marsh and beach/dune fill areas are approximate. High-resolution imagery of Whiskey Island is from 2010.

A more detailed evaluation of the alternatives and environmental consequences for the Terrebonne Basin Barrier Shoreline Restoration project was presented in the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010). The potential environmental consequences for implementing five alternatives, compared to the no action alternative, were considered (USACE 2010). The five alternatives that were evaluated include: Alternative 2 (Timbalier Island Plan E); Alternative 3 (Whiskey Island Plan C and Timbalier Island Plan E); Alternative 4 (Whiskey Island Plan C, Trinity Island Plan C, and Timbalier Island Plan E); Alternative 5 (Whiskey Plan C, Raccoon Island Plan E with a terminal groin, Trinity Island Plan C, and Timbalier Plan E); and Alternative Plan 11 (Whiskey Plan C). The impact analysis was based on a combination of scientific and engineering analyses, professional judgment, and previously compiled information (USACE 2010).

Under the proposed National Ecosystem Restoration (NER) Plan (Alternative 5), short-term impacts are anticipated as a result of the dredging and placement of borrow material during the construction activities, and include impacts to the existing vegetated and non-vegetated habitat, impacts to water quality (e.g., turbidity), the disruption or displacement of wildlife and fisheries, and injury to sessile or slow moving organisms. Short-term increases in the noise level and impacts to air quality (e.g., emissions), navigation, commercial fisheries, and recreational activities are also anticipated as a result of the construction activities. In addition, the Gulf of Mexico water bottoms would be impacted from the removal of sand resources from the borrow site. Over the long-term, project implementation would result in the restoration of beach, dune, and back-barrier marsh habitat, and would provide important and essential habitats used by fish and wildlife for spawning, nursery, nesting, feeding, and cover. Indirect benefits to commercial and recreational activities are expected by protecting, creating, and restoring important and essential fish and wildlife habitats. This Final EIS also provides information on measures that should be taken to avoid and minimize potential adverse impacts to existing resources, such as threatened and endangered species.

The Caillou Lake Headlands proposed action is based on the preferred alternative for the restoration of Whiskey Island (Whiskey Island Plan C) within the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration. The proposed action is expected to have either no effect or short-term adverse impacts on most of the features and resources evaluated. Temporary impacts to existing habitats, water quality (e.g., turbidity), air quality, wildlife, and fisheries, and increases in noise levels, are anticipated as a result of the construction activities. Benthic resources present within the borrow areas, in the conveyance channels that will contain dredge pipe, and at the restoration site will be disturbed during construction by excavation, fill, or the physical impact of pipe placement. Over the mid- to long-term, positive effects are anticipated as the created habitats mature and reach equilibrium. The project would provide additional beach, dune, and back-barrier marsh habitat for marine and estuarine fisheries and avian communities. Benefits to commercial and recreational resources are expected from the enhancement of fish habitat.

The Trustees propose to construct the Caillou Lake Headlands Restoration Project (TE-100; Figure 9-11). This proposed project would continue restoration work on Whiskey Island, as portions of Whiskey Island have been restored during the past 15 years using funds received through the 1990 Coastal Wetland Planning, Protection and Restoration Act (CWPPRA) (LCWCRTF 2002; LCWCRTF 2010).

9.3.3 Alternatives Analysis

In the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010), a total of fourteen alternatives, including the no action alternative, were considered for evaluation. The study included an analysis of trends in variables such as sea level rise, storm surge, hurricanes, and subsidence and considered the impacts of these factors on the sustainability of project designs.

These alternatives consisted of different restoration scenarios for the Terrebonne Basin barrier island chain. Only five of these alternatives, in addition to the no action alternative, were carried forward for a detailed evaluation of environmental consequences. Based on an analysis of habitat benefits and cost-effectiveness, Alternative 5 (including Whiskey Island Plan C, Raccoon Island Plan E with a terminal groin, Trinity Island Plan C, and Timbalier Island Plan E), was selected as the NER Plan. Under Whiskey Island Plan C, Whiskey Island would be restored to its minimal design plan with 5 years of advanced fill. The project layout for Whiskey Island Plan C was designed to avoid disturbing approximately 286 acres of existing mangroves on the island to minimize the ecological impact during construction (USACE 2010).

The proposed Caillou Lake Headlands restoration location of the Louisiana Outer Coast Restoration project is based on the Whiskey Island Plan C.

9.3.4 Findings

9.3.4.1 Summary

The LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010) provides the supporting analysis to determine whether the Caillou Lake Headlands Restoration is likely to result in significant impacts to the quality of the human environment. As stated in USACE (2010), the restoration of Caillou Lake Headlands is expected to provide long-term benefits to Louisiana coastal resources without significant long-term adverse environmental impacts. Construction-related adverse impacts, such as noise, increased turbidity, increased air emissions, the placement of borrow material on existing habitat, and the displacement of wildlife and fisheries, are considered short-term and temporary. In addition, the document notes that "because this alternative would create barrier island habitat with features on a scale similar to existing projects, and would include native species plantings to quickly establish targeted vegetative communities, the anticipated risk of causing conditions favorable to encroachment and impacts by invasive species would be negligible".

Over the long-term, project implementation would result in the restoration of beach, dune, and back-barrier marsh habitat, and would provide important and essential habitats used by fish and wildlife. Indirect benefits to commercial and recreational fisheries are expected by increasing the quantity and quality of fish habitat.

9.3.4.2 Public Input

As part of the LCA Terrebonne Basin Barrier Shoreline Restoration Feasibility Study, a Notice of "Intent To Prepare a Draft Supplemental Environmental Impact Statement" was published in the Federal Register (volume 73, number 246) on December 22, 2008. A public scoping meeting was held on February 10, 2009 in Houma, Louisiana. A total of 45 participants signed in for the scoping meeting (USACE 2010). The Supplemental EIS was released to the public in June 2010, and included a 45-day public review period. A public meeting was held during this time to solicit comments on the proposed action. Comments from the review period were incorporated into the EIS, and the Final EIS was released for a 30-day public review in October 2010 (USACE 2010).

9.3.4.3 Potential Adverse Impacts to Infrastructure

Some oil and gas pipelines are present in the vicinity of the proposed action. To minimize the potential damage to these features, the pipeline locations have been identified so they may be avoided in the implementation of the proposed action. The construction contractor would also verify the location of these features. The restoration work to create the project features on Whiskey Island will not cross pipeline infrastructure. The temporary sediment pipeline in the conveyance corridors from Ship Shoal Block 88 and Whiskey 3A borrow areas will cross existing pipelines, however impacts are not anticipated. For these reasons, adverse impacts to oil and gas infrastructure are not anticipated.

9.3.5 Additional Considerations

9.3.5.1 Section 7 Endangered Species Act (ESA)

The history of the ESA consultation by the USFWS for this project is summarized below. The USFWS issued a final biological opinion in 2010 for the LCA Terrebonne Basin Barrier Shoreline Restoration Project (USFWS 2010) and its effects on threatened piping plover (*Charadrius melodus*) and its designated critical habitat. The USFWS determined that the level of anticipated take is not likely to result in jeopardy to the piping plover species or destruction or adverse modification of its critical habitat. Following implementation, the available habitat for wintering piping plover sheltering and foraging will be increased significantly, to the direct benefit of the species. The USFWS also concurred with the determination of the United States Army Corps of Engineers (USACE) that the project was not likely to adversely affect the West Indian Manatee. Recent research has reinforced the importance of long-term maintenance of overwash features to support the piping plover population (Schupp et al. 2012).

NOAA's National Marine Fisheries Service (Crabtree 2012) responded to a request from the USACE for Section 7 consultation pursuant to the Endangered Species Act (ESA) for the Shell Island and Caillou Lake Headlands project locations for the Louisiana Outer Coast Restoration project. In this consultation, NMFS noted that "Five ESA-listed species of sea turtles (the endangered leatherback, Kemp's ridley, and hawksbill; the threatened/endangered green; and the threatened loggerhead) can be found in or near the action area and may be affected by the project (there is no designated critical habitat in or near the project area). NMFS has analyzed the routes of potential effects from the proposed project and determined that sea turtles are not likely to be adversely affected" (footnotes omitted). NMFS further notes that the "implementation of NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk of injury to sea turtles."

A revised biological assessment was prepared in 2013 for the Caillou Lake Headlands Restoration Project with the project now proposed to be implemented by CPRA instead of the USACE and incorporating a slightly revised design. In an August 12, 2013 letter from the USFWS to the USACE (USFWS 2013), the USFWS set out non-discretionary reasonable and prudent measures (RPMs) and terms and conditions for the project sponsor to minimize take on nonbreeding piping plovers during implementation of the project. These RPMs are discussed further below. The USFWS also provided conservation recommendations to the project sponsor. The August 12, 2013 letter represents an amendment to the 2010 Biological Opinion (USFWS 2010) and incorporates the 2010 Biological Opinion as an attachment to the letter.

The State, NOAA and DOI prepared a supplemental biological assessment (BA) for three barrier island locations in Louisiana that are part of the Louisiana Outer Coast Restoration project: Caillou Lake Headlands (Whiskey Island), Chenier Ronquille, and Shell Island (West Lobe and Portions of East Lobe) (Armbruster et al. 2014). This supplemental BA provides the information pursuant to the ESA and implementing regulation (50 CFR 402.14), to ensure the proposed projects are not likely to jeopardize the continued existence of the proposed red knot (*Calidris canutus rufa*). The information within this Supplemental BA is presented to facilitate a conference for the proposed red knot for each project location independently. In addition, the supplemental BA reviews the Chenier Ronquille and Shell

Island[3] projects with respect to West Indian manatee as manatee was not previously considered and the Shell Island project with respect to piping plover because the environmental baseline of Shell Island has changed since the original consultation. Reinitiation was requested for all three proposed projects on May 13, 2014 (McClain 2014).

For Caillou, the supplemental BA anticipates that “the proposed project May Affect, and is Likely to Adversely Affect the red knot, if the species is listed prior to or during project implementation.” Therefore, the supplemental BA is intended “to initiate a formal conference to address potential impacts from the proposed Caillou Lake Headlands (Whiskey Island) Barrier Island restoration project to the red knot.” The supplemental BA also states that the non-discretionary, reasonable and prudent measures (RPMs) and terms and conditions identified for piping plover will be implemented for red knot as well (Armbruster et al. 2014). These RPMs include:

- A baseline piping plover and red knot distribution survey shall be conducted within the migrating and wintering season immediately prior to initial construction within the action area. As part of that survey, the project footprint should be delineated using a global position system (GPS) unit and appropriately marked/flagged for future survey reference and data collection.
- A survey of the intertidal benthic prey species community shall be conducted within the migrating and wintering season immediately prior to initial construction, at the same time as the piping plover and red knot distribution surveys, in order to establish a baseline of benthic prey species diversity and abundance.
- Piping plover and red knot monitoring surveys shall be conducted during the migrating and wintering seasons throughout initial project construction and three consecutive years following completion of initial construction.
- To confirm re-establishment of suitable foraging habitat for migrating and wintering piping plovers and knots, monitoring surveys of the intertidal benthic prey species community shall be conducted each year following completion of initial construction for three consecutive years, preferably at the same time as the bird surveys.
- USFWS shall be notified in writing at least six months prior to a re-nourishment event for each island. If re-nourishment events are conducted during the migrating and wintering season, piping plover monitoring surveys shall be conducted for the duration of construction activities.
- A comprehensive report describing the actions taken to implement the RPMs and terms and conditions associated with this incidental take statement (including data sheets from surveys conducted) shall be submitted to USFWS by June 1 of the year following completion of all required surveys.
- Upon locating a dead or injured piping plover or red knot that may have been harmed or destroyed as a direct or indirect result of the proposed project, CPRA and/or contractor shall be responsible for notifying the Service’s Lafayette, Louisiana, Field Office (337/291-3100) and the LDWF’s Natural Heritage Program (225/765-2821). Care shall be taken in handling an injured

[3] Effects to manatee were considered previously for dredging borrow areas for the Shell Island project, but were not considered for the deposition of dredged material around Shell Island (USFWS 2012).

piping plover or red knot to ensure effective treatment or disposition and in handling dead specimens to preserve biological materials in the best possible state for later analysis.

If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the Trustees would re-initiate consultations with the regulatory agencies. Trustees would ensure due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

9.3.5.2 Essential Fish Habitat (EFH)

Fishery resources in the project area include marine and estuarine finfish and shellfish. Aquatic and tidally influenced habitats within the project area are designated as EFH for various life stages for shrimp, red drum, reef fish, and stone crab. In addition, the water bodies and wetlands in the project area provide nursery and foraging habitats supportive of a variety of economically important fishery species, such as striped mullet, Atlantic croaker, Gulf menhaden, spotted and sand seatrout, southern flounder, black drum, and blue crab. Some of these species serve as prey for other Federally-managed fish species such as mackerels, snappers, groupers, billfishes, and sharks. An EFH assessment for the proposed project was completed, including consultation with the National Marine Fisheries Service (NMFS) (Croom 2010). Table 9-1 presents a list of defined EFH types for species potentially in the project area.

Table 9-1. Designated EFH for listed federally managed species by various life stages identified for Caillou Lake Headlands Barrier Island Restoration.

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Brown shrimp	Eggs	M	<18-110 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	Juvenile	E	<18 m: SAV, sand/shell/soft bottom, emergent marsh, oyster reef
	Adult	M	14-110 m; sand/shell/soft bottom
White shrimp	Eggs	M	<9-34 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; soft bottom, emergent marsh
	Juvenile	E	<30 m; SAV, soft bottom, emergent marsh
	Adult	M	9-34 m; soft bottom
Pink shrimp	Juvenile	E	<65 m; sand/shell substrate
Gulf stone crab	Eggs	M/E	<18 m: sand/shell/soft bottom
	Larvae/postlarvae	M/E	<18 m; pelagic, oyster reef, soft bottom
	Juvenile	E	<18 m; sand/shell/soft bottom
Red Drum	Eggs	M	<46m; Gulf of Mexico (GOM)
	Larvae/Postlarvae	E	All estuaries; planktonic, SAV, sand/shell/soft bottom, emergent marsh
	Juvenile	M/E	GOM <5 m; all estuaries, SAV sand/shell/soft/hard bottom, emergent marsh
	Adult	M/E	GOM 1-46 m; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Red snapper	Eggs	M	18-37 m; pelagic
	Larvae	M	18-37 m; pelagic
	Juvenile	M	17-183 m; hard/soft/sand/shell bottom
	Adult	M	7-146 m; reefs, hard/sand/shell bottom

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Vermillion snapper	Juvenile	M	20-200 m; reefs, hard bottom
Lane snapper	Eggs	M	4-132 m; pelagic
	Larvae	E/M	4-132 m; reefs, SAV
	Juvenile	E/M	<20 m; SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	Juvenile	E/M	SAV, mangrove, emergent marsh
Dwarf sand perch	Juvenile	M	Hard bottom
Greater amberjack	Eggs	M	1-183 m; pelagic
	Larvae	M	1-183 m; pelagic
	Juvenile	M	1-183 m
Lesser amberjack	Eggs	M	Pelagic
	Larvae	M	Pelagic
	Juvenile	M	55-130 m
Almaco jack	Juvenile	M	15-160 m
Gray triggerfish	Eggs	M	10-100 m; reefs
	Postlarvae/juvenile	M	10-100 m
King mackerel	Eggs	M	35-180 m; pelagic
	Larvae	M	9-180 m; pelagic
	Juvenile	M	<9 m; pelagic
	Adult	M	35-180 m; pelagic
Spanish mackerel	Larvae	M	<50 m; isobath
	Juvenile	E/M	offshore, beach, estuarine
	Adult	M	Pelagic
Bluefish	Postlarvae/Juvenile	E/M	Beaches, estuaries, inlets
	Adult	E/M	Gulf, estuaries, pelagic
Cobia	Eggs	M	Pelagic
	Larvae	M	11-53 m; pelagic
	Juvenile	M	5-183 m; pelagic
Bonnethead shark	Juvenile	M	<25 m; inlets, estuaries, coastal waters
	Adult	M	<25 m
M=Marine; E=Estuarine; F=Freshwater			

NMFS provided the following EFH conservation recommendations (Croom 2010), and a response to each recommendation was included in the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010), in accordance with the Magnuson-Stevens Fishery Conservation and Management Act. Only recommendations that apply to Caillou Lake Headlands are included here. The response to the recommendation is provided indented below the respective recommendation:

- Recommendation: Including tidal creeks and ponds in created marsh platform designs should be considered to the maximum extent practicable to ensure the development of functional habitat heterogeneity.

    Response: The Preconstruction Engineering and Design (PED) process will develop island design alternatives that address habitat heterogeneity, stability, and longevity.

- Recommendation: Containment dikes for the marsh platforms should be degraded or gapped in an acceptable manner to be developed through coordination with NMFS.
  - Response: The Preconstruction Engineering and Design (PED) process will develop island design alternatives that address habitat heterogeneity, stability, and longevity.
- Recommendation: During the PED phase of project implementation, the need for dredging windows to avoid or minimize potential impacts to blue crab in the vicinity of Ship Shoal should be considered through further coordination with NMFS, the Bureau of Ocean Energy Management, Regulation and Enforcement, and other interested resource agencies.
  - Response: All concerned agencies will be consulted regarding timing of utilization of the Ship Shoal borrow areas in order to minimize impact to fisheries resources.

9.3.5.3 Marine Mammal Protection Act

There is no anticipated incidental take of marine mammals associated with the project. The Trustees intend to implement the USFWS "Standard Conditions for In-water Work in the Presence of Manatees" and NOAA's Measures for Reducing Entrapment Risk to Protected Species, revised on May 22, 2012 . The NOAA measures are included below:

Pre-construction Planning

During project design, the project proponents will incorporate at least one escape route into the proposed retention structure(s) to allow any protected species to exit the area(s) to be enclosed. Escape routes must lead directly to open water outside the construction site and must have a minimum width of 100 feet. Escape routes should also have a depth as deep as the deepest natural entrance into the enclosure site and must remain open until a thorough survey of the area, conducted immediately prior to complete enclosure, determines no protected species are present within the confines of the structure.

Pre-construction Compliance Meeting

Prior to construction, project proponents, the contracting officer representative, and construction personnel should conduct a site visit and meeting to develop a project-specific approach to implementing these preventative measures.

Responsible Parties

The project proponents will instruct all personnel associated with the project of the potential presence of protected species in the area and the need to prevent entrapment of these animals. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing protected species. Construction personnel will be held responsible for any protected species harassed or killed as a result of construction activities. All costs associated with monitoring and final clearance surveys will be the responsibility of project proponents and will be incorporated in the construction plan.

Monitoring During Retention Structure Construction

It is the responsibility of construction personnel to monitor the area for protected species during dike or levee construction. If protected species are regularly sighted over a 2 or 3 day period within the enclosure area during retention structure assembly, construction personnel must notify the project proponent. It is the responsibility of the project proponent to then coordinate with the NMFS Marine Mammal Health and Stranding Response team (1-877-WHALE HELP [1-877-942-5343]) or the appropriate State Coordinator for the Sea Turtle Stranding and Salvage Network (see http://www.sefsc.noaa.gov/species/turtles/stranding_coordinators.htm) to determine what further actions may be required. Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area.

Pre-closure Final Clearance

Prior to completing any retention structure by closing the escape route, the project proponent will ensure that the area to be enclosed is observed for protected species. Surveys must be conducted by experienced marine observers during daylight hours beginning the day prior to closure and continuing during closure. This is best accomplished by small vessel or aerial surveys with 2-3 experienced marine observers per vehicle (vessel/helicopter) scanning for protected species. Large areas (e.g. >300 acres) will likely require the use of more than one vessel or aerial survey to ensure full coverage of the area. These surveys will occur in a Beaufort sea state (BSS) of 3 feet or less (measured within the area being closed by the containment), as protected species are difficult to sight in choppy water. Escape routes may not be closed until the final clearance determines the absence of protected species within the enclosure sight.

Post closure Sightings

If protected species become entrapped in an enclosed area, the project proponent and NMFS must be immediately notified. If observers note entrapped animals are visually disturbed, stressed, or their health is compromised then the project proponent may require any pumping activity to cease and the breaching of retention structures so that the animals can either leave on their own or be moved under the direction of NMFS.

In coordination with the local stranding networks and other experts, NMFS will conduct an initial assessment to determine the number of animals, their size, age (in the case of dolphins), body condition, behavior, habitat, environmental parameters, prey availability and overall risk.

If the animal(s) is/are not in imminent danger they will need to be monitored by the Stranding Network for any significant changes in the above variables.

Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area. Coordination by the project proponent with the NMFS SER Stranding Coordinator may result in authorization for these actions.

NMFS may intervene (catch and release and/or rehabilitate) if the protected species are in a situation that is life threatening and evidence suggests the animal is unlikely to survive in its immediate surroundings.

Surveys will be conducted throughout the area at least twice or more in calm surface conditions (BSS 3 feet or less - measured within the area being closed by the containment)), with experienced marine observers, to determine whether protected species are no longer present in the area.

9.3.5.4 Section 106 National Historic Preservation Act (NHPA)

On July 29, 2010, the USACE executed a Programmatic Agreement for the LCA Plan among the USACE, CPRA, SHPO, and ACHP, pursuant to 36 CFR § 800.14(b)(1). The Programmatic Agreement establishes the procedures for consultation, identification of historic properties, and assessment and resolution of adverse effects (Appendix F in USACE 2010). A Phase I Cultural Resources Survey of the project area surrounding Whiskey Island was conducted as part of the LCA TBBSR project in 2011 (Goodwin et al. 2011). The Caillou Lake Headlands project has subsequently undergone a Phase I Cultural Resources Survey (Goodwin et al. 2013a) and a Phase II Cultural Resources Survey (Goodwin et al. 2013b), with the following findings (Goodwin et al. 2013b):

- No reported historic archeological sites, historic standing structures, or significant traditional cultural properties previously have been recorded within 1.0 mi (1.6 km) of the survey area; no shipwrecks previously have been identified within the survey area. Review of the geomorphology and history of the project area suggests that the potential for the discovery of historic shipwrecks varies from low to moderate on the Gulf and bay sides of Whiskey Island, respectively.
- The 2011 Phase I submerged cultural resources investigation included a remote sensing survey of 189.4 linear miles (304.8 km) of transects spaced at 75.0 ft (22.9 m) intervals over an area measuring approximately 1920.0 acres or 3.0 mi^2 (7.8 km^2) surrounding Whiskey Island. No reported cultural resources were recorded in the survey area. The data analyses identified thirteen targets that exhibit the potential to represent submerged cultural resources.
- Three of the targets (07, 09, and 10) identified during the 2011 Phase I survey of submerged areas surrounding Whiskey Island were determined in need of Phase II diving investigation prior to commencement of the NRDA Caillou Lake Headland shoreline restoration project for Whiskey Island. All three of these targets consist of groups of 2-4 magnetometer anomalies; none of the targets exhibited side scan sonar contacts or buried profiler images.
- Controlled archeological assessments (i.e., diver visual, touch and pneumatic probe survey) fully investigated each of the magnetic anomalies that comprised the target groupings and their surrounding areas. On Target 10, an iron fence post was discovered. All contacts with subbottom anomalies resulted in targeted close order pneumatic probe investigation. None of the anomalies were determined to be cultural resources.
- A determination of “No historic properties affected” (36 CFR 800.4) was recommended for the three targets investigated. Concurrence with this recommendation was sought from BOEM, the Louisiana Division of Archaeology (LASHPO) and the U.S. Army Corps of Engineers, New Orleans District (USACE). BOEM and LASHPO agreed with the recommendations for a determination of “No historic properties affected” (36 CFR 800.4) for the anomalies that compose Targets 07, 09 and 10.
- The 2013 Phase I submerged cultural resources investigation included a remote sensing survey of 483 linear miles of transects spaced at 98.0 ft (30.0 m) intervals of the Whiskey 3A and Ship Shoal (Block 88) borrow areas and associated conveyance corridors. Analyses of the data in the Whiskey 3A borrow area and associated conveyance corridor identified two targets (3A Targets 10 and 11) exhibiting characteristics that could represent submerged cultural resources in the

conveyance corridor. Analyses of the data in the Ship Shoal Block 88 borrow area and conveyance corridor identified two targets (88 Targets 04 and 06) that could represent submerged cultural resources in the conveyance corridor.

- The project team consulted with BOEM and adjusted the project design to accommodate recommended buffers. A determination of "No historic properties affected" (36 CFR 800.4) was recommended provided that the four targets identified during data analyses are avoided by a distance determined through consultation with relevant authorities. BOEM and LASHPO agreed with the recommendations.

In addition, DOI is initiating a complete review of this project under Section 106 of the NHPA. This review would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

9.3.5.5 Bald and Golden Eagle Protection Act

Currently, the Caillou Lake Headlands project site does not provide appropriate habitat suitable for nesting bald eagle and no bald eagles are known to nest near the project area. However, if any bald eagle nests are observed prior to or during construction, appropriate best management practices (USFWS 2007) to avoid disturbance to nesting bald eagles shall be implemented.

9.3.5.6 Migratory Bird Treaty Act

Migratory birds are known to nest in the project area. A migratory bird abatement plan is under development by the State in coordination with the USFWS. This plan will include measures to protect migratory birds during project implementation and thereby avoid take under the MBTA.

9.3.5.7 Clean Water Act Section 404/Rivers and Harbors Act (CWA/RHA)

The proposed discharge of dredged or fill material into waters of the United States, including wetlands, or work affecting navigable waters associated with this project is currently being coordinated with the USACE pursuant to the Clean Water Act Section 404 and Rivers and Harbors Act (CWA/RHA). The Joint Coastal Pre-Application Meeting for this project occurred on December 11, 2012, and a permit application was received by January 23, 2013. Coordination with the USACE and final authorization pursuant to CWA/RHA will be completed prior to project implementation.

9.3.5.8 Coastal Zone Management Act

Under the Coastal Zone Management Act of 1972, Federal Trustees must seek to ensure that the selection of the projects for early restoration are consistent to the maximum extent practicable with the federally-approved coastal management programs for the states where such projects include activities with the potential to affect a coastal use or resource. Coincident with the public review of the Phase III DERP/PEIS, the Federal Trustees submitted a consistency determination for the early restoration projects proposed in Louisiana for appropriate review by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM) on December 12, 2013 (Federal Trustees 2013). LDNR OCM responded on February 18, 2014, concurring with the federal determination for purposes of selection of the early restoration projects in Louisiana, but reserved its additional state reviews for consistency for future federal agency activities, and for non-federal activities subject to federal permitting processes or Louisiana's Coastal Use Permit (CUP) program, as required or appropriate to those processes (Haydel 2014).

Previously, the LCA Terrebonne Basin Barrier Shoreline Restoration project, which included Whiskey Island Plan C, was reviewed and found to be consistent with the Louisiana Coastal Resources Program (LCRP), provided the USACE complied with LDWF stipulations (DuCote 2010). A permit application for the Caillou Lake Headland project was reviewed by OCM and a coastal use permit (P20121652) and favorable consistency determination was issued for the project (Morgan 2013).

9.3.6 Summary and Next Steps

As discussed above, DOI has adopted the LCA Integrated Feasibility Study and Final EIS for the Terrebonne Basin Barrier Shoreline Restoration to fulfill DOI's NEPA requirements for analysis of the Caillou Lake Headlands restoration location of the Louisiana Outer Coast Restoration project. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts in preparing the final Phase III ERP/PEIS. Trustees' determination on selection of this project (Louisiana Outer Coast Restoration) will be included in the Record of Decision. This project is consistent with the programmatic Alternative 2 (Contribute to Restoring Habitats and Living Coastal and Marine Resources) and the programmatic Alternative 4 (Preferred Alternative). This project would be implemented in accordance with all applicable laws and regulations.

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USFWS. 2013. Letter to Colonel Richard L. Hansen, U.S. Army Corps of Engineers. August 12. Comments on biological assessment from the Louisiana Coastal Protection and Restoration Authority's (CPRA) consultant, Coastal Engineering Consultants, Inc. (CECI), regarding CPRA's permit application (MVN-2013-0266-WOO) for their proposed Caillou Lake Headland Restoration (i.e., Whiskey Island, CPRA Project TE-l 00) project in Terrebonne Parish, Louisiana.

9.4 Louisiana Outer Coast Restoration Project: Environmental Review B (Chenier Ronquille Barrier Island)

DOI has independently evaluated the 2013 Environmental Assessment for the Chenier Ronquille Barrier Island Restoration Project (Chenier Ronquille EA), BA-76, prepared by NOAA (2013), and finds that it complies with CEQ and DOI requirements for adopting NEPA analyses prepared by other agencies (See Section 7.8 for information on DOI NEPA adoption regulations and criteria). The Chenier Ronquille EA and Finding of No Significant Impact can be found in their entirety at (http://losco-dwh.com).

This project is consistent with coastal protection programs and activities in Louisiana, including the LCRP (Lovell 2011) and the CWPPRA program and activities pursuant to the Louisiana Coastal Area Ecosystem Restoration Study (USACE 2004). These programs and activities have undergone programmatic NEPA analysis[4].

Accordingly, DOI has adopted the Chenier Ronquille EA to fulfill DOI's NEPA requirements for analysis of the Chenier Ronquille restoration location of the Louisiana Outer Coast Restoration project. Below is a brief summary of the portions of the Chenier Ronquille EA that are relevant to this proposed project.

9.4.1 Proposed Action

The proposed restoration on Chenier Ronquille Island would repair the breaches in the shoreline and prevent creation of new breaches over the 20-year project life, while reestablishing and increasing the island's longevity via dune and marsh creation. Additionally, the project would restore the shoreline, dune, and back-barrier marsh to increase island habitat utilized by essential fish and wildlife species both on the barrier headland and in quiescent bays.

Construction would utilize dredged sediment to create a beach, dune and marsh platform. Marsh construction would be to +2.5 ft NAVD88, because soil settlement analysis indicated this would provide the optimum number of years above mean high water (accounting for settlement of fill material, subsidence, and eustatic sea level rise) and is similar to the marsh elevation used for similar successful projects. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies.

The dune has a constructed elevation of +8 feet, NAVD and a width of 150 feet. Dune cross-sections are designed to maintain a minimum of +5 ft NAVD88 dune height after a 10-year storm event (Thomson et al. 2011). Sand fencing would be erected on the constructed dune to capture naturally windblown sand and passively build or maintain the dune feature.

[4] Louisiana Coastal Wetlands Restoration Plan: Main Report and Environmental Impact Statement (LCWCRTF 1993) and Final Programmatic Environmental Impact Statement, Louisiana Coastal Area (LCA), Louisiana, Ecosystem Restoration Study (USACE 2004).

After a period of settlement and salinity stabilization of placed materials, native intertidal and dune habitat species would be planted in phased events over the first 3 years. Plantings would help establish the plant community, and foster retention of placed sediments.

9.4.2 The Need for the Proposed Action

This action meets the purpose and need of the Phase III ERP/PEIS because it will accelerate meaningful restoration of injured natural resources and their services resulting from the Spill.

9.4.3 The Environmental Impacts of the Proposed Action

For background, note that the CWPPRA Task Force and LCWCRTF (1993) prepared a Programmatic Environmental Impact Statement (PEIS) that included information on this type of project (barrier islands). In addition, a Final Programmatic EIS prepared by the USACE as part of the Louisiana Coastal Area Ecosystem Restoration Study (USACE 2004) also includes barrier islands in their evaluation of restoration actions. This document includes background information on the goals of the CWPPRA program and coastal protection and restoration in Louisiana. The project proposed here is consistent with those CWPPRA goals. The EA specifically evaluates the significance of impacts on the quality of the human environment associated with the proposed action and design alternatives.

The Trustees intend to construct alternative 5 (hereafter: the preferred alternative) as evaluated in the Chenier Ronquille EA. The preferred alternative fulfills the project goal and objectives, while providing the lowest cost per constructed acre of the evaluated alternatives. Furthermore, no pipelines have to be crossed to construct the primary dike. It provides the largest marsh of the evaluated design alternatives, which would minimize the potential for breaching.

As discussed in the Chenier Ronquille EA, the preferred alternative is expected to provide long-term benefits to Louisiana coastal resources without significant long-term adverse environmental impacts. Construction-related adverse impacts, such as noise, increased water turbidity, and increased air emissions are considered short-term, minor and not significant because they are temporary or reversible.

With respect to invasive species, the Chenier Ronquille EA states, “Executive Order 13112 requires federal agencies to use authorities to prevent introduction and control (in cost effective and environmentally sound manners) invasive species, and to provide for restoration of native species and habitats in ecosystems that have been invaded. The purpose of the preferred alternative is to restore the native habitat; it would not introduce invasive species.”

9.4.3.1 Section 7 Endangered Species Act (ESA)

The EA provides information on measures that would be taken to avoid and minimize potential adverse impacts to existing resources, such as threatened and endangered species. The project sponsor will uphold all avoidance and minimization measures identified in the Chenier Ronquille EA and associated consultation (USFWS 2012a) and included in the supplemental BA (Armbruster et al. 2014). These measures from the supplemental BA are listed below:

- Education of the Federal and State teams [i.e., any individuals working on the project] and construction contractors on the species interactions to avoid would be part of the ongoing Federal [i.e., NOAA] oversight.
- Nesting colonial waterbirds, piping plover, red knot, and manatee would be avoided given provisions provided by USFWS and NMFS Protected Resources.
- The most recent version of the "Standard Conditions for In-water Work in the Presence of Manatees" provided by USFWS would be implemented.

NOAA's National Marine Fisheries Service (Crabtree 2012) responded to a request from the USACE for concurrence with its project-effect determinations under Section 7 of the Endangered Species Act (ESA) for the Chenier Ronquille Barrier Island Restoration Project. In the concurrence, NMFS noted that "Four ESA-listed species of sea turtles (the endangered leatherback and Kemp's ridley; the threatened/endangered green; and the threatened loggerhead) can be found in or near the action area and may be affected by the project. The site is west of the Mississippi River, thus, NMFS expects no Gulf sturgeon to be present. There is no designated critical habitat in or near the project area.

NMFS has analyzed the routes of potential effects from the proposed project and determined that listed sea turtles are not likely to be adversely affected." NMFS further notes that the "implementation of NMFS' *Sea Turtle and Smalltooth Sawfish Construction Conditions* will further reduce the risk of injury to sea turtles" (footnotes omitted).

The State, NOAA and DOI prepared a supplemental BA for three barrier island locations in Louisiana that are part of the Louisiana Outer Coast Restoration project: Caillou Lake Headlands (Whiskey Island), Chenier Ronquille, and Shell Island (West Lobe and Portions of East Lobe) (Armbruster et al. 2014). This supplemental BA provides the information pursuant to the ESA and implementing regulation (50 CFR 402.14), to ensure the proposed projects are not likely to jeopardize the continued existence of the proposed red knot (*Calidris canutus rufa*). The information within this Supplemental BA is presented to facilitate a conference for the proposed red knot for each project location independently. In addition, the supplemental BA reviews the Chenier Ronquille and Shell Island[5] projects with respect to West Indian manatee as manatee was not previously considered and the Shell Island project with respect to piping plover because the environmental baseline of Shell Island has changed since the original consultation. Reinitiation was requested for all three proposed projects on May 13, 2014 (McClain 2014).

For Chenier Ronquille, the previous consultation (USFWS 2012a) and the supplemental BA concluded that the proposed activities are not likely to adversely affect the piping plover and red knot (if listed) because construction effects are temporary, discountable, and insignificant in nature. In addition, the proposed project would ultimately benefit the piping plover and red knot by increasing, restoring, and prolonging the existence of suitable habitat. Planned conservation measures and the low likelihood of

[5] Effects to manatee were considered previously for dredging borrow areas for the Shell Island project, but were not considered for the deposition of dredged material around Shell Island (USFWS 2012b).

manatee presence indicate the proposed project is also not likely to adversely affect the West Indian manatee.

The natural resource benefits anticipated from implementing the preferred alternative would include creation and restoration of saline marsh, dune, and associated barrier island habitats within the proposed project area. The increase in quality and acreage of fisheries habitat would be expected to have long-term beneficial impacts.

These conclusions are based on a review of relevant literature; site-specific data; project-specific engineering reports related to biological, physical, and cultural resources; and experience gained through many similar barrier island restoration projects in Louisiana over the past decade.

If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would re-initiate consultations with the regulatory agencies. Trustees would ensure due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

9.4.3.2 Essential Fish Habitat (EFH)

An EFH assessment for the proposed project was completed in consultation with NMFS on October 5, 2012 (Fay 2012). Categories of EFH in the proposed project area include estuarine emergent wetlands, mud substrates, submerged aquatic vegetation (SAV), estuarine water column, and marine water column. Red drum, brown shrimp and white shrimp are estuarine-dependent species. In the Barataria Basin, the estuarine-dependent assemblage, including white and brown shrimp and red drum, has shown decreasing trends over the last 10 to 20 years. These species migrate through tidal passes during their post-larval life stage and depend on the estuarine environment for survival and reproduction. Shrimp are prey species for other federally managed fish and crustaceans. Table 9-2 presents a list of defined EFH types for affected species potentially in the project area.

Table 9-2. Designated EFH for listed federally managed species by various life stages identified for Chenier Ronquille Barrier Island Restoration.

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Brown shrimp	Eggs	M	<18-110 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; sand/shell/soft bottom, SAV, marsh, oyster reef
	Juvenile	E	<18 m: SAV, sand/shell/soft bottom, marsh, oyster reef
	Adult	M	14-110 m; sand/shell/soft bottom
White shrimp	Eggs	M	<9-34 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; soft bottom, marsh
	Juvenile	E	<30 m; soft bottom, marsh
	Adult	M	9-34 m; soft bottom

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Red Drum	Larvae/Postlarvae	E	Planktonic, SAV, sand/shell/soft bottom, marsh
	Juvenile	M/E	<5 m; SAV sand/shell/soft/hard bottom, marsh
	Adult	M/E	1-46 m; SAV, pelagic, sand/shell/soft/hard bottom, marsh
Red snapper	Adult	M	7-146 m; reefs, hard/sand/shell bottom
Lane snapper	Larvae	E/M	4-132 m; reefs, SAV
	Juvenile	E/M	<20 m; SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	Juvenile	E/M	SAV, mangrove, emergent marsh
Bonnethead shark	Juvenile	M	<25 m; inlets, estuaries, coastal waters
	Adult	M	<25 m; inlets, estuaries, coastal waters
M=Marine; E=Estuarine; F=Freshwater			

9.4.3.3 Marine Mammal Protection Act

As discussed above, the Trustees intend to implement the "Standard Conditions for In-water Work in the Presence of Manatees". The conservation measures will ensure that construction activities do not startle, harm, or harass a manatee and that no work is conducted if a manatee is present in the action area; therefore, no take of manatee under MMPA is anticipated.

For marine mammals in general, the project is expected to result in short-term displacement from feeding areas during construction but it would have a long-term moderate benefit from increasing prey species nursery habitat (NOAA 2013). There is no anticipated incidental take of marine mammals associated with the project. The Trustees intend to implement NOAA's Measures for Reducing Entrapment Risk to Protected Species, revised on May 22, 2012. These measures are listed in Section 9.3.5.3 above.

9.4.3.4 Section 106 National Historic Preservation Act (NHPA)

Consultation with the SHPO was initiated on February 8, 2011 (NMFS 2011) and has been completed. The SHPO concurred on March 30, 2011 with NOAA's determination based on surveys conducted in 2010 (see NOAA 2013, Appendix A) that no historic properties would be affected by any element of the preferred alternative. Two historic sites previously reported near the project area are now located offshore of the proposed project area due to the area's high erosion, or oil and gas developments buried them. Magnetic and acoustic anomalies identified as suggestive of potentially sensitive submerged cultural resources in the borrow areas would be avoided.

In addition, DOI is initiating a complete review of this project under Section 106 of the NHPA. This review would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

9.4.3.5 Bald and Golden Eagle Protection Act
According to NOAA (2013), bald eagles are not historically present in the project area. However, if any bald eagle nests are observed prior to or during construction, appropriate best management practices (USFWS 2007) to avoid disturbance to nesting bald eagles shall be implemented.

9.4.3.6 Migratory Bird Treaty Act
According to NOAA (2013):

- No migratory birds are known to nest in the area. Foragers would be temporarily displaced during construction and benefit after construction through increasing the quality and longevity of foraging grounds.
- Due to the extended duration of proposed construction activities (and post-construction sand fencing and monitoring activities), it is not possible to conduct all work outside of nesting seasons. Consequently, a qualified biologist will inspect the project area for the presence of undocumented nesting birds and if needed, an abatement plan will be developed in coordination with USFWS and implemented for the duration of project construction.

9.4.3.7 Clean Water Act/Rivers and Harbors Act (CWA/RHA)
The proposed discharge of dredged or fill material into waters of the United States, including wetlands, or work affecting navigable waters associated with this project has been coordinated with the USACE pursuant to the Clean Water Act Section 404 and Rivers and Harbors Act (CWA/RHA). All applicable activities associated with the project have received final USACE authorization pursuant to Permit No. MVN-2011-03148-ETT, which was issued on November 7, 2012.

9.4.3.8 Coastal Zone Management Act
Under the Coastal Zone Management Act of 1972, Federal Trustees must seek to ensure that the selection of the projects for early restoration are consistent to the maximum extent practicable with the federally-approved coastal management programs for the states where such projects include activities with the potential to affect a coastal use or resource. Coincident with the public review of the Phase III DERP/PEIS, the Federal Trustees submitted a consistency determination for the early restoration projects proposed in Louisiana for appropriate review by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM) on December 12, 2013 (Federal Trustees 2013). LDNR OCM responded on February 18, 2014, concurring with the federal determination of consistency for purposes of selection of the early restoration projects in Louisiana, but reserved its additional state reviews for consistency for future federal agency activities, and for non-federal activities subject to federal permitting processes or Louisiana's Coastal Use Permit (CUP) program, as required or appropriate to those processes (Haydel 2014).

Previously, the Chenier Ronquille Barrier Island Restoration project was reviewed for consistency with the Louisiana Coastal Resources Program and found to be consistent with the LCRP (Lovell 2011).

9.4.4 The Environmental Impacts of the Alternatives Considered
During the design phase, six design alternatives were assessed for short and long term attainment of the project objectives. The assessment also included an analysis of trends for such variables as sea-level

rise, subsidence, and frequency of hurricanes to determine the impacts of these variables on the sustainability of designs. To meet project goals and objectives, all design alternatives involve creation of a beach and dune and were designed based on results of geotechnical studies, coastal process assessments, and topographic, bathymetric, and magnetometer surveys (Thomson *et al.* 2011). All design alternatives include the same marsh elevation, borrow areas, access areas, plantings, and containment dike construction. Through various engineering assessments and computer-aided modeling, it was determined that Alternatives 2, 3 and 4 did not meet one or more of the critical project objectives (Thomson *et al.* 2011). Consequently, Alternatives 2, 3 and 4 were eliminated from detailed evaluation. The No-Action Alternative, Alternative 1, Alternative 5, and Alternative 6 were compared in the EA. Because it is practical and feasible from a technical and economic standpoint, and had minimal environmental impacts, Alternative 5 was identified as the preferred build alternative.

The Chenier Ronquille EA provides the supporting analysis to determine whether the proposed action and design alternatives are likely to result in significant impacts to the quality of the human environment. Only short-term adverse impacts are anticipated related to construction and are considered minor and reversible. This conclusion is based on a review of relevant literature, site-specific data, and project-specific engineering reports related to biological, physical, and cultural resources. The area has numerous oil and gas pipelines in the vicinity of the proposed action. To minimize the potential damage to these features, multiple surveys have identified their locations so they may be avoided in the course of the proposed action. The construction contractor would also verify the location of these features. The preferred alternative obviates the need to cross pipeline infrastructure during the construction of the primary dike. For these reasons, adverse impacts to oil and gas infrastructure are not anticipated.

9.4.5 A List of Agencies and Persons Consulted

The project was authorized for engineering and design (Phase 1) on the 19th CWPPRA annual Priority Project List. The CWPPRA project selection process includes extensive public involvement and review by federal and state agencies. The project selection process begins around February of each year, when a series of Regional Planning Teams convene across the coast to solicit project nominations from the public, State and federal agencies, as well as members of industry and academia. The meetings are publicized via public notices and all members of the public are invited to attend. The nominated projects are screened and pared down to 20 nominees. Each federal agency represented in the CWPPRA program, the State, and each coastal parish participates in voting at the public meeting.

Interagency and academic working groups then evaluate the conceptual project. The 20 nominee projects are then voted on at a public meeting by the program's federal agencies and the State to obtain a list of the 10 top-ranking projects to continue through the process. These candidate projects undergo several months of further design and interagency evaluation. In the first months of each calendar year, the candidate projects are presented at a public meeting and voted on by the program agencies to be funded for Phase 1 analysis, which includes the activities necessary to complete engineering and design, permitting, land rights, and environmental compliance before the project moves to construction. All public meetings provide an opportunity for comment by interested parties. The Draft Chenier Ronquille EA was released for public comment on December 1, 2011. No comments were received.

9.4.6 Summary and Next Steps

As discussed above, DOI has adopted the 2013 Environmental Assessment for the Chenier Ronquille Barrier Island Restoration Project (Chenier Ronquille EA), BA-76, prepared by NOAA (2013) to fulfill DOI's NEPA requirements for analysis of the Chenier Ronquille restoration location of the Louisiana Outer Coast Restoration project. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts in preparing this Final Phase III ERP/PEIS. Trustees' determination on selection of this project (Louisiana Outer Coast Restoration) will be included in the Record of Decision. This project is consistent with the programmatic Alternative 2 (Contribute to Restoring Habitats and Living Coastal and Marine Resources) and the programmatic Alternative 4 (Preferred Alternative). This project would be implemented in accordance with all applicable laws and regulations.

9.4.7 References

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McClain, D. 2014. Supplemental Biological Assessment for the Proposed Louisiana Island Restoration: Caillou Lake Headlands (Whiskey Island), Chenier-Ronquille, and Shell Island. 3pp + Attachment.

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USFWS. 2007. National Bald Eagle Management Guidelines. http://www.fws.gov/midwest/eagle/pdf/NationalBaldEagleManagementGuidelines.pdf 210 pp.

USFWS. 2011. Letter to Mrs. Joy Merino, National Marine Fisheries Service. February 17. Response to request for a list of endangered, threatened, and proposed species and designated and proposed critical habitats.

USFWS. 2012a. Letter to Dr. John D. Foret, National Marine Fisheries Service. June 7. Response to request for concurrence that the proposed project is not likely to adversely affect piping plover.

USFWS. 2012b. Letter to Mr. Pete J. Serio, U.S. Army Corps of Engineers. September 26. Informal consultation regarding potential effects to the West Indian manatee and pallid sturgeon from dredging borrow areas to restore Shell Island. 2 pp.

9.5 Louisiana Outer Coast Restoration: Environmental Review C (Shell Island)

For the Shell Island (East and West Lobes) location of the Louisiana Outer Coast Restoration project, DOI has independently evaluated two relevant NEPA documents: (1) the Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final Environmental Impact Statement (EIS) (USACE 2012a), which considers a wide range of alternatives for restoration of Shell Island; and (2) the Shell Island Barrier Island Restoration Project Environmental Assessment (EA) (USACE 2012b), which describes the currently proposed project.

The LCA EIS includes an in-depth discussion of the environmental consequences of barrier island restoration at the Shell Island location and DOI finds that it complies with CEQ and DOI requirements for adopting NEPA analyses prepared by other agencies (See Section 7.8 for information on DOI NEPA adoption regulations and criteria). This document can be found in its entirety at (http://losco-dwh.com). Accordingly, DOI has adopted the LCA Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final EIS to fulfill DOI's NEPA requirements for analysis of the Shell Island (East and West Lobes) location of the Louisiana Outer Coast Restoration project. The USACE EA has relevant information but does not meet all of DOI's criteria for adoption. Below is a brief summary of the portions of the documents that are relevant to this proposed project.

9.5.1 Proposed Action

Restoration at the Shell Island (East and West Lobes) location would occur on Shell Island West and the western portion of Shell Island East, two barrier islands located along the southern margin of the Barataria Basin in Plaquemines Parish (Figure 9-12). Construction of Shell Island would utilize hydraulically dredged sediments to create beach, dune, and back-barrier marsh habitats. The back-barrier marsh platform would be constructed to an elevation of +2.5 ft. NAVD88. This elevation was also used on the Shell Island East Berm Barrier Island Restoration Project adjacent to the east. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. The dune platform would be constructed to an elevation of +8.0 ft. NAVD88, and sand fencing will be erected to capture windblown sand and foster dune development. The dune platform and portions of the supratidal areas would be planted with native vegetation shortly after construction. The back-barrier marsh platform would be planted after a period of compaction and dewatering has occurred and the platform is stable enough for planting activities.

This design includes the restoration of Shell Island West and the western portion of Shell Island East. Access channel and spoil areas include excavation and disposal areas. The Shell Island East Berm Barrier Island Restoration Project (BA-110), which includes the restoration of the eastern portion of Shell Island East, was constructed in 2013.

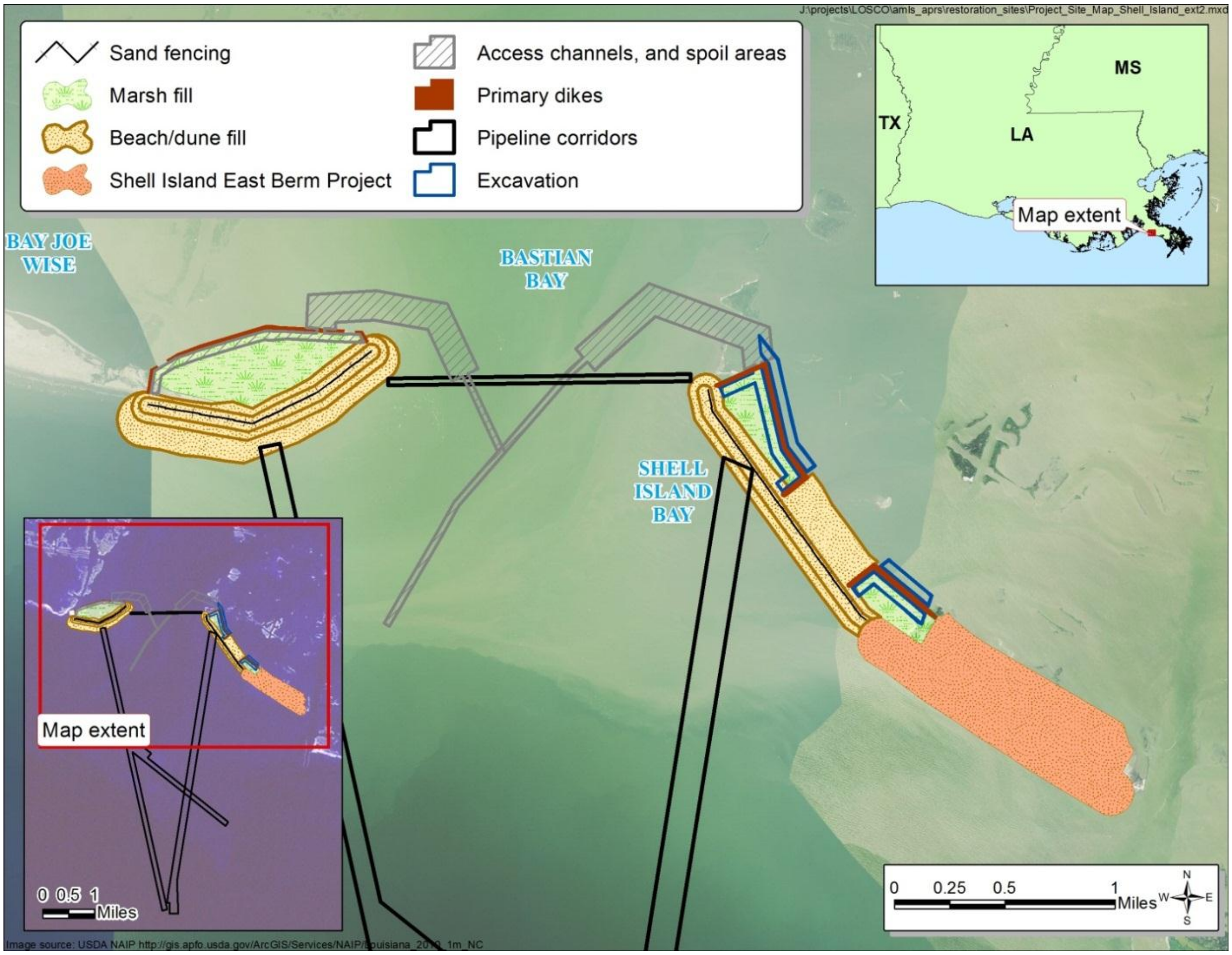

Figure 9-12. Conceptual design for Shell Island (East and West Lobes) location, [also referred to as the Shell Island West NRDA (East and West Lobes) Barrier Island Restoration (BA-111)].

9.5.2 Background

Plans and proposals to restore Shell Island have been developed in multiple documents, including Coast 2050: Toward a Sustainable Coastal Louisiana (LCWCRTF and WCRA 1998), the LCA Ecosystem Restoration Study (USACE 2004a), the Barataria Basin Barrier Shoreline Restoration Feasibility Report (Thomson et al. 2008), the LCA Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final EIS (USACE 2012a), and the Shell Island Barrier Island Restoration Project Environmental Assessment (EA) (USACE 2012b).

The LCA Ecosystem Restoration Study (USACE 2004a) included the Barataria Basin Barrier Shoreline Restoration as a near-term critical restoration feature under the LCA Plan. Caminada Headland and Shell Island reaches were specific features proposed as part of the near-term Barataria Basin Barrier Island Restoration plan. General information on the need for the Barataria Basin Barrier Shoreline Restoration project, the affected environment, and the environmental consequences were presented in the Final Programmatic EIS for the Louisiana Coastal Area (LCA) Ecosystem Restoration Study (USACE 2004b).

A more detailed evaluation of the alternatives and environmental consequences for the Barataria Basin Barrier Shoreline Restoration project was presented in the LCA Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final EIS (USACE 2012a). The potential environmental consequences for implementing the Recommended Plan / National Ecosystem Restoration (NER) Plan (Caminada Headland Alternative 5 and Shell Island Restoration Alternative 5), compared to the no action alternative, were considered (USACE 2012a). The impact analysis was based on a combination of scientific and engineering analyses, professional judgment, and previously compiled information (USACE 2012a). Under the proposed Recommended Plan/NER Plan, short-term impacts are anticipated as a result of the dredging and placement of borrow material during the construction activities, including covering of existing vegetation, increasing the level of turbidity in the water (water quality), the displacement of wildlife and fisheries, and injury to sessile or slow moving organisms. Short-term increases in the noise level and impacts to air quality (e.g., emissions), navigation, commercial fisheries, and recreational activities are also anticipated as a result of the construction activities. In addition, the Gulf of Mexico and Mississippi River water bottoms would be impacted from the removal of sand resources from the borrow site. Over the long-term, project implementation would result in the restoration of beach, dune, and back-barrier marsh habitat, and would provide important and essential habitats used by fish and wildlife for spawning, nursery, nesting, feeding, and cover. Indirect benefits to commercial and recreational fisheries are expected by increasing the quantity and quality of essential fish habitat.

This Final EIS also provides information on measures that should be taken to avoid and minimize potential adverse impacts to existing resources, such as threatened and endangered species.

An EA and Statement of Findings was completed for the Shell Island Barrier Island Restoration Project by the USACE in 2012 (USACE 2012b). The Shell Island Barrier Island Restoration Project EA provides information on the excavation and deposit of fill for constructing the Shell Island East Berm Barrier Island Restoration Project (BA-110) and the Shell Island West NRDA (East and West Lobes) Restoration Project (BA-111). The proposed action described here only includes the Shell Island West NRDA (East and West Lobes) Restoration Project (BA-111); the Shell Island East Berm Barrier Island Restoration Project (BA-110) was constructed in 2013.

9.5.3 Alternatives Analysis

In the LCA Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final EIS (USACE 2012a), a total of 8 action alternatives for Shell Island, in addition to the No Action Alternative, were evaluated. According to USACE (2012a), “the study included an analysis of trends for such variables as sea-level rise, subsidence, and frequency of hurricanes to determine the impacts of these variables on the sustainability of the designs.” All of the action alternatives involved the creation of barrier island back-barrier marsh, beach, and dune habitat, and were based on a feasibility study by Thomson et al. (2008). Alternative 1 would restore two islands, with no renourishment. Alternative 2 would restore two islands, with 10 years of renourishment. Alternatives 3 – 8 would restore a single island, under different renourishment scenarios. Based on an analysis of ecosystem benefits and cost-effectiveness, Shell Island Alternative 5, combined with Caminada Headland Alternative 5, was selected as the NER Plan and the Recommended Plan. Under Shell Island Alternative 5, Shell Island would be restored as a single island with 10 years of advanced fill, and re-nourished 20 years and 40 years after initial construction.

In developing specific engineering plans to implement restoration on Shell Island, CPRA developed a design that includes the construction of two separate lobes, Shell Island West and Shell Island East (Figure 9-7). No practicable, less damaging on-site or off-site alternatives were found feasible to the proposed restoration project (USACE 2012b). The proposed action described here is for the Shell Island West NRDA (East and West Lobes) Restoration Project (BA-111), which includes construction of the West Lobe and a portion of the East Lobe (Figure 9-7). As discussed above, the Shell Island East Berm Barrier Island Restoration Project (BA-110) was constructed in 2013.

9.5.4 Findings

9.5.4.1 Summary

The LCA Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final EIS (USACE 2012a) provides the supporting analysis to determine whether the Shell Island Restoration is likely to result in significant impacts to the quality of the human environment. As stated in this document, the restoration of Shell Island is expected to provide long-term benefits to Louisiana coastal resources without significant long-term adverse environmental impacts. Construction-related adverse impacts, such as noise, increased water turbidity, increased air emissions, the placement of borrow material on existing habitat, and the displacement of wildlife and fisheries, are considered short-term and temporary. This document also notes that because the recommended plan "would create barrier island habitat with features on a scale similar to existing projects and includes native species plantings to quickly establish targeted vegetative communities, the anticipated risk of causing conditions favorable to encroachment and impacts by invasive species would be negligible."

Over the long-term, project implementation would result in the restoration of beach, dune, and back-barrier marsh habitat, and would provide important and essential habitats used by fish and wildlife. Indirect benefits to commercial and recreational fisheries are expected by increasing the quantity and quality of essential fish habitat.

9.5.4.2 Public Input

A Notice of Intent to prepare a Final EIS for the LCA Caminada Headland and Shell Island Restoration Feasibility Study was published in the *Federal Register* (volume 70, number 96) on May 19, 2005. Scoping meetings were held on June 8, 2000; June 20, 2000; June 14, 2005; and June 16, 2005. Public meetings were held on July 26, 2011 in Plaquemines Parish and July 28, 2011 in Lafourche Parish, Louisiana. Meetings were held with stakeholders throughout the planning process.

For the Shell Island Barrier Island Restoration Project EA (USACE 2012b), a 20 day Joint Public Notice with the LA Department of Environmental Quality and the LA Department of Natural Resources was issued on May 8, 2012. All comments received during the 20 day public notice along with any observations by the USACE office and departments of the USACE district were forwarded to CPRA on June 8, 2012 for their concurrence or response. Engineering comments from the USACE district were forwarded to the applicant on June 28, 2012 for their concurrence or reply.

9.5.4.3 Potential Adverse Impacts to Infrastructure

Numerous oil and gas pipelines are present in the vicinity of the proposed action. To minimize the potential damage to these features, the pipeline locations have been identified so they may be avoided in the implementation of the proposed action. The construction contractor would also verify the location of these features prior to any construction activities. The proposed action obviates the need for any construction activities near pipeline infrastructure during the construction of the primary dike. For these reasons, adverse impacts to oil and gas infrastructure are not anticipated.

9.5.5 Additional Considerations

9.5.5.1 Section 7 Endangered Species Act (ESA)

A consultation for the East and West portions of Shell Island (BA-110/111) was completed by the Service on May 22, 2012 (USFWS 2012a). In this analysis, the Service concurred that the proposed East and West Shell Island restorations are not likely to adversely affect the piping plover because the completed project would sustain any existing suitable plover habitat; the potential disturbance to foraging and/or roosting plovers would be temporary and discountable in nature; and there is an abundance of suitable habitat in nearby areas into which piping plovers can temporarily disperse. No conservation measures were required at that time. Manatees were not discussed in the May 22, 2012 consultation, because the species was addressed in a different but related consultation for Caminada Headlands (USFWS 2011).

NOAA's National Marine Fisheries Service (Crabtree 2012) responded to a request from the USACE for Section 7 consultation pursuant to the Endangered Species Act (ESA) for projects including the Shell Island and Caillou Lake Headlands project locations. In this consultation, NMFS noted that "Five ESA-listed species of sea turtles (the endangered leatherback, Kemp's ridley, and hawksbill; the threatened/endangered green; and the threatened loggerhead) can be found in or near the action area and may be affected by the project (there is no designated critical habitat in or near the project area). NMFS has analyzed the routes of potential effects from the proposed project and determined that sea turtles are not likely to be adversely affected" (footnotes omitted). NMFS further notes that the "implementation of NMFS' Sea Turtle and Smalltooth Sawfish Construction Conditions will further reduce the risk of injury to sea turtles."

The State, NOAA and DOI prepared a supplemental BA (Armbruster et al. 2014) for three barrier island locations in Louisiana that are part of the Louisiana Outer Coast Restoration project: Caillou Lake Headlands (Whiskey Island), Chenier Ronquille, and Shell Island (West Lobe and Portions of East Lobe). This supplemental BA provides the information pursuant to the ESA and implementing regulation (50 CFR 402.14), to ensure the proposed projects are not likely to jeopardize the continued existence of the proposed red knot (*Calidris canutus rufa*). The information within this Supplemental BA is presented to facilitate a conference for the proposed red knot for each project location independently. In addition, the supplemental BA reviews the Chenier Ronquille and Shell Island[6] projects with respect to West Indian manatee as manatee was not previously considered and the Shell Island project with respect to

[6] Effects to manatee were considered previously for dredging borrow areas for the Shell Island project, but were not considered for the deposition of dredged material around Shell Island (USFWS 2012b).

piping plover because the environmental baseline of Shell Island has changed since the original consultation. Reinitiation was requested for all three proposed projects on May 13, 2014 (McClain 2014).

The supplemental BA proposed BMPs for Shell Island to avoid and minimize impacts to any piping plover, red knots and West Indian manatee as follows:

1. Education of the Federal and State teams [i.e., any individuals working on the project] and construction contractors on the species interactions to avoid would be part of the ongoing Federal [i.e., NOAA] oversight.
2. Nesting colonial waterbirds, piping plover, red knot, and manatee would be avoided given provisions provided by USFWS and NMFS Protected Resources.
3. The most recent version of the "Standard Conditions for In-Water Work in the Presence of Manatees" provided by USFWS will be implemented.

Implementation of the proposed project would ultimately benefit the red knot and piping plover by increasing, restoring, and prolonging the existence of suitable habitat. Due to the implementation of proposed conservation measures (bullet 1 and 2) and because construction effects are temporary, discountable, and insignificant in nature, we have determined that the proposed project is not likely to adversely affect the piping plover or red knot, if listed.

Due to the implementation of a conservation measure (bullet 3) and the low likelihood of manatee presence, we have determined the proposed project is not likely to adversely affect the West Indian manatee. As mentioned previously, manatees are afforded protection under the Marine Mammal Protection Act (MMPA) of 1972, as amended (16 U.S.C. 1461 et seq.). Because we have minimized effects to manatee to an insignificant and discountable level and no incidental take of manatees is anticipated under ESA, no take under the MMPA will occur (Armbruster et al. 2014).

If effects to listed species or their habitat differ from the effects subject to consultation, including unintended consequences to such species, the trustees would re-initiate consultations with the regulatory agencies. Trustees would ensure due diligence with regard to ensuring no unanticipated effects to listed species and habitats occur, including ensuring that BMPs are implemented and continue to function as intended.

9.5.5.2 Essential Fish Habitat (EFH)

Specific categories of EFH that have been designated in the project area include estuarine emergent wetlands; mud, sand, and shell substrates; estuarine and marine water column; and natural structural features in the proposed fill area. The project area includes existing intertidal and sub-tidal habitats including vegetated marsh, tidal flats and beaches, and shallow open water bottoms, all of which provide EFH for Federally-managed species. In the proposed borrow areas, EFH categories include marine water column and non-vegetated bottoms. An EFH scoping letter was prepared in 2005 that identified listed federally managed species by life stage. An analysis of EFH was completed in conjunction with preparation of the USFWS Draft and Final Coordination Act Report (NMFS PCTS 2012). Table 9-3 presents a list of defined EFH types for affected species potentially in the project area.

Table 9-3. Designated EFH for listed federally managed species by various life stages identified for Shell Island Restoration Project (USACE 2012a).

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Brown shrimp	Eggs	M	<18-110 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	Juvenile	E	<18 m: SAV, sand/shell/soft bottom, emergent marsh, oyster reef
White shrimp	Eggs	M	<9-34 m; sand/shell/soft bottom
	Larvae/postlarvae	M/E	<82 m; planktonic; soft bottom, emergent marsh
	Juvenile	E	<30 m; soft bottom, emergent marsh
	Adult	M	9-34 m; soft bottom
Red Drum	Eggs	M	<46m; Gulf of Mexico (GOM)
	Larvae/Postlarvae	E	All estuaries; planktonic, SAV, sand/shell/soft bottom, emergent marsh
	Juvenile	M/E	GOM <5 m; all estuaries, SAV sand/shell/soft/hard bottom, emergent marsh
	Adult	M/E	GOM 1-46 m; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Red snapper	Adult	M	7-146 m; reefs, hard/sand/shell bottom
Lane snapper	Eggs	M	4-132 m; pelagic
	Larvae	E/M	4-132 m; reefs, SAV
	Juvenile	E/M	<20 m; SAV, mangrove, reefs, sand/shell/soft bottom
Dog snapper	Juvenile	E/M	SAV, mangrove, emergent marsh
Dwarf sand perch	Juvenile	M	Hard bottom
Greater amberjack	Eggs	M	1-183 m; pelagic
	Larvae	M	1-183 m; pelagic
	Juvenile	M	1-183 m
Lesser amberjack	Eggs	M	Pelagic
	Larvae	M	Pelagic
Gray triggerfish	Eggs	M	10-100 m; reefs
	Postlarvae/juvenile	M	10-100 m
King mackerel	Larvae	M	9-180 m; pelagic
	Juvenile	M	<9 m; pelagic
Spanish mackerel	Larvae	M	<50 m; isobath
	Juvenile	E/M	offshore, beach, estuarine
	Adult	M	Pelagic
Cobia	Eggs	M	Pelagic
	Larvae	M	11-53 m; pelagic
	Juvenile	M	5-183 m; pelagic
Bonnethead shark	Juvenile	E	<25 m; inlets, estuaries, coastal waters
	Adult	M	<25 m
Bluefish	Postlarvae/Juvenile	E/M	Beaches, estuaries, inlets
	Adult	E/M	Gulf, estuaries, pelagic

M=Marine; E=Estuarine; F=Freshwater

9.5.5.3 Marine Mammal Protection Act
There is no anticipated incidental take of marine mammals associated with the project. The Trustees intend to implement NOAA's Measures for Reducing Entrapment Risk to Protected Species, revised on May 22, 2012. These measures are listed in Section 9.3.5.3 above.

9.5.5.4 Section 106 National Historic Preservation Act (NHPA)
On July 29, 2010, the USACE executed a Programmatic Agreement for the LCA EIS (USACE 2012a) among the USACE, CPRA, SHPO, and ACHP, pursuant to 36 CFR § 800.14(b)(1). The Programmatic Agreement establishes the procedures for consultation, identification of historic properties, and assessment and resolution of adverse effects. Cultural resource investigations have indicated that Shell Island would experience no direct impacts to cultural resources as the cultural integrity of the area has been compromised due to significant erosion and degradation over the past 50 years. Consequently, any archaeological resources and associated context that once may have been on the Shell Island have likely been destroyed.

The project has undergone an underwater cultural resources remote-sensing survey that identified magnetic anomalies and potential cultural anomalies (CP&E 2011). According to the report, "Potentially significant anomalies and anomaly clusters and associated sonar targets have been buffered and are recommended for avoidance." No historic properties will be impacted if:

- In Investigation Area 35E, 300 foot buffers are maintained around CR-1 (magnetic anomaly 9 and side-scan sonar targets 1 and 2), CR-2 (magnetic anomalies 5 and 30), and CR-3 (magnetic anomalies 6, 7, 8, 10, and 11).
- In Investigation Area 9, 300 foot buffers are maintained around the 15 potential cultural anomalies – CR-4 through CR-18 – identified in the survey.
- In the two pipeline corridors, a 100 foot buffer is maintained around CR-19, a possible buried cultural anomaly.

In addition, DOI is initiating a complete review of this project under Section 106 of the NHPA. This review would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

9.5.5.5 Bald and Golden Eagle Protection Act
According to USACE (2012a), bald eagles are not historically present in the project area. However, if any Bald Eagle nests are observed prior to or during construction, appropriate best management practices (USFWS 2007) to avoid disturbance to nesting Bald eagles shall be implemented.

9.5.5.6 Migratory Bird Treaty Act
According to USACE (2012a):

- A Nesting Prevention Plan would be developed, in coordination with the USFWS and LDWF, that outlines known habitat conditions of the project area, expected and potential colonial wading birds and other migratory birds, regulatory overview of Federal and state statutes relating to the implementation of a Nesting Prevention Plan, proposed abatement methods and techniques, safety and communication plans, ambient noise study implementation, monitoring of the project area, and reporting the status of the abatement measures.

- All abatement measures would be conducted by wildlife biologists familiar with colonial wading bird ecology and with proposed abatement methods (e.g., stationary and active audio and visual repellents and others). Prior to and during the nesting season, the project area would be inspected by qualified personnel for the presence of nesting colonies during the nesting season. In addition to surveillance, nesting prevention measures would be employed to discourage and prevent wading birds from nesting within a 1,000 foot range of the project areas. Active nesting prevention measures would be coordinated with the USFWS and LDWF and likely required from January to September during the year of construction.
- If measures to prevent colonial nesting bird populations are not successful in the project area, construction-related activities that would occur within 1,000 foot of a colony could be restricted to the non-nesting period, which in this region generally extends from September 1 to February 15, depending on the species present. This restriction would likely pose significant problems to construction activity schedules. If wading bird nesting colonies become established in the project area, the 1,000 ft buffer must be maintained unless coordination with the USFWS indicates that the buffer zone may be reduced based on the species present or an agreement is reached with USFWS that allows a modified process to be adopted.

9.5.5.7 Clean Water Act/Rivers and Harbors Act (CWA/RHA)

The proposed discharge of dredged or fill material into waters of the United States, including wetlands, or work affecting navigable waters associated with this project has been coordinated with the USACE pursuant to the Clean Water Act Section 404 and Rivers and Harbors Act (CWA/RHA). All applicable activities associated with the project have received final USACE authorization pursuant to Permit No. MVN-2012-0922-EFF, issued on October 23, 2012.

9.5.5.8 Coastal Zone Management Act

Under the Coastal Zone Management Act of 1972, Federal Trustees must seek to ensure that the selection of the projects for early restoration are consistent to the maximum extent practicable with the federally-approved coastal management programs for the states where such projects include activities with the potential to affect a coastal use or resource. Coincident with the public review of the Phase III DERP/PEIS, the Federal Trustees submitted a consistency determination for the early restoration projects proposed in Louisiana for appropriate review by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM) on December 12, 2013 (Federal Trustees 2013). LDNR OCM responded on February 18, 2014, concurring with the federal determination of consistency for purposes of selection of the early restoration projects in Louisiana, but reserved its additional state reviews for consistency for future federal agency activities, and for non-federal activities subject to federal permitting processes or Louisiana's Coastal Use Permit (CUP) program, as required or appropriate to those processes (Haydel 2014).

Previously, the LCA Barataria Basin Barrier Shoreline Restoration project was reviewed for consistency with the LCRP. Provided that USACE coordinates with LDWF and USFWS regarding piping plover and critical habitat as stipulated, the project was determined as consistent with the LCRP (Lovell 2011).

9.5.6 Summary and Next Steps

As discussed above, DOI has adopted the Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final Environmental Impact Statement (EIS) (USACE 2012a) to fulfill DOI's NEPA requirements for analysis of the Shell Island (East and West Lobes) location of the Louisiana Outer Coast Restoration project. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts in preparing the final Phase III ERP/PEIS. Trustees' determination on selection of this project (Louisiana Outer Coast Restoration) will be included in the Record of Decision. This project is consistent with the programmatic Alternative 2 (Contribute to Restoring Habitats and Living Coastal and Marine Resources) and the programmatic Alternative 4 (Preferred Alternative). This project would be implemented in accordance with all applicable laws and regulations.

9.5.7 References

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9.6 Louisiana Outer Coast Restoration Project: Environmental Review D (North Breton Island)

The proposed project—located at the southern end of the Chandeleur Island chain in Louisiana—would rebuild and re-establish portions of North Breton Island by restoring sand and sediment into the North Breton Island system. This project is intended to restore the island's physical and ecological functions by creating beach, dune and marsh habitats to support nesting brown pelicans, terns, skimmers and gulls—four bird groups injured by the Spill.

9.6.1 Introduction and Background

Breton National Wildlife Refuge (NWR) is recognized by the National Audubon Society as a globally important bird area due to the resources it provides birds. North Breton Island (part of Breton NWR) hosts one of Louisiana's largest historic brown pelican nesting colonies. However, surveys by Breton NWR staff indicate that this colony declined from over 15,000 pairs prior to 1998 to less than several thousand, including a reduction of approximately 50% of breeding pelicans between 2008 and 2012. Without actions to restore sand into the North Breton Island system, the island is expected to completely submerge sometime between 2014 and 2037 and evolve into a re-emerging sand bar (Lavoie 2009), rendering the island unusable by nesting brown pelicans and other seabirds. North Breton Island restoration is designed to increase the longevity of beach, dune and back barrier marsh habitats, providing nesting habitat for brown pelicans, terns, skimmers and gulls.

Restoration of North Breton Island would be designed to mimic the natural processes of barrier island evolution, including the lateral transport of sand. The conceptual design for placement of sand and back barrier marsh sediment mimics the pre-Hurricane Katrina island coverage and expected island evolution pattern. Approximately 3.7 million cubic yards of sand, silt and clay material would be dredged from borrow site(s) located within an offshore shoals borrow area southeast of Breton Island. This sand, silt, and clay material would then be placed on the existing submerged island to create the desired island configuration. Planting of the dune and back-barrier marsh area with native vegetation is planned to take place following construction. Sand fencing would be utilized to trap and retain deposited sediments and help build dune habitats. The proposed project design utilizes proven techniques and established methods used in other Louisiana barrier island restoration projects, such as those constructed through the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) program.

Consistency with Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan

Breton Island NWR was established in 1904 and is the second oldest national wildlife refuge in the National Wildlife Refuge System. The objectives of the refuge are to (1) provide sanctuary for nesting and wintering seabirds, (2) protect and preserve the wilderness character of the islands, and (3) provide sandy beach habitat for a variety of wildlife species. These actions are consistent with the mandates of the National Wildlife Refuge System. In 2008, the refuge developed a comprehensive conservation plan to describe refuge management— the Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan (CCP) (USFWS 2008).

The proposed North Breton project is consistent with the goals, objectives, and strategies of the Delta and Breton National Wildlife Refuges CCP (USFWS 2008). In addition, it explicitly meets the objectives of the refuge and supports the mission of the Refuge System, as defined by the National Wildlife Refuge System Improvement Act of 1997:

“...to administer a national network of lands and waters for the conservation, management, and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.” 16 U.S.C. §668 dd(a)(2).

9.6.2 Project Location

The project would have impacts at two locations: the restoration site at North Breton Island and the borrow area and dredge pipeline corridor located to the southeast of the island.

North Breton Island Restoration Site

The proposed restoration is located in the Breton NWR on North Breton Island at the southern end of the Chandeleur Island chain in the State of Louisiana, Plaquemines Parish in Breton Sound, part of the Gulf of Mexico (Figure 9-13). The approximate coordinates for the island are Latitude 29°29'22.91"N and Longitude 89°10'16.91"W. The proposed project location is managed by USFWS (Southeast Region).

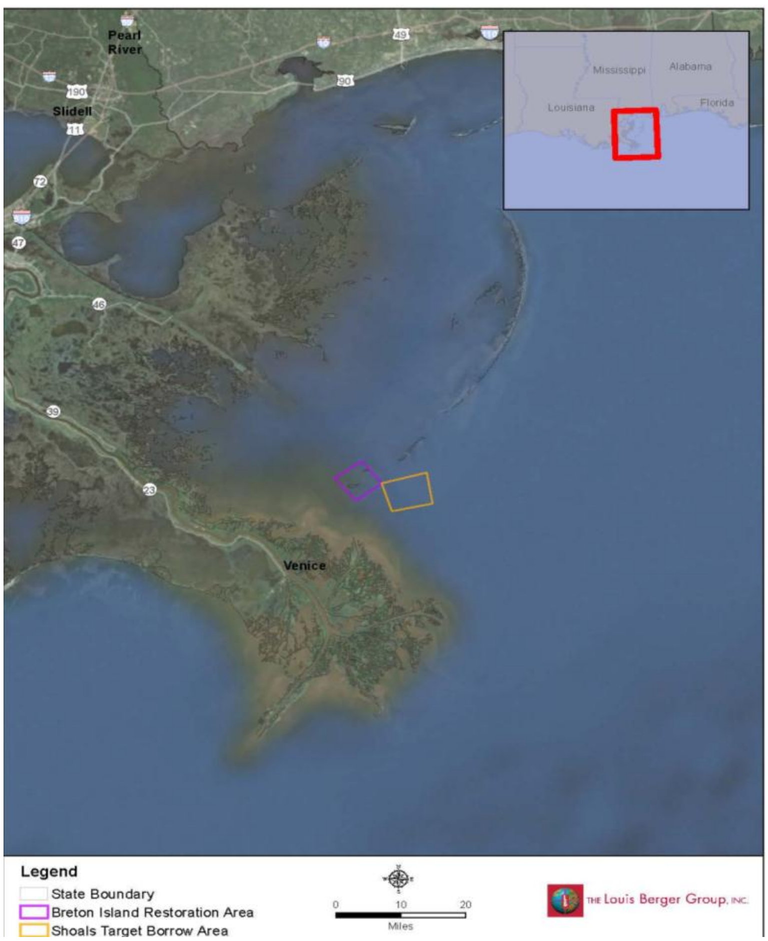

Figure 9-13. Project location.

Borrow Source

The borrow area to be used for the proposed restoration project is located approximately 2.5 miles southeast of Breton Island (Figure 9-14). Specific borrow sites would be identified within this area based on geotechnical analyses and testing of potential dredge material. The approximate center coordinates for the borrow site are Latitude29°44'83.98"N and Longitude 89°07'84.26"W. A corridor would be established between the borrow site(s) and the restoration site to facilitate the placement of a temporary pipeline for transport of hydraulically dredged fill material.

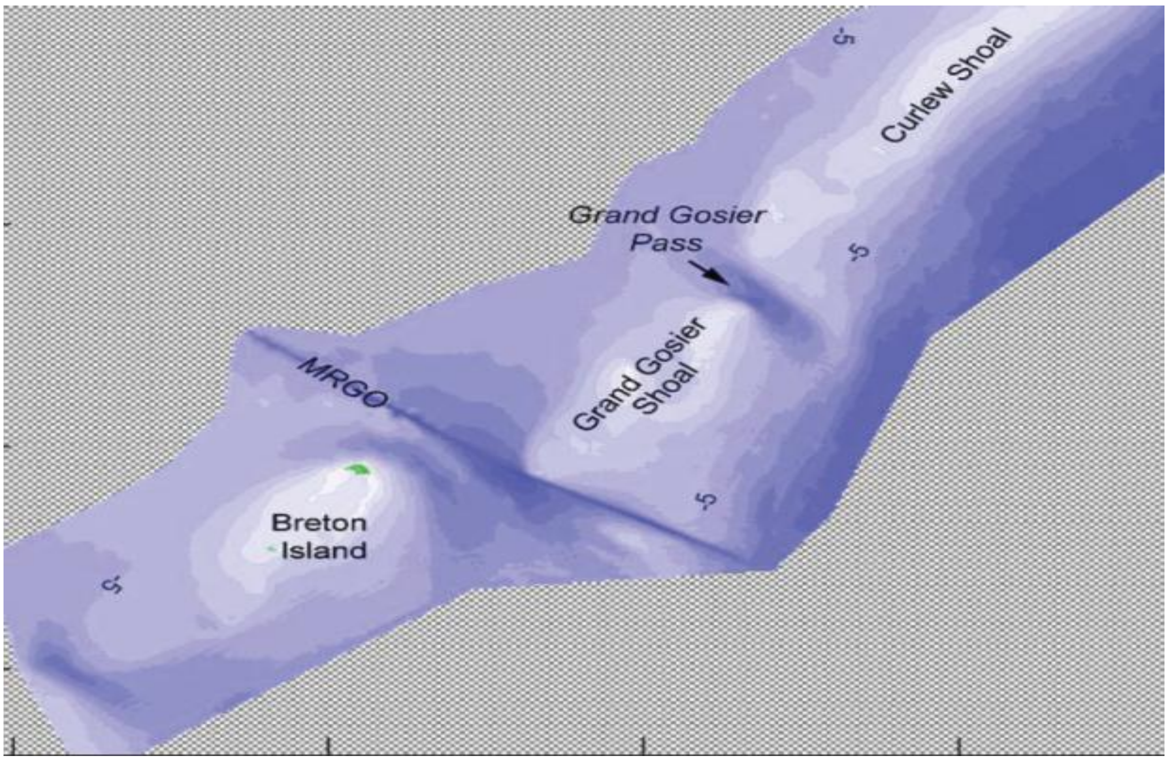

Figure 9-14. Proposed Offshore Shoals Borrow Areas.

9.6.3 Construction and Installation

Island and Back-barrier Marsh

The project is expected to restore approximately 3.0 miles (16,000 linear feet) of beach (76.2 acres), dune (138.7 acres), and back-barrier marsh (137.3 acres) habitat on North Breton Island for a total of 352 acres of barrier island habitat. The dune would be approximately 9 feet-high by 100 feet-wide at the top and 400 feet-wide at the base. The beach would be 3 feet-high by 200 feet-wide, and the back barrier marsh would be 500 feet-wide by 3 feet-high (above existing water depths) for a total expected project width of 1,100 feet. The typical containment dike profile would include a +5 ft. NAVD elevation, a crest width of 10 ft., and side slopes 1 vertical: 4 horizontal. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. Sand fencing (fencing to capture sand that is naturally transported by wind) would be erected on the constructed dune to capture naturally windblown sand to passively build or maintain the dune feature. Sand fencing would be inspected annually and replaced as necessary over the project life.

After a period of settlement and salinity stabilization of placed materials, native intertidal and dune habitat species would be planted in dune and marsh areas. Plantings would help establish the plant community, and foster retention of placed sediments. Marsh plantings would include smooth cordgrass (*Spartina alterniflora*) and possibly black mangrove (*Avicennia germinans*). Dune species would likely include bitter panicum (*Panicum amarum*). Other possible dune species include seaoats (*Uniola paniculata*), roseau cane (Phragmites australis), marshhay cordgrass (*Spartina patens*), gulf cordgrass (*Spartina alterniflora*), matrimony vine (*Lycium barbarum*), or wax myrtle (*Morella cerifera*).

Borrow Area

The borrow area would be located in an offshore shoal area southeast of North Breton Island. Selection of specific borrow site(s) within in the borrow area would be based on geotechnical and sediment (American Society for Testing and Materials (ASTM) standard particle size analysis of soils) analyses of potential dredge material. The borrow area will be sited and designed, to the extent feasible, to minimize adverse impacts to water quality due to inadequate circulation and stratification. Dredged material would be transported to the island via a hydraulic dredge pipeline. A small portion (3,000 feet) of the dredge pipeline—called a pontoon line—may be floating behind the dredge, but the majority would be on the sea floor.

Approximately 3.7 million cubic yards of sand, silt and clay material would be dredged from the borrow area with a hydraulic dredge with a cutterhead. The cutterhead mechanism loosens the bed material and transports it to the suction mouth. The material would be transported via pipeline from the borrow sites to the Breton Island restoration site. Containment dikes, which help retain hydraulically dredged sediments while the marsh platform undergoes compaction and dewatering, are expected to degrade naturally over time. If necessary, dikes would be gapped within the first three years to allow for tidal exchange with the created marsh and to prevent ponding of water within the containment area. Considerations regarding if and when mechanical gapping will be conducted will be based on site inspections and determinations will be made in cooperation with natural resource agencies. Bulldozers would shape the sand for the dune and beach portions of the project. Modeling exercises would be conducted as part of this project to assess possible changes in the wave climate due to changes in substrate contours resulting from source dredging. Models would provide information on how any changes in wave patterns may affect future island dynamics given conceptual restoration designs. Model results would inform the selection of a final design.

Construction Equipment and Logistics

A barge mounted hydraulic dredge with a cutterhead, and a barge mounted booster pump (self-contained barge possibly 90 feet long X 30 feet wide with a crew), and up to 10 miles of dredge pipeline would be used to dredge material and transport it from the borrow site to the island for use in the restoration project. Marsh buggy track hoes (approximately 2 to 5) would be used to construct containment dikes and move dredge pipe. A barge mounted dragline may also be used for construction of the containment dikes. Two or more bulldozers would shape the sand for the dune and beach. Equipment and personnel would be transported to the site via barges, tugboats, and crew boats. In addition, there may be a living quarters barge on site for the crew. Sampling vessels would be used for surveying, sediment borings, and geotechnical work needed for engineering and design.

Construction of the project is expected to take between 6 and 12 months to complete. Construction time would be 10 to 12 hours a day (depending on season and light availability). The project would require approximately 30-40 workers during the 6 to 12 month construction period. Sanitary waste disposal would be provided for the workers during construction. Louisiana Hwy 23 would likely be used to transport workers and some lighter equipment. It is unknown at this time exactly where barges would deploy from, but they would likely come from the Mississippi River to the project site by way of Breton Sound. Personnel shift changes would likely be transported from Venice, LA via crew boats. The bulk of the equipment would be transported via barges through the Mississippi River, Gulf Intracoastal Waterway and other channels.

9.6.4 Operations and Maintenance

North Breton Island is considered a barrier island. Barrier islands are dynamic systems in constant flux formed by the interaction of wave, wind, and tidal energies that erode, transport, and deposit sediments (Leatherman 1982). Because of these processes, islands like North Breton Island are constantly in transition and moving landward (Lavoie 2009).

The performance of the North Breton Island restoration would be assessed using both qualitative and quantitative monitoring protocols. The monitoring program would use performance standards related to the objectives of the project (increased nesting pelicans, terns/skimmers and gulls) that would facilitate evaluation of project performance over time and the potential need for corrective actions. Monitoring would be conducted during and following construction to ensure that project designs and necessary corrective actions are correctly implemented. Post construction performance monitoring would also be conducted to evaluate the project's performance over time with respect to project objectives and to inform adaptive management potentials.

Post-construction monitoring would track the performance of restored beach, dune, and back-barrier marsh habitats, as well as the presence of various species of nesting birds (e.g., brown pelicans, terns, skimmers, and gulls) within restored habitat areas. Proposed performance monitoring at each component could include:

- Annual nest count surveys to estimate additional breeding pairs of brown pelicans, terns/skimmers, and gulls supported by restoration activities;
- Spatial analysis of color-infrared aerial photography collections to monitor changes in habitat; and
- Light Detection and Ranging (LIDAR) and bathymetric surveys to monitor changes in post-construction habitat elevations and island platform bathymetry.

Additional details concerning performance monitoring will be developed prior to project implementation.

9.6.5 Affected Environment and Environmental Consequences

Under the National Environmental Policy Act, federal agencies must consider environmental effects of their actions that include, among others, impacts on social, cultural, and economic resources, as well as natural resources. The following sections describe the affected resources and environmental consequences of the project.

9.6.5.1 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Phase III ERP proposed project location, the No Action alternative assumes that the Trustees would not pursue the North Breton Island location of the Louisiana Outer Coast Restoration project as part of Phase III Early Restoration.

Under the No Action alternative, the existing conditions described for the project location in the affected resources subsections would prevail. Restoration benefits associated with this project location would not be achieved at this time.

9.6.5.2 Physical Environment

Geology and Substrates

Affected Resources

The project area is located in Breton Sound which is part of the Gulf of Mexico. The seafloor within the general project area is somewhat uneven and slopes toward the south. The geology of the region is a complex assemblage of Pleistocene and Holocene and deltaic, nearshore marine, and coastal sedimentary deposits (Pearson 2001). The Holocene deposits overlay older Pleistocene fluvial and deltaic sediments. The surficial seafloor deposits in the project area are identified as "reworked Mississippi Delta" sediments. These sediments typically consist of greater than 80 percent sand and lack clay altogether.

The land that forms Breton NWR is located in a delta lobe created 3,000-4,000 years ago in the St. Bernard deltaic plain of the Mississippi River. Approximately 2,000 years ago, the Mississippi River abandoned the St. Bernard delta complex and moved to the west, forming the LaFourche delta complex. As the cycle of land loss changes progressed in the abandoned delta, the Chandeleur Islands started to form. This land loss continues today and threatens the existence of the Chandeleur Islands and other lands located in the relic deltaic plain not presently receiving sediment input. The natural processes of land formation, subsidence, and sea level rise have been accelerated and altered by human activities, such as building levees, digging canals, and use of fossil fuels.

The Chandeleur Islands are dynamic and are constantly altered and worn down by hurricanes, tropical storms, wind, and tidal action. Early literature on Breton and the Chandeleur Islands mentions trees and a generally higher elevation than exists today. Present elevations of the existing islands are not much higher than sea level.

The soils in the study area have been identified and mapped by the U.S. Department of Agriculture Natural Resource Conservation Service (USDA NRCS 2013). The NRCS data identifies Felicity loamy fine sand, frequently flooded soil as the only soil unit mapped within the project area. The Felicity loamy fine sand is a very gently sloping, somewhat poorly drained, saline, sandy soil with elevations ranging from about 1 foot to 3 feet above sea level. The soil is subject to flooding by saltwater during high storm tides.

Environmental Consequences

The restoration would create marsh, dunes, and beach and increase elevations on the island platform (base). In addition, it would increase the width of the island creating greater resistance to tidal energies. The dredged material proposed for island and marsh construction consists of naturally occurring material deposited in the Gulf over time by geologic processes. Vegetative plantings and sand fences would stabilize soil, reduce re-suspension of recently deposited sediment, reduce wind transport of dune material off the island, and encourage sediment deposition. Over the long-term, dredged materials removed from the borrow sites are expected to be rearranged by natural processes, creating pre-project bathymetric contours in the borrow areas.

Sediment analyses for the restoration site and potential borrow sites would be completed and analyzed prior to project implementation. Overall, the project’s impacts related to soil compaction, erosion, and loss during construction at both the island and borrow site(s) would be minor and in the long term, the project would not be expected to adversely impact geology or substrates.

Hydrology and Water Quality

Affected Resources

Currents in the Gulf are characterized by an "offshore," or open Gulf, and an "inshore," or shelf energy, regime. The open Gulf is influenced by the Loop Current. The shelf circulation shows strong influence from secondary flows of the Loop Current. Currents along the southeastern Louisiana coast flow in a predominantly eastward direction. Longshore currents in the project area are generally light to moderate. Winds in the project area are dominated by easterly trades that flow from the southwest in the summer and from the northeast in winter.

The Breton Sound estuary is about 20 miles wide at the gulf coastline and extends 50 miles inland to Caernarvon, Louisiana. Breton Sound receives inflow and runoff from the Mississippi River. The Caernarvon Freshwater Diversion project diverts fresh water and its accompanying nutrients and sediments from the Mississippi River to coastal bays and marshes in Breton Sound.

Breton Island and the Chandeleur Islands are surrounded by shallow sea water and contain interior ponds that can be somewhat fresher from rainfall. The marshes and ponds of Breton Sound range from fresh where influenced by the Mississippi River to brackish closer to the shoreline with the Gulf of Mexico and Breton Sound. The system is open and not managed by any control structures on the refuge.

According to the Louisiana Department of Environmental Quality (Louisiana DEQ 2012), the waters of Breton Sound do not fully support the designated uses of primary contact recreation (e.g., swimming), fish and wildlife propagation, and oyster propagation. Breton Sound is listed on the US EPA's 303(d) list of impaired waters, with fecal coliform cited as the cause of impairment.

Environmental Consequences

The proposed project would create a localized and temporary increase in turbidity as sediments are dredged from the borrow sites and discharged and placed in the project area. If the disturbed sediments are anoxic, the biological oxygen demand in the water column would increase. No known toxic or hazardous conditions exist in the borrow sites. Dredging could exhume buried debris. It is not expected that such debris would cause water quality concerns. Incidental discharges of fuel and oil from construction equipment could occur. However, a Spill Prevention, Control, and Countermeasure Plan would be developed and implemented to reduce this risk. Any changes in hydrology would be reflective of past island conditions as the island is rebuilt. Modeling exercises would be conducted as part of this project to assess possible changes in the wave climate due to changes in substrate contours resulting from source dredging. Models would provide information on how any changes in wave patterns may affect future island dynamics given conceptual restoration designs. Model results would inform the selection of a final design.

Overall, potential impacts to water resources are expected to be short term and minor as a result of increases in turbidity during active dredging activities.

9.6.5.3 Air Quality and Greenhouse Gas Emissions

Affected Resources

The Clean Air Act ("CAA") requires the State of Louisiana to adopt ambient air quality standards to protect the public from potentially harmful amounts of pollutants. Six common air pollutants (also known as "criteria pollutants") are regulated by EPA. They are particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides, and lead. The Louisiana Department of Environmental Quality has designated areas meeting the state's ambient air quality standards by their monitoring and modeling program efforts, (i.e., attainment areas). Louisiana has no carbon monoxide, nitrogen oxides, sulfur oxides, particulate or lead nonattainment areas.

Currently, Plaquemines Parish is classified by EPA as an attainment area in accordance with the National Ambient Air Quality Standards (NAAQS). The EPA's GHG Reporting Rule establishes mandatory GHG reporting requirements for sources that emit 25,000 metric tons or more of carbon dioxide equivalent (CO_2e) per year (EPA 2013a). Many sources of man-made air pollution affect Breton NWR including onshore industry, power plants, car emissions, and offshore oil and gas development (USFWS 2012; USFWS 2013c).

Environmental Consequences

Project implementation would require the use of boats as well as barge-mounted and land-based heavy equipment for up to 10 or more hours per day over a 6-12 month construction period. This would temporarily affect air quality and elevate greenhouse gas emissions in the project vicinity due to emissions and increased dust from operation of construction vehicles and equipment. Any air quality impacts that would occur would be localized, limited to the construction phase of the project, and limited by the size of the project. Therefore, short-term, minor impacts to air quality would occur. The project would have no long term impacts on air quality.

Engine exhaust from hydraulic cutterhead dredge, booster pumps, front-end loaders, cranes, boats, and trucks would contribute to an increase in greenhouse gas emissions. The following tables describe the likely greenhouse gas emission scenario for the implementation of this project.

Based on the assumptions described in Table 9-4 below, GHG emissions would not exceed 25,000 metric tons per year. Given the projected construction-phase GHG emissions, along with the small scale and short duration of the project, predicted impacts from greenhouse gas emissions would be short-term and minor.

Table 9-4. Greenhouse Gas Impacts of the Proposed Project.

VESSEL/CONSTRUCTION EQUIPMENT	NO. OF HOURS OPERATED[1]	CO_2 (METRIC TONS)[2]	CH4 (CO_2E) (METRIC TONS)[3]	N_2O (CO_2E) (METRIC TONS)	TOTAL CO_2E (METRIC TONS)
Crane	2,400	87	0.03	0.3	87.33
Grader	2,400	117	0.09	9	126.09
Bulldozer (2)	4,800	228	0.12	1.2	229.32
Trackhoe (2)	4,800	210	0.12	1.2	211.32
Dumptruck[4]	2,400	102	0.06	0.6	102.66
Tugboat[5]	2,400	4,800	9	36	4,845
Boat[6]	2,400	1,350	3	12	1,365
Dredge Pump[7]	2,400	911	1.1	0.5	912.6
TOTAL					7,879.32

[1] Emissions assumptions for all equipment based on 240 10-hour days of operation per piece of equipment over a 12-month construction period.
[2] CO_2 emissions assumptions for diesel and gasoline engines based on EPA 2009.
[3] CH_4 and N_2O emissions assumptions and CO_2e calculations based on EPA 2011.
[4] Construction equipment emission factors based on USEPA NONROAD emission factors for 250hp pieces of equipment. Data was accessed through the California Environmental Quality Act Roadway Construction Emissions Model.
[5] Fuel economy assumptions for a 3000hp marine diesel tug based on Walsh 2008.
[6] Fuel economy assumptions for a 300hp marine diesel powerboat and 1000hp marine diesel passenger ferry based on Becker, no date.
[7] Fuel economy assumptions for a dredge pump based on Johnson 2013.

9.6.5.4 Noise

Affected Resources

Noise can be defined as unwanted sound and noise levels, and its impacts are interpreted in relationship to effects on nearby visitors to the NWR and wildlife. The Noise Control Act of 1972 (42 U.S.C. § 4901 to 4918) was enacted to establish noise control standards and to regulate noise emissions from commercial products such as transportation and construction equipment. The standard measurement unit of noise is the decibel (dB), which represents the acoustical energy present. Noise levels are measured in A-weighted decibels (dBA), a logarithmic scale which approaches the sensitivity of the human ear across the frequency spectrum. A 3-dB increase is equivalent to doubling the sound pressure level, but is barely perceptible to the human ear. Table 9-5 shows typical noise levels for common sources expressed in dBA. Noise exposure depends on how much time an individual spends in different locations.

Noise levels in the project area vary depending on the season, time of day, number and types of noise sources, and distance from noise sources. Existing sources of noise in the project area are from offshore oil production, commercial vessels, recreational boating, overhead aircraft and ambient natural sounds such as wind, waves, and wildlife.

Table 9-5. Common noise levels.

NOISE SOURCE OR EFFECT	SOUND LEVEL (DBA)
Rock-and-roll band	110
Truck at 50 feet	80
Gas lawnmower at 100 feet	70
Normal conversation indoors	60
Moderate rainfall on foliage	50
Refrigerator	40
Bedroom at night	25

Source: Adapted from BPA 1986, 1996

Noise-sensitive receptors include sensitive land uses and those individuals and/or wildlife that could be affected by changes in noise sources or levels due to the project. Noise-sensitive receptors in the project area include beach recreational use and wildlife.

Environmental Consequences

Instances of increased noise are expected during the construction phases associated with the restoration project. The proposed project would generate construction noise associated with equipment during placement of the fill material, grading, and dredging. Construction equipment noise is known to disturb fish, marine mammals and nesting shorebirds (discussed below). Construction noise would also create a potential nuisance to visitors to the Breton NWR in areas adjacent to project construction activities. Construction noise would be temporary and the construction period is not anticipated to last more than 12 months. Because construction noise would be temporary, negative impacts to the human environment during construction activities would be short-term and minor, as they would likely attract attention but would not result in visitors changing their activities.

After completion of the project, noise sources would be expected to include the existing sources described above, and noise levels would return to pre-project levels.

9.6.5.5 Living Coastal and Marine Resources

Vegetation

Affected Resources

Based on a 2010 USGS habitat analysis, total habitat included approximately 1 acre of dune, 8 acres of scrub-shrub (vegetated island), 197 acres of beach (unvegetated mud flat and intertidal material) and 6 acres of back barrier marsh. These dynamic habitats can change over time and may currently differ from 2010 analysis. Vegetation on the island consists of black mangrove (*Avicennia germinans*), smooth cordgrass (*Spartina alterniflora*) associated with the emergent salt marsh. The other vegetation habitats found on the island are dune zones of saltmeadow cordgrass (*Spartina patens*) or sea oats (*Uniola paniculata*), barrier island shrub/scrub zone of Southern wax myrtle (*Myrida cerifera*), Eastern baccharis (*Baccharis halimifolia*), and yellow rattlebox (*Sesbania drummondii*), and high marsh or upland-grassland dominated by saltmeadow cordgrass (Penland et al. 1997).

Wetlands are essential breeding, rearing, and feeding grounds for many species of fish and wildlife. Barrier island wetlands, flats, and subtidal habitat provide unique nursery, foraging, and spawning habitat for numerous marine and estuarine species of commercial and recreational importance. Review of the USFWS National Wetlands Inventory (USFWS NWI 2013) identified wetlands within the project area as estuarine intertidal emergent and unconsolidated shore under Cowardin classification system (Cowardin 1979).

Environmental Consequences

The project would result in conditions substantially more conducive to healthy barrier island vegetative communities than currently exists. The project proposal includes approximately 137 acres of back-barrier marsh wetland restoration, which would have an overall major beneficial effect on the wetland system on the island. Installation of native vegetative plantings will encourage colonization of native dune vegetation and the development of emergent vegetated wetlands. Dune plantings would occur post construction to stabilize newly placed sediments, and installation of native wetland vegetation on the marsh platform would occur as the material consolidates and dewaters. Project construction would result in a net benefit of an estimated 352 acres of dune (139 acres), beach (76 acres) and wetland (137 acres) habitat. The implementation of the proposed restoration activities would not be expected to disturb or adversely impact waters of the U.S. or adversely modify wetlands. While construction-related activities may temporarily disturb habitat adjacent to wetland acreage, in the long term the proposed project would improve wetland habitat and protect it from further erosion and loss. All necessary evaluations would be undertaken during engineering and design to minimize adverse construction-related impacts to vegetated habitats, namely scrub-shrub and marsh acreage, on North Breton Island. Overall, the proposed project would provide long-term beneficial impacts on wetlands and upland habitats. The majority of the project affecting existing aerial habitat would occur on unvegetated beach. This work involves augmenting both the width and height of portions of this habitat, as well as actively planting it with appropriate vegetation, expanding its availability, increasing its longevity, and increasing the quality of the habitat for nesting terns and skimmers. The North Breton Island is a highly dynamic system, and acres of beach habitat, especially, are likely to change prior to restoration implementation. Exact acreages affected would depend on acreage existing at the time of project implementation and final restoration design. All future acreages of dune, beach and marsh could be considered net habitat contributions of the project, considering that the island is expected to completely submerge in the near future without actions to restore sand into the system (i.e., the proposed restoration action).

Wildlife

Affected Resources

Breton NWR provides nesting resources for twenty-three species of birds. Birds that use the project area include waterbirds, sea birds, waders, shore birds, birds of prey, and passerines. Species of concern and/or significance for management purposes that are known to occur on Breton NWR and may use the project area include: piping plover (*Charadrius melodus*), brown pelican (*Pelecanus occidentalis*), redhead (*Aythya americana*), laughing gull (*Leucophaeus atricilla*), royal tern (*Thalasseus maximus*), Caspian tern (*Hydroprogne caspia*), sandwich tern (*Thalasseus sandvicensis*), black skimmer (*Rynchops niger*), sooty tern (*Onychoprion fuscatus*), common tern (*Sterna hirundo*), least tern (*Sternula antillarum*), Forster's tern (*Sterna forsteri*), gullbilled tern (*Gelochelidon nilotica*), magnificent frigate bird (*Fregata magnificens*), great egret (*Ardea alba*), reddish egret (*Egretta rufescens*), snowy egret (*Egretta thula*), clapper rail (*Rallus longirostris*), white ibis (*Eudocimus albus*), tricolored heron (*Egretta tricolor*), black-crowned night heron (*Nycticorax nycticorax*), little blue heron (*Egretta caerulea*), herring gull (*Larus argentatus*), and kelp gull (*Larus dominicanus*) (USFWS 2008). The more common nesting species include royal, Caspian, and sandwich terns, laughing gulls, brown pelicans, and black skimmers. All these species are protected under the Migratory Bird Treaty Act.

In the past, Breton NWR has supported large colonies of colonial nesting seabirds and still provides some nesting habitat, although limited in comparison to previous years. Historically, large nesting colonies of brown pelicans; laughing gulls; and royal, Caspian and sandwich terns used the islands. Less abundant were nesting black skimmers, with occasional common, least, Forster's, and gull-billed terns. To avoid visitor disturbance to nesting seabird colonies, each colony is posted as a closed area during the nesting season; approximately five percent of the island is used by nesting birds.

Prior to Hurricane Katrina, terns nests numbered 35,000 to 50,000; brown pelican nests averaged 6,000 to 8,000 and peaked at approximately 12,000 nests; and black skimmers nests averaged 3,000. In the nesting seasons following Katrina, these numbers fell by approximately 80%, potentially due to loss of supporting habitat. In 2007, terns numbered 7,000 nests; brown pelicans produced 2,500 nests; and black skimmers numbered 450-500 nests.

During the winter, large numbers of waterfowl such as redheads, canvasback (*Aythya valisineria*), and scaup (*Aythya sp.*) frequent the numerous islands. Wintering waterfowl populations begin building in the fall and peak in mid-December and January. The most common species observed are mottled duck, (*Anas fulvigula*), gadwall (*Anas strepera*), northern pintail (*Anas acuta*), American wigeon (*Anas americana*), green-winged teal (*Anas crecca*), and snow geese (*Chen coerulescens*). The most common resident marsh and waterbirds are great blue heron, little blue heron, white ibis, glossy /white-faced ibis, great egrets, snowy egrets, tricolored herons, yellow-crowned night-herons (*Nyctanassa violacea*), and black-crowned night-herons. The refuge serves as a staging area for many passerine birds during migration, and large concentrations of shorebirds are sometimes observed feeding in the mudflats.

Magnificent frigatebirds (*Fregata magnificens*) are regularly observed flying over the refuge. Endangered piping plover inhabit Breton NWR islands during winter periods. Bald eagles (*Haliaeetus leucocephalus*) are known to nest in southern Louisiana (Wright and Hess 2002); however, they are not known to nest within Breton NWR.

No terrestrial wildlife surveys have been conducted in the project area; however, based on the types of habitat present, and because of its size, elevation, location and overwashes, it is expected that there are no resident mammals, amphibians, or non-marine reptiles on North Breton Island. Historically there were raccoons and occasional nutria present (personal communication from Brian Spears, USFWS September 2013).

Environmental Consequences

The time frame within which major restoration activities would take place at North Breton Island would be relatively short (up to 12 months). Birds would be expected to avoid the area as desired while construction is occurring. Impacts to birds would be avoided by implementing the Louisiana Guidelines for Minimizing Disturbance to Colonial Nesting Birds (USFWS 2014a). A bird abatement plan may also be necessary to avoid impacts to nesting birds (USFWS 2014a). No bald eagles are known to nest in Breton NWR. Thus, no adverse impacts to bald eagles are anticipated.

The proposed project would create an estimated 352 acres of barrier island habitat through the restoration of about 215 acres of dune, berm and swale habitats and the protection and creation of approximately 137 acres of back-barrier marsh. The project would restore bird nesting habitat and would have long-term major beneficial impacts for bird populations. Given the likely lack of mammals, non-marine reptiles, and amphibians, the project would have no impacts to area populations.

Marine and Estuarine Fauna (fish, shell beds, benthic organisms)

Affected Resources

There are a number of aquatic species found in the project area. Fish species include sand seatrout, spotted or speckled seatrout, searobins, red drum, tonguefish, flounders, Atlantic bumper, and porgys. Benthic organisms include bivalves, gastropods and other mollusks, anemones, amphipods, annelids, brown and white shrimp, and echinoderms.

Environmental Consequences

This project would likely result in short term minor adverse impacts due to construction and dredging-related disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. Short-term, localized minor impacts to fisheries resources would occur during the construction phase of the project. Mobile aquatic animals would be expected to move away from the fill and borrow sites during construction and return following completion of construction. Isolated, short-term effects on pelagic fish eggs and larvae in the immediate area may occur. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the dredging activity and the placement of the fill material at the island. However, these types of species are typically numerous in the Gulf and recolonize quickly.

The island and backwater marsh restoration would provide overall long term benefits to marine species by providing additional habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans. Restoration of the tidal marsh habitat would benefit numerous aquatic species and enhance resident fish populations.

The direct effect of dredging is the removal of sediment along with the organisms living in the sediment. Impacts could include entrapment and likely death of slow-moving organisms (such as crabs) and benthic organisms (such as polychaetes) during dredging in the borrow sites and smothering of benthic organisms and more sessile fish species in the deposition sites.

Dredging would change substrate topography, indirectly impacting benthic and other aquatic organisms using this habitat. Depending on the depth-of-cut, dredging in the Gulf could result in low dissolved oxygen in bottom waters. Low dissolved oxygen already occurs in the nearshore Gulf, especially during the summer months, so the site and dimensions of the proposed borrow sites could contribute to localized low dissolved oxygen which may pose a risk to some fish and crustaceans with low mobility.

The project would provide overall long term benefits to marine species by providing additional fish habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans. Restoration of the tidal marsh habitat would benefit numerous aquatic species such as blue crab, red drum and speckled sea trout. Over the life of the project, the quality of fish habitat would increase.

Any adverse impacts to marine and estuarine fauna (fish, shell beds, benthic organisms) are expected to be short in duration and minor as those species that would be affected are likely numerous in the area.

Protected Species

Affected Resources

Protected species and their habitats include Endangered Species Act-listed species and designated critical habitat that are regulated by either USFWS or NMFS. Protected species also include marine mammals protected under the Marine Mammal Protection Act and essential fish habitat under the Magnuson-Stevens Fishery Conservation and Management Act. The piping plover and red knot (proposed) are the only bird species protected under the Endangered Species Act that utilize the island for wintering habitat (personal communication from Brian Spears, USFWS, September 2013). Critical habitat for piping plover is designated within the project area.

Five species of endangered or threatened species of sea turtles were identified as possibly being present in the project area: loggerheads, green, hawksbill, Kemp's ridley, and leatherback turtles (Fuller et al. 1987). Sea turtles forage in the waters of coastal Louisiana and likely occur within the project area.

There are 22 different species of marine mammals, including baleen whales, toothed whales, dolphins, and manatees, known to occur in the Gulf of Mexico. The project area is located within the NOAA-defined nearshore estuarine waters to the continental shelf edge (depths of 0-656 feet). Typically whales do not occur in the nearshore waters over the continental shelf of the Gulf of Mexico. Of the 22 species of marine mammals known to occur in the Gulf of Mexico, only three protected species of dolphins commonly occur in nearshore waters (bottlenose, Atlantic spotted, and Risso's).

The bottlenose dolphin inhabits the Gulf of Mexico year round and is the most commonly observed dolphin in nearshore waters. The Atlantic spotted dolphins prefer warm-temperate waters over the continental shelf, edge, and upper reaches of the slope and are very active at the surface. Risso's dolphins are typically found around the continental shelf edge and steep upper sections of the slope (>328 feet in depth) (NOAA 2010).

Of the five listed endangered whale species (sperm whale, sei whale, fin whale, blue whale, humpback whale), only the sperm whale is considered to commonly occur in the Gulf of Mexico. The sperm whale is predominantly found in deep ocean waters, generally deeper than 3,280 feet, on the outer continental shelf. Due to the relatively shallow depth in the project area, the sperm whale, or any other endangered whale, is not likely to be present during construction.

The West Indian Manatee has been observed in Louisiana waters; however, sightings are very rare and almost always occur in coastal bays and estuaries (USFWS 2013b). Manatees, which are an inshore and nearshore species, are not expected to be encountered in the project area, which is 16 miles offshore to the northeast of Venice, Louisiana.

Essential fish habitat consists of waters and substrate that are necessary to Federally-managed fish species for spawning, breeding, feeding, or growth to maturity. Aquatic and tidally influenced wetland habitats in portions of the Gulf of Mexico surrounding the project area are designated as essential fish habitat ("EFH") for a variety of federally managed species, including shrimp, red drum, reef fish, stone crab, spiny lobster and coral (USFWS 2014b). In addition, several species of shark are known to occur in the proposed project footprint including the following species: scalloped hammerhead shark, finetooth shark, blacktip shark, bull shark, spinner shark, Atlantic sharpnose shark, and blacknose shark. The smooth dogfish, silky shark, yellowfin tuna, and whale shark all have EFH found near the borrow area as well. Detailed information on federally managed fisheries and the EFH is provided in the 2005 generic amendment of the Fisheries Management Plans for the Gulf of Mexico prepared by the Gulf of Mexico Fishery Management Council (GMFMC 2005). The generic amendment was prepared as required by the Magnuson-Stevens Fishery Management Conservation and Management Act.

Environmental Consequences

The proposed restoration activities would restore dune, shoreline, and interior marsh habitats, thus creating foraging and nesting habitat for birds.

This project would likely result in short term moderate adverse impacts to piping plovers and red knot due to construction and dredging related disturbances. Some birds may leave the area during deployment activities, but would likely return after activities cease. The proposed project would not adversely modify or destroy critical habitat, and would ultimately restore and increase the longevity of the piping plover critical habitat by restoring dune and beach habitat. On December 15, 2013, the DOI submitted a biological assessment to, and requested formal consultation with, the USFWS Lafayette Ecological Services Field Office (ES FO), under Section 7 of the ESA, for impacts from the proposed North

Breton Island restoration proposal to piping plover and its designated critical habitat and red knot, if red knot is listed as a threatened or endangered species prior to the completion of the proposed project (McClain 2013). In a response dated May 9, 2014, the ES FO transmitted a biological opinion and conference opinion which concurred with the DOI determination that the proposed project:

- is not likely to adversely affect the endangered West Indian manatee because: (a) manatees are not permanent inhabits of the project area; and (b) the USFWS would implement, as part of the project construction plan, standard conditions for in-water work in areas that may have manatees thereby, avoiding take of manatee under the Marine Mammal Protection Act of 1972;
- is not likely to adversely affect nesting sea turtles due to a lack of nesting on the Breton NWR;
- is not likely to directly kill any piping plovers or red knots though all piping plovers and red knots (if listed) using the affected 198 acres (all of which is also designated piping plover critical habitat) of suitable habitat on North Breton Island could be taken in the form of harm and harassment, but that this level of anticipated take is not likely to result in jeopardy to the piping plover and red knot (if listed) species or destruction or adverse modification of piping plover critical habitat. The opinion includes reasonable and prudent measures to minimize take on non-breeding piping plovers. Discussions are ongoing regarding final terms and conditions associated with the piping plover incidental take statement; and
- is not likely to destroy or adversely modify designated piping plover critical habitat in Unit LA-7 (USFWS 2014a).

A Biological Assessment and a request for informal consultation was submitted to the NOAA Fisheries Service (Fisheries Service) on January 21, 2014 under section 7 of the ESA for impacts from the proposed North Breton Island restoration proposal to Gulf sturgeon, in-water sea turtles and endangered or threatened species of whales. The letter also requested coordination in regards to the Marine Mammal Protection Act of 1972 (Craig 2014). In a response received April 2, 2014, the Fisheries Service concurred that the proposed project is not likely to adversely affect Gulf sturgeon, its designated critical habitat, or in-water sea turtles (Crabtree 2014). Overall, the rebuilding and restoration of the island should have a positive impact on federally-listed sea turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, which could utilize the area. Whale species in the Gulf are typically found in deeper waters on the outer continental shelf or along the shelf break; therefore, they would not be impacted during the construction activities on the island or the activity at the dredge site and the proposed project will result in no effect for listed whales. The letter acknowledged that the USFWS will ensure compliance with the Best Management Practices in National Marine Fisheries Service's "Sea turtle and smalltooth sawfish construction conditions" and "Measures for reducing entrapment risk to protected species".

This project would likely result in short term minor adverse impacts to EFH due to construction and dredging related disturbances. Some species may leave the area during deployment activities, but would likely return after activities cease. Sessile and other limited movement species, especially those buried/burrowed in the substrate, could be injured or killed by the dredging activity and the placement of the fill material at the island. However, these types of species are typically numerous in these areas.

Informal consultation with NOAA's Southeast Region Habitat Conservation Division (SER HCD), under provisions of the Magnuson-Stevens Act, for impacts from the proposed North Breton Island restoration proposal to EFH was requested on February 20, 2014 (personal communication from Jamie Schubert, NOAA). In a response dated March 17, 2014, the SER HCD concurred that negative impacts from implementing the proposal would be temporary and minor (Fay 2014). The SER HCD had no EFH conservation recommendations to provide pursuant to the Magnuson-Stevens Act at that time.

Restoring the island and backwater marsh can enhance resident fish populations. In the long term, project implementation would be beneficial to protecting EFH from erosion and to maintaining the productivity of marine fishery resources. The proposed restoration activities would restore unique and important barrier island habitat, including marsh and wetland habitat, and help maintain a diversity of different categories of EFH throughout the proposed project area and Breton Sound. In the long term, project implementation would be beneficial to protecting EFH from erosion and to maintaining the productivity of marine fishery resources.

Below is a list of Conservation Measures and Reasonable and Prudent Measures included within the Biological Opinion that will be implemented to protect trust resources. These measures are subject to change pending the Final Biological Opinion:

- The Contractor shall be aware of threatened and endangered species and migratory birds, and implement practices and follow all conditions set forth by NOAA, USFWS, and LDWF to protect these resources.
- The DOI should carefully mark and stake the boundaries of the project footprint on North Breton Island and ensure that those markers are maintained for the duration of project construction activities. Should the project actions (e.g., personnel, equipment, etc.) affect suitable habitat outside of those boundary markers and beyond the action area as described in the biological opinion, then the level of incidental take (i.e., all piping plovers using the existing 198 acres of bare sand, mud flat, and intertidal habitats) for this project would be exceeded and the DOI should reinitiate section 7 consultation with the Service as soon as possible.
- A baseline survey for piping plovers and red knots should be conducted within the migrating and wintering season immediately prior to initial construction in order to determine each species' preferred habitat use within the action area. Such information could then be used as an aid to determine whether specific project actions require slight modifications in order to minimize the effects of the take for future migrating and wintering seasons. For example, initial bird surveys may aid in locating and marking appropriate access routes for ORVs and other work-related equipment, as well as equipment staging areas, in order to reduce disturbance to foraging and roosting birds to the maximum extent practicable.
- A simple diversity and abundance survey of the intertidal benthic prey species community should be conducted within the migrating and wintering season immediately prior to initial construction (preferably at the same time as the bird distribution surveys) in order to establish a baseline of benthic prey species diversity and abundance (e.g., biomass). Again, such information could then be used as an aid to determine whether specific project actions require slight modifications in order to minimize the effects of the take for future migrating and

wintering seasons. For example, initial surveys could locate areas of abundant benthic prey where birds may tend to congregate for foraging, and those areas could be flagged for avoidance by regular personnel traffic to reduce disturbance to foraging piping plovers and red knots.

- Piping plover and red knot monitoring surveys should be conducted during the migrating and wintering seasons throughout initial project construction in order to determine whether access routes are working or whether they need to be adjusted, and for three consecutive years following completion of initial construction to determine whether birds are still utilizing the project area during the benthic recovery period. The frequency of surveys will be determined in coordination with the Service.
- To determine if incidental take exceeds the anticipated recovery time (i.e., up to two years) of suitable foraging habitat on North Breton Island for migrating and wintering piping plovers and red knots, monitoring surveys of the intertidal benthic prey species community should be conducted each year following completion of initial construction for three consecutive years. Such information could also be used to determine whether corrective actions (that may be necessary to achieve success criteria) require slight modifications in order to minimize the effects of the take.
- Due to the remoteness of the project area, weather conditions, potential logistical constraints, and the need to closely coordinate with Breton NWR staff, the DOI should meet with the Service within six months of the date of this biological opinion to coordinate and develop a detailed monitoring plan and schedules for bird and benthic surveys.
- Due to the duration between receiving construction funds and letting out contracts, the Service should be notified in writing at least six months prior to mobilization when construction will be initiated so that the DOI and the Service can coordinate and exchange updated species and project information to ensure that re-initiation of consultation is not necessary.
- A comprehensive report describing the actions taken to implement the RPMs and terms and conditions associated with the incidental take statement shall be submitted to the Service by June 30 of the year following completion of all required surveys.
- To reduce potential impacts to the Gulf sturgeon, the cutterhead would remain completely buried in the sediment during dredging operations. The Contractor would be responsible for surveillance, management, and control of their construction activities to minimize interference with, disturbance to, and damage of water, fish, and wildlife resources.

In addition, the Trustees will implement NOAA's "Measures for Reducing Entrapment Risk to Protected Species," revised on May 22, 2012. These measures are listed in Section 9.3.5.3 above.

Invasive Species

Affected Resources

The potential introduction of terrestrial and aquatic non-native invasive species of plants, animals, and microbes is a concern for any new project. Non-native invasive species could alter existing terrestrial or aquatic ecosystems, may cause economic damages and losses, and are frequently the second most common reason for protecting species under the Endangered Species Act. The species that are or may become introduced, established, and invasive are difficult to identify. Therefore our analysis focuses on pathway control or actions/mechanisms that may be taken or implemented to prevent the spread of species on site or introduction of species to a site. This project involves dredging sediments from a nearby marine environment and placing them on shore and in shallow waters to create the barrier island. Vegetation will also be brought to the island and planted. A variety of construction equipment (both in-water and on land) will be used. Each of these actions and pieces of equipment serve as a potential pathway to introduce or spread invasive species. To ensure these pathways are "broken" and do not spread or introduce species the following BMPs will be implemented: all equipment to be used during the project, including personal gear, will be inspected and cleaned such that there is no observable presence of mud, seeds, vegetation, insects (especially ants and snails), and other species. Native vegetation will be used for planting. Prior to bringing to vegetation to the island, it will be inspected and "non-target[7]" species will be removed.

Environmental Consequences

Surveys have not been conducted to determine if invasive species are present on Breton Island. Because the island is currently subject to frequent overwash due to low elevation, invasive terrestrial species are not currently expected. Sediments for island restoration will come from a nearby and adjacent area and due to this proximity the sediments are expected to support the fauna in aquatic habitats at Breton. BMPs to prevent the spread of invasive species through common pathways will be implemented thereby minimizing the potential for short and long-term adverse impacts from the proposed project. The implementation of these BMPs meets the spirit and intent of EO 13112.

9.6.6 Human Uses and Socioeconomics

9.6.6.1 Socioeconomics and Environmental Justice

Affected Resources

There are no Environmental Justice areas of concern near the project area. Breton Island is part of Plaquemines Parish, Louisiana's most southern parish, where the Mississippi River meets the Gulf of Mexico. The project area is not located near any urban centers; the closest town is Venice, approximately 18 miles to the southwest, on the west bank of the Mississippi River. There are no incorporated communities anywhere within the Parish. Most of the Parish's population is distributed along a narrow band of land on each bank of the Mississippi River. In 2012, the estimated Parish population was 23,921 and the 2007-2011 median household income was $55,301 (US Census 2012). Major sources of employment and income are the seafood industry, off-shore oil industry, shipping, and citrus farming (GNO Inc. 2013). The unemployment rate in Plaquemines Parish in 2012 was 6.5% (LWC 2012). According to the U.S. Census Bureau, approximately 30% of the population of Plaquemines Parish is considered to be minority.

[7] A non-target species is any species that is present on the species of choice but is not desirable and should be removed. For example, within soil that is often packed around plant roots, there may be species of snails capable of carrying parasites that can affect birds or fire ants that may attack bird eggs or chicks.

Millions of pounds of shrimp, oysters, crab, and fish are produced annually by the commercial fishing industry in Louisiana. Louisiana's commercial fishing industry catches about 25 percent of all the seafood landed in America and is the largest producer of shrimp and oysters in the United States (Louisiana 2013). In Plaquemines Parish over 5 percent of the population is directly employed in the fishing industry (US Census 2013). Plaquemines Parish is also considered a “sportsman’s paradise” for sport fishing (GNO Inc. 2013). Encompassing seventy miles of the Mississippi River, Plaquemines Parish is the eighth largest port in the United States and is noted for exporting coal, petro-chemicals, and grain. The Parish is a major operational center for the offshore oil and gas industry. The oil industry, including production, support, storage, transportation, refining, and petrochemicals is estimated to be a $1.2 billion industry in Plaquemines Parish. In 2006, employment associated with the oil industry accounted for over 8,000 direct, indirect, and induced employment opportunities, or over 30% of total jobs in the parish (LSU 2006).

In August 2005, the entire Parish was devastated by Hurricane Katrina, which caused extensive structural damages and flooding, major losses to the commercial fishing industry, and a substantial decrease in population primarily due to people not returning to the area after evacuating. Residents are trickling back as housing and other infrastructure are repaired or replaced, but major questions remain about levee protection and the viability of local communities.

Environmental Consequences

Because this project is located offshore, it would have no adverse impacts on the socioeconomic status of the communities and counties adjacent to the project. Minor, short-term beneficial effects could occur from increased employment during project construction. Engineering and design work could employ a number of Federal, State, and/or consultant employees for up to 2 years. The construction crew could consist of 30 to 40 people, who would be employed for a period of 6 to 12 months. These economic benefits would be concentrated in the service and retail industry sectors. Beneficial economic effects would accrue to local recreational supply retailers, restaurants, and hospitality providers.

Environmental Justice Analysis

The relevant demographic data were obtained from the U.S. Census Bureau. Data are presented at the parish level to accommodate the geographic size of each portion of the study area.

In this analysis, a Parish is considered to have a minority population if its nonwhite population is greater than 50 percent or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as parishes in which the percentage of the population below poverty status exceeds 50 percent, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There is not a minority or low-income population in the impact zone – North Breton Island is uninhabited and Plaquemines Parish as a whole also does not meet these criteria. Furthermore, there is no high and adverse impact anticipated from the proposed project.

9.6.6.2 Cultural Resources

Affected Resources

This project is currently being reviewed under Section 106 of the NHPA to identify any historic properties located within the project area and to evaluate whether the project would affect any historic properties. There are no known historic or cultural resources within the Delta or Breton NWRs (USFWS 2008). In addition, no evidence of archaeological sites has been reported on North Breton Island (Goodwin 1993). The earliest accounts of Breton Island are from French explorations of the area in 1698-1699. It is assumed that any visits to the island were probably brief to collect desired resources because of the harsh living conditions compared to other barrier islands. While the Section 106 review process is ongoing, an initial review of the project indicates that historic properties have the potential to exist within the project area. The island is located near historically documented shipping routes used by the French leading to settlements along the Gulf coast. Because of the shallow waters of Breton Sound, the majority of historic boat use was limited to smaller vessels such as sloops, luggers, and longboats. The navigation history indicates that watercraft of various types have sailed the waters of Breton sound since the arrival of Europeans to the area. There is a potential for historical shipwrecks within the area due to natural and manmade hazards. However, past studies found no evidence of known shipwrecks within the project area (Goodwin 1993).

In 1915, several families and a school were located on Breton Island. Prior to the hurricane of that year, the island was evacuated. The hurricane destroyed the settlement, and it was never rebuilt (USFWS 2013a). In addition, there was an oil facility just off of North Breton Island operated by Kerr McGee. The building was destroyed during hurricane Katrina in 2005. Part of a bulk head, well heads, valves and flowlines still remain at the site.

Environmental Consequences

Currently, there are no historic or cultural resources known to exist within the project area (USFWS 2008). It is anticipated that cultural resources would be unaffected by the proposed project. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

9.6.6.3 Land and Marine Management

Affected Resources

Breton NWR includes North Breton Island and all of the Chandeleur Islands in St. Bernard and Plaquemines Parishes, Louisiana. As federal lands, these islands are not subject to local planning and zoning regulations, but are managed according to the Delta and Breton NWR CCP. As discussed above, management objectives set forth by the CCP are to provide sanctuary for nesting and wintering birds; protect and preserve the wilderness character of the islands; and, provide sandy barrier beach habitat for a variety of wildlife species.

Public use at Breton NWR centers on wildlife viewing and fishing from the beaches and in the shallow water surrounding the islands. Camping on the islands is no longer permitted due to the large amount of land lost to Hurricane Katrina and possible impacts to nesting birds on the remaining habitat. To avoid visitor disturbance to nesting bird colonies, each colony is posted as a closed area during the nesting season; approximately five percent of the islands is used by nesting birds.

Environmental Consequences

Under the proposed project, no changes would occur to the current land use at Breton NWR. Land use and management authority at the refuge would remain under the purview of the US Fish and Wildlife Service, and no development at the site would occur. The proposed project would be consistent with and support the Breton NWR CCP, as it would provide sanctuary for several species of nesting and wintering seabirds and would restore sandy barrier beach habitat.

Under the Coastal Zone Management Act of 1972, Federal Trustees must seek to ensure that the selection of the projects for early restoration are consistent to the maximum extent practicable with the federally-approved coastal management programs for the states where such projects include activities with the potential to affect a coastal use or resource. Coincident with the public review of the Phase III DERP/PEIS, the Federal Trustees submitted a consistency determination for the early restoration projects proposed in Louisiana for appropriate review by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM) on December 12, 2013 (Federal Trustees 2013). LDNR OCM responded on February 18, 2014, concurring with the federal determination of consistency for purposes of selection of the early restoration projects in Louisiana, but reserved its additional state reviews for consistency for future federal agency activities, and for non-federal activities subject to federal permitting processes or Louisiana's Coastal Use Permit (CUP) program, as required or appropriate to those processes (Haydel 2014).

Although this project occurs on federal land, which is not part of any state's coastal zone, if it is determined that it can affect a state(s)' coastal use or resource, a final consistency determination will be submitted for this project and activities will take place consistent with the program’s requirements.

Therefore, the proposed project would have no impacts to Land and Marine Management.

9.6.6.4 Aesthetics and Visual Resources

Affected Resources

The refuge consists of an island chain starting 16 miles offshore to the northeast of Venice, Louisiana and extending northward toward the Mississippi Gulf Coast for a distance of 70 miles. The general visual character of the area surrounding the refuge can be described as undeveloped. The topography is flat to gently sloping with low-lying marshlands, and land elevations range from 0 to less than 6 feet above sea level. The landscape in the vicinity of the proposed project area is characterized by a mosaic of marsh wetlands, dunes and beaches. There are no designated protected viewsheds in the vicinity of the proposed restoration activities. Unobstructed views of open water exist from dunes and at higher elevations of the island.

Environmental Consequences

Temporary impacts to visual resources would result from implementation of the proposed restoration activities. Construction equipment would be temporarily visible to visitors and recreational users. These construction-related impacts to visual resources would be minor, since the island is not visible from mainland Louisiana and construction activities and equipment would only be visible to visitors arriving by boat. Because the dune and marsh restoration would consist of the placement of natural sand, silt and clay material, no impacts to visual resources are anticipated as a result of restoration activities. Dune restoration and revegetation is anticipated to result in a long-term minor visual enhancement to the refuge, as the project is intended to mimic the natural processes associated with barrier island formation.

9.6.6.5 Tourism and Recreational Use

Affected Resources

North Breton Island is located within Breton NWR and accessible by boat only. There is no regular commercial boat transport to the island, but charters are available to visitors. Small craft vessels generally reach the southern islands from launches in Venice, Louisiana. Public use includes wildlife viewing and fishing from the beaches and shallow waters surrounding the island. Camping is no longer permitted due to the large amount of land lost to Hurricane Katrina and possible impacts to nesting birds on the remaining habitat. To avoid visitor disturbance to nesting seabird colonies, each colony is posted as a closed area during the nesting season; approximately five percent of the islands is used by nesting birds. Visitor use at Breton NWR is confined mainly to the spring, summer and early fall months, with approximately 2,500 visits per year (USFWS 2013a). North Breton Island is a small portion of Breton NWR; visitor use to North Breton Island is likely lower than for the rest of the refuge.

Environmental Consequences

During the construction period, the visitor recreational experience would be adversely impacted by noise and visual disturbances associated with the use of construction equipment. Access to waters surrounding the island would potentially also be restricted during dredging activities. While these temporary inconveniences would result in minor adverse impacts on tourism and recreational use, over the long term the project would result in minor beneficial impacts to tourism and recreational use. Opportunities for recreational activity at the shoreline would be enhanced as a result of improved fishing and bird watching opportunities accruing from improved habitat conditions. The implementation of the proposed project would not be expected to result in an increase in the number of visitors, due to the island's small size and its distance from shore; however, the project would contribute positively to improvements in the quality of the visitor experience. Overall, adverse impacts to tourism and recreational use would be short term and minor. Over the long term the project would result in minor beneficial impacts to tourism and recreational uses.

9.6.6.6 Infrastructure

Affected Resources

Breton Island is a remote barrier island with no services or infrastructure. It is not located near any urban centers; the closest town is Venice, approximately 18 miles away and across the Mississippi River. Pipelines and other infrastructure associated with offshore oil production are present throughout Breton Sound and the Gulf of Mexico. While no pipelines are known to lie within the anticipated restoration footprint, several known, existing pipelines and facility infrastructure cross the area of the proposed borrow sites as shown in Figure 9-15. Magnetometer surveying within the target borrow area and associated conveyance corridors, access channels, and project fill areas will be conducted as part of project engineering and design before construction activities begin to better delineate these structures.

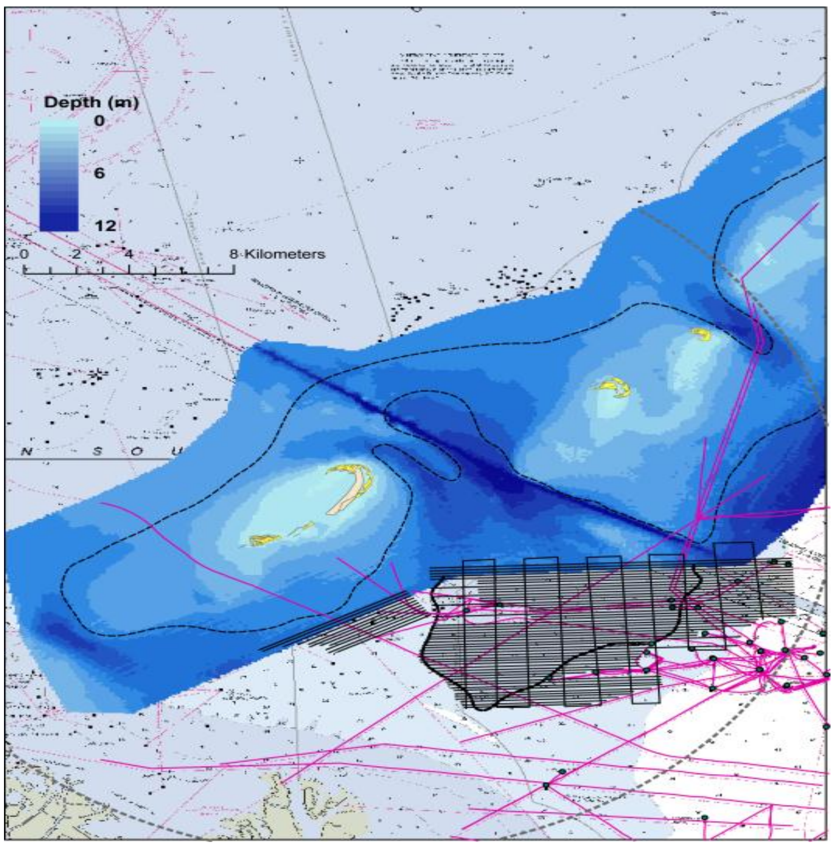

Figure 9-15. Project area, showing known pipeline infrastructure.

Environmental Consequences

The project would not impact utility, transportation, or other infrastructure associated with urban development, as no such infrastructure exists on North Breton Island and no development is proposed. Existing oil production facilities and pipelines would not be impacted, as these would be identified and avoided during construction. Therefore, the proposed project would have no impacts to infrastructure.

9.6.6.7 Public Health and Safety

Affected Resources

The management of hazardous materials is regulated under various federal and state environmental and transportation laws and regulations, including the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Emergency Planning and Community Right-to-Know Act, the Hazardous Materials Transportation Act, and the Louisiana Voluntary Investigation and Remedial Action statute. The purpose of the regulatory requirements set forth under these laws is to ensure the protection of human health and the environment through proper management (identification, use, storage, treatment, transport, and disposal) of these materials. Some of these laws provide for the investigation and cleanup of sites that have already been contaminated by releases of hazardous materials, wastes, or substances.

A review of the US Environmental Protection Agency EnviroMapper revealed no known sources of contamination or hazardous materials located on or immediately adjacent to North Breton Island (EPA 2013b). However, numerous oil and gas facilities exist within Breton Sound. Oil and gas facilities are subject to chemical releases that may have the potential to affect the site.

Environmental Consequences

Project deployment would use mechanical equipment, boats, and barges that use oil, lubricants and fuels. The contractor would be required to take appropriate actions to prevent, minimize, and control the spill of construction related petroleum or hazardous materials such as vehicle fuels, oil, hydraulic fluid, and other vehicle maintenance fluids, and to avoid releases and spills. If a release should occur such releases would be contained and cleaned up promptly in accordance with all applicable regulations. As a result, no impacts associated with construction-related petroleum or hazardous materials would be anticipated.

Although numerous oil and gas pipelines and wellheads are present in the area, the probability of impacts related to petroleum or hazardous materials is low provided that care is taken not to disturb these pipelines. The principal impacts of the proposed project on public health and safety would be related to the potential mobilization of hazardous waste from excavation and handling of sediments containing oil, heavy metals, or other materials, which could result in exposure to the environment and workers. Sediment analysis would be completed prior to project implementation. If hazardous materials are encountered in the project area during construction activities, appropriate measures for the proper assessment, remediation, management, and disposal of the contamination would be required in accordance with applicable federal, state, and local regulations.

Because of the nature and location on the project, no impacts to public health and safety, or shoreline erosion are anticipated as a result of construction and dredging activities to rebuild and re-establish dunes and wetlands. The project and its construction are not anticipated to generate hazardous waste or the need for disposal of hazardous waste. In the event of a fuel or oil spill from the vessels or equipment, all procedures, regulations and laws pertaining to Oil Spill Prevention and Response would be adhered to and the incident would be reported to appropriate agencies. All occupational and marine safety regulations and laws would be followed to ensure safety of all workers and monitors. Therefore, public health and safety would be unaffected by the proposed project.

9.6.7 Summary and Next Steps

The NEPA analysis of the environmental consequences suggests that short term minor adverse impacts are anticipated to all potentially affected resources except "Protected Species", where a short term moderate adverse impact is anticipated to piping plover and red knot due to construction and dredging related disturbances. No moderate to major adverse impacts are anticipated to result to all other resources. Based on initial designs, the project would provide long-term benefits by restoring more than 300 acres of beach, dune, and back-barrier marsh habitats at the North Breton Island barrier island location in Louisiana. The Trustees considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts. Trustees' determination on selection of this project (Louisiana Outer Coast Restoration) will be included in the Record of Decision. This project is consistent with the programmatic Alternative 2 (Contribute to Restoring Habitats and Living Coastal and Marine Resources) and the programmatic Alternative 4 (Preferred Alternative). This project would be implemented in accordance with all applicable laws and regulations.

9.6.8 References

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9.7 Louisiana Marine Fisheries Enhancement, Research, and Science Center: Project Description

9.7.1 Project Summary

The Louisiana Marine Fisheries Enhancement, Research, and Science Center ("the Center") would establish state of the art facilities to responsibly develop aquaculture-based techniques for marine fishery management. The proposed project would include two sites (Calcasieu Parish and Plaquemines Parish) with the shared goals of fostering collaborative multi-dimensional research on marine sport fish and bait fish species; enhancing stakeholder involvement; and providing fisheries extension, outreach, and education to the public. Specifically, the project would provide Louisiana with an important management tool for monitoring the long term health of wild populations of popular recreation marine species by developing the ability to release known numbers of marked juveniles into pre-determined habitats as part of well-designed studies that would allow for measurement and detection of changes in wild populations of marine sport fish species. The Center would also establish living laboratories to support a variety of marine fisheries outreach and educational activities for the public. The estimated cost for this project is $22,000,000.

9.7.2 Background and Project Description

Development of the Center would support the State of Louisiana's ongoing efforts to manage recreational fishery resources by establishing the state's first marine fish hatchery facility, and developing public venues for marine fishery educational activities. Fish produced at the Center would be utilized for a variety of research projects, including the targeted release of small numbers of marked sport fish species to study Louisiana's recreational fishery. The Center would allow the Louisiana Department of Wildlife and Fisheries ("LDWF") to incorporate aquaculture technology and outreach venues as tools for marine fisheries management, and involve stakeholders through educational opportunities. Outreach and educational activities at the Center would deliver information to visitors on fisheries management topics and the importance of conserving valuable marine species and habitats. These activities are designed to encourage recreational angling and increase visitors' appreciation of Louisiana's unique natural resources.

9.7.2.1 Calcasieu Parish Facility

The primary location for the Center would be at a site near the north end of Calcasieu Lake, and south of the city of Lake Charles (Figure 9-16). The proposed facility includes construction of a multi-purpose building and pond complex to be used for marine fisheries research, production, education, and outreach. The building will house multiple components including a visitor center, support space for staff and collaborating researchers, and a hatchery complex.

The public visitation and outreach components of the facility would provide dedicated space for public education on fisheries management activities and restoration programs, and would include a reception area, educational exhibits, display aquaria, marine animal touch tank, visitor restrooms, and a youth fishing pond. The support areas of the building would include administrative and staff offices, meeting rooms, dormitory, crew support areas, two laboratories, feed storage and preparation, maintenance shop, and equipment storage rooms.

The hatchery complex would be focused on the production of spotted seatrout (*Cynoscion nebulosus*), red drum (*Sciaenops ocellatus*), and southern flounder (*Paralichthys lethostigma*). The indoor hatchery components would employ the use of modern recirculating aquaculture systems ("RAS") technology to provide the required controlled systems needed for year round production capability. The production pond complex would consist of three 0.5-acre multi-purpose rearing ponds. To support these systems, the facility would include a salt water intake, pump station and pipeline, a water reservoir pond and storage tanks, a freshwater well, and effluent treatment ponds.

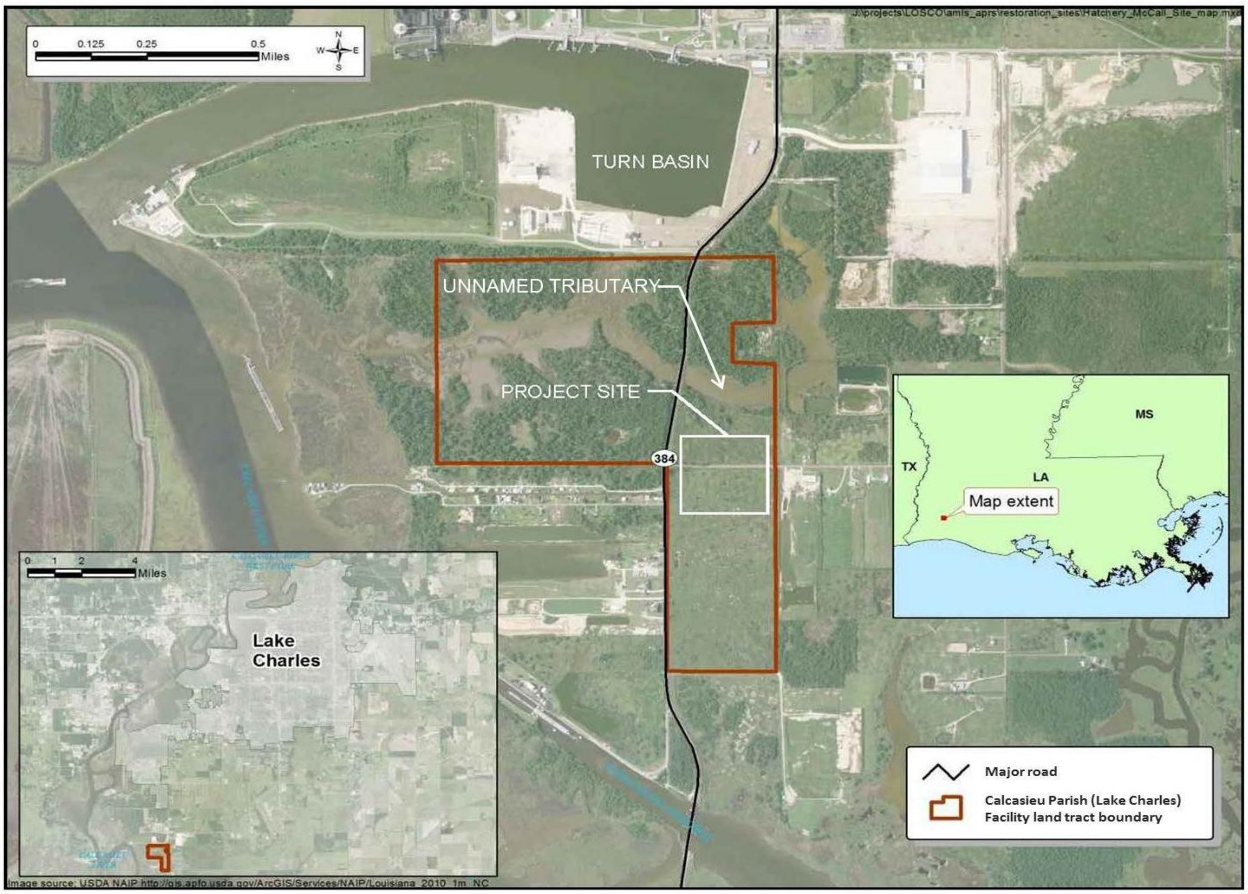

Figure 9-16. Location of the Calcasieu Parish site.

9.7.2.2 Plaquemines Parish Facility

A second facility would be located in Plaquemines Parish, northwest of West Pointe à la Hache (Figure 9-17). This facility would serve as a research and demonstration facility for marine baitfish in support of recreational sport fishing. The species of fish proposed are the Gulf killifish (*Fundulus grandis*) and the Atlantic croaker (*Micropogonias undulatus*). At this site, the project would involve constructing a multi-purpose building and renovating/reconditioning existing onsite facilities. As currently proposed, the constructed building would house a staff office, crew support and baitfish culture area with small-scale RAS to support research and demonstration of technology for marine baitfish husbandry. Existing onsite facilities that were previously used for plant propagation would be renovated or reconditioned, including a Mississippi River water intake structure and pumping station, infrastructure components (e.g., water pipelines, access roads), and ponds for research, effluent treatment, and water storage. The facility would help develop and improve techniques for marine baitfish holding and production systems, which would be demonstrated and disseminated to improve access to live bait for recreational fishing in Louisiana.

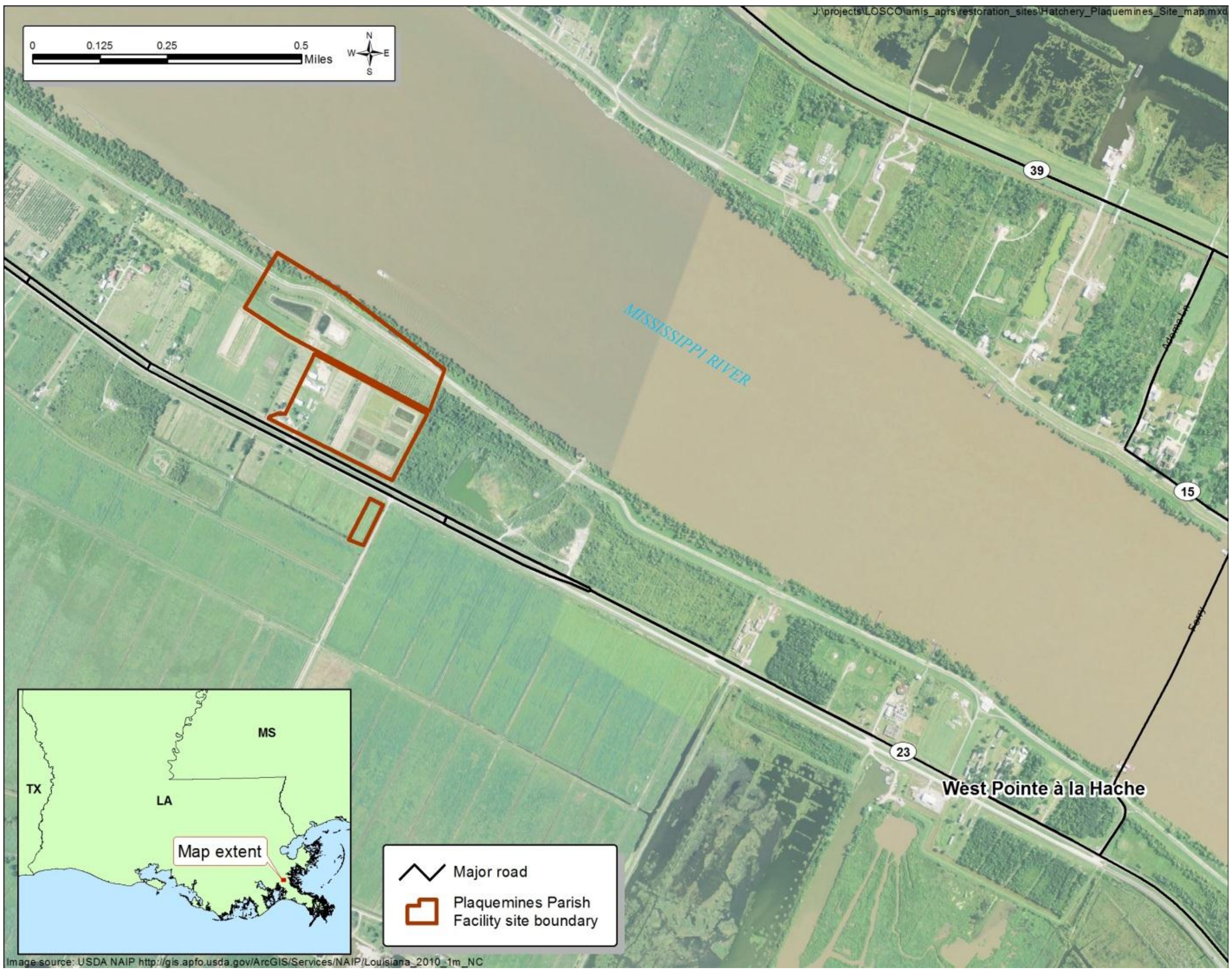

Figure 9-17. Location of the Plaquemines Parish satellite facility.

Hatchery Operations

The operating plans at both locations would be guided by species-specific best management practices ("BMPs") addressing fish husbandry and spawning, live food production and larval rearing, as well as production systems for growing fish to desired sizes. Fish grown at the hatchery facilities would be used for a variety of research projects.

Wild caught brood fish would be collected, acclimated, and conditioned to spawn using temperature and photoperiod manipulation of holding systems. Fertilized eggs would be collected, enumerated, and incubated in dedicated tanks. The resulting larvae would either be fed live foods (e.g., rotifers, artemia) in larval-rearing systems, or stocked in outdoor systems which provide a natural source of zooplankton for forage. Juvenile fish would be reared in a combination of tank and/or pond systems utilizing natural and artificial diets (e.g., zooplankton, forage fish, commercially available feeds, and research diets).

Sport fish produced at the Center would be used for the long-term monitoring of Louisiana's fishery resources and the habitats that support them. The production and release of marked hatchery fish will be carried out in conjunction with LDWF's statewide fishery monitoring program. Initial releases of marked, hatchery-produced sport fish will be targeted experimental stockings to investigate ecological hypotheses and evaluate release strategies (*e.g.,* spatial and temporal variation, fish size, marking techniques).

9.7.3 Evaluation Criteria

The Trustees evaluated the project based on the evaluation criteria described in Chapter 2 and the additional RRP Program-specific criteria described in the introduction to this chapter. The project would enhance the public's use and/or enjoyment of natural resources, helping to offset adverse impacts to such uses caused by the Spill. The nexus to resources injured by the Spill is clear. See C.F.R. § 990.54(a)(2); and 6(a)-(c) of the Framework Agreement. Recreational fishing in Louisiana was adversely impacted by the Spill, as widespread closures of areas for recreational fishing were necessary because of oil and clean-up/response activities. The objective of this restoration project is to help compensate for the loss of recreational fishing services resulting from the Spill by constructing and operating the facilities described above to support and improve the State of Louisiana's management of marine fishery resources (via the production of sport and bait fish and associated research) as well as public education and outreach.

A thorough review, including review under applicable environmental laws and regulations, is described in Section 9.8 and indicates that adverse effects from the project would largely be minor, localized (e.g., within the construction footprint), and often of short duration. In addition, the best management practices and measures to avoid or minimize adverse effects described in Section 9.8 would be implemented. As a result, collateral injury would be avoided and minimized during project implementation (construction and installation and operations and maintenance). See 15 C.F.R. § 990.54(a)(4).

The designs for the Center are technically feasible and based on proven techniques and established methods used in other fish hatchery and research center projects. See 15 C.F.R. § 990.54 (a)(3); and 6(e) of the Framework Agreement. The project could be developed at a reasonable cost and implemented with minimal delay, as the State of Louisiana has already engaged in significant work associated with planning and permitting for the Center that demonstrates the project's feasibility and high likelihood of success. See 15 C.F.R. § 990.54 (a)(1), (a)(3); RRP Program FPEIS (NOAA et al. 2007b, p. 104); and 6(e) of the Framework Agreement. The project supports existing restoration strategies and is consistent with anticipated long-term restoration needs because it will improve scientific understanding of the fishery resource in Louisiana. See RRP Program FPEIS (NOAA et al. 2007b, p.104); and 6(d) of the Framework Agreement.

9.7.4 Performance Criteria, Monitoring, and Maintenance

Monitoring will be designed around the objective of the project which is to develop two sites (Calcasieu Parish and Plaquemines Parish) with the shared goals of fostering collaborative multi-dimensional research on marine sport fish and bait fish species; enhancing stakeholder involvement; and providing fisheries extension, outreach, and education to the public. Construction monitoring will be done before, during, and in a subsequent period following construction to ensure that project designs are correctly implemented. Successful implementation of this restoration project will be measured by (1) the completion of construction of the facilities and (2) the operations of the facilities as anticipated, including public outreach and education. LDWF will monitor the operations of the Center in multiple ways, including documenting compliance with all permitting requirements, monitoring the operational status of the hatchery components, and monitoring the number of fish produced and released annually. The Center is also designed as an education and outreach facility, so the number and types of visitors (e.g., tourists, school groups) to the facilities will be recorded.

The facilities at both Center locations are designed as research facilities, so there will be ongoing scientific efforts to optimize hatchery performance, including monitoring the effects of different protocols on outcomes. The production and release of marked hatchery fish are intended to be carried out in conjunction with LDWF's statewide fishery monitoring program and will help develop and evaluate strategies for the management of marine fish species by providing information on the recruitment, survival, health, and movements of these populations.

Maintenance and staffing of the facilities will be the responsibility of LDWF and will be done as specified in the design plans for the Center.

9.7.5 Offsets

NRD Offsets are $33,000,000 expressed in present value 2013 dollars, based on a benefit-to-cost ratio of 1.5, to be applied against the monetized value of lost recreational use provided by natural resources injured in Louisiana, which will be determined by the Trustees' assessment of lost recreational use for the Spill. See Chapter 7 of this document (Section 7.2.2) for a description of the methodology used to develop monetized Offsets.[8]

[8] For the purposes of applying the NRD Offsets to the calculation of injury after the Trustees' assessment of lost recreational use for the Spill, the Trustees and BP agree as follows:

- The Trustees agree to restate the NRD Offsets in the present value year used in the Trustees' assessment of lost recreational use for the Spill.
- The discount rate and method used to restate the present value of the NRD Offsets will be the same as that used to express the present value of the damages.

9.7.6 Cost

The total estimated cost to implement this project is $22,000,000. This cost reflects estimates developed from the most current information available to the Trustees at the time of the project negotiation. The cost includes provisions for planning, engineering and design, construction, monitoring, and potential contingencies.

9.8 Louisiana Marine Fisheries Enhancement, Research, and Science Center: Environmental Review

9.8.1 Introduction and Background

In response to the Spill, a Gulf Coast region-wide Early Restoration effort is underway to address the impacts of the Spill on natural resources and on associated lost human uses of those resources. The Center is a component of that effort, and is intended to address a portion of the recreational uses lost as a result of the Spill. The Center would include development of two sites in Louisiana – one in Calcasieu Parish and one in Plaquemines Parish – that would support the State of Louisiana's ongoing management of its saltwater sport fishery. The proposed facilities would support research, hatchery production of sport fish and baitfish, and public education and outreach. The proposed project would provide state-of-the art facilities for collaboration with stakeholders and for rearing fish for research projects. Fish produced at the proposed Calcasieu Parish facility would be marked and released in conjunction with the existing Louisiana Department of Wildlife and Fisheries (LDWF) marine fisheries monitoring program. This work would provide information on recruitment, survival, health, and movements of marine fish populations, which would be used to help develop and evaluate strategies for the management of Louisiana's saltwater sport fishery. Additionally, staff and researchers at the proposed Plaquemines Parish facility would conduct and disseminate the results of research on marine baitfish production and holding techniques. The Center would also serve as a venue for public outreach and educational activities concerning marine habitats and ecosystems, as well as related fisheries management and conservation issues.

9.8.1.1 Calcasieu Parish Facility

The proposed Calcasieu Parish facility would function as the main location for the Center. The primary function of the facility would be for research on, production of, and education about marine sport fish species including red drum (*Sciaenops ocellatus*), spotted seatrout (*Cynoscion nebulosus*), and southern flounder (*Paralichthys lethostigma*). Fish produced at the facility's hatchery would be used for long-term monitoring of the fishery resources and the habitats that support them. The facility would also house a visitor complex to provide education and outreach on Louisiana's fisheries and marine ecosystems.

9.8.1.2 Plaquemines Parish Facility

The proposed Plaquemines Parish facility would serve as a secondary location for the Center. The primary function of the facility would be for marine baitfish research. The proposed species for this research would be the Gulf killifish (*Fundulus grandis*) and the Atlantic croaker (*Micropogonias undulatus*). This facility would operate as a demonstration site for research and education activities regarding effective marine baitfish holding and culture systems.

9.8.2 Project Location

9.8.2.1 Calcasieu Parish Facility

The proposed Calcasieu Parish facility site is located on a 320.5-acre privately-owned tract of land north northeast of Calcasieu Lake and south of Lake Charles, near the Calcasieu River. The proposed facility site would occupy a small portion of the full tract (Figure 9-18). LDWF would negotiate an appropriate long-term land use arrangement with the landowner as part of the final project design and permitting process.

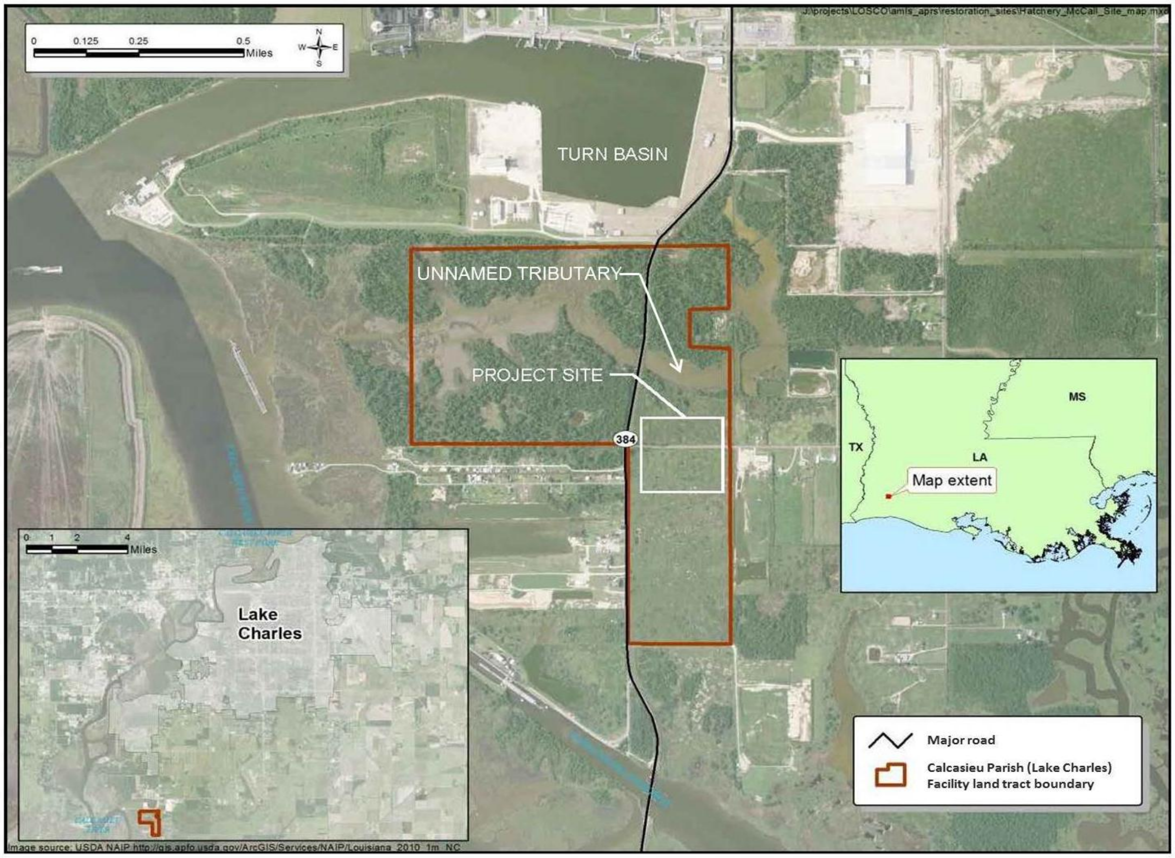

Figure 9-18. Vicinity map for the proposed Calcasieu Parish facility. The area labeled as "project site" encompasses where the buildings and ponds are expected to be situated.

The tract is located in Sections 16 and 21, T11S, R9W (Figure 9-18). The tract is transected from north to south by Big Lake Road and from west to east by Joe Ledoux Road. An unnamed tributary to the Calcasieu River and the Gulf Intracoastal Waterway (GIWW) crosses the northern end of the tract from west to east. The latitude/longitude of the tract is 30.097313° N, 93.288029°W (NAD83).

The tract of land proposed for the Calcasieu Parish facility lies just outside the boundary of the Louisiana Coastal Zone, although it is mapped within the 100-year floodplain. The property is currently undeveloped and privately owned. Its natural land features include emergent wetlands, mima mounds, bayous, and forested wetlands, and the land is hydrologically connected to surrounding streams, bayous, rivers, and lakes. The wetlands within the boundary of the tract have likely been degraded by activities such as channelization, drainage, levees, logging, pumping and past cattle grazing. Surrounding land uses are primarily residential and industrial. There are no schools, churches, cemeteries, hospitals, or other public buildings located on or immediately adjacent to the tract of land proposed for the facility. According to historical records, Benoit Cemetery was originally located in the northern section of the tract, but this cemetery was relocated off the site in 1963. The Lake Charles Regional Airport is approximately 4 miles northeast of the proposed facility site.

9.8.2.2 Plaquemines Parish Facility

The proposed Plaquemines Parish facility site is located near the community of West Pointe à la Hache, on property previously leased by the Louisiana State University Agricultural Center (LSU AgCenter) from Plaquemines Parish. The former LSU AgCenter Coastal Area Research Station (CARS) used the site for research on citrus and coastal plant propagation (Figure 9-19), and when it closed in 2011 the site ownership reverted back to Plaquemines Parish. LDWF would negotiate an appropriate long-term land use arrangement with the Parish as part of the final project design and permitting process. The property is bordered to the east by the Mississippi River, to the north by private property, to the west by Belle Chasse Highway (LA 23), and to the south by private property. Plaquemines Parish currently owns the property. The latitude/longitude is 29.579955°N, 89.820681°W (NAD83).

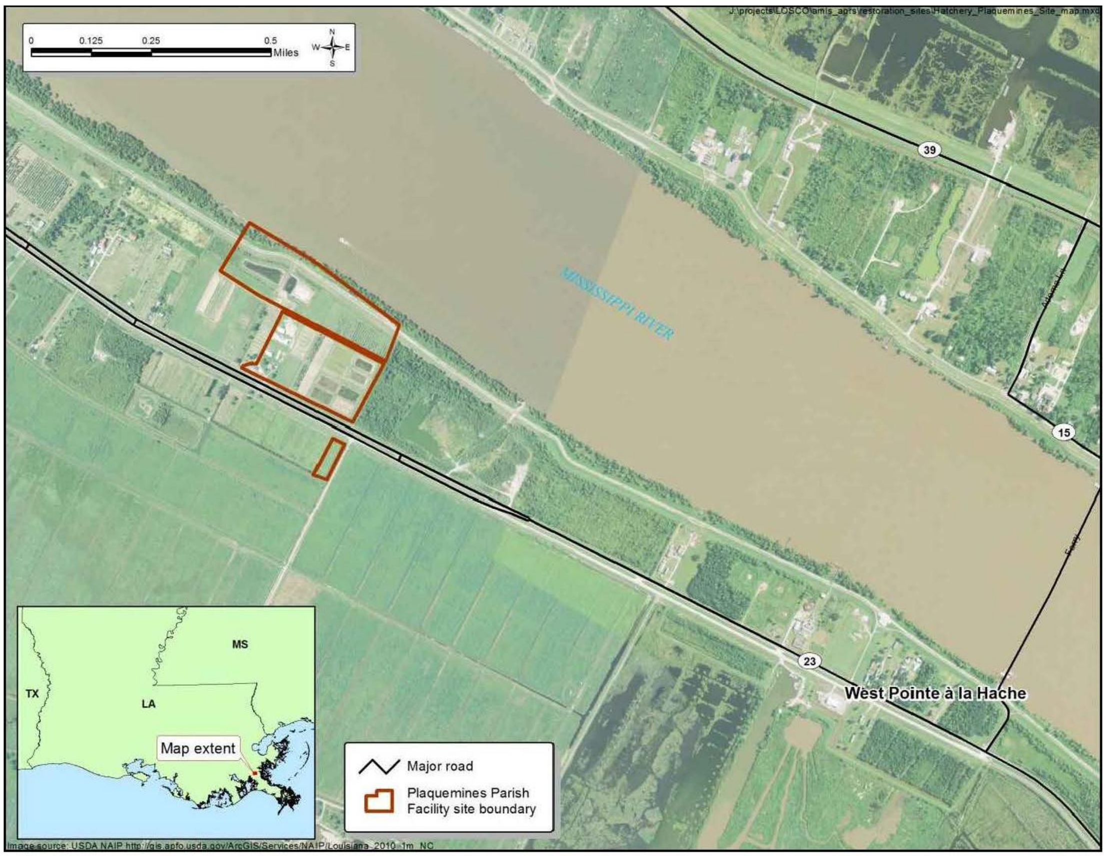

Figure 9-19. Vicinity map for the Plaquemines Parish facility.

Project activities are proposed to occur in a “fastland” area[9] that is protected by levees. This location lies within the Louisiana Coastal Zone and is mapped within the 100-year floodplain. The site has been impacted by development, land modification, and recent hurricanes and has been primarily used for industrial, agricultural, and residential purposes. Currently, the site is used by Plaquemines Parish as a receiving location for processing piles of earthen material that will be distributed and graded across the site after it is dried. The existing ponds will not be affected by this work.

9.8.3 Construction and Installation

9.8.3.1 Calcasieu Parish Facility

The proposed Calcasieu Parish facility would require construction of a multi-purpose building and pond complex to be used for marine fisheries research and production as well as public education and outreach (Figure 9-20). The facility would also require construction of a water supply system, including: 1) an intake and pump station that would pump water from the Turn Basin, an offshoot of the Calcasieu shipping canal (see Figure 9-18 for location of Turn Basin); 2) buried pipelines for water intake and effluent; and 3) an outfall structure for release of treated effluent, currently proposed for the unnamed tributary (see Figure 9-18 for location of unnamed tributary).

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[9] According to the Louisiana Office of Coastal Management, “fastlands” are lands surrounded by publicly-owned, maintained, or otherwise validly existing levees or natural formations as of Jan. 1, 1979, or as may be lawfully constructed in the future, which prevent activities, not to include the pumping of water for drainage purposes, within the surrounded area from having direct and significant impacts on coastal waters.”

(http://dnr.louisiana.gov/index.cfm?md=pagebuilder&tmp=home&pid=420, Accessed Aug. 28, 2013).

Figure 9-20. Proposed site plan for the Calcasieu Parish facility.

The elevated building is envisaged to be approximately 26,000 ft^2 containing an internal drive thru corridor and would include covered porches and six exterior stair systems for ingress and egress. It would be designed as a concrete, pier-supported structure located above base flood elevation and engineered to meet hurricane wind design standards. The building would be equipped with emergency systems to help protect staff and continue operations during severe weather events.

As currently proposed, the multi-purpose building would contain a hatchery, visitor center, dormitory, administrative and staff offices, meeting rooms, crew support areas, two laboratories, covered access corridor, maintenance shop, and equipment storage rooms (Figure 9-21). The hatchery would employ the use of modern RAS technology needed to provide the required indoor, controlled-environment fish production systems for year-round production capability. The hatchery portion of the building would be located immediately adjacent to the administrative and staff offices and crew support areas. Access to the hatchery production area would be accommodated by a 12-foot wide internal drive aisle with entry and exit ramps used to facilitate vehicle transport of fish and equipment to the elevated building. The visitor center is proposed as a 2,430 ft^2 dedicated space for public education on marine fisheries and restoration programs. This area would likely include a reception area, educational exhibits, display aquaria, marine animal touch-tank, and visitor restrooms.

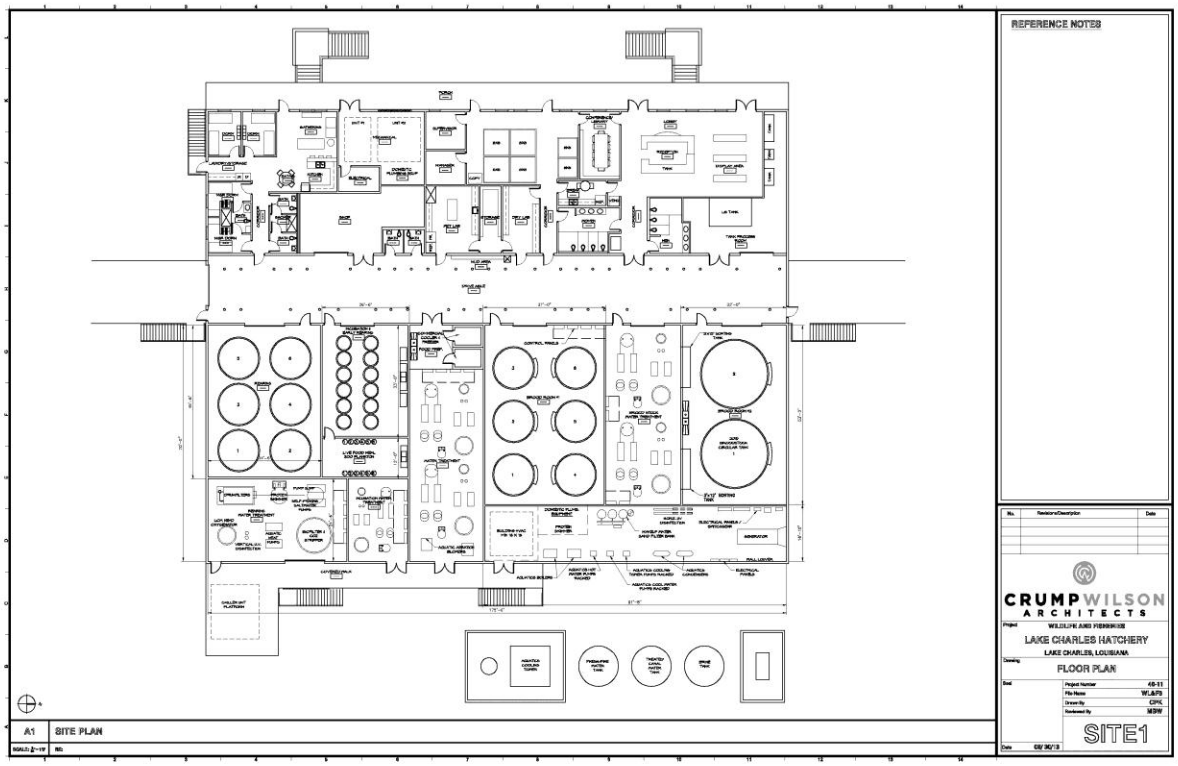

Figure 9-21. Proposed floor plan for Calcasieu Parish multi-purpose building.

The proposed facility would also include a pond complex consisting of a lined saltwater storage reservoir, three lined multi-purpose rearing ponds, and two lined effluent treatment ponds, as well as a youth fishing pond to the west of the multi-purpose building (see Figure 9-20). Each pond would be 0.5 surface acres in size, except the visitor fishing pond, which would be approximately one acre. The ponds would be constructed using compacted earthen dikes and pond liners to control seepage and improve pond fish rearing operations. Construction fill material would be obtained from existing borrow areas at or adjacent to the facility. Ponds would be equipped with concrete outlet structures and fish harvest basins (kettles), and would employ plastic piping for supply and drainage.

Grading and Ground Disturbance

The proposed facility, including the buildings, pond complex, and youth fishing pond, would be built on approximately 12 acres east of Big Lake Road. The excavation or placement of structures within or on soils would require a geotechnical evaluation to determine design and construction methodology. At a minimum, this evaluation would apply to ponds, buildings, pipelines, intake structures, and access roads. Further details are provided below.

Buildings

Multi-Purpose Building: Construction of the multi-purpose building (and associated parking areas) would impact approximately 4 acres and include clearing and grading of undeveloped land.

Storage Building: A pre-engineered storage building (3,200 ft^2) would be located near the production ponds. Construction of the building would require clearing and grading of undeveloped land.

Emergency Backups: In the event of a storm, the facility would have a backup generator(s) with the capacity to run the administrative area and hatchery until normal utilities could be restored. The emergency generator(s) would be sized to handle the entire energy load for the site and are anticipated to be powered from natural gas, accessing a nearby natural gas main line. Automatic transfer switches would be installed at the hatchery building to automatically transfer the load to the generator in the event of power outage. Liquid oxygen systems would also be used to oxygenate fish systems in the event of power outages.

Ponds

Fish Production Ponds: Construction disturbances for the rearing ponds would include clearing and grading of undeveloped land for pond complex construction. There would be a total of three fish production ponds, each approximately 0.5-acre in size. The pond depths would slope from 3 to 6 feet deep. The ponds would be constructed using compacted earthen dikes and an impermeable membrane such as an EPDM rubber pond liner for seepage control and improved pond fish rearing performance. Excavation of 2-4 feet of soil would be anticipated pending results of the geotechnical evaluation. The ponds would require an under-drain system to discharge groundwater and gases away from the bottom of the ponds. Fill material for construction would be obtained from existing borrow areas, either on site or immediately adjacent to the site. Water supply would be provided for each pond, which would require excavation, trenching and backfilling to install pipelines. The pond water supply system would include a fully-looped piping system to provide deep end and shallow end water delivery. Isolation valves and system drains would also be provided within the water supply piping system for ease of maintenance. Each pond would be equipped with a concrete interior "U-shaped" fish harvest kettle, concrete outlet structure, and a concrete kettle access stairway. The pond drainage would also require pipeline excavation, trenching and backfilling.

The three 0.5-acre fish production ponds would be stocked and operated to facilitate multiple pond-rearing cycles per year. According to Schwartz and Boyd (1995), the last 10-20% of the pond drainage contains higher concentrations of contaminants compared to the first 80-90% of discharge. Therefore, the proposed effluent treatment system would target those parameters by treating the last portion of the pond during drainage. The bottom portion of the pond draining cycle would be directed to the effluent treatment system to reduce the level of solids and associated nutrients prior to its release into the unnamed tributary. The proposed fishing pond system would also be integrated with the effluent treatment system to further limit solids and nutrients from leaving the facility. The effluent treatment system would be an actively managed treatment, meaning that a multi-tiered or staged process would be utilized allowing for a portion of the system to remain active while another portion of the system is properly dewatered, collected waste concentrated, and system cleaned prior to waste removal from the facility to an approved sludge disposal area. To further remove excess nutrients from discharge water, the final design process would evaluate the feasibility of using multi-trophic integrated aquaculture (e.g., coastal plants, shellfish) within the effluent ponds, and/or developing separate constructed wetlands for coastal plant production. There are many attractive attributes of utilizing wetlands for treatment of wastewater, including the physical entrapment of pollutants through adsorption in the surface soils and organic material, utilization and transformation of the elements by microorganisms and the low energy/low maintenance requirements to attain consistent treatment levels (USEPA 1998).

Youth Fishing Pond: The youth fishing pond would require excavation of approximately one acre and the installation of compacted levees. The stock species, water supply, and design concepts for this pond would be developed following preliminary design.

Water Supply System

Intake and Pump Station: As proposed, the building and ponds at the Calcasieu Parish facility would receive water from the Turn Basin, approximately 0.5 mile north of the site (Figure 9-18). The Turn Basin is an offshoot of the Calcasieu shipping canal located outside of the coastal zone. Water would flow by gravity from the Turn Basin through an intake screen into a concrete sump adjacent to the Turn Basin. The intake system would be constructed in such a way that aquatic species (such as fish and marine mammals) cannot be impinged or entrapped during operation. Pumps within the sump would provide canal water to the building and ponds. The pump station would include a multiple submersible or line shaft turbine pump system using variable frequency drive controlled motors. The proposed pump station capacity would be designed to accommodate pond filling and pond operation and to service the requirements of the building. Total water flow requirements would be anticipated to vary throughout the year based on seasonal production. The estimated flow rate would range between 500 and 1,000 gpm. All buried pipe would be installed using an open trench method.

Well: Two new wells would be drilled to accommodate fish production and facility needs. A 300 gpm well would be drilled (depth unknown at this time) to serve as a production well. The well water would be used to adjust salinity of culture water, to treat marine fish parasites, and for general facility operations. In addition, a domestic well would be drilled to meet potable water needs for the facility (depth and flow-rate unknown at this time). Regional groundwater yields reflecting State and Parish well records would be used to develop these wells. Actual depths would be determined based upon well driller data and associated testing.

Pipeline: The water supply pipeline would be a buried, 10-inch pipeline that would extend between the pump station and the building, the saltwater supply pond, and the production ponds. The ponds and building would also receive water from the new production process well located on the facility grounds. All buried pipe would be installed using an open trench method.

Saltwater Reservoir Pond: This 0.5–acre pond would be used for water storage, solar warming, and rapid pond filling. The reservoir would be lined with an impervious membrane for erosion control, seepage containment, and water quality maintenance. The pond would also function as a backup water supply when pumping station is non-operational (pump service, power outage).

Water Storage Tanks: Three insulated fiberglass tanks would be located adjacent to the visitor/hatchery building to store water for use in the RAS and water supply systems. The three 15,000 gallon tanks would hold: 1) fresh water (available also for fire safety), 2) treated Turn Basin water, and 3) manufactured brine water for salinity adjustments.

Effluent System

Effluent Ponds: Two ponds would be constructed for treatment of effluent from the building and rearing ponds. These ponds would be approximately 0.5 acres and would be constructed using the same methods used for the production ponds. These ponds would incorporate drainage structures that are used to dry the ponds for sediment removal. The two ponds would alternate in usage to facilitate sediment removal. To remove excess nutrients from discharge water, the final design process will determine the appropriateness of using multi-trophic integrated aquaculture in conjunction with the effluent ponds, or potentially with adjacent constructed wetlands.

Discharge Pipeline: Discharge of treated effluent water would flow via buried 24-inch pipe to an un-named tributary to the Calcasieu River and the GIWW approximately 1,000-feet to the north. The effluent discharge system would be constructed in such a way that aquatic species (such as fish and marine mammals) cannot be impinged or entrapped during operation. All buried pipe would be installed using an open trench method.

General Sitework

Site Drainage: Existing site drainage would be evaluated to determine capacity during storm events. Additional drainage and grading would be required where construction activities occur. Culverts and ditches would be upsized, as needed. Site-specific drainage calculations would be evaluated during the design process.

Roads and Parking: Road construction would involve an additional 130 feet of paved two-lane road and 130 feet of additional paved single-lane road. Pedestrian sidewalks around the building and parking lot would be constructed, as appropriate. The pond complex would include construction of an additional 150 feet of paved two-lane road and about 3,300 feet of 12-foot wide aggregate road around the pond perimeters.

Mobilization, Staging and Stockpiling

Temporary staging areas for materials, supplies, equipment, and a contractor office trailer would be located within the proposed site boundary. Base aggregate, asphalt, concrete, pipe, building components, earthen pond fill material, liners, and all building equipment would be delivered to the site. Construction access to the facility would be from Joe Ledoux Road. Construction crews would include a general contractor and subcontractors for earthwork, building construction (plumbing, HVAC, electrical), pond lining, and other specialty trades. Estimated crew sizes would range between 10 and more than 50 persons depending on the type of work and the stage of project construction.

9.8.3.2 Plaquemines Parish Facility

The Plaquemines Parish facility site was severely impacted by Hurricane Isaac in 2012 and the majority of the existing pumps, water lines, buildings, greenhouses and storage facilities were damaged. At this facility, construction would include rehabilitation of existing ponds, pumping stations, water lines, and access roads, and the addition of a new elevated building (Figure 9-22).

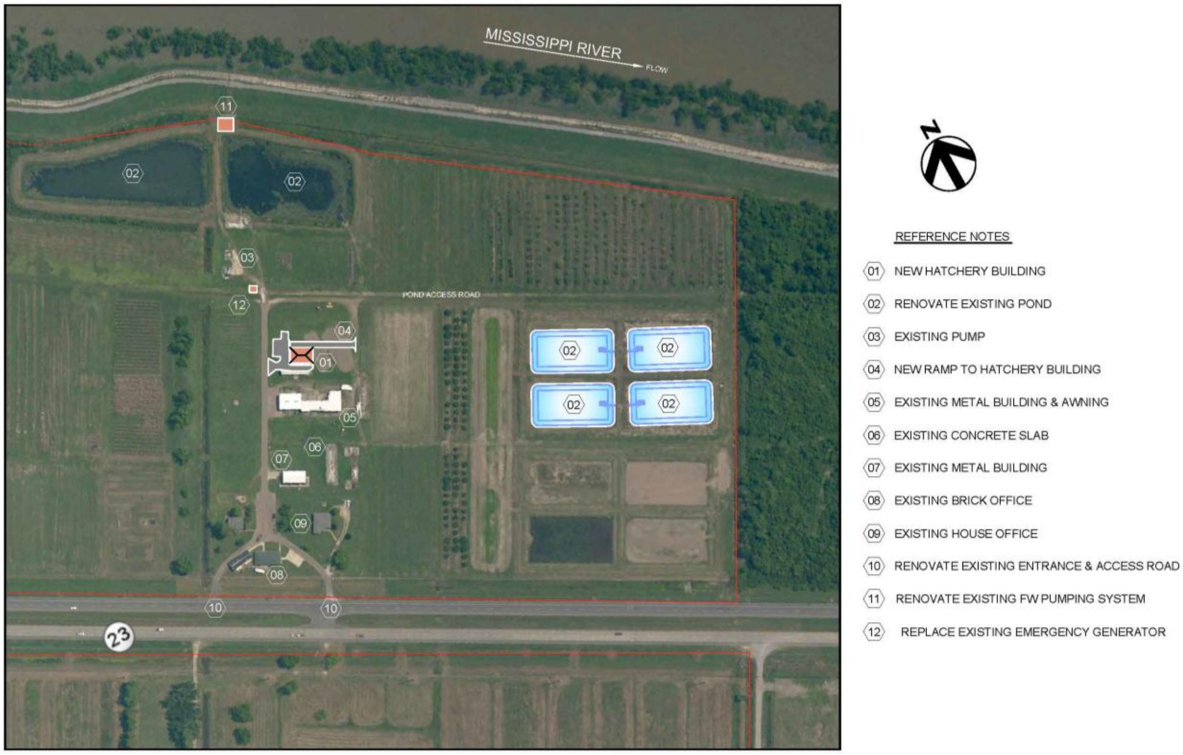

Figure 9-22. Site plan for the Plaquemines Parish facility.

The proposed multi-purpose building would be a concrete, pier-supported structure located above the base flood elevation, and designed to meet hurricane wind design standards (Figure 9-23). The building dimensions, as currently proposed, would be approximately 60ft x 40ft (2,400 ft^2) and of similar construction to the proposed Calcasieu Parish facility building described above. The building would be elevated approximately 12 feet above ground level with an access ramp for vehicles, and would contain a staff office, crew support area, and a baitfish culture area. The administrative portion of the new structure would consist of offices, a conference room and crew support areas. Production areas would include space for tank systems, water processing, and storage and preparation.

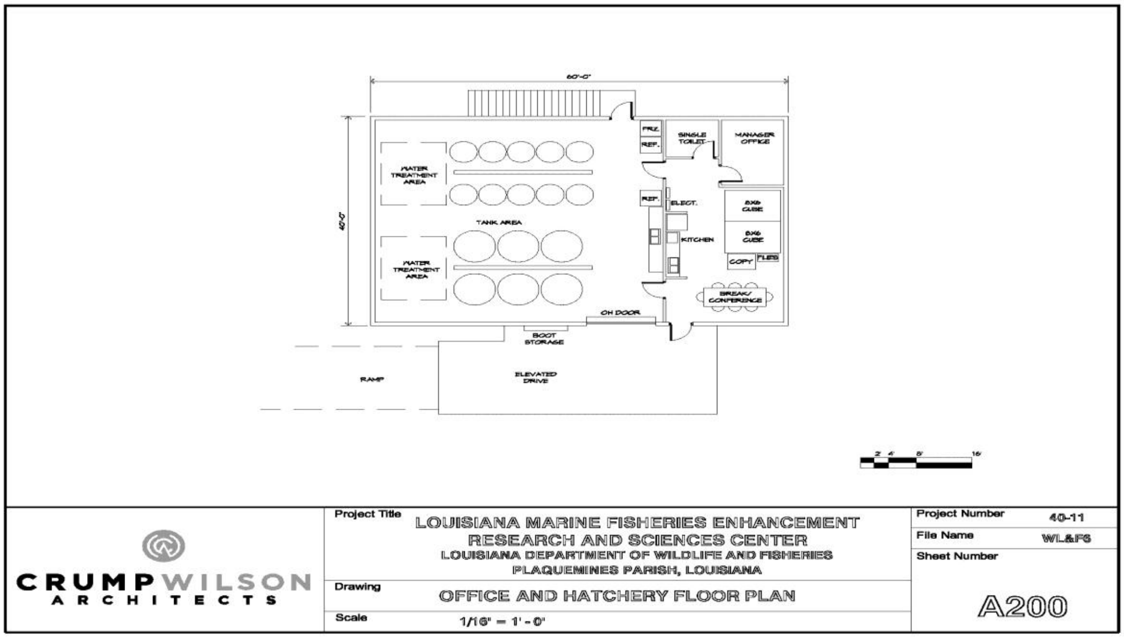

Figure 9-23. Floor plan for the Plaquemines Parish facility.

Grading and Ground Disturbance

All proposed construction would be completed in areas previously affected by construction and operation of CARS. The suitability of the imported earthen material observed on-site as a base for construction would be assessed during the geotechnical investigation; removal or re-grading of this material would be carried out as necessary. Work would include renovation of existing infrastructure, as well as construction of new infrastructure. The following table summarizes the work anticipated at the site (Table 9-6):

Table 9-6. Proposed construction for the Plaquemines Parish facility

EXISTING NO RENOVATION	EXISTING RENOVATION REQUIRED	NEW CONSTRUCTION
House Office	Ponds	Multi-Purpose Building
Metal Building with Awning	Freshwater Pump and Water Lines	Emergency Generator(s)
Concrete Slab	Site Utilities	Parking
Metal Building	Entrance & Access Roads	
Brick Office		

Multi-Purpose Building: The proposed building would be built on previously disturbed land within the tract described in Section 9.8.2.2. Construction of the building and parking lots would impact approximately 2 acres and would include re-grading of previously developed land.

Emergency Generator(s): In the event of a storm, the facility would have backup generator(s) with the capacity to run the administrative area and hatchery until normal utilities could be restored. The emergency generator(s) would be sized to handle the entire energy load for the site and are anticipated to be powered from natural gas, accessing a nearby natural gas main line. Automatic transfer switches would be installed at the hatchery building to automatically transfer the load to the generators in the event of power outage.

Parking: Site construction would include rehabilitation of existing roads to access the ponds. New or renovated parking would be added near the hatchery building and at the facility entrance.

Pond Renovation: Pond construction would include rehabilitation of the previous coastal plant propagation ponds and would include re-grading, compaction and installation of water supply and water control structures. Renovated ponds would be used for water storage, effluent treatment, and research on integrated multi-trophic aquaculture for freshwater and low-salinity production of baitfish and coastal plants.

Pump and Water Line Renovation: Site construction would include restoration of the existing Mississippi River water pumping system and related piping systems to support the proposed baitfish program. The existing pump system draws water from an existing intake structure in the Mississippi River and discharges into holding ponds; water is then pumped from the holding ponds to the rest of the site.

Site Utility Renovation: Construction at the facility would also require rehabilitation of existing utility systems for electrical, communications, and domestic water and wastewater treatment and connections to public utility providers.

Mobilization, Staging and Stockpiling
Temporary staging areas for material, supplies, equipment, and a contractor office trailer would be located within the proposed facility. Base aggregate, concrete, pipe, building components, and all building equipment would be delivered to the site. Construction access to the facility would be from Highway 23 (LA 23). Construction crews would include a general contractor and subcontractors for earthwork, building construction (plumbing, HVAC, electrical), and other specialty trades. Estimated crew sizes would range from 5 to 20 persons depending on the type of work and the stage of project construction.

9.8.4 Both Facilities

9.8.4.1 Contracting
Construction would be completed based upon construction contract documents (*e.g.,* drawings, specifications, cost estimates, and contracts) reviewed and approved by the Louisiana Department of Administration and LDWF. Construction would be completed by a qualified general contractor and subcontractors using established state construction standards and requirements with comprehensive oversight by the architect/engineering design team and state construction administrators.

9.8.4.2 Construction Schedule
The estimated time for final design, any final permitting, and contractor selection needs is 18 months after procurement of funding. Construction duration (which includes construction and start-up) is then estimated to be 16 to 24 months for the Calcasieu Parish site and 14 to 18 months for the Plaquemines Parish site. Work is anticipated to be conducted between 7 am and 4 pm, Monday through Friday.

9.8.5 Operations and Maintenance

9.8.5.1 Calcasieu Parish Facility

Marine fish production would include broodstock collection and maintenance, live food production, egg incubation and larval rearing, and both pond and indoor rearing systems. Wild captured red drum, spotted seatrout and southern flounder broodfish would be collected from Louisiana waters and quarantined to monitor fish health before use in the indoor controlled spawning systems. Broodstock would be induced to spawn with temperature and photoperiod manipulation using established protocols and technology. Fertilized eggs would be collected for hatching and resultant larval fish would either be fed live foods in larval-rearing systems, or stocked in outdoor systems which provide a natural source of zooplankton for forage. Juvenile fish would be reared in a combination of tank and/or pond systems utilizing natural and artificial diets. Hatchery-produced fish would be tagged and/or marked prior to release to help inform fishery managers about the recruitment, survival, and population health of important recreational fish species and support management decisions.

Water from the source water supply systems would be micro-screened, UV disinfected, and sand filtered before use in the facility. Water salinity in the culture systems would be adjusted using artificial seawater brine systems. The facility would employ RAS technology to reduce source water volume requirements and significantly reduce operating costs associated with large volume heating and chilling of water. The indoor systems would be expected to operate using 95-to 99-% re-circulation with water treatment. This technology would include operation of self-cleaning, biosecure, and environmentally-managed circular tanks that provide controlled indoor rearing systems to spawn and rear the targeted species. These circular tank systems would provide the capability to rear advanced larger size fish (referred to as “Phase 2” or “Phase 3”) to meet precise size and timing requirements needed by LDWF research programs.

Ponds would be stocked and operated to facilitate multiple pond-rearing cycles per year. Fish production would be completed using established BMPs for marine fish production, and fish quality would be monitored and assessed using American Fisheries Society Bluebook Fish Health procedures.

Effluent water from the building and ponds requiring solids reduction would be treated in two lined, 0.5 acre settling ponds. To remove excess nutrients from discharge water, the final design process would determine the appropriateness of using multi-trophic integrated aquaculture in conjunction with the effluent ponds, or potentially with adjacent constructed wetlands. Effluent would be discharged to an unnamed tributary of the Calcasieu River and the GIWW. Treatment would be designed to meet applicable Louisiana Pollutant Discharge Elimination System (LPDES) discharge standards.

Facility Operations

The Calcasieu Parish facility would be staffed, operated, and maintained by LDWF. LDWF intends to appropriately budget funds necessary for the continued operation and maintenance of the Center from within the department’s self-generating revenues or from other funding sources made available at the time.

Upon completion of construction, LDWF would undertake comprehensive facility commissioning, operational system testing, and staff training. Operation and maintenance manuals would be generated for all fish hatchery systems and building systems, including fish culture/spawning systems; process water treatment systems; source water supply systems; HVAC, electrical, and alarm/instrumentation systems; and emergency procedures. Operation of the facility would be enhanced by the use of computer-based instrumentation that provides computerized control of the industrial systems, on-going data acquisition, and an alarm system that would provide 24-hour/7-day per week monitoring and electronic notification of operational problems. In order to avoid fish loss, the building, emergency power systems (including emergency generators), and related hurricane-tolerant infrastructure would allow for continuous operation of the fish life-support components during adverse weather events.

LDWF would prepare an operating plan for both sites. The plan would outline the target annual production goals (including broodstock requirements) by species (*e.g.,* numbers and sizes), identify the required indoor fish culture and outdoor pond facilities and water quantities needed, and would include an annual operating budget. The LDWF operating plan would incorporate BMPs for marine fish rearing and hatchery operation, including a disease and health management plan, which addresses the protocols for wild broodfish management in addition to standard fish culture practices. A genetic resource management plan would also be developed to avoid deleterious effects to the genetic integrity of wild populations. While stock enhancement is not a goal of this project, all releases of marked hatchery fish would be coordinated with fishery managers and monitored to ensure adequate assessment of spatial, temporal, and ecological interactions with wild populations (e.g., Lorenzen et al. 2010). LDWF is sensitive to conservation genetics principles on which the facilities would operate with respect to the various wild stocks. As such, there would be a focus on effective population size and the geographic partitioning of genetic diversity of the targeted species.

Sport fish produced at the Center would be marked and released to assist with the long-term monitoring of Louisiana's fishery resources and the habitats that support them. The production, release, and monitoring of marked hatchery fish would be carried out in conjunction with LDWF's statewide fishery monitoring program. Thus, the Center's performance would be evaluated in part based on its ability to help develop and evaluate strategies for the management of marine fish species by providing information on the recruitment, survival, health, and movements of these populations. Maintenance of the facility equipment and grounds would be performed by LDWF staff and through maintenance contracts with major equipment manufacturers or professional service contractors.

9.8.5.2 Plaquemines Parish Facility

The Plaquemines Parish facility would pump freshwater from the Mississippi River to holding ponds, from which water would be supplied for building and pond operations. Flow would be variable, up to 1,000 gpm, and dependent upon seasonal production needs.

The facility operation would include the use of indoor, small-scale, bio-secure and environmentally controlled culture systems, using RAS technology. Desired salinity levels in RAS would be achieved using synthetic sea salt mixtures. The RAS would be used to support research and demonstration of techniques to produce Gulf killifish and Atlantic croaker, which are important marine baitfish for recreational sport fishing. The rehabilitation of existing ponds would be used for a combination of effluent treatment and research projects on integrated multi-trophic aquaculture for freshwater and low-salinity production of baitfish and coastal plants.

Facility Operations

The Plaquemines Parish facility would be staffed, operated, and maintained by LDWF. LDWF intends to appropriately budget funds necessary for the continued operation and maintenance of the Center from within the department's self-generating revenues or from other funding sources made available at the time. Upon completion of construction, LDWF would conduct comprehensive facility commissioning, operational system testing, and staff training. These operations would cover all water supply source and drainage systems; indoor tank and recirculation systems; and HVAC, electrical and alarm/instrumentation systems. Commissioning and staff training would also include how to operate the rehabilitated research ponds and other facility pond infrastructure including the existing Mississippi River water pumping system. Maintenance of the facility equipment and grounds would be completed by the LDWF staff or by service contractors. In order to avoid fish loss, the elevated building, emergency power systems (including emergency generator), and related hurricane-tolerant infrastructure would allow for continuous operation of the baitfish life-support components during adverse weather events.

The baitfish research and demonstration program for Gulf killifish and Atlantic croaker would follow an annual research plan and operating budget developed by LDWF to specifically address the seasonal variability of live marine baitfish. Currently all marine baitfish in Louisiana are wild caught, thus cultured baitfish could potentially supplement the wild supply to provide year round availability for recreational fishermen. The demonstration component of the facility would be to teach BMPs for handling and holding live marine baitfish, to improve the quality of the product whether wild caught or cultured. The research component of the facility would tackle the fundamental scientific information needs for successful live marine baitfish holding and production, including husbandry and maturation, controlled spawning, larviculture, nutrition, grow-out, fish health, economics, and marketing. The baitfish research and demonstration programs would target gaps in the science of marine baitfish production to further the propagation of important and valuable marine baitfish species. The operation of the facility would include demonstration of baitfish aquaculture technology to the Louisiana marine baitfish industry, recreational sport fishermen, and academia as a part of information dissemination through education, extension, and outreach.

9.8.6 Affected Environment and Environmental Consequences

9.8.6.1 No Action

Both OPA and NEPA require consideration of the No Action alternative. For this Phase III ERP proposed project location, the No Action alternative assumes that the Trustees would not pursue the Louisiana Marine Fisheries Enhancement, Research, and Science Center as part of Phase III Early Restoration.

Under the No Action alternative, the existing conditions described for the project location in the affected resources subsections would prevail. Restoration benefits associated with this project location would not be achieved at this time.

9.8.6.2 Physical Environment

Geology and Substrates

Calcasieu Parish Facility

Affected Resources
Soils at the Calcasieu Parish facility include (AN) - Aquents, frequently flooded, (CO) - Clovelly muck, (Cr)-Crowley-Vidrine silt loams, and (GB) Ged clay. A geotechnical investigation, which would occur during the design phase, would determine the characteristics and stability of subsurface soil conditions within the footprint of the proposed facilities and ponds. This investigation could influence the design and placement of project features and reveal construction limitations.

The Calcasieu Parish site is characteristic of coastal prairie habitat and includes mima mounds, wetlands, and forested areas adjacent to an unnamed tributary. Mima mounds are natural formations that occur in some coastal prairies within the Gulf Coast Region. These land features are low, flattened, circular to oval in shape, dome-like mounds composed of loose, sandy loam or loamy sand soils. Mima mounds range in diameter from 18-feet to more than 135-feet and between 1-foot to more than 4-feet in height. The low areas between mima mounds often contain shallow, emergent, freshwater wetlands due to the restricted run off over higher clay content surface soils.

Environmental Consequences
Construction of the approximately 12-acre facility would result in long-term adverse impacts to the affected soils and soil substrate in areas where the footprint of the facility (*e.g.,* the building, roads, and ponds) would alter the soil substrate through fill, compaction and earth moving activities. Construction could also result in short-term soil erosion. To minimize impact, disturbed soils would be re-vegetated and/or landscaped thereby resulting in no long-term adverse effects from erosion. The proposed project would result in short-term minor adverse impacts to soil resources surrounding the facility.

Specific measures would be implemented during construction to minimize impacts to soils including BMPs such as the implementation of an erosion control and storm water management plan, installation of sediment traps prior to commencement of construction activities, post-construction revegetation, and on-going construction monitoring to ensure compliance.

Plaquemines Parish Facility

Affected Resources
Soils at the Plaquemines Parish facility include (CV)-Carville, Cancienne, and Schriever, frequently flooded, (Cm)-Cancienne silt loam, (Co)-Cancienne silty clay loam, (Ha)-Harahan clay, and (Sk)-Schriever clay. As described previously, earthen material is being processed and spread at the site.

This project facility is proximal to the Mississippi River and the Mississippi River and Tributaries levee. The U.S. Army Corps of Engineers, New Orleans District regulates activities within 1,500 ft of the levee. A geotechnical investigation, which would occur during the final design phase, would evaluate project features and determine if there are any unusual subsurface conditions.

Environmental Consequences

New construction of a building (approximately 2,400 ft^2), access roads, and parking at the Plaquemines Parish facility would result in short-term adverse impacts to soils (< 10 acres). The impact footprint would be small because the majority of the facility was previously developed. Subsequent to construction, affected soils at the periphery of the facility would be revegetated and/or landscaped; thereby reducing erosion effects. The proposed project would result in short-term minor adverse impacts to soil resources surrounding the facility.

Specific measures would be implemented during construction to minimize impacts to soils including BMPs such as the implementation of an erosion control and storm water management plan, installation of sediment traps prior to commencement of construction activities, post-construction revegetation, and on-going construction monitoring to ensure compliance. The proposed excavation of existing ponds and pump modifications would also be subjected to an Engineering Review for minor Section 408 requirements at the USACE District level, including evaluation of the geotechnical analysis.

9.8.6.3 Hydrology and Water Quality

Calcasieu Parish Facility

Affected Resources

Hydrology

The proposed Calcasieu Parish facility located on Map Number 22019C0635F (effective February 18, 2011) is within FEMA Zones A/AE, the 100-year flood zone. The land that contains the facility is characteristic of coastal prairie habitats within the Gulf Coast region.

A 2013 field delineation of the study area (87.2 acres within a 320.5 acre land tract) identified a total of 7.08 acres of wetlands. The non-tidal areas north of Joe Ledoux Road had a lower percentage of depressional wetlands than the southern side due in part to drainage towards the lower tidal areas. Two ponds, totaling 0.24 acres, were identified on the north and south sides of Joe Ledoux Road (Figure 9-24). The delineation of the study area mentioned above does not constitute an official Jurisdictional Determination (Preliminary or Approved) by the USACE Regulatory Branch. An approved delineation and jurisdictional determination was requested from the New Orleans District of the USACE by LDWF in February 2014. An official approved determination has not been made to date.

Two open waters (channels) totaling 12.1 acres were also identified during field investigations. The first open water/channel is an unnamed tributary of the Calcasieu River and the GIWW, located within the study area, which is a tidally influenced waterway and a receiving body of storm water runoff. Although the channel appears to be a natural land feature, it has been altered from its natural geomorphological character due to the Big Lake Road crossing and the construction of the Turn Basin, in addition to other land use disturbances upstream of the study area. Water flow within the channel was apparent, but slow. Little shoreline erosion was observed during field investigations. A desktop review of aerial imagery concluded that the channel water bottom is exposed during dry seasons when the water level is low (Figure 9-24).

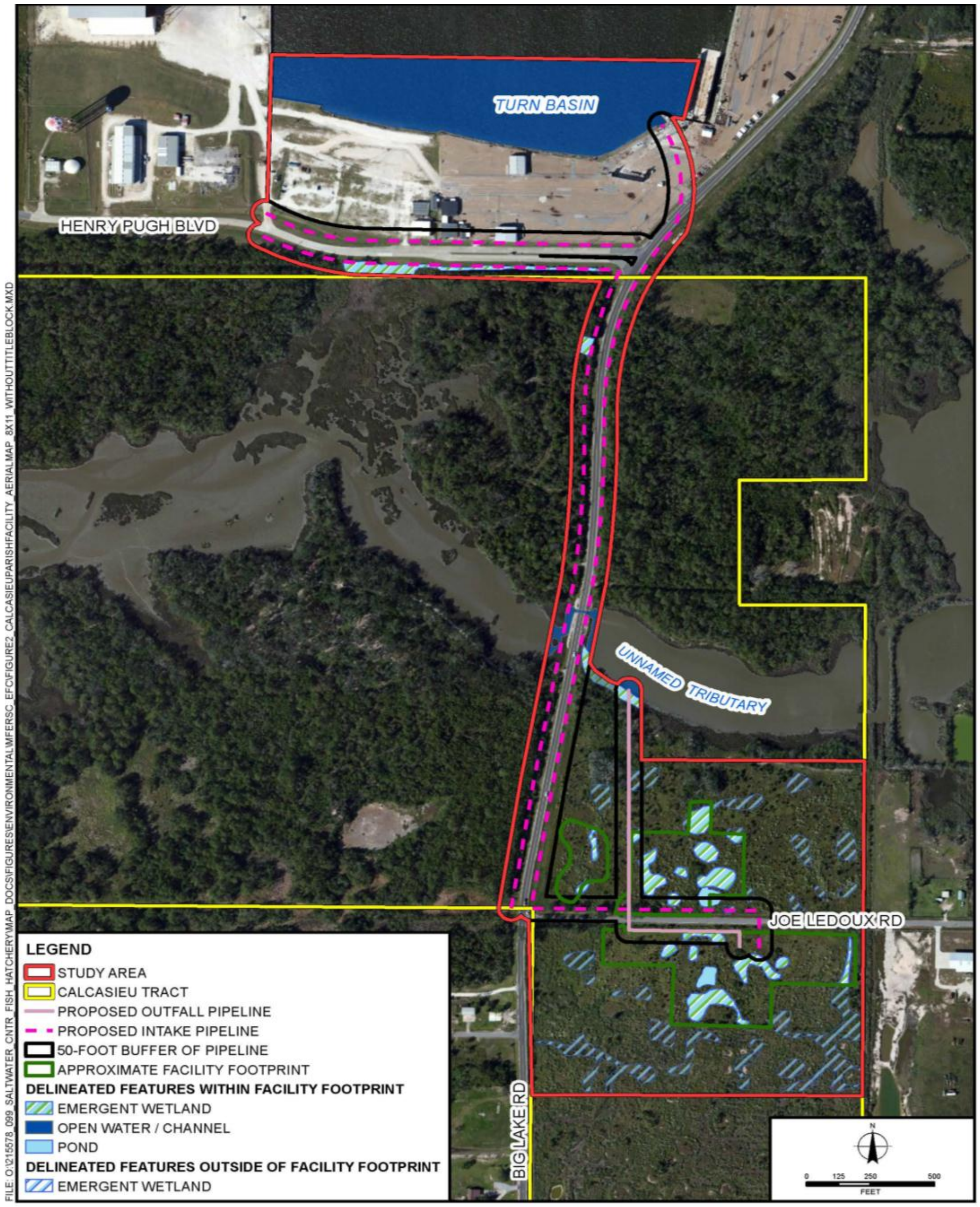

Figure 9-24. Calcasieu Parish facility preliminary wetland delineation based on 2013 field survey.

The second open water/channel that lies within the study area was identified as the Turn Basin which connects to the Calcasieu River. It is located north of Henry Pugh Road and within the LNG Shipping Yard. Field investigations revealed that the shoreline of the channel is lined with concrete matting and riprap and consists of few areas of natural vegetation. Little shoreline erosion of the Turn Basin shoreline within the study area was observed (Figure 9-24).

The field delineation also identified several excavated drainage ditches in the study area. The ditches occur along Henry Pugh Boulevard, Big Lake Road, and Joe Ledoux Road. These ditches appear to have been excavated in uplands for the purposes of stormwater flow away from transportation infrastructure. These drainage ditches appear to convey water directly to the unnamed tributary. The ditch running parallel to the south side of Henry Pugh Boulevard appears to hold some water based on the field investigation (Figure 9-24).

Water Quality

Segments within 5 miles of the proposed project were assessed for the Final 2012 Louisiana Water Quality Inventory: Integrated Report (305(b)/303(d)) (Segments LA 030301_00, LA 030303_00, LA 030304_00, LA 030305_00, LA 030401_00, LA 030402_00, LA 030403_00, LA 030901_00, LA 031001_00, LA 031002_00, LA_031101_00). According to the 2012 303(d) list of impaired waters, as reported by the Louisiana Department of Environmental Quality, one of these Segments found within 5 miles of Calcasieu Parish facility was listed as impaired: the Gulf Intracoastal Waterway.

The Gulf Intracoastal Waterway, from Calcasieu Lock to East Calcasieu River (Segment LA 031101_00), is listed as impaired due to the presence of higher than allowable levels of chloride, sulfates, total dissolved solids, and water temperature. The suspected sources for the chloride, sulfates, and total dissolved solids included changes in tidal circulation and flushing and impacts from hydrostructure flow regulation and modification. The suspected source for water temperature included natural sources and drought-related impacts. This impaired water was located approximately 0.3 mile southwest and downgrade of the Calcasieu Parish facility (Table 9-7).

Prien Lake (Segment LA 030303_00) and the Calcasieu River, from below Moss Lake to the Gulf of Mexico (Segment LA 030401_00) were both listed as impaired in the 2008 303(d) list of impaired water bodies due to higher than allowable levels of fecal coliform and low dissolved oxygen concentrations. According to the 2012 303(d) list, these Segments are no longer considered impaired.

Table 9-7. 303(d) impaired waters within 5-miles of the Calcasieu Parish Facility.

STREAM SEGMENT NUMBER	STREAM SEGMENT DESCRIPTION	SUSPECTED CAUSES OF IMPAIRMENT	SUSPECTED SOURCES OF IMPAIRMENT	RELATION TO SITE
LA031101_00	Intracoastal Waterway-From Calcasieu Lock to East Calcasieu River Basin boundary	Chloride	Changes in Tidal Circulation/Flushing; Impacts from Hydrostructure Flow	Located downgrade southwest 0.3 mile
LA031101_00	Intracoastal Waterway-From Calcasieu Lock to East Calcasieu River Basin boundary	Sulfates	Changes in Tidal Circulation/Flushing; Impacts from Hydrostructure Flow	Located downgrade southwest 0.3 mile
LA031101_00	Intracoastal Waterway-From Calcasieu Lock to East Calcasieu River Basin boundary	Total Dissolved Solids	Changes in Tidal Circulation/Flushing; Impacts from Hydrostructure Flow	Located downgrade southwest 0.3 mile
LA031101_00	Intracoastal Waterway-From Calcasieu Lock to East Calcasieu River Basin boundary	Temperature, water	Drought-related Impacts; Natural Sources	Located downgrade southwest 0.3 mile

Source: LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY 2012 303d List of Impaired Waters.

Environmental Consequences
Construction of the facility would result in minor modifications to hydrology at the Calcasieu Parish facility site. The introduction of impermeable surfaces (parking lot, roads, sidewalks) would create higher rates of runoff during storm events, resulting in faster hydrographic peaking and potential for erosion and sedimentation of ancillary waterways. The degree to which impacts would occur would be reduced through the implementation of mitigation measures such as revegetation around the facility or other appropriate and cost-effective on-site treatment options. Despite the incorporation of these measures, however, natural hydrologic flows would be altered to some degree by the construction of the facility. These adverse impacts would be long-term but are expected to be relatively minor, given the small footprint of the facility compared to the overall size of the land tract. Approval from local floodplain administrators and FEMA would be sought for potential impacts to the 100-year floodplain that might modify the characteristics of floodwaters. During final design, standard engineering review would include an analysis of both the volume and velocity of runoff from the site to ensure that offsite effects would be reduced.

There are currently no ground water restrictions in place for Calcasieu Parish. However, prior notification to the Louisiana Department of Natural Resources (LDNR) Groundwater Resources Program would be provided before construction of process water wells for the proposed developments. Review by the LDNR would ensure that no adverse effects to groundwater would occur. Pond lining would prevent seepage of pond water into groundwater. Therefore, no adverse impacts to groundwater would be expected from pond construction.

Construction would result in short-term, adverse impacts to stormwater due to increased sedimentation from disturbance of ground cover, extensive excavation, and grading of the facility. A comprehensive Stormwater Pollution Prevention Plan with Best Management Practices to protect water quality (*e.g.,* silt fence, re-vegetation) would likely mitigate these impacts (see Section 9.8.6.2 for additional discussion on erosion effects). Additionally, these measures would also likely fulfill the requirements of the Section 401 Certification.

Operation of the facility could result in long-term, minor impacts to the Turn Basin from construction and operation of the water intake system. Operation of the facility would result in long-term, minor impacts to an unnamed tributary of the Calcasieu River and the GIWW from the discharge of effluent water. It is expected that this impact would be minor because the treatment of effluent would be designed to meet applicable LPDES discharge standards to reduce turbidity and nutrient discharge in receiving waters. To remove excess nutrients from discharge water, the final design process would determine the appropriateness of using multi-trophic integrated aquaculture in conjunction with the lined, 0.5 acre settling ponds, ponds, or potentially with adjacent constructed wetlands. There are no LPDES general permits that authorize operational discharges from hatcheries. According to Louisiana Environmental Regulatory Code, Title 33, Part IX. Subpart 1, Section 2507, a fish hatchery may be designated on a case-by-case basis as a concentrated aquatic animal production facility by the state administrative authority if it is determined to be a "significant contributor of pollution to waters of the state." No permit is required until the state administrative agency has made its determination based on a facility inspection (Title 33 §2507 (C)(2)). Coordination with the state administrative authority would be initiated to assist in a determination of LPDES applicability. If required during the final permitting process, additional evaluations including a review of the water balance of the Turn Basin and surrounding systems would be performed to assess any potential impacts to surrounding waters and determine if modifications to the design of the proposed intake or effluent systems are needed.

Based on the preliminary conceptual designs currently available, construction on this facility site will likely require a permit under Section 404 of the Clean Water Act to authorize impacts to waters of the U.S., including wetlands. Construction of the facility and ponds within the currently proposed facility footprint may result in direct adverse impacts to approximately 2 acres of emergent wetlands and 0.19 acres of open water ponds. Disturbance from the construction of the intake and outfall pipeline would impact as much as approximately 1.84 acres of wetlands and open water/channel. Once the approved jurisdictional determination is made and as design progresses, impacts to wetlands and other waters will be minimized by modifying the site plan to the extent practicable. The compensatory mitigation requirements of Section 404 permitting would provide for the replacement of the functions of wetlands and waters impacted by the proposed project. Because the project would not appreciably diminish the availability of emergent wetlands and open water ponds in the project area, there would be no fragmentation of wetland vegetative communities and, therefore, short-term and long-term impacts would be localized and minor.

Plaquemines Parish Facility

Affected Resources

Hydrology

Despite the facility's proximity to the Mississippi River, no natural hydrologic surface connections between the River and the site were apparent, due to the constructed levee system. The Plaquemines Parish facility located on Map Number 2201390430B (effective May 1, 1985) is entirely within FEMA Zone A, the 100-year flood zone.

During field investigations held in September of 2013, existing open water/ponds and wetland areas were observed within the Plaquemines Parish facility study area (approximately 40.34 acres of the land tract were studied). The open water/pond and wetland features observed are remnants of previously constructed ponds and wetlands which were used for research purposes at CARS that once operated on the property. No natural wetlands or aquatic features occur on the property. The wetlands present are characterized as freshwater emergent and have resulted from the cessation of constant artificial pumping of water inflows to the constructed ponds. Based on the field investigations, 5.57 acres of emergent wetlands and 2.28 acres of ponds were delineated within the study area (Figure 9-25). The field investigation and delineation of the study area mentioned above does not constitute an official Jurisdictional Determination (Preliminary or Approved) by the USACE Regulatory Branch. An approved delineation and jurisdictional determination was requested from the New Orleans District of the USACE by LDWF in February 2014. No official approved determination has been made to date.

According to the LDNR online database (Strategic Online Natural Resource Information System [SONRIS] 2011), three Coastal Use Permits (CUPs) were previously acquired for work conducted partially or completely within the Plaquemines Parish facility. In February 2007, the LSU AgCenter received a permit (CUP NUM:P20070171) to create wetland propagation ponds on the project site. In June 2008, LSU AgCenter received a permit (CUP NUM:P20080659) to improve existing buildings and build new structures. In April 2009, CLL Partnership, LTD received a permit (CUP NUM:P20090080) across Hwy 23 from the LSU AgCenter to excavate a borrow pit for fill material.

Figure 9-25. Plaquemines Parish facility preliminary wetland delineation based on 2013 field survey.

Water Quality

Segments within 5-miles of the proposed project were assessed for the Final 2012 Louisiana Water Quality Inventory: Integrated Report (305(b)/303(d)) (LA 020904_00, LA 020907_00, LA 042102_00, LA 042104_00, LA 070301_00). According to the 2012 303(d) List of impaired waters as reported by the Louisiana Department of Environmental Quality, there were no impaired water bodies within 1-mile of the Plaquemines Parish facility. Two impaired water bodies were located approximately 4.3 and 4.8

miles north and upgrade from the Plaquemines Parish facility. An estuarine segment (Segment LA 042102_00) of the River Aux Chenes, also called the Oak River, and Petit Lake (Segment LA 042104_00) was listed as impaired due to the presence of higher than allowable levels of fecal coliform. Suspected sources of impairment are listed below in Table 9-8.

Table 9-8. 303(d) impaired waters within 5 miles of the Plaquemines Parish Facility.

STREAM SEGMENT NUMBER	STREAM SEGMENT DESCRIPTION	SUSPECTED CAUSES OF IMPAIRMENT	SUSPECTED SOURCES OF IMPAIRMENT	RELATION TO SITE
LA042102_00	River Aux Chenes; also called Oak River (Estuarine)	Fecal Coliform	Wildlife Other than Waterfowl	Located upgrade north 4.3 miles
LA42104_00	Petit Lake	Fecal Coliform	Marina/Boating Sanitary On-vessel Discharges	Located upgrade north 4.8 miles
LA42104_00	Petit Lake	Fecal Coliform	On-site Treatment Systems (Septic Systems and Similar Decentralized Systems)	Located upgrade north 4.8 miles
LA42104_00	Petit Lake	Fecal Coliform	Wildlife Other than Waterfowl	Located upgrade north 4.8 miles

Source: Louisiana Department of Environmental Quality 2012 303d list of Impaired Waters.

Environmental Consequences

Construction of the facility would result in minor modifications to hydrology at the site. The small footprint of new construction would increase the area of impermeable surface and would create higher rates of runoff during storm events resulting in faster hydrographic peaking and potential for erosion and sedimentation of ancillary waterways. The degree to which impacts would occur could be reduced through the implementation of mitigation measures such as re-vegetation around the facility. Despite the incorporation of these measures, however, natural hydrologic flows would be altered to some degree by the construction of the facility. During final design, standard engineering review would include an analysis of both the volume and velocity of runoff from the site to ensure that offsite effects would be reduced. These adverse impacts would be long-term but would be expected to be very minor, given the small footprint of new construction on an already developed site.

There are currently no groundwater restrictions in place for Plaquemines Parish. Pond lining would prevent seepage of pond water into groundwater. No adverse impacts to groundwater would be expected.

Construction would result in short-term, adverse impacts to stormwater due to increased sedimentation from disturbance of ground cover, excavation, and grading of the facility. A comprehensive Stormwater Pollution Prevention Plan with Best Management Practices to protect water quality (*e.g.,* silt fences, re-vegetation) and reduce potentially adverse effects to water quality. These measures would also likely fulfill the requirements of the Section 401 Water Quality Certification and mitigate these impacts.

Based on conceptual plans, the operation of the facility would result in long-term, minor impacts to an inland marsh of the Barataria Estuary from the discharge of effluent water. This impact would be expected to be minor because the treatment of effluent in 0.5 acre settling ponds would be designed to meet applicable LPDES discharge standards. The water leaving the effluent ponds would enter an existing drainage ditch system that crosses LA 23 and discharges into an inland marsh of the Barataria Estuary. As described above, there are no LPDES general permits that authorize operational discharges from hatcheries. According to Louisiana Environmental Regulatory Code, Title 33, Part IX. Subpart 1, Section 2507, a fish hatchery may be designated on a case-by-case basis as a concentrated aquatic animal production facility by the state administrative authority if it is determined to be a "significant contributor of pollution to waters of the state." No permit is required until the state administrative agency has made its determination based on a facility inspection (Title 33 §2507 (C)(2)). Coordination with the state administrative authority would be initiated to assist in a determination of LPDES applicability.

Approximately 3.2 acres of emergent freshwater wetlands and 2.3 acres of open water/ponds resulting from previous agricultural CARS activities were delineated within the facility foot print (six renovated ponds outlined in green) during field investigations held in September of 2013 (Figure 9-25). The Plaquemines Parish facility is proposed to be located within a "fastland[1]" area with no anticipated impacts to natural wetlands and aquatic features. Again, this delineation of the study area does not constitute an official Jurisdictional Determination (Preliminary or Approved) by the USACE Regulatory Branch. An approved delineation and jurisdictional determination was requested from the New Orleans District of the USACE by LDWF in February 2014. No official approved determination has been made to date.

9.8.6.4 Air Quality and Greenhouse Gas Emissions

Both Facilities

Affected Resources

The Clean Air Act of 1970 and EPA regulatory programs govern air pollution assessment and control. In Louisiana, the EPA and Louisiana Department of Environmental Quality are responsible for air quality protection. Under authority of the Clean Air Act, the EPA established primary and secondary pollutant criteria called the National Ambient Air Quality Standards. Primary standards provide public health protection, including protecting the health of "sensitive" populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. EPA has established standards for the following six principal pollutants, which are called "criteria" pollutants: particle pollution (often referred to as particulate matter), ground-level ozone, carbon monoxide, sulfur dioxide, nitrogen dioxide, and lead. Units of measure for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic meter of air (µg/m3).

A regulatory driver for air emissions and air quality analysis is the federal General Conformity program, the rules for which are set forth in 40 C.F.R. § 93, Subpart B. The purpose of the General Conformity program under the Clean Air Act is to prevent, or force mitigation of, any federal actions that would impair a state's approved plan to achieve attainment with the National Ambient Air Quality Standards. If there is a federal agency action to approve/permit or to provide funds for the Proposed Action, General Conformity rules may apply. The General Conformity program applies only to projects located in an area that is designated as "non-attainment" (geographic areas that do not adhere to national ambient air requirements) or "maintenance" (former non-attainment area) with respect to one or more of the National Ambient Air Quality Standards.

The Louisiana Department of Environmental Quality is federally authorized to administer the federal Part 70 (Title V) and New Source Review programs. The EPA has delegated to Louisiana Department of Environmental Quality the authority to implement and enforce certain New Source Performance Standards and National Emission Standards for Hazardous Air Pollutants (NESHAPs) promulgated by EPA under 40 C.F.R. §§ 60, 61, and 63. Besides exemptions that do not require Louisiana Department of Environmental Quality approval, any source that emits, or has the potential to emit, any air contaminant (defined as "particulate matter, dust, fumes, gas, mist, smoke, or vapor, or any combination thereof, visible or not, produced by processes other than natural") requires written approval from Louisiana Department of Environmental Quality. If the Proposed Action has the potential to emit air contaminants, it should be further evaluated for the applicability of exemptions and/or air permitting requirements. For instance, construction activities for the Proposed Action should meet ambient air quality, visibility, odor, and opacity standards and implement reasonable particulate matter control.

The proposed facilities are located in Plaquemines and Calcasieu Parishes. These parishes are not listed as a non-attainment or maintenance areas for the National Ambient Air Quality Standards. Thus, the proposed project is not likely to be subject to General Conformity requirements.

Greenhouse gases are chemical compounds found in the Earth's atmosphere that absorb and trap infrared radiation as heat. Human activities such as deforestation, soil disturbance, and burning of fossil fuels disrupt the natural cycle by increasing the greenhouse gas emission (release) rate over the removal (storage) rate, which results in a net increase of greenhouse gases in the atmosphere. The principal greenhouse gases emitted into the atmosphere through human activities are CO_2, methane, nitrous oxide, and fluorinated gases, such as hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride (EPA 2010b). CO_2 is the major greenhouse gas emitted, and the burning of fossil fuels accounts for 81 percent of all U.S. greenhouse gas emissions (EPA 2010b; Houghton 2010; U.S. Energy Information Administration 2009b).

Environmental Consequences

Temporary adverse impacts to air quality would be minor for the proposed project. Air emissions from standard construction equipment and vehicular traffic would be expected, but would be anticipated to be within reasonable allowable limits. Potential impacts would be temporary and limited to construction. Reasonable particulate matter control measures would be implemented. Air quality issues would be minor during facility operations. This would include automobile emissions associated with employees and visitors traveling to and from the site. Additional emissions would be produced by electricity generated offsite needed to support the facility.

Construction of the facilities would require use of equipment that would contribute to air quality emissions and GHGs such as CO_2. Due to the small area, the exhaust emissions are expected to be minor, with bulldozer, backhoe, and grader being the most likely equipment used to prepare the site to be developed. Any air quality degradation would be very limited to the area immediately around the construction site and would only last during the site preparation period— estimated to be 16 to 24 months for the Calcasieu Parish site and 14 to 18 months for the Plaquemines Parish site. Table 9-9 describes the estimated GHG emission scenario for the implementation of both facilities. Because detailed construction plans have not yet been developed, this scenario (total hours for different types of equipment) is a preliminary estimate. The calculation of greenhouse gas impacts provides an indication of the relative magnitude of emissions from the construction activities and should not be considered a precise estimate.

Based on the assumptions detailed in Table 9-9, the project would generate approximately 1,065 metric tons of GHGs during project construction. The following mitigation measures have been identified to reduce emissions from the project:

- Shut down idling construction equipment, if feasible.
- Locate staging areas as close to construction sites as practicable to minimize driving distances between staging areas and construction sites.
- Encourage the use of the proper size of equipment for the job to maximize energy efficiency.
- Encourage the use of alternative fuels for generators at construction sites, such as propane or solar, or use electrical power where practicable.

Operation of the two facility sites would increase energy consumption above pre-construction levels. The use of RAS would minimize emissions associated with water heating and cooling compared to facilities that use flow-through systems. Based on the above, and with the incorporation of mitigation measures, the Center would have long-term minor impacts on greenhouse gas emissions.

Table 9-9. Greenhouse gas impacts of the proposed project for major construction equipment.

EQUIPMENT DESCRIPTION	EQUIPMENT SIZE (HP)[1]	LOAD FRACTION[2]	TOTAL HOURS USED	Power Consumed (hp-hr)	CO_2 FACTOR-kg/hp-hr[3,4]	CO_2 (MT)	CH_4 FACTOR-kg/hp-hr[3,4,5]	CH_4 (MT)	N_2O FACTOR-kg/hp-hr[3,4,5]	N_2O (MT)	TOTAL CO_2 e (MT)
Preliminary Greenhouse Gas (GHG) Emissions during Construction of the Calcasieu Parish Facility											
Diesel Dumpers/Tenders	10.00	0.21	1,583	3,324.3	0.51772	1.72	0.00044	0.00	0.00130	0.00	1.7
Diesel Cement & Mortar Mixers	5.98	0.43	186	478.5	0.51772	0.25	0.00044	0.00	0.00130	0.00	0.2
Diesel Grader	231.20	0.59	689	93,985.1	0.51772	48.66	0.00044	0.04	0.00130	0.12	48.8
Diesel Backhoe	87.17	0.21	405	7,413.8	0.51772	3.84	0.00044	0.00	0.00130	0.01	3.9
Diesel rubber tire dozer	136.30	0.59	262	21,069.3	0.51772	10.91	0.00044	0.01	0.00130	0.03	10.9
Diesel loader	87.17	0.21	1,583	28,977.9	0.51772	15.00	0.00044	0.01	0.00130	0.04	15.1
Diesel Cranes	237.70	0.43	1,200	122,653.2	0.51772	63.50	0.00044	0.05	0.00130	0.16	63.7
Diesel Trenchers	61.02	0.59	27	972.0	0.51772	0.50	0.00044	0.00	0.00130	0.00	0.5
Diesel Excavator	137.60	0.59	1,741	141,341.3	0.51772	73.18	0.00044	0.06	0.00130	0.18	73.4
Diesel Asphalt Paver	134.60	0.59	91	7,226.7	0.51772	3.74	0.00044	0.00	0.00130	0.01	3.8
Diesel Tandem Roller	84.76	0.59	148	7,401.2	0.51772	3.83	0.00044	0.00	0.00130	0.01	3.8
Diesel Vibratory Roller	84.76	0.59	190	9,501.6	0.51772	4.92	0.00044	0.00	0.00130	0.01	4.9
Diesel Water Truck	419.90	0.59	600	148,644.6	0.51772	76.96	0.00044	0.07	0.00130	0.19	77.2
Diesel Pick Up Truck	56,000 gallons of fuel used	N/A	16,800 hours used	N/A	10.20648 (kg/gallon)	571.56 MT	0.008694 (kg/gallon)	0.49 MT	0.025668 (kg/gallon)	1.44 MT	573.5 MT
Total						878.6 MT		0.7 MT		2.2 MT	881.5 MT
Preliminary Greenhouse Gas (GHG) Emissions during Construction of the Plaquemines Parish Facility											
Diesel Dumpers/Tenders	10.00	0.21	558	1,171.8	0.51772	0.61	0.00044	0.00	0.00130	0.00	0.6
Diesel Cement & Mortar Mixers	5.98	0.43	62	159.5	0.51772	0.08	0.00044	0.00	0.00130	0.00	0.1
Diesel Grader	231.20	0.59	18	2,455.3	0.51772	1.27	0.00044	0.00	0.00130	0.00	1.3
Diesel Backhoe	87.17	0.21	117	2,141.8	0.51772	1.11	0.00044	0.00	0.00130	0.00	1.1
Diesel rubber tire dozer	136.30	0.59	91	7,317.9	0.51772	3.79	0.00044	0.00	0.00130	0.01	3.8

EQUIPMENT DESCRIPTION	EQUIPMENT SIZE (HP)[1]	LOAD FRACTION[2]	TOTAL HOURS USED	Power Consumed (hp-hr)	CO_2 FACTOR-kg/hp-hr[3,4]	CO_2 (MT)	CH_4 FACTOR-kg/hp-hr[3,4,5]	CH_4 (MT)	N_2O FACTOR-kg/hp-hr[3,4,5]	N_2O (MT)	TOTAL CO_2 e (MT)
Diesel Loader	87.17	0.21	558	10,214.6	0.51772	5.29	0.00044	0.00	0.00130	0.01	5.3
Diesel Cranes	237.70	0.43	600	61,326.6	0.51772	31.75	0.00044	0.03	0.00130	0.08	31.9
Diesel Trenchers	61.02	0.59	8	288.0	0.51772	0.15	0.00044	0.00	0.00130	0.00	0.1
Diesel Excavator	137.60	0.59	17	1,380.1	0.51772	0.71	0.00044	0.00	0.00130	0.00	0.7
Diesel Asphalt Paver	134.60	0.59	16	1,270.6	0.51772	0.66	0.00044	0.00	0.00130	0.00	0.7
Diesel Tandem Roller	84.76	0.59	34	1,700.3	0.51772	0.88	0.00044	0.00	0.00130	0.00	0.9
Diesel Vibratory Roller	84.76	0.59	67	3,350.6	0.51772	1.73	0.00044	0.00	0.00130	0.00	1.7
Diesel Water Truck	419.90	0.59	600	148,644.6	0.51772	76.96	0.00044	0.07	0.00130	0.19	77.2
Diesel Pick Up Truck	5667 gallons of fuel used	N/A	1,700 Hours Used	N/A	10.20648 (kg/gallon)	57.84 MT	0.008694 (kg/gallon)	0.05 MT	0.025668 (kg/gallon)	0.15 MT	58.0 MT
Total						182.8 MT		0.2 MT		0.5 MT	183.4 MT

HP = horse power
kg/hp-hr=kilograms per horse power per hour
CO_2= carbon dioxide
mt = metric tons
CH_4 = methane
N_2O = nitrogen dioxide
CO_2e= CO_2 equivalent

1 U.S. Environmental Protection Agency. Assessment and Standards Division, Office of Transportation and Air Quality. Nonroad Engine Population Estimates. EPA-420-R-10-017. NR-006e. July 2010, pages A12-A25. http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2010/420r10017.pdf

2 U.S. Environmental Protection Agency. Assessment and Standards Division, Office of Transportation and Air Quality. Nonroad Engine Population Estimates. EPA-420-R-10-017. NR-006e. July 2010, pages A12-A25. http://www.epa.gov/otaq/models/nonrdmdl/nonrdmdl2010/420r10017.pdf

3 For CO2: U.S. Government Printing Office. Electronic Code of Federal Regulations. 40 C.F.R. 98. Table C-1 to Subpart C of Part 98: Default CO2 Emission Factors and High Heat Values for Various Types of Fuel.
For CH4 and N2O: U.S. Government Printing Office. Electronic Code of Federal Regulations. 40 C.F.R. 98. Table C-2 to Subpart C of Part 98: Default CH4 and N20 Emission Factors and High Heat Values for Various Types of Fuel."

4 EPA Publication AP-42, Compilation of Air Pollutant Emission Factors, Volume 1, Stationary Point and Area Sources, Table 3.3-1, page 3.3-6.

5 U.S. Government Printing Office. Electronic Code of Federal Regulations. 40 C.F.R. 98. Table A-1 to Subpart A of Part 98—Global Warming Potentials.

9.8.6.5 Noise

According to the EPA, noise is defined as "unwanted or disturbing sound." Sound becomes unwanted when it either interferes with normal activities, such as sleeping or conversation, or disrupts or diminishes one's quality of life. Ambient noise is defined as existing background noise generated from multiple sources in a surrounding environment, such as noise from construction sites, air traffic, automobiles, and industrial operations.

The Noise Control Act of 1972 establishes a national policy to help ensure that all Americans are protected from noise at a level that may jeopardize their health and welfare. The Act also serves to (1) establish a means for effective coordination of federal research and activities in noise control; (2) authorize the establishment of federal noise emission standards for products distributed in commerce; and (3) provide information to the public regarding the noise emission and noise reduction characteristics of these products.

Units of noise are measured and reported in dBA, a typical weighted measurement of sound. Institutional recognition of noise is provided by the Occupational Noise Exposure (29 C.F.R. Part 1910.95) under the Occupational Safety and Health Act of 1970. This section mandates that noise levels emitted from construction equipment be below 90 dBA for exposures of 8 hours per day or more. The upper limit for unprotected hearing exposure established by the Occupational Safety and Health Administration (OSHA) is 115 dBA.

Calcasieu Parish Facility

Affected Resources

Ambient noise levels at the Calcasieu Parish facility are moderate, resulting from sources such as roadway traffic, industrial facilities operations, barge traffic near the port, recreational boating noise, and air traffic from the nearby Lake Charles Regional Airport (located approximately four miles from the project site). Local residents will experience direct, yet temporary noise impacts from construction, typical of construction equipment and human labor activities.

Environmental Consequences

A minor, temporary increase in noise (*e.g.,* similar to that of noise stemming from nearby port and oil and gas activities) could be expected in association with construction equipment, machinery, and human labor activities at the proposed project facility. Construction would be limited to daylight working hours in order to reduce the noise impacts to the surrounding environment. Noise from construction activities dissipates as it emanates further from its source. While the nearest residential area lies within 500 feet of the proposed facility, these adjacent homes are located behind the project site off of Joe Ledoux Road and are likely not to be directly impacted from operational traffic associated with facility maintenance vehicles, supply trucks, or visitors, utilizing Big Lake Road as the main entrance to the site. Residences adjacent to the facility (a minimum of approximately 500 feet from the site) will experience the more direct impact, with more populated residential areas further north being able to perceive less of the noise. Noise levels during construction and facility operations will not exceed acceptable limits of OSHA regulations, will be temporary and localized in nature, and will not adversely impact or add stress to the environment or its human and biological inhabitants. Construction access is anticipated to be from Joe

Ledoux Road. Ambient noise directly surrounding the site would not likely exceed noise levels pre-construction because of the large undisturbed area and natural forest type vegetation around the facility footprint providing a buffer for residential areas to the north.

Plaquemines Parish Facility

Affected Resources

The Plaquemines Parish site lies in a semi-rural setting along LA 23, with the nearest residential area located approximately 500-feet of the facility. Across LA 23, the predominant land use type is agriculture. The residential areas within one mile of the facility lie mostly on the east side of LA 23, with populations increasing to the south of the project site. Varying degrees of ambient noise levels are experienced daily by residents from current highway construction, highway traffic along LA 23, barge traffic on the Mississippi River, industrial plant operations, agricultural operations, and recreational and commercial fishing boats in nearby waterways and marinas. Noise from vehicular traffic along LA 23 and agricultural and industrial plant operations are usually between 50 and 60 dBA at 100 feet.

Environmental Consequences

A minor, temporary increase in noise (*e.g.*, similar to noise associated with current road construction on LA 23) can be expected in association with construction equipment, machinery, and human labor activities at the proposed project facility. Construction would be limited to daylight working hours in order to reduce the noise impacts to the surrounding environment. Noise from construction activities dissipates as it emanates further from its source. Residences adjacent to the facility will experience the more direct impact, with more populated residential areas further south being able to perceive less of the noise. Noise levels during construction and facility operations will not exceed acceptable limits of OSHA regulations, will be temporary and localized in nature, and will not adversely impact or add stress to the environment or its human and biological inhabitants.

9.8.6.6 Biological Environment

Coastal and Submerged Aquatic Vegetation

Calcasieu Parish Facility

Affected Resources

The project is within the northern portion of the Western Gulf Coastal Plain ecoregion which is typically characterized by relatively flat coastal plain and grassland habitats. Inland from this region, the plains are older and mostly forest or savanna-type habitats. The vegetation in the vicinity of the project area transitions from tidal brackish marsh to a narrow-band of live oak riparian habitat and coastal prairie to the south. The narrow band of tidal brackish marsh dominated by smooth cordgrass (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*) occurs along the unnamed tributary north of the proposed facility. On August 27th, 2013, no submerged aquatic vegetation was observed by HDR Engineering, Inc. ("HDR") in the unnamed tributary or the Turn Basin north of the project site, at the potential locations for outfall and intake structures, respectively. The tidal marsh is bordered by a narrow band of riparian woods containing live oak and pines with an understory dominated by yaupon (*Ilex vomitoria*).

The project site's history of cattle grazing, altered hydrology, fire suppression, and lack of brush management has resulted in the invasion of the coastal prairie by Eastern baccharis (*Baccharis halimifolia*) and Chinese tallow (*Triadica sebifera*), which have altered the natural vegetative community. The project site consists of a matrix of depressional wetlands within the upland areas on the site. The uplands are dominated by Eastern baccharis, Chinese tallow, southern bayberry (*Myrica cerifera*), goldenrod (*Solidago spp.*), and bermudagrass (*Cynodon dactylon*). Vegetation observed in wetland depressions include cattail (*Typha spp.*), sand spikerush (*Eleocharis montevidensis*), roundhead rush (*Juncus validus*), buttonweed (*Diodia virginiana*), smartweed (*Polygonum hydropiperoides*), and creeping primrose-willow (*Ludwigia repens*). Due to previous grazing and alterations on the site, the encroachment and dominance by invasive shrub species has reduced the diversity of the wetland vegetation community, thus resulting in a diminished functional quality of the wetland depression matrix.

The proposed facility would obtain water for its operations from the Turn Basin and the treated effluent would be discharged to the unnamed tributary to the north of the proposed facility. The Turn Basin is located near Henry Pugh Road and is the proposed location of the intake pipeline (Figure 9-24). Most areas along the shoreline of the Turn Basin are lined with concrete matting and consist of few areas of natural vegetation. Little shoreline erosion was observed near the Turn Basin by HDR during a site visit on August 27, 2013. The existing shoreline vegetation includes both invasive and native plants dominated by species such as cordgrass (*Spartina spp*.), groundseltree, chinese tallow, black willow (*Salix nigra*), rouseau cane (*Phragmites australis*), and Mimosa spp.

The proposed location of the intake pipeline would begin at the Turn Basin and follow Big Lake Road south along its right of way ("ROW") to the 0.5-acre storage reservoir south of Joe Ledoux Road. Although the exact location of the pipeline has yet to be determined, the construction corridor would be no wider than 50 feet and would stay within or as close to the road ROW as possible to minimize disturbance to adjacent upland forested habitat. Figure 9-24 illustrates a conceptual plan for the proposed intake and outfall pipeline locations. Upland areas along the Big Lake Road ROW are dominated by loblolly pine (*Pinus taeda*), yaupon (*Ilex vomitoria*), hackberry (*Celtis occidentalis*), and wax myrtle (*Morella cerifera*).

Environmental Consequences

Several sensitive natural vegetation communities were observed on the Calcasieu Parish facility site. The proposed facility will be located in the most heavily degraded portion of the property where native plants were cleared and non-native grasses were planted for livestock grazing. Siting the proposed facility in this area would minimize impacts to coastal prairie, a mima mound wetland complex at the southern portion of the site, and bottomland hardwood and brackish marsh located along the unnamed tributary and west of Big Lake Road. This plan would preserve the majority of the mima mound-wetland complex, brackish marsh, and bottomland forest for potential enhancement and outdoor environmental educational activities complementary to the mission of the facility. The construction of the facility, ponds, and parking areas would result in permanent impacts to the grassland and shrub habitat. Impacts to wetlands would be required to be mitigated through the Section 404 process that requires replacement of the functions and values of the wetlands affected by project implementation.

Construction of the water supply and outfall pipelines would require temporary disturbance of vegetation in the grassland, woodlands and tidal areas. However, impacts to large specimen trees would be avoided through design and the surface herbaceous vegetation could be restored with native species following construction.

Because the project would preserve the majority of the sensitive habitats in the project area and the impacts to the degraded portion of the property would be limited to the facility footprint, there would be no fragmentation of sensitive vegetative communities and, therefore, short-term and long-term impacts would be localized and minor.

BMPs would be followed during facility construction and operation to prevent and control the invasion of nuisance plant species common to Calcasieu parish, including but not limited to those invasive species observed onsite (groundsel tree, bermudagrass, and Chinese tallow). The facility site, staging, and buffer areas would be inspected for common invasive species prior to the onset of construction. A control plan would be implemented, if necessary, to ensure these species don't increase in distribution or abundance at the site due to project operation. The site would be inspected periodically to identify and control new colonies/individuals of an invasive species not previously observed prior to construction.

During facility construction and operation, water extracted from water bodies, as well as equipment (including personal gear, machinery, vehicles, or vessels) should be inspected for presence of mud or soil, seeds, invasive aquatic weeds, and/or any other invasive vegetation before being brought to the site and before being moved from the site to prevent the transport and spread of such species. Moreover, propagated or transplanted vegetation would be inspected and certified as pest and disease free prior to planting in restoration project areas.

Plaquemines Parish Facility

Affected Resources

Vegetation at the Plaquemines Parish Facility consists primarily of bermudagrass, ruderal vegetation, and other grasses and forbs typical of disturbed sites such as goldenrod (*Solidago spp*.) and sumpweed (*Iva annua*). Vegetation including chinese tallow, groundsel tree, golden rod, bermudagrass, alligator weed (*Alternanthera philoxeroides*) and wild cow pea (*Vigna luteola*) dominates the berms surrounding the production ponds. Due to the extensive, recent deposition of earthen material, most of the site is bare dirt with depressions where water has pooled.

Most of the constructed ponds were used for wetland plant propagation. However, since suspension of operations of CARS in 2011, pioneer wetland species that are characteristic of disturbed sites have invaded the ponds. Vegetative conditions within the ponds can be characterized as having low structural diversity and few plant strata. The majority of the ponds are dominated by species such as wild cow pea, smartweed, pond flat-sedge (*Cyperus odoratus*), common duck weed (*Lemna minor*), and angle-stem primrose-willow (*Ludwigia leptocarpa*) which create a generally uniform mat of vegetation. The fringes contain species such as cattail and giant reed (*Phragmites australis*) which provide the only structural diversity.

Environmental Consequences
Due to the extent of previous alterations of the site for agriculture and for construction and operation of CARS as well as current alterations associated with the processing and placement of earthen material, impacts to native vegetation communities from this proposed project are expected to be minor or non-existent and would not contribute to habitat fragmentation. Rehabilitation of constructed ponds would result in the loss of vegetation that might have recruited since the suspension of CARS operations in 2011.

BMPs would be followed during facility construction and operation to prevent and control the invasion of nuisance plant species common to Plaquemines parish, including but not limited to those invasive species observed onsite (groundsel tree, alligator weed, giant reed, bermudagrass, and Chinese tallow). The facility site, staging, and buffer areas would be inspected for common invasive species prior to the onset of construction. A control plan would be implemented, if necessary, to ensure these species don't increase in distribution or abundance at a site due to project operation. The site would be inspected periodically to identify and control new colonies/individuals of an invasive species not previously observed prior to construction.

During facility construction and operation, water extracted from water bodies, as well as equipment (including personal gear, machinery, vehicles, or vessels) should be inspected for presence of mud or soil, seeds, invasive aquatic weeds, and/or any other invasive vegetation before being brought to the site and before being moved from the site to prevent the transport and spread of such species. Moreover, propagated or transplanted vegetation would be inspected and certified as pest and disease free prior to planting in restoration project areas if required.

9.8.6.7 Terrestrial Wildlife Species (including birds)

Calcasieu Parish Facility

Affected Resources
The Calcasieu Parish facility is within the Western Gulf Coastal Plain ecological region, which is a sub-region of the Great Plains and covers the coastal plain from southwestern Louisiana to northeastern Mexico (Wiken *et al.* 2011). The region has a humid, sub-tropical climate with hot summers and mild winters. The region is marked by flat coastal plains, barrier islands, dunes, beaches, bays, estuaries, and tidal marshes. Prior to conversion to cropland, livestock grazing and urban development, the coastal prairies consisted of tallgrass prairie in southwest Louisiana and southeast Texas, transitioning to sandy plains in southern Texas and northeast Mexico. Native vegetation in the prairies included little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), yellow Indiangrass (*Sorghastrum nutans*), tall dropseed (*Sporobolus compositus*), silver bluestem (*Bothriochloa saccharoides*), and common curleymesquite (*Hilaria berlangeri*) in a mixture with hundreds of other herbaceous species. Dominant vegetation in coastal marsh communities typically consists of cordgrass (*Spartina* spp.), saltgrass (*Distichlis* spp.), needlerush (*Juncus roemerianus*), and saltmarsh bulrush (*Scirpus robustus*) (Wiken et al. 2011).

Typical wildlife of the Western Gulf Coastal Plain would include a diverse avian, mammalian, amphibian, reptile and invertebrate community, including species such as white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), ringtail (*Bassariscus astutus*), armadillo (*Dasypus novemcinctus*), swamp rabbit (*Sylvilagus aquaticus*), cottontail (*Sylvilagus floridanus*), northern yellow bat (*Lasiurus intermedius*), American alligator (*Alligator mississippiensis*), northern cricket frog (*Acris crepitans*), eastern narrow-mouthed toad (*Gastrophryne carolinensis*), small-mouthed salamander (*Ambystoma texanum*), alligator snapping turtle (*Macrochelys temminckii*), LeConte's sparrow (*Ammodramus leconteii*), Sprague's pipit (*Anthus spragueii*), least bittern (*Ixobrychus exilis*), yellow rail (*Coturnicops noveboracensis*), Wilson's snipe (*Gallinago delicata*), and many species of ducks and geese. The Calcasieu site's history of cattle grazing and modification of the natural vegetation community has altered the potential for terrestrial wildlife use of the site.

The August 2013 site visit, although not a formal survey, revealed very low avian diversity around the approximate footprint of the proposed multi-purpose facility, which was dominated by generalist and disturbance-tolerant species such as the American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), northern cardinal (*Cardinalis cardinalis*), and northern mockingbird (*Mimus polyglottos*). Snowy egrets (*Egretta thula*) and great egrets (*Ardea alba*) were observed in the unnamed tributary and may have colonial roosting and nesting sites (*i.e.* rookeries) along the tributary. A September 2013 survey of the potential intake pipeline corridor along Big Lake Road revealed more woodland avian species as well as brushy edge species including Carolina wren (*Thryothorus ludovicianus*), northern flicker (*Colaptes auratus*), pileated woodpecker (*Dryocopus pileatus*), red-bellied woodpecker (*Melanerpes carolinus*), American redstart (*Setophaga ruticilla*), Carolina chickadee (*Poecile carolinensis*), gray catbird (*Dumetella carolinensis*), brown thrasher (*Toxostoma rufum*), and belted kingfishers (*Ceryle alcyon*) adjacent to the unnamed tributary. Also, several raptor species were observed, including the black vulture (*Coragyps atratus*), red-tailed hawk (*Buteo jamaicensis*) and red-shouldered hawk (*B. lineatus*). In addition, signs of common generalist mammal species such as the raccoon (*Procyon lotor*) and the nine-banded armadillo (*Dasypus novemcinctus*) were also observed at the site.

No surveys or trapping surveys have been conducted for reptiles or amphibians at this site; however, the matrix of small depressional wetlands on the project site may provide cover and breeding areas for local populations. These depressions range from <0.1 acres to 1.2 acres in size and have various hydrological regimes. Many of these depressions may only have saturated soils and no standing water, while others may hold water for sufficient periods for amphibian breeding requirements. Typical southern Louisiana amphibians which may utilize the project site for breeding and cover include the southern leopard frog (*Rana sphenocephala*), the gulf coast toad (*Bufo nebulifer*), Fowler's toad (*Anaxyrus fowleri*), eastern narrowmouthed toad (*Gastrophryne caroliniensis*), and green frog (*Lithobates clamitans*). Reptiles potentially present on the project site include green anole (*Anolis carolinensis*), five-lined skink (*Plestiodon fasciatus*), and eastern mud turtle (*Kinosternun subrubrum*).

Environmental Consequences

The Calcasieu Parish facility is planned primarily in areas with hydrology and vegetation previously affected by road and grazing activities. Shrub-nesting passerine habitat could experience minor impacts due to land clearing; however, the observed species were considered highly adaptable and tolerant of disturbance, so no substantial adverse effects to the population would be anticipated.

The current site plan would result in the loss of approximately 2.2 acres of small depressional wetland and open water pond areas that might provide cover and breeding habitat for common amphibians. However, the quality of these areas has been impacted due to historic alterations to the vegetative community resulting in the encroachment of shrubs and a likely reduction in the diversity of amphibian and reptile species. The loss of depressional wetlands could lead to short-term, lower reproductive success for species adapted to the lower quality habitats; however, similar habitat and/or higher quality habitat would remain around the planned facility (*i.e.* mima mound-wetland complex and tributary-marsh habitat). The proposed facilities would be located adjacent to Joe Ledoux Road and would create a moderate barrier to dispersal. However, mitigation required by Section 404 of the Clean Water Act would require the replacement of the functions and values of the wetlands adversely affected by the project.

Plaquemines Parish Facility

Affected Resources

The Plaquemines Parish facility is within the Mississippi Alluvial Plain eco-region which extends from southern Illinois south to the Gulf of Mexico. The Mississippi River watershed drains all or parts of thirty-one states, two Canadian provinces, and approximately 3.2 million square kilometers before the river finally reaches the Gulf (Griffith 2010). This region has a humid subtropical climate where winters are generally mild and precipitation and temperatures increase from north to south. Prior to settlement and cultivation, bottomland forest covered most of the region. However, due to extensive agricultural development and levee systems, which affect the hydroperiod of the floodplain, this ecological region is the most altered in the U.S. (Griffith 2010). The region is mostly a broad, flat alluvial plain with river terraces, swales, and levees providing the main elements of relief.

Native bottomland deciduous forest which covered the region before much of it was cleared included inundated river swamp forests containing bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*); frequently-flooded hardwood swamp forests consisting of water hickory (*Carya aquatica*), red maple (*Acer rubra*), green ash (*Fraxinus pennsylvanica*), and river birch (*Betula nigra*); and seasonally-flooded areas dominated by sweetgum (*Liquidambar styraciflua*), sycamore (*Platanus occidentalis*), laurel oak (*Quercus laurifolia*), Nuttall oak (*Q. nutallii*), and willow oak (*Q. phellos*). The widespread loss of forest and wetland habitat has significantly impacted wildlife and bird populations in the region, although it is still a major bird migration corridor. Representative species in forested bottomlands of the alluvial plain include white-tailed deer, black bear (*Ursus americanus*), bobcat (*Felis rufus*), gray fox (*Urocyon cinereoargenteus*), raccoon, swamp rabbit, wild turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), wood thrush (*Hylocichla mustelina*), yellow-throated vireo (*Vireo flavifrons*), American alligator, wading birds, ducks and geese (Griffith 2010).

The Plaquemines Parish site has been heavily impacted due to development, construction and operation of CARS and recent hurricanes. Vegetation observed at the Plaquemines Parish site in September 2013 consisted primarily of bermudagrass, ruderal vegetation, and other grasses and forbs typical of disturbed sites such as goldenrod (*Solidago* spp.) and sumpweed (*Iva annua*). Vegetation including chinese tallow, groundsel tree, golden rod, bermudagrass, alligator weed (*Alternanthera philoxeroides*) and wild cow pea (*Vigna luteola*) dominates the berms surrounding the production ponds. Due to the extensive, recent deposition of earthen material, most of the site is bare dirt with depressions where water has pooled.

Most of the constructed ponds were used for wetland plant propagation. However, since suspension of CARS operations in 2011, pioneer wetland species which are characteristic of disturbed sites have invaded the ponds. Vegetative conditions within the ponds can be characterized as having low structural diversity and few plant strata. The majority of the ponds are dominated by species such as wild cow pea, smartweed, pond flat-sedge (*Cyperus odoratus*), common duck weed (*Lemna minor*), and angle-stem primrose-willow (*Ludwigia leptocarpa*) which create a generally uniform mat of vegetation. The fringes contain species such as cattail and giant reed (*Phragmites australis*) which provide the only structural diversity. At least 2-in of surface water is visible in each pond, and the soils are saturated.

No formal terrestrial species surveys were conducted, so a full inventory of wildlife was not obtained during the site visit. Due to the recent disturbance at the site, no evidence of common generalist mammalian species were observed. However, representative species could include the raccoon, armadillo, feral hog (*Sus scrofa*), and coyote (*Canis latrans*). Reptile and amphibian species that may use the site include rat snake (*Elaphe obsolete*), green anole, gulf coast toad, northern cricket frog, and the red-eared slider (*Trachemys elegans*). Bird species observed during the September 2013 site visit included great blue heron (*Ardea herodias*), snowy egret (*Egretta thula*), great egret (*Ardea alba*), cattle egret (*Bubulcus ibis*), tricolored heron (*Egretta tricolor*), least sandpiper, killdeer (*Charadrius vociferus*), black-necked stilt (*Himantopus mexicanus*), greater yellowlegs (*Tringa melanoleuca*), mourning dove (*Zenaida macroura*), red-bellied woodpecker, and northern cardinal.

Environmental Consequences

Proposed construction would include restoration of existing access roads, plant propagation ponds and site buildings damaged in recent hurricanes. Pond construction would include the rehabilitation of ponds previously used for coastal plant propagation by re-grading, compaction and installation of water supply and water control structures. One new building, approximately 40ft by 60ft would be constructed. All proposed construction would be completed in areas previously impacted by CARS.

Dredging and rehabilitation of the on-site constructed ponds would remove herbaceous wet-edge habitat that could have developed since suspension of management operations. This could result in minor adverse effects to wildlife which may have utilized these edge habitats over the past two years, including wading birds, reptiles and amphibians. Due to the extent of previous alteration and current ground disturbance activities, adverse environmental consequences to terrestrial wildlife and avian species would be minor.

Environmental Consequences – Both Facilities

The construction of aquaculture ponds for the brooding and rearing of bait fish and commercial sport fishes could attract piscivorous bird species, such as herons, cormorants, egrets, kingfishers, and ducks, as well as mammals such as raccoons. Damage prevention and/or control strategies for managing bird damage and/or losses at each of the proposed facilities would be assessed during project development. Any prevention or control measures deemed necessary would be established in compliance with the Migratory Bird Treaty Act and LDWF regulations. Ground-clearing construction activities would be conducted outside of the avian nesting season, March 15 to September 15, to the extent practicable, to avoid direct impacts to nesting birds, in accordance with the Migratory Bird Treaty Act. If the project schedule should require ground-clearing activities during this time, pre-construction nest surveys of areas to be cleared would be conducted by a qualified biologist.

9.8.6.8 Marine and Estuarine Fauna (fish, shell beds, benthic organisms)

Both Facilities

Affected Resources

The southwest region (Calcasieu Parish facility) and the southeast region (Plaquemines Parish facility) are tidally influenced and support a wide variety of living aquatic resources including resident and migratory fishes, crustaceans, and benthic invertebrates. Representative species may include: spotted seatrout (*Cynoscion nebulosus*), southern flounder (*Paralichthys lethostigma*), Atlantic croaker (*Micropogonias undulatus*), black drum (*Pogonias cromis*), Gulf menhaden (*Brevoortia patronus*), striped mullet (*Mugil cephalus*) and blue crab (*Callinectes sapidus*). These estuarine-dependent species serve as prey for other aquatic species, including species in managed fisheries such as red drum, billfishes, snappers and sharks. Habitats in these regions typically include but are not limited to, estuarine emergent wetlands (e.g., marsh edge, inner marsh, marsh ponds, and tidal creeks); submerged aquatic vegetation; seagrasses; mud, sand, shell, and rock substrates (e.g., oyster reefs and barrier island flats); mangrove wetlands; and estuarine water column.

<u>Essential Fish Habitat</u>

The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) is the primary law governing marine fisheries management in Waters of the United States. The MSFCMA defines essential fish habitat ("EFH") as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." NOAA's Restoration Center prepared an EFH assessment for the Center as part of the initiation of a formal EFH consultation with NMFS in February 2014, with the consultation completed in April 2014 (Fay 2014). According to NMFS, there is currently no EFH represented at the proposed Plaquemines Parish facility because the project area is not in tidally influenced habitats designated as EFH. An overview of the EFH assessment for the Calcasieu Parish facility is provided below.

Brown shrimp *(Farfantepenaeus aztecus)*, white shrimp (*Litopenaeus setiferus)*, and red drum (*Sciaenops ocellatus)* are the three managed species known to reside in Gulf of Mexico waters near the proposed Calcasieu Parish facility that fall under the responsibility of the MSFCMA. Table 9-10 presents a list of defined EFH types and their presence by life stages for each of these three species. The identified species occupy estuarine and marine habitats at various life stages of their life cycle, thus they have an almost year-round local presence that extends into the Calcasieu River (NOAA 2011). A description of each of these three species, including the applicable fishery management plan authorities for the Gulf of Mexico that cover the species, is provided below.

Table 9-10. Designated EFH for listed federally managed species by various life stages identified for Calcasieu Parish Facility.

SPECIES	LIFE STAGE	SYSTEM[1]	DESIGNATED EFH
Brown shrimp *Farfantepenaeus aztecus*	Eggs	M	18-110 m; sand/shell/soft bottom
	Larvae	M/E	<82 m; planktonic; sand/shell/soft bottom, SAV, emergent marsh, oyster reef
	Juvenile	E	<18 m: SAV, sand/shell/soft bottom, emergent marsh, oyster reef
	Adult	M	<14-110 m; sand/shell/soft bottom
White shrimp *Litopenaeus setiferus*	Eggs	M	9-34 m; sand/shell/soft bottom
	Larvae	M/E	<82 m; planktonic; soft bottom, emergent marsh
	Juvenile	E	<30 m; SAV, soft bottom, emergent marsh
	Adult	M	9-34 m; sand/shell/soft bottom
Red Drum *Sciaenops ocellatus*	Eggs	M	<46m; nearshore and offshore Gulf of Mexico (GOM)
	Larvae/Postlarvae	E	All estuaries; planktonic, SAV, sand/shell/soft bottom, emergent marsh
	Juvenile	M/E	GOM <5 m; all estuaries, SAV sand/shell/soft/hard bottom, emergent marsh
	Adult	M/E	GOM 1-46 m; all estuaries SAV, pelagic, sand/shell/soft/hard bottom, emergent marsh
Sources: GMFMC, 1998, 2004, 2005, 2011 NMFS, 2013; Fay, 2014			M=Marine; E=Estuarine; F=Freshwater

Shrimp Fishery Management Plan

Commercially, the white and brown shrimp are the two important penaeid species along the Atlantic and Gulf coasts. Spawning and larval development of these two species occur in the Gulf. They have similar life history stages, are estuarine-dependent and vary seasonally in abundance. Brown shrimp utilize the same nursery grounds as the white shrimp during the growth period from the post larval stage to the adult stage. Marine shrimp are omnivorous scavengers, their diet include polychaetes, nematodes, fish tissue, algae and plant matter. Young brown shrimp move into the estuaries during the late winter and spend several months feeding before beginning the return journey to the Gulf of Mexico to spawn. They normally reach harvestable size and congregate in open bays during May. White shrimp behave similarly but the postlarvae do not reach inshore waters until early summer when brown shrimp are moving out. White shrimp move offshore in the fall when cooling water temperatures trigger a return migration (LSU 1999).

Red Drum Fishery Management Plan

The red drum occurs in a variety of habitats over different substrates throughout the Gulf of Mexico. Habitats range in depth from about 40 meters offshore to very shallow in estuarine wetlands with substrates that include sand, mud and oyster reefs (GMFMC 1998). There exists a general Gulfward migration in the late fall and a bayward movement in the spring. After spawning occurs in the Gulf, the planktonic larvae are carried by tidal currents into the quiet, shallow water of estuaries, with preferred areas including grassy clumps or slightly muddy bottoms. Juveniles develop and become abundant in the shallow water areas in late fall and move into deeper water of the bay as the weather becomes colder, and many may leave the bay systems while others remain. Adults are roving marine predators that opportunistically feed both on and off the bottom on a variety of invertebrate and vertebrate prey including marine worms, crab, shrimp and other fishes.

Environmental Consequences

Calcasieu Parish Facility

Construction

In-water and/or land based construction activities could impact the marine and estuarine fauna located in the vicinity of the proposed intake and outfall structures and pipeline by increasing erosion and elevating turbidity in the bottom sediment and the estuarine water column. This would be anticipated to occur from ground disturbance caused by mechanized equipment during pipeline installation and placement of water intake and outfall structures, removal of habitat during excavation and trenching, and the conversion of soft bottom substrate to hard substrate along some portion of the proposed pipeline. Such activities would result in the incidental suspension of solids and turbidity, the release of potential contaminants contained within the sediments, and a reduction in the dissolved oxygen (DO) levels in the area as a result of the release of oxygen demanding materials such as organic materials contained within the sediments. The estuarine water column is sensitive to the vertical and horizontal distributions of waterborne constituents such as salinity, temperature, dissolved oxygen, nutrients, and turbidity, all influenced directly by freshwater inflow from inland sources. Given the likelihood that localized bottom sediments have been re-suspended by past storm events or strong winds and tidal currents, the probability of supplementary anthropogenic contaminant dispersal during project construction is very low. DO concentrations along the proposed pipeline corridor could be reduced; however, any impacts would be localized and temporary.

The most likely impact to shellfish and finfish in the water from grading and ground disturbing activities, such as those mentioned above, would be temporary behavioral changes resulting in avoidance of the area. The duration of avoidance for these species would be determined by construction time expended in/near the water, but a rapid return to normal distribution and behavior would be anticipated. EFH supporting all life stages of white shrimp, brown shrimp, and red drum have been identified by NMFS in the area of the proposed project site. Due to their mobility, most juvenile and adult finfish and shellfish species would be able to actively avoid direct impacts within the construction area. Benthic organisms, such as clams, worms, and other infauna within the construction area would be directly affected for the short term during construction. Larger, more mobile benthic and epibenthic species would experience temporary displacement. Since construction activities would not have a substantial effect on sessile species occupying a small portion of the open water benthic community, the species inhabiting the areas of construction activity would be expected to re-establish from adjacent populations. Therefore, impacts would be expected to be short-term and minor.

BMPs such as turbidity curtains, erosion control screens, and staked hay bales would be used to reduce or eliminate erosion and elevated turbidity during the construction phase. Equipment and transport vehicles could potentially release minor amounts of petroleum products into the water system and wetland areas through operational use and spillage. Water quality impacts to the pelagic water column could occur as a result of accidental spills of petroleum lubricants and fuel during pipeline construction.

Implementation of preventative and mitigative BMPs using regulatory guidelines to reduce the risk of accidental construction spills will be used for protection of the aquatic ecosystem. Impacts from hydrostatic testing of the pipeline to verify material integrity immediately after construction could occur from toxic effects of chemical additives after discharge of the used test water. Hydrostatic test water would be treated as required by the LDEQ, and discharges would be conducted in accordance with applicable Louisiana Pollution Discharge Elimination System (LPDES) requirements. Given the small footprint of the facility, any pollutants released during facility construction would result in short term, minor impacts to marine and estuarine fauna.

<u>Operation</u>

Marine fish production would include broodstock collection and maintenance, live food production, egg incubation and larval rearing, and both pond and indoor rearing systems. Wild captured red drum, spotted seatrout and southern flounder broodfish would be collected from Louisiana waters and quarantined to monitor fish health before use in the indoor controlled spawning systems. Broodstock would be induced to spawn with temperature and photoperiod manipulation using established protocols and technology. Fertilized eggs would be collected for hatching and resultant larval fish would either be fed live foods in larval-rearing systems or stocked in outdoor systems, which provide a natural source of zooplankton for forage. Juvenile fish would be reared in a combination of tank and/or pond systems utilizing natural and artificial diets. Hatchery-produced fish would be tagged and/or marked prior to release to help inform fishery managers about the recruitment, survival, and population health of important recreational fish species and support management decisions. The release of hatchery-produced fish will occur as part of LDWF's research and management programs, and is not intended to affect local or regional native stock. In the long term, the aquatic community could benefit from the facilities' research activities that have a potential to improve management of marine species. Thus, no adverse impacts to federally-managed species are expected to result from introduction of hatchery produced specimens.

During hatchery operation, water will be supplied from the Turn Basin. The amount of water withdrawn from the Turn Basin is anticipated to be minimal compared to the amount of water already present; therefore, little to no effect on water quality is anticipated as a result of water withdrawn from the Turn Basin. Thus, marine and estuarine environments and EFH are not expected to be impacted by water quality changes caused by water withdrawals form the Turn Basin. If required during the final permitting process, additional evaluations including a review of the water balance of the turn basin and surrounding systems would be performed to assess any potential impacts to surrounding waters and determine if modifications to the design of the proposed intake systems are needed. To minimize entrainment and impingement of ichthyofauna (such as fish and marine mammals) during water abstraction, a submerged intake screen would be included in the design of the intake structure, thereby minimizing the effects on marine and estuarine fauna. Final design will determine the best location for the intake structure and screen design.

The hatchery components of the facility would include indoor RAS and an outdoor rearing pond complex. Water from the source water supply systems would be micro-screened, UV disinfected, and sand filtered before use in the hatchery. Fish production would be completed using established BMPs for marine fish production, and fish quality would be monitored and assessed using American Fisheries Society Bluebook Fish Health procedures; therefore, there should be minimal to no effects to marine or estuarine fauna as a result of hatchery operations. Effluent leaving the facility would pass through various levels of treatment prior to any discharge to the unnamed tributary of the Calcasieu River/GIWW. The treatment scenarios will include an integrated effluent treatment system for management of solids and nutrients, so that discharged water would be pursuant to LPDES permit conditions including testing and monitoring.

To reduce source water volume requirements, the hatchery would employ RAS technology. The indoor hatchery systems would be expected to operate using 95 to 99 percent re-circulation with water treatment. This technology would include operation of self-cleaning, biosecure, and environmentally managed circular tanks that provide controlled indoor rearing systems to spawn and rear the targeted species. These circular tank systems would provide the capability to rear advanced larger size fish (referred to as “Phase 2” or “Phase 3”) to meet precise size and timing requirements needed by LDWF research programs. The proposed circular tanks utilized for the RAS system are considered self-cleaning and have features that directly remove waste from the outflow prior to delivery to the disposal stream. This constant removal of generated wastes allows for quick capture of solids and the associated nutrients such as phosphorus. Micro-screen based technology is used to treat the overflow water and drainage wastewater streams in the RAS system. The quick capture of these solids minimizes breakdown of the solids and reduces the chance for further dissolution of nutrients (Wong and Pierdrahita 2000). Micro-screen backwash and rearing unit cleaning water are all captured and sent to the effluent treatment system for further sequestration.

The three 0.5-acre fish production ponds would be stocked and operated to facilitate multiple pond-rearing cycles per year. According to Schwartz and Boyd (1995), the last 10-20% of the pond drainage contains higher concentrations of contaminants compared to the first 80-90% of discharge. Therefore, the proposed effluent treatment system will target those parameters by treating the last portion of the pond during drainage. The bottom portion of the pond draining cycle will be directed to the effluent treatment system to reduce the level of solids and associated nutrients prior to its release into the unnamed tributary. The proposed fishing pond system will also be integrated with the effluent treatment system to further limit solids and nutrients from leaving the facility. The effluent treatment system will be an actively managed treatment, meaning that a multi-tiered or staged process will be utilized allowing for a portion of the system to remain active while another portion of the system is properly dewatered, collected waste concentrated, and system cleaned prior to waste removal from the facility to an approved sludge disposal area. To further remove excess nutrients from discharge water, the final design process will evaluate the feasibility of using multi-trophic integrated aquaculture (e.g., coastal plants, shellfish) within the effluent ponds, and/or developing separate constructed wetlands for coastal plant production. There are many attractive attributes of utilizing wetlands for treatment of wastewater, including the physical entrapment of pollutants through adsorption in the surface soils and organic material, utilization and transformation of the elements by microorganisms and the low energy/low maintenance requirements to attain consistent treatment levels (USEPA 1998).

Operation of the hatchery could result in long-term, minor impacts to the marine and estuarine species and the EFH-managed species found in the unnamed tributary of the Calcasieu River/GIWW through the discharge of effluent water and storm water run-off from the parking area. It is expected that this impact on the water quality of the unnamed tributary would be long-term, but minor because the run-off from the parking lot would be naturally filtered by the existing adjacent wetlands, and the effluent water would be treated in an integrated system designed to meet applicable LPDES permit conditions. There are currently no LPDES general permits that authorize operational discharges from hatcheries. According to Louisiana Environmental Regulatory Code, Title 33, Part IX. Subpart 1, Section 2507, a fish hatchery may be designated on a case-by-case basis as a concentrated aquatic animal production facility by the state administrative authority if it is determined to be a "significant contributor of pollution to waters of the state." No permit is required until the state administrative agency has made its determination based on a facility inspection (Title 33 §2507 (C)(2)). Coordination with the state administrative authority would be initiated to assist in a determination of LPDES applicability. If required during the final permitting process, additional evaluations including a review of the water balance of the turn basin and surrounding systems would be performed to assess any potential impacts to surrounding waters and determine if modifications to the design of the proposed intake or effluent systems are needed. Finally, the water quality of the unnamed tributary would be monitored as per the terms of the LPDES permit conditions to determine the effectiveness of the above mentioned treatment methods and the need, or lack thereof, for remedial actions.

LDWF would prepare an operating plan for both sites. The plan would outline the target annual production goals (including broodstock requirements) by species (e.g., numbers and sizes), identify the required indoor fish culture and outdoor pond facilities and water quantities needed, and would include an annual operating budget. The LDWF operating plan would incorporate best management practices for marine fish rearing and hatchery operation, including a disease and health management plan, which addresses the protocols for wild broodfish management in addition to standard fish culture practices. A genetic resource management plan would also be developed to avoid deleterious effects to the genetic integrity of wild populations.

Sport fish produced at the Center would be marked and released to assist with for the long-term monitoring of Louisiana's fishery resources and the habitats that support them. The production, release, and monitoring of marked hatchery fish would be carried out in conjunction with LDWF's statewide fishery monitoring program. The release of hatchery-produced fish will occur as part of LDWF's research and management programs, and is not intended to affect local or regional native stock. Thus, no adverse impacts to marine or estuarine species and EFH-managed species are expected to result from introduction of hatchery produced specimens. In the long term, the aquatic community could benefit from the facilities' research activities that have a potential to improve management of marine species. The Center's performance would be evaluated in part based on its ability to help develop and evaluate strategies for the management of marine fish species by providing information on the recruitment, survival, health, and movements of these populations. Maintenance of the facility equipment and grounds would be performed by LDWF staff and through maintenance contracts with major equipment manufacturers or professional service contractors.

Plaquemines Parish Facility

Construction

During the construction and operation of the facility, water will be supplied from the Mississippi River into storage reservoir ponds located within the proposed project site. Water from the source water supply systems would be micro-screened, UV disinfected, and sand filtered before use in the facility to reduce pollutant discharge and fish interception from the Mississippi River. The amount of water withdrawal from the Mississippi River is anticipated to be minimal compared to the amount of water already present; therefore, little to no effect on water quality as a result of water withdrawn from the Mississippi River is anticipated. Thus, no impacts to marine or estuarine species resulting from changes in water quality from Mississippi River water withdrawals are expected. As previously noted, no EFH is present within the Plaquemines Parish Facility impact area, therefore no impact to EFH or EFH-managed species are anticipated.

Because no extensive, open water habitat would be adversely affected by this project, impacts to marine or estuarine species during active over-land construction would be minor and short-term. Erosion controls would be implemented to prevent discharges of storm water runoff that can have a significant impact on sediment transport and water quality to receiving waters.

If found in proximity to construction activities, oysters could be temporarily affected by elevated suspended sediment concentrations similar to episodic increases caused by vessel traffic and storm events; however, only minor temporary impacts are expected.

Temporary and minor direct impacts to the bottom sediment and water column would result from the incidental suspension of substrate disturbed by equipment during the construction phase. The most likely impact to shellfish and finfish from construction activities in the water would be temporary behavioral or avoidance of the area. The duration of avoidance for these species would be determined by construction time expended in/near the water, but a rapid return to normal distribution and behavior would be anticipated. Benthic organisms, such as clams, worms, and other infauna within the construction area would be directly affected. Larger, more mobile benthic and epibenthic species would experience temporary displacement. Since construction activities would not have a substantial effect on sessile species occupying a small portion of the open water benthic community, the species inhabiting the areas of construction activity would be expected to re-establish from adjacent populations. Therefore, impacts would be expected to be short-term and minor.

During the construction of the facility, equipment and transport vehicles could potentially release minor amounts of petroleum products into the water system and wetland areas through operational use and spillage. Given the small footprint of the facility, any pollutants released during facility construction would result in minor impacts to marine or estuarine species. BMPs such as turbidity curtains, erosion control screens, and staked hay bales would be used to reduce or eliminate erosion and elevated turbidity during the construction phase. Overall, impacts would be minor because of the small footprint of the intake/outfall structures in the waterways near both facilities.

Operation
The facility would employ RAS technology to increase overall efficiency and reduce source water volume requirements. The indoor systems would be expected to operate using 95 to 99 percent re-circulation with water treatment. The amount of water withdrawal from the Mississippi River is anticipated to be minimal compared to the amount of water already present; therefore, little to no effects on marine or estuarine species is anticipated as a result of water withdrawal.

Operation of the Plaquemines Parish facility would result in long-term, minor impacts to an inland marsh of the Barataria Estuary from the discharge of effluent water. The water leaving the effluent ponds would enter an existing drainage ditch system that crosses LA 23 and discharges into an inland marsh of the Barataria Estuary. These effluent ponds would incorporate drainage structures used to dry the ponds for the removal of sediment to reduce potential turbidity in receiving waters. The resulting impact on water quality would be expected to be minor because the treatment of effluent in 0.5 acre settling ponds would be designed to meet applicable LPDES discharge standards. Thus, no impacts to marine or estuarine fauna are expected.

The primary operational impact to marine or estuarine species during operation of the proposed Plaquemines Parish facility would be impingement and/or entrainment in the renovated existing Mississippi River water pumping system and related piping systems. Mortality of mobile species in both juvenile and adult life stages would not be expected, but these species would be temporarily displaced from their habitat. Water intake velocity of 0.5 foot per second or less reduces the potential for fish egg and larval mortality through the impingement and/or entrainment of ichthyoplankton. Potential impacts related to water resources associated with water intakes are considered minor, but long term because they would continue for the life of the proposed facility.

The production of baitfish is not intended to affect local or regional native stock. Thus, no adverse impacts to marine or estuarine species are expected to result from introduction of hatchery produced specimens. In the long term, the aquatic community could benefit from the facilities' research activities that have a potential to improve management of marine species.

9.8.6.9 Protected Species

Both Facilities

Affected Resources
Plants and animals with federal classifications of Endangered or Threatened are protected under the Endangered Species Act (ESA), as amended. In addition, Candidate and Proposed species have sufficient information to warrant listing, but statutory protection is precluded by higher listing priorities. Section 7 of the ESA requires federal agencies to consult with the USFWS or National Marine Fisheries Service regarding any actions that may adversely affect listed species. Protection is also afforded to Louisiana state-listed species, and the LDWF enforces the state regulations.

A desktop review of critical habitat located on the Calcasieu and Plaquemines parish sites was completed in August of 2013 using the USFWS Critical Habitat Mapper (http://criticalhabitat.fws.gov/crithab/flex/crithabMapper). Based on this review, no critical habitat for federally listed species has been designated within either project locations. Species habitat requirements, aerial photographs, and street level views (Google Maps) were reviewed to further determine if potential habitat exists for any federal or state-listed species. For both facilities, determination of the presence or absence of suitable habitat is based on a review of species' habitat requirements and field observations from site visits that occurred in August, September and October of 2013. Federal- and state-listed species and the habitat determinations for both facilities are included in Table 9-11. Suitable habitat could be present at one or both facilities for the peregrine falcon *(Falco peregrinus)*, bald eagle *(Haliaeetus leucocephalus)*, Sprague's pipit *(Anthus spragueii)*, piping plover *(Charadrius melodus)*, red knot *(Calidris canutus rufa)*, and the West Indian manatee *(Trichechus manatus)*.

Table 9-11. Listed, candidate, and proposed species with potential to occur at the proposed facilities in Calcasieu and Plaquemines Parishes.

COMMON NAME/ SCIENTIFIC NAME	LISTING STATUS	FACILITY	PREFERRED HABITAT AND POTENTIAL FOR OCCURRENCE
[1,2] Piping plover *Charadrius melodus*	Federal: Threatened State: Threatened	Calcasieu, Plaquemines	Habitat: Open, sparsely vegetated coastal beaches Potential: Although not preferred habitat, marsh habitat along the unnamed tributary at the Calcasieu project site and on the fringes of the large ponds at the Plaquemines project site may be utilized during migration to preferred wintering or migration stopover habitats along the coast
[1] Peregrine falcon *Falco peregrinus*	Federal: None State: Threatened	Plaquemines	Habitat: Open areas along the coast Potential: Yes, facility ponds may attract birds which are prey for falcons
[1] Bald eagle *Haliaeetus leucocephalus*	Federal: Delisted State: Endangered	Calcasieu, Plaquemines	Habitat: Nests in large trees near open water, primarily in southeast LA Potential: Yes, potential winter habitat available in the bottomland forested areas on the Calcasieu property
[1] Brown pelican *Pelecanus occidentalis*	Federal: Delisted State: Endangered	Plaquemines	Habitat: Bays, tidal estuaries or along the coast, nests in shrub thickets within dunes of barrier islands, feeds in deep and shallow coastal waters Potential: No suitable habitat
[1] Red-cockaded woodpecker *Picoides borealis*	Federal: Endangered State: Endangered	Calcasieu	Habitat: Mature, longleaf pine savannah Potential: No suitable habitat
[1] Sprague's pipit *Anthus spragueii*	Federal: Candidate State: Candidate	Calcasieu, Plaquemines	Habitat: Open prairie or fields Potential: Low, former agricultural pasture at Plaquemines facility may have suitable wintering habitat
[1] Red wolf *Canis rufus*	Federal: Endangered State: Extirpated	Calcasieu	Habitat: Upland and lowland forest, shrubland, river bottoms, coastal prairies and marshes Potential: No, considered to be extirpated in Louisiana
[1] West Indian manatee *Trichechus manatus*	Federal: Endangered State: Endangered	Calcasieu, Plaquemines	Habitat: Marine open water, bays, and rivers Potential: Rare sightings in Calcasieu basin
[1] Green sea turtle *Chelonia mydas*	Federal: Threatened State: Threatened	Plaquemines	Habitat: Warm bays and oceans, seagrass beds, estuaries; mainland beaches and islands Potential: No suitable habitat
[1] Hawksbill sea turtle *Eretmochelys imbricata*	Federal: Endangered State: Endangered	Plaquemines	Habitat: Warm bays and shallow portions of oceans; seagrass beds; estuaries; mainland beaches and islands (nesting). Potential: No suitable habitat
[1] Kemp's Ridley sea turtle *Lepidochelys kempii*	Federal: Endangered State: Endangered	Plaquemines	Habitat: Warm bays and coastal waters; tidal rivers; estuaries; sea grass beds; sandy coastal beaches are used for nesting. Potential: No suitable habitat
[1] Leatherback sea turtle *Dermochelys coriacea*	Federal: Endangered State: Endangered	Plaquemines	Habitat: Open ocean and deeper waters of the Gulf and coastal bays; coastal beaches and barrier islands (nesting). Potential: No suitable habitat
[1] Gulf sturgeon *Acipenser oxyrinchus desotoi*	Federal: Threatened State: Threatened	Plaquemines	Habitat: All saltwater habitats, except during the spawning season when it is found in major rivers that empty into the Gulf of Mexico Potential: No suitable habitat

COMMON NAME/ SCIENTIFIC NAME	LISTING STATUS	FACILITY	PREFERRED HABITAT AND POTENTIAL FOR OCCURRENCE
[1] Pallid sturgeon *Scaphirhynchus albus*	Federal: Endangered State: Endangered	Plaquemines	Habitat: Large rivers in Southeast United States, prefers the main channels of excessively turbid rivers in areas with strong currents over firm sandy bottom Potential: No suitable habitat
[1,2] Red Knot *Calidris canutus rufa*	Federal: Proposed Threatened State: Proposed Threatened	Calcasieu, Plaquemines	Habitat: Wintering habitat – intertidal marine habitats, especially near coastal inlets, estuaries, and bays, or along resting formations Potential: Although not preferred habitat, marsh habitat along the unnamed tributary at the Calcasieu project site and on the fringes of the large ponds at the Plaquemines project site may be utilized during migration instead of preferred wintering or migration stopover habitats along the coast.
Sources: [1]USFWS Information, Planning, and Conservation System (IPaC) Official Species List for Plaquemines and Calcasieu Project Locations (September 12, 2013), Louisiana Natural Heritage Program - Species by Parish Lists for Calcasieu and Plaquemines Parishes (September 12, 2013), LDWF Rare Animal and Plant Tracking Lists and Fact Sheets, NatureServe Explorer (http://www.natureserve.org/explorer/), Native Plant Information Network (http://www.wildflower.org/explore/). [2]Natural Resource Damage Assessment and Restoration (NRDAR). Memo to the Field Supervisor of the Louisiana Ecological Services Office. 31 Jan 2014.			

The peregrine falcon is listed by the LDWF as threatened. This species typically nests on cliffs in the north and western regions of the U.S., and it has been documented using buildings for nesting in the eastern U.S. Historically, breeding falcons have also used cavities in large trees in the southern U.S. Wintering falcons are typically found in open coastal areas, where they feed primarily on other birds, including small passerines, shorebirds, doves, pigeons, and ducks. No suitable nesting habitat occurs for the Peregrine Falcon at either project location; however, the hatchery ponds may attract piscivorous bird species which may be prey for wintering falcons. No suitable roosting habitat occurs at either project location, so falcons would not use either site for cover or roosting, but a transient foraging falcon could be observed feeding at a site (NatureServe Explorer 2013a).

The bald eagle is listed by the LDWF as endangered and is also protected under the Bald and Golden Eagle Protection Act. This species of bird is a large raptor which breeds and winters across the U.S. and North America. Eagles typically nest near open water bodies in large trees but also may nest in other structures capable of supporting the large stick nests. Wintering eagles use similar habitat during the winter, including major river corridors, large lakes and reservoirs, and coastal areas. In Louisiana, the bald eagle breeds mostly in river and coastal areas of southeast Louisiana. Wintering eagles may occur along other rivers and lakes or reservoirs across Louisiana. Eagles are primarily piscivorous but also steal food from other raptors and scavenge available carrion. The bald eagle may occur at either facility as a transient forager (NatureServe Explorer 2013a).

The Sprague's pipit is listed by both the USFWS and the LDWF as a candidate species. This species is a small, cryptic, prairie grassland bird which breeds in the northern U.S. and Canada and winters in the southern U.S. and northern Mexico. The Sprague's pipit prefers dry, open grasslands with no shrubs or trees to breed and winter and is strictly a ground nesting species that feeds primarily on insects and seeds. The pipit has been declining due to conversion of grassland to agriculture and grazing. Both project locations are within the wintering range of the pipit; however, only a 1.5 acre portion of the Plaquemines Parish facility site, on the southwest side of Highway 23, may contain suitable wintering habitat (NatureServe Explorer 2013a).

The piping plover is listed as a threatened species by both the USFWS and the LDWF. It is a relatively small active forager generally found on beaches and mudflats of barrier islands in the southeastern coastal parishes for breeding and wintering. It feeds on a variety of aquatic invertebrates such as insects, crustaceans and mollusks. The red knot is listed by both the USFWS and the LDWF as a proposed threatened species. The red knot is a large bulky sandpiper that breeds in drier tundra areas, such as sparsely vegetated hillsides and migrates south to southern South America to winter in intertidal marine habitats, especially near coastal inlets, estuaries, and bays. It feeds on invertebrates, especially bi-valves, small snails, and crustaceans. Although not preferred habitat, the piping plover and the red knot may use the marsh habitat along the unnamed tributary at the Calcasieu project site and on the fringes of the large ponds at the Plaquemines project site during migration instead of its preferred wintering or migration stopover habitat along the coast. However, the probability of this species using this area is very low (NatureServe Explorer 2013a).

The West Indian Manatee is listed as endangered by both the USFWS and the LDWF. This species is an opportunistic herbivorous forager that is typically grey in color, has a large seal-shaped body with paired flippers and a round paddle-shaped tail (NatureServe Explorer 2013b). Course hair is distributed sparsely all over its entire body, with stiff whiskers around the face and muzzle (NatureServe Explorer 2013b). Adult manatees, on average are approximately 10 feet long and weigh close to 1,200 pounds (NatureServe Explorer 2013b). Calves are between 3 and 4 feet long and weigh approximately 66 pounds on average at birth. Manatees inhabit freshwater, brackish, and marine environments, preferring shallow water (3' – 6') where they forage on submergent, emergent, and floating aquatic vegetation including cord grass, alga, turtle grass, manatee grass, and eel grass, etc. (USFWS 2014). Populations of the West Indian Manatee occur primarily in warm waters along the coast of Florida and the Caribbean, but manatees have also been sighted in bays and estuaries as far west as Texas during warmer months(NatureServe Explorer 2013b). "Historically, this species has sought natural, warm-water sites, including springs, deep water areas, and areas thermally influenced by the Gulf Stream, as refuges from the cold. In the spring, manatees leave the warm-water sites and may travel great distances during the summer, only to return to warm water sites in the fall" (USFWS 2014). In the 1930's and 40's, industrial plants and other facilities such as power plants, paper mills, etc., were built along coastal and riverine shoreline areas and began discharging heated water into areas accessible to manatees (USFWS 2014). Large numbers of wintering manatees have been attracted to these warm water sites and have caused manatees to expand their wintering grounds into previously unsuitable areas rather than natural warm water sites (USFWS 2014).

In Louisiana, the vast majority of manatees have been sighted in the warm southeastern coastal waters. According to LDWF records, there have been a few instances over the last century when manatees were found in southwestern Louisiana, upstream of the Calcasieu River and downstream of Calcasieu Lake and Black Bayou; however, none of the sightings were in the general vicinity of the Calcasieu Parish project site. Although the presence of the manatee is rare and the project area does not contain preferred habitat, the waters of the Turn Basin and unnamed tributary are accessible to manatees for foraging and stopover. The water levels in the Turn Basin are not shallow enough to support aquatic and submerged aquatic vegetation suitable for foraging; therefore, the probability of the manatees being located in this area is low. The unnamed tributary's bank is lined with cord grass, an aquatic plant known to provide forage for manatees; however, the water level along the bank of the unnamed tributary is too shallow for the manatees to approach for purposes of grazing; consequently, the probability of manatees being sighted in this area is believed low.

Environmental Consequences

The Trustees acknowledge that habitat suitable for red wolf exists within Louisiana and that the Calcasieu parish facility is proposed in habitat suitable for red wolf. However, the project will not affect the species because the red wolf is not expected to occur in the project area.

No suitable nesting habitat occurs for the Peregrine Falcon at either project location; however, the hatchery ponds may attract piscivorous bird species which may be prey for wintering falcons. No suitable roosting habitat occurs at either project location, so falcons would not use either site for cover or roosting, but a transient foraging falcon could be observed feeding at a site.

The bald eagle may occur at either facility as a transient forager, but the lack of suitable roosting and nesting habitat at the sites precludes the occupation of the project areas by a breeding or wintering eagle. Due to the lack of suitable habitat and transient occurrence of a foraging eagle, the USFWS concurred that there would be no take of bald eagles.

The project locations are within the wintering range of the Sprague's pipit; however, only a 1.5 acre portion of the Plaquemines Parish facility site, on the southwest side of Highway 23, may contain suitable wintering habitat. Due to the small size of this parcel and historic agricultural use of the site, the USFWS concurred that there would be no effect on the Sprague's pipit.

Because the habitat on the project site is not optimal, the piping plover and red knot would move from the site readily during construction. If piping plover and red knots were to stop at the marsh habitat to rest or forage during construction, they could be startled by nearby construction noise. In the presence of construction, it is expected that any startled birds will move to more suitable habitats in their wintering range. This movement is representative of normal foraging behavior patterns of both species; therefore, any disturbance effects from construction noise would be insignificant and discountable.

Consultation with USFWS under Section 7 of the ESA to evaluate potential impacts to listed, proposed, or candidate species was initially completed in February 2014 (McClain 2014). Based on this consultation, the proposed project may affect, but is not likely to adversely affect, piping plover and red knot. USFWS determined that no conservation measures were necessary to minimize impacts to these listed species.

A comment was raised during public review of the DERP/PEIS that manatees could be present in the Calcasieu basin; subsequently, an informal consultation with USFWS under Section 7 was reinitiated through email in May of 2014 (personal communication from Holly Herod, DOI). USFWS concurred with the determination that the proposed project may affect, but is not likely to adversely affect, the West Indian manatee (personal communication from Jeff Weller, USFWS). In this consultation, LDWF has agreed to follow standard BMPs intended to protect manatees from direct effects of the construction of the intake and outfall structures. The following in-water work conditions will be implemented during construction.

- All personnel associated with the project should be instructed about the potential presence of manatees, manatee speed zones, and the need to avoid collisions with and injury to manatees. The permittee should advise all construction personnel that there are civil and criminal penalties for harming, harassing, or killing manatees which are protected under the Marine Mammal Protection Act of 1972 and the Endangered Species Act of 1973.
- All work, equipment, and vessel operation must cease if a manatee is spotted within a 50-foot radius (buffer zone) of the active work area. Once the manatee has left the 50 foot buffer zone on its own accord (manatees must not be herded or harassed into leaving) and after 30 minutes have passed without additional sightings of manatee(s) in the buffer zone, in-water work can resume under careful observation for manatee(s) and under idle/no wake speeds for vessel operations
- All vessels shall operate at idle/no wake speeds whenever a manatee is spotted outside of the 50 foot buffer zone, but within 100 yards of the active work zone
- Siltation or turbidity barriers should be properly secured, made of material in which manatees cannot become entangled, and be monitored to avoid manatee entrapment or impeding their movement
- Temporary signs concerning manatees should be posted prior to and during all in-water project activities and removed upon project completion. One temporary sign should be posted in a location easily visible to vehicle operator and should read Caution: Boaters in conspicuous letters. Another sign, measuring at least 8.5" by 11 ", should be posted in a location prominently visible to all personnel engaged in water-related activities and explain the special requirements of vessel operation at idle/no wake speeds if manatee(s) are spotted; vessel operation at idle/no wake speeds if manatee(s) are spotted; vessel operation at idle/no wake speeds when there is less than four foot bottom clearance; and the necessary shut-down of all in water operations when manatee(s) are within 50 feet of the work area
- Collisions with, injury to, or sightings of manatees should be immediately reported to the Service's Louisiana Ecological Services Office (337/291-3100) and the Louisiana Department of Wildlife and Fisheries, Natural Heritage Program (225/765-2821). Please provide the nature of the call (i.e., report of an incident, manatee sighting, etc.); time of incident/sighting; and the approximate location, including the latitude and longitude coordinates, if possible.

Furthermore, during facility operation, the intake structure would be screened to prevent impingement of manatees as well as other aquatic species, such as ichthyofauna. Also, water discharged into the unnamed tributary would not be heated but may vary slightly from the ambient temperature of the water in the unnamed tributary. However, water flow is not expected to be continuous and therefore should not attract manatees. The extremely low probability presence, coupled with the avoidance and minimization measures agreed upon by LDWF and USFWS, would minimize potential effects to manatees to an insignificant and discountable level. Because the project is not likely to adversely affect manatees under the ESA, the proposed project is not anticipated to result in take under the MMPA.

9.8.6.10 Human Uses and Socioeconomics

9.8.6.10.1 Socioeconomics and Environmental Justice

Calcasieu Parish Facility

Affected Resources
The Calcasieu Parish facility is located entirely in Calcasieu Parish, near the Calcasieu River and several lakes and canals. The land near the facility is characteristic of rural lands developed for residential areas and port-side industries.

In 2010, the total population of the block group intersecting the Calcasieu Parish facility was 10,014. According to the U.S. Census Bureau, the population of Calcasieu Parish has increased by about five percent over the past 10 years from 183,577 in 2000 to 192,768 in 2010. Approximately 13 percent of the population in the block group intersecting the Calcasieu Parish facility is considered to be minority. By contrast, 29 percent of the Calcasieu Parish population is considered to be minority.

The block group containing the Calcasieu Parish facility has a median household income of $40,852, which is above the 2011 HHS poverty guideline. The median household income for Census Tract 1800 (which includes this block group) is $46,037.

Environmental Consequences
The proposed project would not be expected to change the socioeconomic conditions surrounding the Calcasieu Parish facility or generate pressure on housing or public services that could not be absorbed by the existing infrastructure. The proposed project would be anticipated to support community cohesion by providing permanent and temporary employment opportunities for local residents. As estimated by LDWF, the proposed project would create 8 permanent jobs (1 manager, 1 supervisor, 3 biologists, and 3 technicians). The project engineer estimates that 30 construction related jobs would be generated for 18 months during the construction of the facility. Beneficial economic effects would be associated with the project (employment and visitors).

Environmental Justice Analysis
In this analysis, an analytical unit, such as a block group, census tract, or parish, is considered to have a minority population if its nonwhite population is greater than 50 percent or is meaningfully larger than the general (statewide) nonwhite population. Low-income areas are defined as areas in which the percentage of the population below poverty status exceeds 50 percent, or is meaningfully greater than the general population (average statewide poverty level). To make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.
- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet any of the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. There are no identified minority and low income populations located in the vicinity of the Calcasieu Parish site. Furthermore, there are no high and adverse impacts anticipated from the proposed project.

Plaquemines Parish Facility

Affected Resources

The Plaquemines Parish facility is adjacent to the Mississippi River and many of the commercial and industrial developments in the area depend on fisheries and on marine vessels utilizing the river for trade and transport. The land surrounding the Plaquemines Parish facility is used for industrial and agricultural uses.

In 2010, the total population of the U.S. Census Bureau block group intersecting the project area was 834. According to the U.S. Census Bureau, the population of Plaquemines Parish has decreased by about 14 percent over the past ten years from 26,757 in 2000 to 23,042 in 2010.

Approximately 65 percent of the population in the block group (Block Group 1 of Census Tract 504) intersecting the project area is considered to be minority. Approximately 13 percent of the population in the census tract containing the Plaquemines Parish facility is considered to be minority, whereas Plaquemines Parish as a whole is approximately 30 percent minority.

The block group containing the Plaquemines Parish facility has a median household income below the poverty guideline. Block Group 1 of Census Tract 504 has a median household income of $19,405 while the whole of Census Tract 504 has a median household income of $36,354.

Environmental Consequences

The proposed project would not be expected to change the socioeconomic conditions surrounding the Plaquemines Parish facility or generate pressure on housing or public services that could not be absorbed by the existing infrastructure. Although the immediate area surrounding the project site has a significant minority population, the proposed project would not result in adverse impacts to these groups. The proposed project would be anticipated to support community cohesion by providing permanent and temporary employment opportunities for local residents. As estimated by LDWF, the proposed project would generate 3 permanent positions (2 biologists, 1 technician). The project engineer estimates that 20 construction related jobs would be generated for 12 months during the construction of the facility. There would be beneficial economic effects associated with the increased temporary and permanent employment and income generated by visitors.

Environmental Justice Analysis

As described above, to make a finding that disproportionately high and adverse effects would likely fall on minority or low-income populations, three conditions must be met simultaneously:

- There must be a minority or low-income population in the impact zone.
- A high and adverse impact must exist.

- The impact must be disproportionately high and adverse on the minority or low-income population.

The Trustees find that this project location does not meet the criteria for determining that disproportionately high and adverse effects would likely fall on minority or low-income populations. Although the population in the immediate vicinity of the project area (Block Group 1 of Census Tract 504) is considered to be minority and low-income, the project would not result in a high and adverse impact to any of the analyzed resource categories, including environmental and economic categories.

9.8.6.11 Cultural Resources

The potential for cultural resources within the proposed project locations were investigated in preparation for compliance with both NEPA and Section 106 of the National Historic Preservation Act, as amended ("NHPA"). NEPA requires consideration of important historic and cultural aspects of our national heritage, while Section 106 of the NHPA requires federal agencies to "take into account" the "effect" that an undertaking will have on "historic properties." Historic properties are those included in or eligible for inclusion in the National Register of Historic Places (NRHP) and may include structures, buildings, districts, objects, and sites. In accordance with the Advisory Council on Historic Preservation (ACHP) regulations pertaining to the protection of historic properties (36 C.F.R. 800.4), federal agencies are required to identify and evaluate historic-age (50 years or older) resources for NRHP eligibility and assess the effects that the undertaking would have on historic properties.

Calcasieu Parish Facility

Affected Resources

Project historians reviewed the NRHP and the Louisiana Cultural Resource Map (sponsored by the Louisiana Department of Culture, Recreation, and Tourism [LDCRT]) to identify any previously documented historic and archeological historic resources in the project area. Under the NHPA, the Louisiana Office of Cultural Development (LOCD) within LDCRT is given the role of the State Historic Preservation Office (SHPO). Archeologist Clayton M. Tinsley conducted initial visits to the proposed Calcasieu Parish facility location on November 7 and 8, 2011. HDR cultural resource staff completed additional field work at the Calcasieu Parish facility location on August 19-23, October 9, and October 30, 2013.

A Phase I cultural resources survey of the project area was conducted to determine all potential impacts to cultural resources as required by NEPA and Section 106 of NHPA. A Phase I survey was conducted of the Calcasieu Parish facility site in August and October 2013 and did not identify any prehistoric archaeology (HDR 2013). The survey did record one historic age archaeological site (16CU81), which likely represents the scattered remains of a twentieth-century farmstead. The historic-age site was recorded at the southeast intersection of Joe Ledoux Road and Big Lake Road. The site lacked contextual integrity and was recommended not eligible for listing in the NRHP. In February 2014, the SHPO completed review of the Phase I draft report and concurred that site 16CU81 is not eligible for nomination to the NRHP and that no historic properties would be impacted by this project (Breaux 2014).

Environmental Consequences
Because no NRHP-eligible historic resources were found during the Phase I survey of the Calcasieu Parish facility site, the proposed project would not be expected to have adverse impacts on cultural resources. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources

Plaquemines Parish Facility

Affected Resources
The facility would be located directly adjacent to the levee of the main channel of the Mississippi River. The Plaquemines Parish facility location has been heavily affected by development, land modification, and hurricanes. Two historic-age domestic residences were identified and photographed within the Plaquemines Parish location during a visit conducted in 2011 by HDR Archaeologist Clayton Tinsley. The photographs were subsequently examined by HDR Architectural Historian Ann Keen. The second building (the only one in existence today) has been heavily damaged by recent storm events. It was recommended not eligible for inclusion in the NRHP. A letter presenting this recommendation was sent to the SHPO in January 2014 (Keen 2014). The SHPO concurred with this recommendation in March 2014 and concluded that no known historic properties would be affected by the project (Keen 2014).

Environmental Consequences
The Plaquemines Parish facility has a low potential for buried cultural resources because of the significant alterations to the site; therefore, it is unlikely that field work will be required for this project facility location. The original historic-age houses have been either removed or extensively damaged. The remaining structure was recommended not eligible for inclusion in the NRHP; therefore, no direct or indirect effects are anticipated. As environmental review continues, direct and indirect effects of the proposed project on cultural resources along with any relevant planned mitigation measures of the Plaquemines Parish facility would be determined upon review of this project under Section 106 of the NHPA. A complete review of this project under Section 106 of the National Historic Preservation Act is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources.

9.8.6.12 Infrastructure

Calcasieu Parish Facility

Affected Resources
The Calcasieu Parish facility is located off Big Lake Road, which is a two-way two-lane, undivided minor arterial. Based on information gathered from the LaDOTD, the flow of vehicular traffic appears relatively light along the portion of the highway adjacent to the site. Currently, there is no known infrastructure for onsite water supply.

Based on information from Louisiana One Call, Entergy provides electric service in the area and has electrical poles along Big Lake Road. Centerpoint Energy has a gas main in the area from which service can be extended; however, they do not have a gas main adjacent to the proposed project site.

Environmental Consequences

The facility is designed to accommodate up to 15,000 visitors per year, translating to an average of 55 visitors per day. Carpooling is typical for a facility of this type; therefore, the number of vehicles that would approach the facility could be expected to be much lower than the number of visitors. The facility would be expected to mostly attract recreational road users (visitors on weekends), and as such, should not greatly impact the Annual Average Daily Traffic in the area. Although no major road improvements would be anticipated because of this project, minor improvements such as an exclusive right turn lane could be considered in the event that traffic studies determine the need for road improvement. Some traffic control devices such as reduced speed signage could also be necessary to accommodate the increase in vehicular and pedestrian traffic.

It is not anticipated that during construction or operations the increase in traffic would substantially affect the circulation network. A traffic control plan would be instituted during construction to provide for safe ingress/egress of construction workers, equipment and materials (e.g., scheduling, staging, signage, flagmen). With the incorporation of a traffic control plan, the effects associated with construction activities would be minimized.

During final design, the localized circulation network would be reviewed by a qualified traffic engineer to ensure that there are no adverse issues related to turning movements, queuing, ingress/egress, etc. Signage (in accordance with all local requirements) to the facility could be implemented at final design; however, at this phase of development, those types of details are unknown. If signage was included in the final plans, effects to traffic would be further minimized.

Water for the Calcasieu Parish facility would be sourced from proposed onsite wells and the offsite Turn Basin – a branch of the Calcasieu shipping canal and the Gulf Intracoastal Waterway. The offsite water supply basin is located approximately 0.5 miles north of the site; therefore a conveyance system is proposed to transport water to the site. Water from the basin will gravity-flow through a proposed intake screen and then into an adjacent concrete sump. Pumps within the sump are proposed to pump water at the rate of 500 – 1,000 gpm to the ponds through a proposed sub-surface 10-inch pipe. Two on-site wells, one for potable water and another for process water are also proposed to service the building and ponds, respectively. Potable water withdrawn from the wells would be needed for employees and visitors to the facility. Due to the limited number of staff needed to support the facility, it would be expected that groundwater supplies would be adequate to support the facility. During final design, an assessment would be conducted to identify the daily capacity of water needed to support the site and conduct an assessment of the groundwater supplies to determine if adequate volume of water is available. This assessment would need to verify that there would be no adverse effects on existing users of the groundwater supplies. In the event that groundwater supplies were found to not be available, potable water would be transported to the site. Other water needed for the facility would be marine (salt water). It is, therefore, expected that groundwater would not be adversely affected by the project.

Design plans have not been formulated at this time; however, it would be expected that electric service would be supplied from the nearest pole along Big Lake Road. The type of connection will depend on the electric load required to operate the facility. During final design, coordination with the electric provider (Entergy) would ensure that all improvements are installed as required.

Based on discussions with Centerpoint Energy, a natural gas line can be extended to serve the proposed facility. As noted for electric service, design plans have not been formulated at this time. During final design, coordination with Centerpoint Energy would ensure that all gas facilities are installed as required.

Plaquemines Parish Facility

Affected Resources

The site for the proposed Plaquemines Parish facility is located off LA 23. Locally known as Belle Chasse Highway, LA 23 is a two-way, four-lane, divided road. A driveway access to the facility is located on the northbound side of the highway and there is a U-turn in the vicinity of the site for southbound traffic to obtain access to the property. The LaDOTD provides live traffic information for the portion of Belle Chasse Highway that is adjacent to the facility. These broadcasts indicate that there is no perceivable traffic congestion (e.g. traffic slow-downs) in the area even during peak morning and afternoon hours, suggesting that there is capacity for a higher usage.

A pump station and pipeline still exists near the Mississippi River; however, a conditions assessment of the pump and water line has not been conducted. Water service is available and provided by Severn Trent Services with meters already in place. Entergy currently has infrastructure along LA 23 and supplies electric power along that corridor. There is an existing electricity connection to the Plaquemines Parish facility. Natural gas is available through Atmos Energy from lines in place along LA 23, between Lacrosse Lane and Loafala Lane.

Environmental Consequences

When in operation, the facility is designed to accommodate approximately 1,000 visitors per year. Due to the current light road usage and the low volume of traffic projected to visit this facility, no major road improvements or installation of traffic signals are anticipated.

It is not anticipated that during construction or operations that the increase in traffic would substantially affect the circulation network. It is assumed that a traffic control plan would be instituted during construction to provide for safe ingress/egress of construction workers, equipment and materials (e.g., scheduling, staging, signage, flagmen). With the incorporation of a traffic control plan, the effects associated with construction activities would be minimized.

During final design, the localized circulation network would be reviewed by a qualified traffic engineer to ensure that there are no adverse issues related to turning movements, queuing, ingress/egress, etc. Signage (in accordance with all local requirements) to the facility may be implemented at final design; however, at this phase of development, those types of details are unknown. If signage is included in the final plans, there would be no adverse effects to traffic.

Water for facility operations at the Plaquemines Parish facility would be sourced from the Mississippi River. Existing pumps would be used to convey fresh water from the Mississippi River into holding ponds and then to the proposed facility.

Capacity for potable water for use in the building is readily available through Severn Trent Services. According to the provider, two or more water meters are currently in place. Potable water would be supplied to the facility via connections to the trunk line that runs along LA 23.

Although a load sheet was unavailable during discussions with the provider, Entergy anticipates they can service the facility with electric power and does not foresee any issues with regard to load. Based on the current site plan, Entergy may require an onsite pad, built to flood elevation, and use multiple connection points to deliver power.

To provide natural gas service to the facility, Atmos would need to install a service line from LA 23 to the facility point of metering. As noted for the electric services, final design has not progressed to the point of design of the infrastructure. During final design, coordination with Atmos Energy would occur to ensure that all gas facilities are installed as required. Potable water would be provided by Severn Trent Services. At this time, project design has not quantified the amount of water needed and waste water generated by the facility. Due to the fairly small size of the facility, it is not anticipated that this would be a limiting factor. Coordination with the water department would occur to verify that water/wastewater services can be adequately supplied.

Construction and operation of the proposed project is not anticipated to adversely impact the existing infrastructure.

9.8.6.13 Land and Marine Management

Under the Coastal Zone Management Act of 1972, Federal Trustees must seek to ensure that the selection of the projects for early restoration are consistent to the maximum extent practicable with the federally-approved coastal management programs for the states where such projects include activities with the potential to affect a coastal use or resource. Coincident with the public review of the Phase III DERP/PEIS, the Federal Trustees submitted a consistency determination for the early restoration projects proposed in Louisiana for appropriate review by the Louisiana Department of Natural Resources (LDNR) Office of Coastal Management (OCM) on December 12, 2013 (Federal Trustees 2013). LDNR OCM responded on February 18, 2014, concurring with the federal determination of consistency for purposes of selection of the early restoration projects in Louisiana, but reserved its additional state reviews for consistency for future federal agency activities, and for non-federal activities subject to federal permitting processes or Louisiana's Coastal Use Permit (CUP) program, as required or appropriate to those processes (Haydel 2014).

Calcasieu Parish Facility

Affected Resources

According to the Calcasieu Parish Police Jury GIS interactive website (http://cppj.totaland.com/), the project site for the Calcasieu Parish facility was designated and coded as being zoned for “i2, Heavy Industrial”. The area surrounding the project site was largely zoned Heavy Industrial, with the exception of a few small tracts west of Big Lake Road being zoned as “mhp, Manufactured Home Park” and “a1, Agricultural” and the area adjacent to the east of the project site being zoned as “i2r, Heavy Industrial Restricted” and “r2, Mixed Residential” (see Figure 9-26). The southeast section of the project site was also zoned by Calcasieu Parish as having “Parish Higher Standards”, having a particular provision regulating elevation. The tract is located in Floodzone “AE”, typically having a construction elevation requirement of 11 feet. Due to known flooding in this area, Calcasieu Parish Government has implemented the provision that constructed buildings on this site be elevated to 12 feet (Figure 9-27).

Figure 9-26. Land use zoning in the vicinity of the Calcasieu Parish facility.

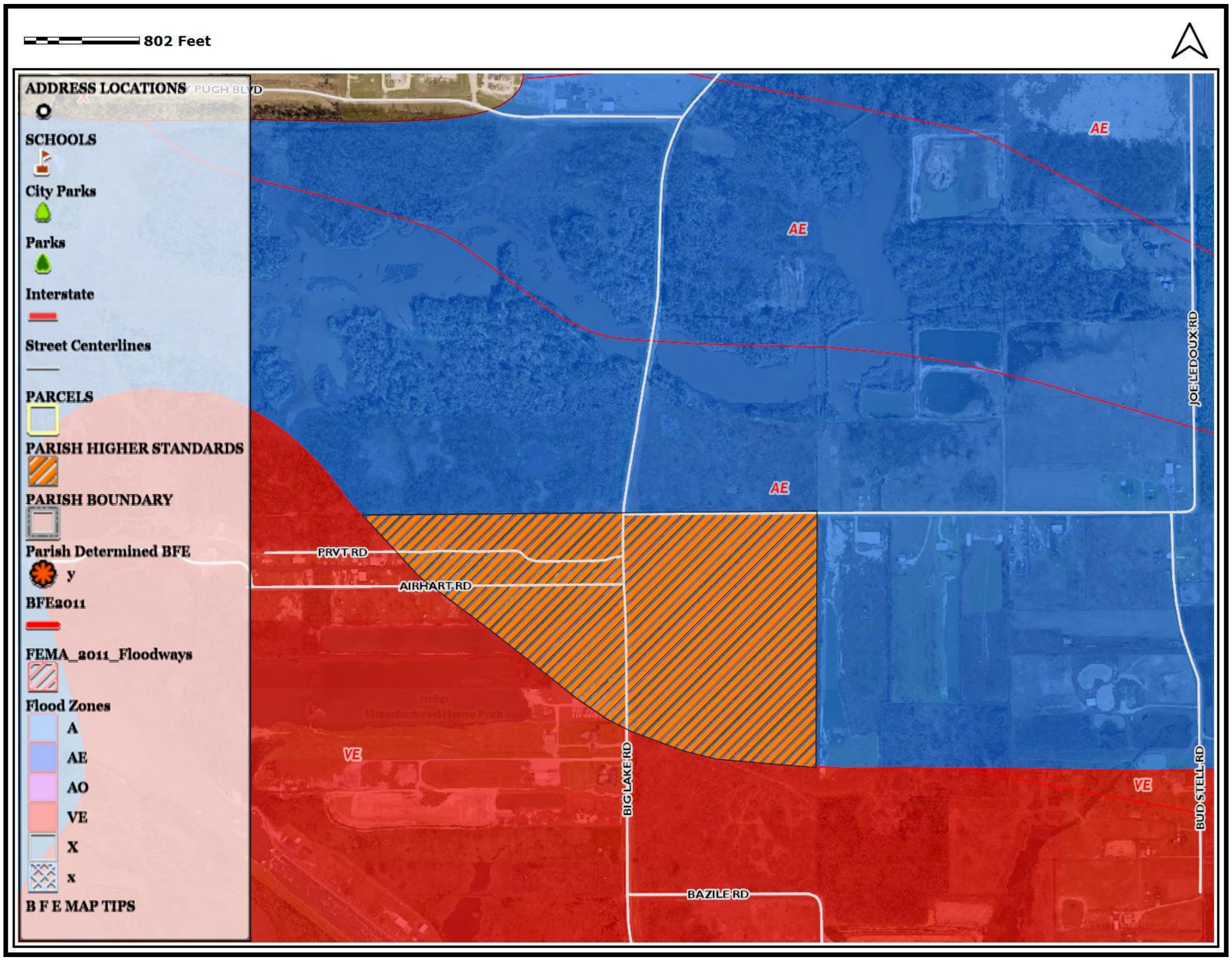

Figure 9-27. Flood zones in the vicinity of the Calcasieu Parish facility.

Land uses in the vicinity include agriculture, boat launches, docks, residential housing, barge terminal, oil and gas production, and local industry. There are no schools, churches, cemeteries, hospitals, or other public buildings on the Calcasieu Parish land tract. Natural land features within the tract include emergent wetlands, mima mounds, and forested wetlands. Natural streams, bayous, rivers and lakes surround the location and are used to support recreational and commercial fishing and navigation.

Environmental Consequences

Although the facility location and placement of the intake pump and pipeline are outside of the Louisiana Coastal Zone, a Joint Permit Application would still be submitted to the LDNR OCM and forwarded to the USACE and Louisiana Department of Environmental Quality for Section 10/404 permit review for potential impacts to Waters of the U.S., including wetlands. The proposed project facility and associated discharge would not be expected to have adverse impacts to land use and will have no effect on current land use zoning designated by Calcasieu Parish.

Plaquemines Parish Facility

Affected Resources

Discussions had with the Plaquemines Parish Planning and Zoning Department revealed that the Plaquemines Parish facility falls within the Plaquemines Parish Flood Plain District. This District comprises areas subject to periodic or occasional inundation from stream overflows, storms, and tidal conditions. The use of property and buildings or structures within the Flood Plain District are subject to residential, commercial, and industrial requirements of the Plaquemines Parish Building and Sanitary Codes. Permitted land use of this property is limited to single and two-family residences, farming and keeping of agricultural livestock, public recreation, fishing/hunting lodges, camps, boat houses/docks, shipyards, marinas/yacht club, oil field services and supply companies, warehouses, mineral extraction and development of natural resources, and ice making plants. Mobile homes and all other commercial and industrial uses of properties within the Flood Plain District are subject to the approval of the Parish Council.

The Plaquemines Parish facility was once State property that was leased as a citrus and coastal plant research facility. The project facility site has already been heavily impacted because of this development and land modification. Land use in the vicinity includes conventional agriculture, citrus orchards, residential housing, oil and gas production, river transportation, and local industry. Natural land features surrounding the facility are typical of riverine and marsh habitat.

The proposed project area lies entirely within the Louisiana Coastal Zone as designated by LDNR OCM.

Environmental Consequences

The LCRP requires compensatory mitigation for impacts to vegetated wetlands in the Louisiana Coastal Zone. It is likely that the proposed project would require a CUP because the entire Plaquemines Parish facility is located within the Louisiana Coastal Zone. A Joint Permit Application would be submitted to OCM and USACE for a CUP and USACE authorization under Section 10/404. Construction may result in adverse impacts to vegetated wetlands within the footprint of the construction area; these impacts would be mitigated by fulfilling compensatory mitigation requirements. See Section 9.8.6.3 for a description of wetlands on the site.

Though it is likely that the improvements and activities associated with this facility would require a CUP and approval from the Parish Council, there would be no impact to land use zoning as it would be consistent with local zoning regulations.

9.8.6.14 Aesthetics and Visual Resources

Calcasieu Parish Facility

Affected Resources

The proposed project would be located at 8277 Big Lake Road in Lake Charles, Louisiana. The land tract is undeveloped and its natural land features include emergent wetlands, mima mounds, forested wetlands, streams, bayous, rivers, and lakes. Oil and gas infrastructure is present in surrounding areas, as are port traffic and recreational and commercial fishing.

Plaquemines Parish Facility

Affected Resources
The proposed project would be located at 22193 Highway 23 in Port Sulfur, Louisiana and would consist of construction within a fastland area adjacent to the Mississippi River within the Louisiana Coastal Zone. The landscape surrounding the project area is characteristic of natural riverine habitats and supports rural residential, agricultural, and industrial areas along LA 23 and the Mississippi River.

Both Facilities

Environmental Consequences
The use of large equipment could have a temporary, adverse visual impact during project construction. These short-term construction-related impacts to visual resources would be minor. The design of the proposed Calcasieu Parish facility is intended to have an attractive aesthetic that would blend into the southwest Louisiana landscape and be attractive to visitors. However, it would result in a permanent change to the existing landscape. Impacts to visual and aesthetics resulting from construction of the Calcasieu facility would be long term and minor.

The rehabilitation of the proposed Plaquemines Parish facility would benefit local aesthetics as compared to the current condition, which reflects the adverse impact of hurricane damage. Overall, there would be a long term moderate net benefit to visual and aesthetics resulting from rehabilitation of the Plaquemines Parish facility.

9.8.6.15 Tourism and Recreational Use

Calcasieu Parish Facility

Affected Resources
There are limited tourism facilities in Calcasieu Parish near the proposed facility location. The City of Lake Charles has tourism infrastructure, including hotels and restaurants.

Plaquemines Parish Facility

Affected Resources
There are limited tourism facilities in Plaquemines Parish near the proposed facility location. Tourism is primarily associated with fishing and other outdoor recreational activities.

Both Facilities

Environmental Consequences
Both facilities would provide a venue for public recreation and education, as well as a research and production center for marine species to be used by LDWF, local academia, and the general public. It is anticipated that the proposed project would benefit tourism through the recreational and educational use of the project facilities, with the greatest benefit in the vicinity of the Calcasieu Parish facility because of the visitor’s center at that location.

Outreach and educational activities at the Center would deliver information to visitors on fisheries management topics and the importance of conserving valuable marine species and habitats. These activities are designed to encourage recreational angling and increase visitors' appreciation of Louisiana's unique natural resources. The educational components of the project would also allow for opportunities to highlight the many different cultural and biological aspects of marine fisheries in Louisiana. Specifically, the visitor center at the Calcasieu Parish facility would include adaptable informational displays that could be routinely updated and changed to focus on a wide variety of issues pertinent to marine habitats and fisheries. Visitors would be expected to stay within the developed footprint of each proposed facility and would not have any indirect environmental impacts on natural or cultural resources from visiting either facility.

The proposed Calcasieu Parish facility is also anticipated to benefit from convenient access and good exposure, as it would be located off a prominent highway in the area. Interstate access to the Calcasieu Parish facility is available via I-10. Along I-10, around the City of Lake Charles, the Interstate Highway 210 turns south and connects to Highway 385 which splits and leads to Big Lake Road. Local visitors heading from areas to the east of the tract can use E Gauthier Road (Highway 3092).

9.8.6.16 Public Health and Safety and Shoreline Protection

Both Facilities

During the operations of the fish hatchery, chemicals that may be classified as hazardous may be transmitted, stored and used on site in minor quantities. The chemicals that may be considered for use during fish husbandry operations include formalin, chelated copper, praziquantel, oxytetracycline, potassium permanganate, MS222, hydrogen peroxide and tamed iodophors. All chemicals used are to be approved by USDA for fish.

All employers with hazardous chemicals in their workplaces must have labels and Material Safety Data Sheets for their exposed workers, and train them to handle the chemicals appropriately (OSHA 2013). These chemicals will be stored in the appropriate container types (by classification) and will be restricted from public access.

In addition to the hazardous materials discussed above, there is a potential that it may be necessary to transmit, store and handle medications (e.g., antibiotics) to control diseases (e.g., fungal infections) of the fish. All chemicals will be stored in appropriate containers restricted from the public and with certain chemicals, in explosion proof cabinets/rooms with temperature controls.

In the event of an emergency, police, fire, and hospital facilities would be able to adequately serve the project locations. The Calcasieu Parish Sheriff's office and Cajun Country Fire Department are both located approximately five miles from the site in Lake Charles. Women and Children's Hospital is located approximately six miles from the site in Lake Charles. The Plaquemines Parish Sheriff's office and Port Sulfur Volunteer Fire are both located approximately 10-11 miles from the site in Port Sulfur. The Plaquemines Medical Center is located approximately 12 miles from the site in Port Sulfur.

Shorelines near the Calcasieu Parish facility currently appear to be stable through natural stabilization and manmade features such as articulated concrete matting and vegetation.

Construction of the Plaquemines Parish facility is planned within 1,500-ft of the channelized and highly altered Mississippi River shoreline. The Mississippi River and Tributary levee system bordering the river appears to be stabilizing the shoreline.

Environmental Consequences

The transportation of hazardous materials is regulated by the Department of Transportation. Safe handling, storage and disposal of these types of chemicals are mandated by a variety of Federal and state regulations, including OSHA. Employees whose responsibilities include handling hazardous materials must undergo training. Therefore, with the required adherence to the established regulations required for the transportation, storage and handling of hazardous materials, no adverse effects to public health or environment are expected to occur associated with the use of minor amounts of hazardous materials at the facilities. Existing regulations are in effect to cover the use of medications to control diseases of the fish. Use of medications would result in minor adverse effects to public health and the environment.

Personal protective equipment would be required for all construction personnel and authorized access zones would be established at the perimeter of the site during construction. Construction of the Calcasieu and Plaquemines Parish facilities is not anticipated to have any impacts on nearby shorelines. Shoreline stabilization measures would be incorporated into design as needed in areas where the potential exists for erosion to occur in order to protect marine resources and ensure public health and safety. As a result, no impacts to public health and safety are expected to occur from the implementation of the Proposed Action.

9.8.6.17 Phase I Environmental Site Assessment

As part of due diligence, an ASTM-conforming Phase I Environmental Site Assessment would be completed for both proposed locations as part of the development of negotiated arrangements for long-term land use with the site owners. The first step of a Phase I Environmental Site Assessment is typically an environmental records search that searches for hazardous waste sites on or near the locations of interest. On September 13, 2013, an environmental records search was requested through Environmental Data Resources, Inc. (EDR, Inc.), a national environmental database provider for hazardous waste sites that are known to regulatory agencies. EDR searched environmental databases for the subject sites, and a buffer zone surrounding the subject sites, for all databases (federal, state, local, and tribal) listed in the American Society for Testing and Materials (ASTM) E 1527-05 guidance for the performance of Phase I Environmental Site Assessments. The distances searched vary for each database (up to 1 mile), in accordance with ASTM requirements, because different issues have different potential travel distances of contaminants. No proposed, active, or delisted National Priority List "Superfund" sites were found within 1 mile of both proposed site locations (EDR 2013a, b).

It is important to note that not all of the required elements of an ASTM-conforming Phase I have been conducted yet, only the database search task. A site visit by a qualified Environmental Professional (as defined in ASTM E 1527), review of historical source data, review of specific case files, and interviews with representatives of businesses in the area would be conducted when the Phase I assessments are completed. Based on the Phase I results and conclusions, recommendations for additional investigation or remediation could be proposed at that time.

9.8.7 Summary and Next Steps

The proposed Louisiana Marine Fisheries Enhancement, Research, and Science Center would establish state of the art facilities to responsibly develop aquaculture-based techniques for marine fishery management. The proposed project would include two sites (Calcasieu Parish and Plaquemines Parish) with the shared goals of fostering collaborative multi-dimensional research on marine sport fish and bait fish species; enhancing stakeholder involvement; and providing fisheries extension, outreach, and education to the public. Specifically, the project would provide Louisiana with an important management tool for monitoring the long term health of wild populations of popular recreation marine species by developing the ability to release known numbers of marked juveniles into pre-determined habitats as part of well-designed studies that would allow for measurement and detection of changes in wild populations of marine sport fish species. The Center would also establish living laboratories to support a variety of marine fisheries outreach and educational activities for the public. The project is consistent with Alternative 3 (Contribute to Providing and Enhancing Recreational Opportunities) and Alternative 4 (Preferred Alternative).

NEPA analysis of the environmental consequences suggests that minor adverse impacts to some resource categories and no moderate to major adverse impacts are anticipated to result. The project would provide long-term benefits by supporting the State of Louisiana's ongoing management of its saltwater sport fishery. The proposed facilities would support research, hatchery production of sport fish and baitfish, and public education and outreach. The Trustees have considered public comment and information relevant to environmental concerns bearing on the proposed actions or their impacts, including information provided on the presence of manatee in the Calcasieu basin that triggered re-initiation of consultation with the USFWS under Section 7 of the Endangered Species Act and Marine Mammal Protection Act. Trustees' determination on selection of this project will be included in the Record of Decision.

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9.9 Cumulative Impacts of Phase III Early Restoration Projects Proposed in the State of Louisiana

9.9.1 Introduction

This section analyzes the potential for cumulative impacts to resources to occur as a result of the Phase III early restoration projects proposed in Louisiana. The CEQ regulations for implementing NEPA require the assessment of cumulative impacts in the decision-making process for federal projects. The regulations define cumulative impacts as the:

> *impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions*.

40 C.F.R. § 1508.7. In the context of the Phase III Early Restoration Program, cumulative impacts assessment requires the Trustees to (1) define appropriate spatial and temporal boundaries for the analysis; (2) describe existing environmental and/or socioeconomic conditions for affected resources within the spatial and temporal boundaries; (3) identify past, present and reasonably foreseeable future government and private actions that could have or contribute to potentially significant impacts on the affected resources; and (4) characterize the cumulative impacts of the proposed project assuming implementation of the other present and reasonably foreseeable future actions.

Given the broad geographic scope of the Phase III program, the requirement for cumulative impacts analysis poses unique challenges. In addition to the programmatic cumulative impacts analysis in Chapter 6, the Trustees have developed a cumulative impacts analysis around discrete, state-by-state, spatially-based or temporally-based project groupings that focus the analysis on areas where projects would occur (e.g., watersheds, estuaries or counties). The analysis focuses on those affected resources for which proposed projects have a potential contribution to cumulative impacts. This state-by-state analysis is designed to supplement the programmatic cumulative impact analysis found in Chapter 6. Following the CEQ guidance for scoping cumulative analyses, the goal is not to capture every theoretically possible impact, but instead 'to count what counts.' Defining spatial boundaries in this manner also facilitates identification and analysis of existing environmental and socioeconomic conditions.

The cumulative impacts analysis depends heavily on the availability of information and data about past, present and reasonably foreseeable future actions. For the analysis of the Phase III program, the Trustees identified present and potentially significant future actions through outreach to local, state and/or federal experts familiar with major environmental and development initiatives that have a potential to contribute significantly to cumulative impacts. In some cases, environmental analyses of reasonably foreseeable future actions are available to inform the Trustees' analyses. Some of these actions, particularly past actions are discussed in Chapter 6 of the Final Phase III ERP/PEIS. But in the absence of such completed analyses, the Trustees generally had to rely on expert judgments, primarily qualitative, about the potential for impacts, using publicly available information about the likely design and location of these actions.

In developing the following cumulative impact analysis, the cumulative actions discussed in Chapter 6 were considered (e.g. marine transportation, oil and gas, etc.). As part of the cumulative analysis, past, present and reasonably foreseeable future actions were identified. This analysis considers the incremental contribution of proposed Phase III early restoration projects to potential cumulative impacts to resources discussed in Chapter 3. The analysis includes resources that are relevant to the concerns identified on the smaller regional scale.

For Louisiana, DOI has adopted existing NEPA analyses, including cumulative impacts analyses, for three locations of the proposed Louisiana Outer Coast restoration project: Chenier Ronquille, Shell Island (East and West Lobes), and Caillou Lake Headlands. These cumulative impact analyses are briefly summarized below in Section 9.9.4, together with a description of were not specifically identified at the time that the previous cumulative impact analyses developed for the islands were completed.

For the remainder of the proposed Phase III projects in Louisiana, the Trustees believe the cumulative impact analyses discussed here represent best estimates of how current environmental and socioeconomic conditions may be changed by the proposed actions when their impacts are combined with other past, present and reasonably foreseeable future actions. However, the cumulative effects analysis remains subject to uncertainties and data limitations. Nonetheless, because the proposed Phase III Early Restoration actions in Louisiana are all designed to improve environmental quality directly or to increase public access and enjoyment of natural resources, the Trustees concluded that although some of the projects may have an incremental contribution to adverse cumulative impacts, the contribution would not be substantial over the long term. The reasons for this conclusion are detailed in the remainder of this chapter.

9.9.2 Spatial and Temporal Boundaries for Louisiana Projects

9.9.2.1 Spatial Boundaries

The Phase III early restoration projects proposed in Louisiana included in this cumulative analysis are physically separated from each other and are distributed across a wide geographical range in Louisiana. The projects were therefore analyzed in three separate geographic groupings in order to analyze the potential for cumulative impacts at appropriate regional scales.

In developing the following cumulative impact analysis, the cumulative actions discussed in Chapter 6 were considered (e.g. marine transportation, oil and gas, etc.). As part of the cumulative analysis, past, present and reasonably foreseeable future actions were identified (past actions are considered part of the existing conditions analyzed in the individual environmental reviews). This analysis considers the incremental contribution of proposed Phase III early restoration projects to potential cumulative impacts to resources discussed in Chapter 3. The analysis includes resources that are relevant to the concerns identified on the regional scale.

For Phase III projects in Louisiana, three regional or spatial analyses were developed. They are: Analysis 1 – Breton Sound; Analysis 2 – Calcasieu Parish in the vicinity of Lake Charles; Analysis 3 – Southeastern Plaquemines Parish. Each region was analyzed for past, present and reasonably foreseeable future actions which have, are, or could take place and result in cumulative impacts to the affected resource when combined with the impacts of the projects being considered.

Cultural resource investigations have been undertaken for all proposed projects in Louisiana and consultations are in process. Although the consultation process has not been completed, no cumulative impacts to cultural resources are anticipated. If cultural resources would be impacted, mitigation identified during the consultation process would be implemented.

9.9.2.2 Temporal Boundaries

As detailed in Chapter 6, the temporal boundary may vary by each resource and project. Once the impacts of the proposed actions are no longer experienced by the affected resource, the cumulative impacts of the other past, present and reasonably foreseeable future actions need no longer be considered. For the most part, actions are qualified as those that are anticipated to persist beyond the construction phase for Phase III proposed projects and those that are ongoing for other actions considered in the cumulative analysis.

9.9.3 Identification of Other Actions Included in the Cumulative Impact Scenarios

For purposes of the cumulative impacts analyses in this Chapter, past actions are assumed to be represented in the existing conditions discussed in the environmental reviews for the projects in Louisiana. Present actions are those that are occurring now and result in ongoing impacts to the same resources that the proposed action will impact. Reasonably foreseeable future actions are those actions that are likely to occur and affect the same resource as the proposed alternatives. The determination of what future actions should be considered requires a level of certainty that they will occur to ensure that the consideration of future actions is not overly speculative. This level of certainty could be met by a number of factors such as the completion of permit applications, the subject of approved proposals or planning documents, or other similar evidence. Determining how far into the future to consider actions is based on the impact of the alternatives being considered.

9.9.4 Summary of Existing Cumulative Impact Analyses for Three Barrier Island Locations

As discussed previously, DOI has independently evaluated the LCA EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010), the Chenier Ronquille EA, BA-76, prepared by NOAA (2013) ,and the Louisiana Coastal Area (LCA) Barataria Basin Barrier Shoreline Restoration Final Integrated Construction Report and Final Environmental Impact Statement (EIS) (USACE 2012) and has adopted these three documents to fulfill DOI's NEPA requirements for analysis of the Caillou Lake Headlands, Chenier Ronquille, and Shell Island (East and West Lobes) locations of the Louisiana Outer Coast Restoration project, respectively. The cumulative impact analyses included in these documents consider the direct and indirect impacts of past, present and reasonably foreseeable future actions in the analysis of environmental consequences resulting from proposed projects, including other Federal, State, local, and private restoration efforts across coastal Louisiana.

The EA analysis completed for Chenier Ronquille (NOAA 2013) and the EIS analysis completed for Shell Island (USACE 2012) considered the effects of the Spill in the analyses. The Spill was not previously considered in the LCA EIS for the Terrebonne Basin Barrier Shoreline Restoration (USACE 2010) that includes analysis of the Caillou Lake Headlands project, and therefore the environmental consequences of the Caillou Lake Headlands alternatives were not considered in light of the Spill. However, the environmental consequences of the Caillou Lake Headlands alternatives would occur regardless of the Spill and are would not materially change because of the Spill.

The proposed implementation of all four locations of the Louisiana Outer Coast Restoration project does not represent a material change in the cumulative impact analyses already completed for the Chenier Ronquille, Caillou Lake Headlands, and Shell Island (East and West Lobes) locations. Each of these cumulative impact analyses already considered other barrier island restoration efforts across coastal Louisiana as part of their analysis of past, present and reasonably foreseeable future actions.

Specifically, there are no indications that there would be additional significant cumulative impacts associated with the implementation of the four island locations that are part of the Louisiana Outer Coast Restoration project that would result in impacts beyond what were analyzed in the previous cumulative impact analyses conducted separately for Caillou Lake Headlands, Chenier Ronquille, and Shell Island. As shown in Figure 9-2, the four islands are found in three separate basins. North Breton Island is located in Breton Sound, on the east side of the Mississippi River delta, more than 30 miles from Shell Island and Chenier Ronquille and more than 100 miles from Caillou Lake Headlands. The Caillou Lake Headlands site is located in Terrebonne Basin, more than 70 miles from Shell Island and Chenier Ronquille to the east. While Chenier Ronquille and Shell Island are located approximately 10 miles apart within the Barataria Basin Shoreline complex, the two islands are using distinct borrow sources. Shell Island will be built with borrow taken from the Mississippi River, while Chenier Ronquille is using borrow sources in the Gulf of Mexico, closer to the island. Because of these distinct borrow source locations and the distance between the islands, there are unlikely to be additional cumulative impacts associated with the construction of these islands, even if the construction activities occur simultaneously. The supplemental Biological Assessment prepared for Caillou Lake Headlands, Chenier Ronquille, and Shell Island (Armbruster et al. 2014) also notes that these three islands are independent from each other.

The table below (Table 9-12) lists restoration projects that were not specifically identified at the time that the previous cumulative impact analyses developed for the islands were completed. Projects that were included in the previous cumulative impact analyses are not included in Table 9-12. For each of the actions, the table provides (1) a brief description of the action and (2) a listing of resource categories that are the most likely areas of concern for cumulative impacts when the action is considered in conjunction with implementation of the Caillou Lake Headlands, Chenier Ronquille, or Shell Island locations of the Louisiana Outer Coast Restoration project. All three of the previous cumulative impact analyses considered a broad range of past, present and reasonably foreseeable future actions, including planned barrier island restoration projects through the CWPPRA program.

Table 9-12. New Activities Identified in the Vicinity of Caillou Lake Headlands, Chenier Ronquille, or Shell Island, Since the Previous Cumulative Impact Analyses were Developed

Category/Projects	Project Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
New Activities Identified in the Vicinity of Caillou Lake Headlands		
CWPPRA Phase II Project: Raccoon Island Shoreline Protection/Marsh Creation Project. [Note that this project was analyzed as part of the proposed action together with Caillou Lake Headlands in USACE (2010) and has now been completed]	This project involves installation of eight segmented breakwaters along the gulf side of the island, creation of marsh on the land side of the island using dredged sediment, and vegetative plantings. The project area consists of 502 acres of supratidal, intertidal, and subtidal habitat found on Raccoon Island.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
New Activities Identified in the Vicinity of Chenier Ronquille		
No new activities identified since November 2013 cumulative impacts analysis for Chenier Ronquille (NOAA 2013)		
New Activities Identified in the Vicinity of Shell Island		
Berm to Barrier Project: Shell Island East- BERM [Placement of the sand material as a protective berm was analyzed as part of the cumulative impacts analysis in USACE(2012)]	This project involves restoring the integrity of the barrier island, with a total fill area of 613 acres on Shell Island East and a total fill area of 345 acres on Shell Island West.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation

The new activities identified in Table 9-12 do not result in cumulative impacts beyond those previously analyzed, with the exception of Shell Island. As described in the supplemental BA (Armbruster et al. 2014), the restoration of the eastern portion of Shell Island East, represents a change to the environmental baseline of the Shell Island project. Because of that restoration, the Trustees anticipate that the eastern portion of Shell Island East would be able to support foraging and resting shorebirds, including both piping plover and red knot, by the time the proposed Shell Island location is ready for implementation. This change has resulted in additional conservation measures on Shell Island to avoid and minimize impacts to any piping plover or red knots that may now be using the area (see Section 9.5.5).

9.9.5 Analysis 1: Breton Sound (North Breton Island)

This section summarizes the cumulative impacts to resources associated with the proposed North Breton Island location of the Louisiana Outer Coast Restoration project. This project location is evaluated to determine if the effects of restoration on North Breton Island, when combined with other past, present and reasonably foreseeable future actions in Breton Sound, may result in cumulative impacts to resources.

9.9.5.1 Spatial and Temporal Boundaries

This project location is not grouped together for a cumulative analysis with other proposed Phase III projects in Louisiana because of its location in Breton Sound, on the opposite (east) side of the Mississippi River from the other proposed Phase III projects in Louisiana (see Figure 9-2). Work in this project location is expected to be implemented at a later date from the other proposed Louisiana Outer Coast Restoration Project locations and thus would not be implemented within a timeframe that would contribute temporally to cumulative impacts from the other project locations. This project location is evaluated to determine if the effects of restoration on North Breton Island, when combined with other past, present and reasonably foreseeable future actions in Breton Sound, may result in cumulative effects to resources.

Table 9-13 summarizes the impacts to resources associated with the proposed North Breton Island location of the Louisiana Outer Coast Restoration project.

Table 9-13. Summary of Impacts of Proposed Phase III Early Restoration Project- North Breton Island location of the Louisiana Outer Coast Restoration Project.

	Geology and Substrates	Hydrology and Water Resources	Air Quality and GHGs	Noise	Living Coastal and Marine Resources	Protected Species	Habitats	Socioeconomics and Environmental Justice	Land and Marine Management	Aesthetics and Visual Resources	Tourism and Recreational Use	Infrastructure	Public Health and Safety and Shoreline
Early Restoration Proposed Project Location													
North Breton Island	s	s	s	s	+/s	+/s	+/s	+	NE	s	+/s	NE	NE

- Represents an adverse effect
+ Represents a beneficial effect
s Represents a short-term adverse effect
NE represents no effect
+/s represents a long-term beneficial effect, but a short-term adverse effect

Currently, there are no historic or cultural resources known to exist within the project area (USFWS 2008). It is anticipated that historic or cultural resources would be unaffected by the proposed project. A complete review of this project under Section 106 of the NHPA is ongoing and would be completed prior to any project activities that would restrict consideration of measures to avoid, minimize or mitigate any adverse effects on historic properties located within the project area. This project would be implemented in accordance with all applicable laws and regulations concerning the protection of cultural and historic resources. Therefore, implementing the North Breton Island location of the Louisiana Outer Coast Restoration Projects is not expected to contribute to adverse cumulative impacts to historic or cultural resources.

9.9.5.2 Identification of Other Actions Included in the Cumulative Impact Analysis

For purposes of the cumulative impacts analysis in this Section, past actions are assumed to be represented in the existing conditions discussed in the environmental review for the North Breton Island location of the Louisiana Outer Coast Restoration project.

Present actions are those that are occurring now and result in ongoing impacts to resources that are also expected to be affected by the proposed Early Restoration project.

Reasonably foreseeable future actions are those actions that are likely to occur and could have impacts to one or more of the resources affected by a proposed Early Restoration project. The determination of what future actions should be considered requires a level of certainty that they will occur to ensure that the consideration of future actions is not overly speculative. This level of certainty could be met by a number of factors such as the completion of permit applications, the subject of approved proposals or planning documents, or other similar evidence.

9.9.5.3 Summary of Impacts of the North Breton Island Location of the Louisiana Outer Coast Restoration Project

The impacts of the proposed North Breton Island location of the Louisiana Outer Coast Restoration project that are most relevant to consider for assessment of cumulative impacts are:

- Short-term, minor adverse effects to water quality and noise during construction.
- Short-term, minor adverse effects to living coastal and marine resources during construction, with an overall long-term major beneficial effect on vegetation, wildlife, and marine and estuarine fauna.
- Short-term, moderate adverse impacts to piping plovers and red knot due to construction and dredging related disturbances, with the proposed project ultimately restoring and increasing the longevity of piping plover critical habitat by restoring dune and beach habitat. Best management practices to protect piping plover, red knot, and piping plover critical habitat were developed during ESA Section 7 consultation with USFWS and would be followed during construction. Minor socioeconomic benefits through increased employment during construction.

Key past, present and reasonably foreseeable future actions included in this analysis include on-going refuge management activities as discussed in the Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan (CCP) (USFWS 2008) and a variety of on-going general activities in Breton Sound, including marine transportation, on-going oil and gas industry activities, on-going commercial fishing activities, and on-going tourism and recreational activities associated with the Delta and Breton National Wildlife Refuges.

9.9.5.4 Identification of Past, Present and Reasonably Foreseeable Future Actions and Impacts

Past, present and reasonably foreseeable future actions in Breton Sound have contributed to adverse cumulative effects to certain resources. Activities that result in coastal land loss contribute to adverse cumulative effects to habitat and living coastal marine resources, including sensitive habitats and protected species. Ongoing activities in Breton Sound, such as marine transportation activities (including shipping and dredging), commercial fishing, and activities associated with the oil and gas industry can contribute to impacts to resources such as water quality, noise, habitats, and living coastal and marine resources. Visitor use at the Delta and Breton National Wildlife Refuges also can contribute to impacts to resources. The Phase I early restoration project “Louisiana Oyster Cultch Project” includes cultch placement locations in Breton Sound. The proposed North Breton Island location of the Louisiana Outer Coast Restoration project is not expected to affect these oyster resources and does not contribute to cumulative impacts of the oyster project. There are no other Phase I or Phase II early restoration projects near the proposed North Breton Island location of the Louisiana Outer Coast Restoration project.

Past, present and reasonably foreseeable future actions that have been considered as applicable for this cumulative impacts analysis:

- Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan (CCP) (USFWS 2008)
- On-going marine transportation activities in Breton Sound
- On-going commercial and recreational fishing activities in Breton Sound
- On-going oil and gas activities in Breton Sound
- Visitor use at Delta and Breton National Wildlife Refuges

There are also environmental stewardship and restoration activities that have occurred, are underway or proposed for Breton Sound. For example, on-going refuge management activities are discussed in the Delta and Breton National Wildlife Refuges Comprehensive Conservation Plan (CCP) (USFWS 2008).

In most cases, detailed environmental impact data are not available for these actions. Consequently, the analyses generally reflect qualitative best professional judgment about potential impacts. Also, as noted previously, the focus of the cumulative impacts analysis is on the resource areas that are deemed most likely to exhibit cumulative impacts; hence the analysis does not include in the listing those resources where impacts have been judged to be de minimis.

Resources with potential for cumulative impacts

Noise

Existing sources of noise in the project area are from offshore oil production, commercial vessels, recreational boating, overhead aircraft and ambient natural sounds such as wind, waves, and wildlife. The proposed project would generate construction noise associated with equipment during placement of the fill material, grading, and dredging. Construction noise could create a potential nuisance to visitors to the Breton NWR in areas adjacent to project construction activities. Construction noise would be temporary and the construction period is not anticipated to last more than 12 months. Because construction noise would be temporary, negative impacts to the human environment during construction activities would be short-term and minor, as they would likely attract attention but would not result in visitors changing their activities. After completion of the project, noise sources would be expected to include the existing sources described above, and noise levels would return to pre-project levels. Therefore, the proposed project would not contribute a substantial adverse cumulative impact from noise on sensitive receptors.

Air Quality

Many sources of man-made air pollution affect Breton NWR including onshore industry, power plants, car emissions, and offshore oil and gas development (USFWS 2012; USFWS 2013). Any air quality impacts that would occur from the proposed project would be localized, limited to the construction phase of the project, and limited by the size of the project. Therefore, short-term, minor impacts to air quality would occur. The project would have no long term impacts on air quality. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on air quality in the region.

Hydrology and Water Resources

Overall, potential impacts to water resources are expected to be short term and minor as a result of increases in turbidity during active dredging activities. The project will mimic the natural geography and dynamics of the island and its system within the aquatic environment, facilitating restoration of historic hydrology. Modeling exercises would be conducted as part of this project to assess possible changes in the wave climate due to changes in substrate contours resulting from source dredging. Models would provide information on how any changes in wave patterns may affect future island dynamics given conceptual restoration designs. Model results would inform the selection of a final design. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on hydrology and water resources.

Geology and Substrates

The Chandeleur Islands are dynamic and are constantly altered and worn down by hurricanes, tropical storms, wind, and tidal action. Overall, the project’s impacts, related to soil compaction, erosion, and loss during construction at both the island and borrow site(s) would be minor and in the long term, the project would not be expected to adversely impact geology or substrates. The restoration would create marsh, dunes, and beach and increase elevations on the island platform (base). In addition, it would increase the width of the island creating greater resistance to tidal energies. The dredged material proposed for island and marsh construction consists of naturally occurring material deposited in the Gulf over time by geologic processes, and the project would use sand resources appropriate for the island’s environment, mimicking the natural geography and dynamics of the island and its system. Vegetative plantings and sand fences would stabilize soil, reduce re-suspension of recently deposited sediment, reduce wind transport of dune material off the island, and encourage sediment deposition. Over the long-term, dredged materials removed from the borrow sites are expected to be rearranged by natural processes, creating pre-project bathymetric contours in the borrow areas. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on geology and substrates.

Living Coastal and Marine Resources and Habitats

Breton NWR provides nesting resources for twenty-three species of birds. The time frame in which major restoration activities would take place at North Breton Island would be relatively short (up to approximately 12 months). The project would restore bird nesting habitat and would have long-term major beneficial impacts for bird populations.

The project would result in conditions substantially more conducive to healthy barrier island vegetative communities than currently exists, mitigating further erosion and loss.

While construction-related activities may temporarily disturb habitat adjacent to wetland acreage, in the long term the proposed project would improve wetland habitat and protect it from further erosion and loss. Overall, the proposed project would provide long-term beneficial impacts on wetlands and upland habitats. The majority of the project affecting existing aerial habitat would occur on unvegetated beach. This work involves augmenting both the width and height of portions of this habitat, as well as actively planting it with appropriate vegetation, expanding its availability, increasing its longevity, and increasing the quality of the habitat for nesting terns and skimmers.

This project would likely result in short term minor adverse impacts due to construction and dredging-related disturbances and small changes to sessile species populations if present; however, there would likely be no impact to feeding, reproduction, or other factors affecting population levels. Short-term, localized minor impacts to fisheries resources would occur during the construction phase of the project. Mobile aquatic animals would be expected to move away from the fill and borrow sites during construction and return following completion of construction. Isolated, short-term effects on pelagic fish eggs and larvae in the immediate area may occur. Sessile and other limited movement species, especially those buried/burrowed in the substrate could be injured or killed by the dredging activity and the placement of the fill material at the island. However, these types of species are typically numerous in the Gulf and recolonize quickly.

The island and backwater marsh restoration would provide overall long term benefits to marine species by providing additional habitat, increased benthic productivity, and enhanced recruitment and production of fish and crustaceans. Restoration of the tidal marsh habitat would benefit numerous aquatic species and enhance resident fish populations.

Any adverse impacts to marine and estuarine fauna (fish, shell beds, benthic organisms) are expected to be short in duration and minor as those species that would be affected are likely numerous in the area. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on living coastal and marine resources. The project is expected to contribute a beneficial long term impact in the area.

Protected Species

On April 14, 2014, the DOI determined in a draft biological opinion that the proposed project is not likely to adversely affect the endangered West Indian manatee, that nesting sea turtles are not likely to be adversely affected due to a lack of nesting on the Breton NWR, that the project is not likely to directly kill any piping plovers or red knots, and that the project is not likely to destroy or adversely modify designated piping plover critical habitat. The proposed project would not contribute to increased human disturbance on North Breton Island because Breton NWR would continue to be managed under current NWR goals and objectives. Overall recreational use of North Breton Island is in the form of nearby fishing and bird watching and photography. Any future proposed actions that are within endangered or threatened species habitat will require Section 7 or 10 permitting from the Service to be covered under the Act, and any future work on the Breton NWR would require a Special Use Permit (USFWS 2014).

In addition, the wilderness designation of federally owned lands in Breton NWR (excluding North Breton[10]) and the remoteness of the island limits human disturbance to those who can safely access it with a motorized vessel. The National Marine Fisheries Service concurred that the proposed project is not likely to adversely affect Gulf sturgeon, its designated critical habitat, or in-water sea turtles (Crabtree 2014).

Overall, the rebuilding and restoration of the island should have a positive impact on federally-listed sea turtles such as the hawksbill, green, leatherback, loggerhead, and Kemp's ridley, which could utilize the area. Restoring the island and backwater marsh can enhance resident fish populations. In the long term, project implementation would be beneficial to protecting EFH from erosion and to maintaining the productivity of marine fishery resources. The proposed restoration activities would restore unique and important barrier island habitat, including marsh and wetland habitat, and help maintain a diversity of different categories of EFH throughout the proposed project area and Breton Sound. In the long term, project implementation would be beneficial to protecting EFH from erosion and to maintaining the productivity of marine fishery resources.

The proposed restoration activities would restore dune, shoreline, and interior marsh habitats, thus creating foraging and nesting habitat for birds. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on protected species. The project is expected to contribute a beneficial long term impact to protected species and their habitat.

Socioeconomics and Environmental Justice

There are no Environmental Justice areas of concern near the project area. Because this project is located offshore, it would have no adverse impacts on the socioeconomic status of the communities and counties adjacent to the project. Minor, short-term beneficial effects could occur from increased employment during project construction. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on minority or low income populations, or on the socioeconomics of the area.

Aesthetics and Visual Resources

The refuge consists of an island chain starting 16 miles offshore to the northeast of Venice, Louisiana and extending northward toward the Mississippi Gulf Coast for a distance of 70 miles. The general visual character of the area surrounding the refuge can be described as undeveloped.

Temporary impacts to visual resources would result from implementation of the proposed restoration activities. Construction equipment would be temporarily visible to visitors and recreational users. These construction-related impacts to visual resources would be minor, since the island is not visible from

[10] Pursuant to the Wilderness Act, all of the Federally-owned lands in Breton NWR (except for North Breton Island) were designated the Breton Wilderness on January 3, 1975 (Public Law 93-632). North Breton was excluded because an oil facility was located on that island. The Breton Wilderness is listed as a Class I Prevention of Significant Deterioration Area under the Clean Air Act. For the past few years, the only visible improvement within the Breton Wilderness was the Chandeleur lighthouse on the north end of the islands. The lighthouse was constructed before the turn of the century (http://www.fws.gov/breton/).

mainland Louisiana and construction activities and equipment would only be visible to visitors arriving by boat. Because the dune and marsh restoration would consist of the placement of natural sand, silt and clay material, no impacts to visual resources are anticipated as a result of restoration activities. Dune restoration and revegetation is anticipated to result in a long-term minor visual enhancement to the refuge, as the project is intended to mimic the natural processes associated with barrier island formation. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on aesthetics and visual resources.

Tourism and Recreation

North Breton Island is accessible by boat only. There is no regular commercial boat transport to the island, but charters are available to visitors. Small craft vessels generally reach the southern islands from launches in Venice, Louisiana. Public use includes wildlife viewing and fishing from the beaches and shallow waters surrounding the island. Camping is no longer permitted due to the large amount of land lost to Hurricane Katrina and possible impacts to nesting birds on the remaining habitat.

During the construction period, the visitor recreational experience would be adversely impacted by noise and visual disturbances associated with the use of construction equipment. Access to waters surrounding the island would potentially also be restricted during dredging activities. While these temporary inconveniences would result in minor adverse impacts on tourism and recreational use, over the long term the project would result in minor beneficial impacts to tourism and recreational use. Opportunities for recreational activity at the shoreline would be enhanced as a result of improved fishing and bird watching opportunities accruing from improved habitat conditions. Therefore, the proposed project would not contribute a substantial adverse cumulative impact on tourism and recreation.

Summary of Cumulative Impacts

Overall, the cumulative impact of past, present and reasonably foreseeable future actions related to the North Breton Island Location of the Louisiana Outer Coastal Restoration project would result in beneficial cumulative impacts over the long-term, as restoration and environmental stewardship activities and other barrier island restoration projects would all contribute to improving the natural environment. Similar to other past, present and reasonably foreseeable future actions, implementation of the North Breton Island location project would result in short-term adverse impacts from disturbance during construction that would no longer occur once the project is completed. There would be beneficial cumulative impacts from restored habitat to which the Breton Island location project would contribute.

9.9.6 Analysis 2: Calcasieu Parish in the vicinity of Lake Charles

This section summarizes the cumulative impacts to resources associated with the proposed Calcasieu Parish location of the Louisiana Marine Fisheries Enhancement, Research, and Science Center (also referred to in this analysis as the "Calcasieu Parish facility"). This project location is evaluated to determine if the effects of the proposed restoration project at the Calcasieu Parish facility, when combined with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, may result in cumulative impacts to resources.

Existing environmental and socio-economic conditions in and around the Calcasieu Parish facility are represented by the affected environment in the preceding environmental review for this project. These conditions reflect the environmental impacts of past projects in the area and therefore are the assumed starting point for the cumulative analysis.

9.9.6.1 Spatial and Temporal Boundaries

The Calcasieu Parish facility is located in western Louisiana, more than 200 miles to the west of the other proposed projects (see Figure 9-1). Therefore, this project location is not grouped together for a cumulative analysis with other proposed Phase III projects in Louisiana, reflecting the fact that the project's impacts are expected to be localized and without measurable spatial overlap with other projects with respect to the affected resources. The projects are far enough apart that ecological interactions between them are unlikely to occur at a scale that results in measureable impacts, even if this project is implemented simultaneously with other proposed Phase III early restoration projects in Louisiana.

9.9.6.2 Summary Impacts of the Calcasieu Parish Facility

Table 9-14 summarizes the impacts to resources associated with proposed Calcasieu Parish Facility.

Table 9-14. Summary of Impacts of Proposed Phase III Early Restoration Projects- Calcasieu Parish Facility.

	Geology and Substrates	Hydrology and Water Resources	Air Quality and GHGs	Noise	Living Coastal and Marine Resources	Protected Species	Habitats	Socioeconomics and Environmental Justice	Land and Marine Management	Aesthetics and Visual Resources	Tourism and Recreational Use	Infrastructure	Public Health and Safety and Shoreline
Early Restoration Proposed Project													
Calcasieu Parish location of the Louisiana Marine Fisheries Enhancement, Research, and Science Center	-	-	-	s	-	NE	-	+	NE	+/s	+	NE	NE

- Represents an adverse effect

+ Represents a beneficial effect

s Represents a short-term adverse effect

NE represents no effect

+/s represents a long-term beneficial effect, but a short-term adverse effect

The impacts of the proposed Calcasieu Parish facility that are most relevant to consider for assessment of cumulative impacts are:

- Short-term, minor adverse effects to water quality and visual resources during construction.
- Short-term and long-term minor adverse effects to geology and substrates, hydrology and water quality, air quality, living coastal and marine resources and habitats resulting from construction and operations of the facility.
- Moderate adverse effects to wetlands on-site that would require compensatory mitigation under Clean Water Act Section 404 permitting.
- Short-term and long-term socioeconomic and tourism benefits through increased employment during construction and on-going operation of the facility, including a visitor center.

9.9.6.3 Identification of Past, Present and Reasonably Foreseeable Future Actions and Impacts

Past, present and reasonably foreseeable future activities that were evaluated in the cumulative impact analysis for the Calcasieu Parish facility include primarily those restoration and development activities occurring in Calcasieu Parish in the vicinity of Lake Charles with the potential to impact resources similar to those that would be impacted by the construction and operation of the Calcasieu Parish facility. These activities include various restoration projects including marsh creation and restoration, shoreline protection, and hydrologic restoration. In addition, other projects that could impact the area and result in some levels of disturbance include marine transportation projects, energy development, coastal development, and development of tourism infrastructure.

The table below (Table 9-15) identifies past, present and reasonably foreseeable future projects in the categories described in Chapter 6. For each of the actions, the table provides (1) a brief description of the action and (2) a listing of resource categories that are the most likely areas of concern for cumulative impacts when the action is considered in conjunction with implementation of the proposed Calcasieu Parish facility. In most cases, detailed environmental impact data are not available for these other actions. Consequently, the analyses generally reflect qualitative best professional judgment about potential impacts. Also, as noted previously, the focus of the cumulative impacts analysis is on the resource areas that are deemed most likely to exhibit cumulative impacts; hence the analysis does not include in the listing those resources where impacts are expected to be minimal.

Table 9-15. Other Activities Identified in Calcasieu Parish in the Vicinity of Lake Charles

Category/Projects	Project Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
Restoration Related to the Spill (Early Restoration Phases I & II, Restore Act, Gulf Environmental Benefit Fund, North American Wetlands Conservation Fund, National Academy of Sciences)		
No known projects in the vicinity of the Calcasieu Parish facility		
Other Habitat Restoration Projects		
Sabine Refuge Marsh Creation, Cycles 4 and 5	Sabine Refuge Marsh Creation, Cycles 4 and 5 consist of the creation of 230 and 232 acres (respectively) of brackish marsh platform using material dredged from the Calcasieu	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources

Category/Projects	Project Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
	River Ship Channel.	• Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Black Lake Terracing project (marsh restoration)	The Black Lake Terracing Project restored marsh on four separate sites, including areas west of Hackberry near Black Lake and areas on the Cameron Prairie National Wildlife Refuge. More than 50 miles of marsh terraces were built to restore 2,500 acres of marsh habitat.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Kelso Bayou Marsh Creation and Hydrologic Restoration	This marsh creation and hydrologic restoration project in Kelso Bayou includes creating/nourishing 319 acres of marsh, providing 3,200 linear feet of shoreline protection, and installing rock armor at the mouth of Kelso Bayou to prevent additional tidal scour.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Rabbit Island Restoration	The goal of the project is to restore approximately 200 acres of pelican nesting and marsh habitat by adding sediment, through beneficial use of sediment dredged from the Calcasieu Ship Channel.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Military Operations		
No known projects in the vicinity of the Calcasieu Parish facility		
Marine Transportation		
New export grain terminal at the Port of Lake Charles	A new, state-of-the-art export grain terminal is under construction at the Port of Lake Charles. The grain export terminal will replace the Port's aging grain elevator.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice
Energy Activities (Offshore oil production, Offshore Natural Gas Facilities, State Oil and Gas Activities)		
Existing energy infrastructure and	There are multiple on-going oil and natural gas production and activities in	• Geology and substrates • Hydrology and water resources

Category/Projects	Project Description	Key Resource Areas with Potential to Contribute to Cumulative Impacts
activities	this region.	• Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources
Marine Mineral Mining, Including Sand and Gravel Mining		
No known projects in the vicinity of the Calcasieu Parish facility		
Coastal Development and Land Use		
Lake Charles Power Center (Shopping Center) Construction	The shopping center under construction in an urban developed area of Lake Charles off Highway 210 is a 1,000,000 square foot facility, with a 3-phase construction plan.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Transportation Rail improvements	$22 million in rail improvements are underway to build a loop track system inside the City Docks to handle additional traffic between Chennault International Airport and City Docks.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice
Fisheries and Aquaculture		
No known projects in the vicinity of the Calcasieu Parish facility		
Tourism and Recreation		
Marina infrastructure maintenance	Several marinas are operated in Calcasieu Parish. They require regular maintenance, and undergo occasional expansions.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation

9.9.6.4 Cumulative Impacts Analysis

Looking at past, present and reasonably foreseeable future projects, Table 9-15 identifies the following resource categories where there is a possibility that impacts of past, present and reasonably foreseeable future actions might result in interactions or additive effects when combined with those of the Calcasieu Parish facility.

The following resource categories are identified for further cumulative impacts analysis:

- Geology and substrates
- Hydrology and water resources
- Air quality and GHGs
- Noise
- Living coastal and marine resources
- Habitats
- Socioeconomics and environmental justice
- Tourism and recreation

Cumulative impacts for each of these categories are discussed below.

Geology and substrates

All of the projects identified in Table 9-15 are potential contributors to cumulative impacts on geology and substrates by disturbing sediments on, during, or as a result of construction activities. Four of these projects are marsh creation and restoration projects that would be expected to result in a long-term benefit to geology and substrates by restoring or protecting marsh sediments.

The environmental review for the proposed Calcasieu Parish facility identified long-term adverse effects to affected soils and soil substrate in areas where the footprint of the facility would alter the soil substrate through fill, compaction and earth moving activities. Construction could also result in short-term soil erosion. To minimize impact from construction, disturbed soils would be re-vegetated and/or landscaped thereby resulting in no long-term adverse effects from erosion. The proposed Calcasieu Parish facility would also result in short-term minor adverse impacts to soil resources surrounding the facility. Specific measures would be implemented during construction to minimize impacts to soils including BMPs such as the implementation of an erosion control and storm water management plan, installation of sediment traps prior to commencement of construction activities, post-construction revegetation, and on-going construction monitoring to ensure compliance.

Overall, the proposed Calcasieu Parish facility would not result in long-term changes to the character of the sediments or geologic features beyond the footprint of the project area. When the Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to geology and substrates would likely occur. However, the Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts because of the relatively small footprint of the Calcasieu Parish facility.

Hydrology and Water Resources

Nine projects are identified in Table 9-15 as potential contributors to cumulative impacts on hydrology and water resources. Four of these projects are marsh creation and restoration projects that would be expected to result in short-term minor impacts to water quality during project implementation but would result in a long-term benefit to hydrology and water quality in the vicinity of Calcasieu Lake, southwest of Lake Charles. The short-term, minor impacts to hydrology and water resources associated with construction of the Calcasieu Parish facility in combination with those of the aforementioned projects are not expected to cause an adverse cumulative impact in the short or long-term.

Five projects are included in the categories of marine transportation, energy activities, coastal development and land use, and tourism and recreation which would involve construction activities. These projects have the potential to cause long-term hydrological or water quality impacts as a result of increases in impervious surfaces, which could result in increased stormwater runoff with impacts to surface water and wetlands.

The environmental review for the Calcasieu Parish facility identified short-term and long-term minor adverse effects to hydrology and water quality resulting from construction of the facility, the introduction of impermeable surfaces, construction and operation of the water intake system, and discharge of effluent water. These impacts would be reduced through the implementation of mitigation measures and BMPs to reduce stormwater runoff and the treatment of effluent that would be designed to meet applicable LPDES discharge standards. Based on the preliminary conceptual designs currently available, construction of the facility, ponds, and the intake and outfall pipeline would also impact wetlands and other waters. These impacts would be minimized by modifying the site plan to the extent practicable. The compensatory mitigation requirements of Section 404 permitting would provide for the replacement of the functions of wetlands and waters impacted by the proposed project.

When the Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to hydrology and water quality would likely occur. However, the Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts.

Air Quality and GHGs

All of the projects identified in Table 9-15 are potential contributors to cumulative impacts on air quality and GHGs during construction activities because they all require vehicles, equipment, or processes that produce emissions of pollutants and GHGs. Industrial expansion and commercial development projects such as the port terminal expansion and shopping mall construction would contribute to long-term impacts on air quality and GHGs because the projects would be expected to result in increased energy use.

The environmental review for the Calcasieu Parish facility identified minor temporary adverse impacts to air quality during construction and minor long-term adverse impacts during facility operations resulting from the automobile emissions associated with employees and visitors traveling to and from the site. Operation of the facility would increase energy consumption above pre-construction levels, resulting in long-term minor impacts on GHG emissions. Mitigation measures during construction to reduce emissions and measures to increase the energy efficiency of the facility would reduce these impacts.

When the proposed Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to air quality and GHG emissions would likely occur. However, the

Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts because of the relatively small impacts of the Calcasieu Parish facility on air quality and GHG emissions.

Noise

All of the projects identified in Table 9-15 are potential contributors to cumulative impacts on noise during construction activities because they all require vehicles, equipment, or processes that produce noise. Industrial expansion and commercial development projects such as the port terminal expansion and shopping mall construction would contribute to long-term impacts on noise associated with the operation of these facilities. The environmental review for the proposed Calcasieu Parish facility identified minor temporary adverse impacts to noise during construction but did not anticipate that ambient noise during facility operation would exceed noise levels pre-construction.

When the proposed Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to noise would likely occur. However, the Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts to noise because of the minor and temporary increase in noise associated with construction and the buffer of natural vegetation around the facility footprint.

Living coastal and marine resources

All of the projects identified in Table 9-15 with the exception of the Lake Charles Power Center (Shopping Center) Construction are potential contributors to cumulative impacts on living coastal and marine resources. These projects may result in adverse effects to marine and estuarine fauna during construction activities; however, these effects would be expected to be short term and localized. Some of these adverse effects could be long-term if the facilities constructed disturb habitat. Four of these projects are marsh creation and restoration projects that would be expected to result in a long-term benefit to living coastal and marine resources associated with the creation or enhancement of additional marsh habitat in the vicinity of Calcasieu Lake, southwest of Lake Charles.

The environmental review for the Calcasieu Parish facility identified short-term and minor adverse impacts to marine and estuarine fauna during construction from grading and ground-disturbing activity that could elevate turbidity in the bottom sediment and estuarine water column and directly affect benthic organisms. These impacts would be reduced by BMPs that would be used to reduce or eliminate erosion and elevated turbidity during construction. Impacts are expected to be short-term and minor. Implementation of BMPs intended to protect manatees from direct effects of the construction of the intake and outfall structures and from any impacts during facility operation would minimize potential effects to manatees to an insignificant and discountable level.

When the proposed Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, the Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts to these resources because impacts from facility construction and operation would be minor and temporary.

Habitats

All of the projects identified in Table 9-15 are potential contributors to cumulative impacts on habitats. These projects may result in adverse effects to habitats during construction activities that remove vegetation or disturb soil; however, these effects would be expected to be short term and localized. Some of these localized adverse effects could be long-term if the facilities constructed permanently disturb habitat. Four of these projects are marsh creation and restoration projects that would be expected to result in a long-term benefit to habitat associated with the restoration activities in the vicinity of Calcasieu Lake, southwest of Lake Charles.

The environmental review for the Calcasieu Parish facility identified that the construction of the facility, ponds, and parking areas would result in permanent impacts to grassland and shrub habitat. Impacts to wetlands would be required to be mitigated through the Section 404 process that requires replacement of the functions and values of the wetlands affected by project implementation. Construction of the water supply and outfall pipelines would require temporary disturbance of vegetation in the grassland, woodlands and tidal areas. Shrub-nesting passerine habitat could experience minor impacts due to land clearing; however, the observed species were considered highly adaptable and tolerant of disturbance, so no substantial adverse effects to the population would be anticipated. BMPs would be followed during facility construction and operation to prevent and control the invasion of nuisance plant species common to Calcasieu parish.

When the proposed Calcasieu Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Calcasieu Parish in the vicinity of Lake Charles, short and long-term cumulative adverse impacts to habitats would likely occur. However, the Calcasieu Parish facility would not contribute substantially to cumulative adverse impacts to habitats because impacts from facility construction would primarily be short-term with long-term impacts occurring within the facility footprint.

Socioeconomics and environmental justice

All of the projects identified in Table 9-15 are potential contributors to cumulative impacts to socioeconomics by contributing to job creation during the construction phase of the projects. Industrial expansion and commercial development projects such as the port terminal expansion and shopping mall construction would contribute to long-term benefits from job creation and increased economic activity. Restoration projects could increase recreational opportunities resulting from improved habitats. Construction and operation of the proposed Calcasieu Parish facility would result in beneficial economic effects from increased employment and from visitors. However, the proposed project would not be expected to change the socioeconomic conditions surrounding the Calcasieu Parish facility or generate pressure on housing or public services that could not be absorbed by the existing infrastructure.

Cumulative impacts to socioeconomics from the proposed Calcasieu Parish facility in combination with other past, present and reasonably foreseeable future actions are beneficial. There are no anticipated cumulative impacts to environmental justice from the proposed Calcasieu Parish facility because there are no identified minority and low income populations located in the vicinity of the Calcasieu Parish site.

Tourism and recreation

The four habitat restoration projects, construction of the Lake Charles power center, and maintenance of marina infrastructure would provide long-term benefits to tourism and recreation by improving recreational experiences and providing destinations of potential interest to tourists and recreationists. It is anticipated that the proposed Calcasieu Parish facility would benefit tourism through the recreational and educational use of the project facilities, especially the visitor's center.

Cumulative impacts to tourism and recreation from the proposed Calcasieu Parish facility in combination with other past, present and reasonably foreseeable future actions are beneficial.

9.9.6.5 Summary of Cumulative Impacts

Based on the above analysis of past, present and reasonably foreseeable future actions and the anticipated resources to be impacted by these actions (see Table 9-15), the proposed Calcasieu Parish facility would not substantially contribute to adverse cumulative impacts in the region for these resources.

9.9.7 Analysis 3: Southeastern Plaquemines Parish

This section summarizes the cumulative impacts to resources associated with the proposed Plaquemines Parish location of the Louisiana Marine Fisheries Enhancement, Research, and Science Center (also referred to in this analysis as the "Plaquemines Parish facility"). This project location is evaluated to determine if the effects of the proposed restoration project at the Plaquemines Parish location, when combined with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish may result in cumulative impacts to resources.

Existing environmental and socio-economic conditions in and around the Plaquemines Parish facility are represented by the affected environment in the preceding environmental review for this project. These conditions reflect the environmental impacts of past projects in the area and therefore are the assumed starting point for the cumulative analysis of impacts.

9.9.7.1 Spatial and Temporal Boundaries

The Plaquemines Parish facility is located along the Mississippi River. It is geographically distanced from the Louisiana Outer Coast Restoration project and the Calcasieu Parish location of the Louisiana Marine Fisheries Enhancement, Research, and Science Center (see Figure 9-17). Therefore, this project location is not grouped for a cumulative analysis with the other proposed Phase III projects in Louisiana, reflecting the fact that the project's impacts are expected to be localized and without measurable spatial overlap with other projects with respect to the affected resources. The projects are far enough apart that ecological interactions between them are unlikely to occur at a scale that results in measureable impacts, even if this project is implemented simultaneously with other proposed Phase III early restoration projects in Louisiana.

9.9.7.2 Summary Impacts of the Plaquemines Parish Facility

Table 9-16 summarizes the impacts to resources associated with the proposed Plaquemines Parish facility.

Table 9-16. Summary of Impacts of Proposed Phase III Early Restoration Projects- Plaquemines Parish Facility.

	Geology and Substrates	Hydrology and Water Resources	Air Quality and GHGs	Noise	Living Coastal and Marine	Protected Species	Habitats	Socioeconomics and	Land and Marine Management	Aesthetics and Visual Resources	Tourism and Recreational Use	Infrastructure	Public Health and Safety and
Early Restoration Proposed Project													
Plaquemines Parish location of the Louisiana Marine Fisheries Enhancement, Research, and Science Center	s	-	-	s	s	NE	-	+	NE	+/s	+	NE	NE

- Represents an adverse effect
+ Represents a beneficial effect
s Represents a short-term adverse effect
NE represents no effect
+/s represents a long-term beneficial effect, but a short-term adverse effect

The impacts of the proposed Plaquemines Parish facility that are most relevant to consider for assessment of cumulative impacts are:

- Short-term, minor adverse effects to geology and substrates, noise, and living coastal and marine resources during construction.
- Short-term and long-term minor adverse effects to hydrology and water quality, air quality, and habitats resulting from construction and operations of the facility. Based on conceptual plans, the operation of the hatchery would result in long-term, minor impacts to an inland marsh of the Barataria Estuary from the discharge of effluent water. This impact would be expected to be minor because the treatment of effluent in 0.5 acre settling ponds would be designed to meet applicable LPDES discharge standards.
- Short-term and long-term socioeconomic and tourism benefits through increased employment during construction and on-going operation of the facility.

9.9.7.3 Identification of Past, Present and Reasonably Foreseeable Future Actions and Impacts

Past, present and reasonably foreseeable future activities that were evaluated in the cumulative impact analysis for the Plaquemines Parish facility include primarily those restoration and development activities occurring in southeastern Plaquemines Parish with the potential to impact resources similar to those that would be impacted by the construction and operation of the Plaquemines Parish facility. These activities include various restoration projects including marsh creation and restoration. In addition, other projects that could impact the area and result in some levels of disturbance include marine transportation projects, energy development, coastal development, aquaculture, and development of tourism infrastructure.

The table below (Table 9-17) identifies past, present and reasonably foreseeable future projects in the categories described in Chapter 6. For each of the actions, the table provides (1) a brief description of the action and (2) a listing of resource categories that are the most likely areas of concern for cumulative impacts when the action is considered in conjunction with implementation of the proposed Plaquemines Parish facility. In most cases, detailed environmental impact data are not available for these actions. Consequently, the analyses generally reflect qualitative best professional judgment about potential impacts. Also, as noted previously, the focus of the cumulative impacts analysis is on the resource areas that are deemed most likely to exhibit cumulative impacts; hence the analysis does not include in the listing those resources where impacts are expected to be minimal.

Table 9-17. Other Activities Identified in Southeastern Plaquemines Parish

Category/Projects	Project Description	Key Resource Areas with Potential for Cumulative Impacts
Restoration Related to the Spill (Early Restoration Phases I & II, Restore Act, Gulf Environmental Benefit Fund, North American Wetlands Conservation Fund, National Academy of Sciences)		
Phase I Early restoration project; Lake Hermitage Marsh Creation	The Lake Hermitage Marsh Creation – NRDA Early Restoration Project involves the creation of 104 acres of brackish marsh within a project footprint known as the "Lake Hermitage Marsh Creation Project" developed for and funded through the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) Program.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Other Habitat Restoration Projects		
Lake Hermitage Marsh Creation (CWPPRA project)	The goals of this project are to create approximately 593 acres of wetlands, reduce tidal exchange in marshes surrounding Lake Hermitage, and reduce fetch and turbidity to promote submerged aquatic vegetation.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Bayou Dupont Marsh and Ridge Creation Project	Goals for this project consist of: 1) creating and nourishing approximately 300 acres of marsh through pipeline sediment delivery from the Mississippi River, and 2) creating a ridge along a portion of the southwestern shoreline of Bayou	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice

Category/Projects	Project Description	Key Resource Areas with Potential for Cumulative Impacts
	Dupont.	• Aesthetics and visual resources • Tourism and recreation
West Point a la Hache outfall management	The objective of the siphon is to restore the marshes to a fresher state by reintroducing fresh water, sediment, and nutrients to the area.	• Geology and substrates • Hydrology and water resources • Living coastal and marine resources • Habitats • Aesthetics and visual resources • Tourism and recreation
CIAP Project: Fringe Marsh Repair	This project uses dredge materials to reestablish shoreline in critical areas of fragile marsh with the goal of creating 300 acres of marsh in Plaquemines Parish.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Military Operations		
No known projects.	N/A	N/A
Marine Transportation		
Operation of the Venice Port Complex	The Venice Port Complex lies at the end of the state's birdfoot Delta Because of this strategic location.It is an important oil and gas hub for the eastern and east central gulf. It is a multipurpose facility – including heavy industry tenants and major drilling, production, and service companies, as well as commercial fishing and recreational facilities, many of which are regularly expanding.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Energy Activities (Offshore oil production, Offshore Natural Gas Facilities, State Oil and Gas Activities)		
Existing energy infrastructure and activities	There are multiple on-going oil and natural gas production and activities in this region.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources
Marine Mineral Mining, Including Sand and Gravel Mining		
CIAP Project: Mississippi River Long Distance Sediment Pipeline		• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats

Category/Projects	Project Description	Key Resource Areas with Potential for Cumulative Impacts
		• Socioeconomics and environmental justice • Aesthetics and visual resources
Coastal Development and Land Use		
Deposition of earthen material at the proposed Plaquemines Facility site	The site was temporarily used as a storage place for dredged materials. These will be removed prior to the construction of the facility.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources
Elevating and partial paving of the Lake Hermitage Road	This infrastructure improvement project is to upgrade the conditions of Lake Hermitage Road, involving paving and other road-work.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation
Railway improvements	The railroad industry is investing several million dollars into the New Orleans Gulf Coast Railway for capital improvements and traffic maintenance as supports the growing community in Plaquemines Parish.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice
Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS): New Orleans to Venice/Non-Federal levee project	The New Orleans to Venice (NOV) project is upgrading the existing Federal levees on the east bank of Plaquemines from Phoenix to Bohemia and on the west bank from St. Jude to Venice. For this project the Corps will apply the new and more stringent design criteria that is being used for the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS)	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice
Fisheries and Aquaculture		
Buras Marina Remote Oyster Setting Facility	The Buras marina is the staging ground for an oyster setting facility. Oyster cultch storage occurs at the facility, and it is the launching place for the oyster operations.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental

Category/Projects	Project Description	Key Resource Areas with Potential for Cumulative Impacts
		justice • Aesthetics and visual resources • Tourism and recreation
Tourism and Recreation		
Marina infrastructure maintenance	Several marinas are operated in Plaquemines Parish. They require regular maintenance, and undergo occasional expansions.	• Geology and substrates • Hydrology and water resources • Air quality and GHGs • Noise • Living coastal and marine resources • Habitats • Socioeconomics and environmental justice • Aesthetics and visual resources • Tourism and recreation

9.9.7.4 Cumulative Impacts Analysis

Looking at past, present and reasonably foreseeable future projects, Table 9-17 identifies the following resources where there is a possibility that impacts of past, present and reasonably foreseeable future actions might result in interactions or additive effects when combined with those of the Plaquemines Parish facility.

The following resource categories were identified for further cumulative impacts analysis:

- Geology and substrates
- Hydrology and water resources
- Air quality and GHGs
- Noise
- Living coastal and marine resources
- Habitats
- Socioeconomics and environmental justice
- Aesthetics and visual resources
- Tourism and recreation

Cumulative impacts for each of these categories are discussed below.

Geology and Substrates

All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on geology and substrates by disturbing sediments on, during, or as a result of construction activities. Five of these projects are marsh creation and restoration projects that would be expected to result in a long-term benefit to geology and substrates by restoring or protecting marsh sediments.

The environmental review for the proposed Plaquemines Parish facility identified long-term adverse effects to affected soils and soil substrate in areas where the footprint of the facility would alter the soil substrate through fill, compaction and earth moving activities. Construction could also result in short-term soil erosion. To minimize impact from construction, disturbed soils would be re-vegetated and/or landscaped thereby reducing erosion effects. The proposed Plaquemines Parish facility would also result in short-term minor adverse impacts to soil resources surrounding the facility. Specific measures would be implemented during construction to minimize impacts to soils including BMPs such as the implementation of an erosion control and storm water management plan, installation of sediment traps prior to commencement of construction activities, post-construction revegetation, and on-going construction monitoring to ensure compliance.

Overall, the proposed Plaquemines Parish facility would not result in long-term changes to the character of the sediments or geologic features beyond the footprint of the project area. When the Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to geology and substrates would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts because of the relatively small footprint of the Plaquemines Parish facility.

Hydrology and Water Resources

All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on hydrology and water resources. Five of these projects are marsh creation and restoration projects that would be expected to result in short-term minor impacts to water quality during project implementation but would result in a long-term benefit to hydrology and water quality. The short-term, minor impacts to hydrology and water resources associated with construction of the Plaquemines Parish facility in combination with those of the aforementioned projects are not expected to cause an adverse cumulative impact in the short or long-term.

The remaining projects in Table 9-17 are included in the categories of marine transportation, energy activities, marine mineral mining, coastal development and land use, fisheries and aquaculture, and tourism and recreation and would all involve construction activities. These projects have the potential to cause long-term hydrological or water quality impacts as a result of increases in impervious surfaces, which could result in increased stormwater runoff with impacts to surface water and wetlands. Upgrades to existing levees can also impact hydrology.

The environmental review for the Plaquemines Parish facility identified short-term and long-term minor adverse effects to hydrology and water quality resulting from construction of the facility, the introduction of impermeable surfaces, the renovation and operation of the water intake system, and discharge of effluent water. These impacts would be reduced through the implementation of mitigation measures and BMPs to reduce stormwater runoff and the treatment of effluent that would be designed to meet applicable LPDES discharge standards.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to hydrology and water quality would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts.

Air Quality and GHGs
All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on air quality and GHGs during construction activities because they all require vehicles, equipment, or processes that produce emissions of pollutants and GHGs. Industrial and infrastructure projects such as port operations, road building, and railway improvement would contribute to long-term impacts on air quality and GHGs because the projects would be expected to result in increased energy use.

The environmental review for the Plaquemines Parish facility identified minor temporary adverse impacts to air quality during construction and minor long-term adverse impacts during facilitiy operations resulting from the automobile emissions associated with employees and visitors traveling to and from the site. Operation of the facility would increase energy consumption above pre-construction levels, resulting in long-term minor impacts on GHG emissions. Mitigation measures during construction to reduce emissions and measures to increase the energy efficiency of the facility would reduce these impacts.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to air quality and GHG emissions would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts because of the relatively small impacts of the Plaquemines Parish facility on air quality and GHG emissions.

Noise
All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on noise during construction activities because they all require vehicles, equipment, or processes that produce noise. Industrial and infrastructure projects such as port operations and railway expansion would contribute to long-term impacts on noise associated with the operation of these facilities. The environmental review for the proposed Plaquemines Parish facility identified minor adverse impacts to noise during construction and facility operations but did not anticipate that noise from the project would adversely impact or add stress to the environment or its human and biological inhabitants.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to noise would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts to noise because of the relatively small impacts of the Plaquemines Parish facility on ambient noise.

Living coastal and marine resources
All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on living coastal and marine resources, with the exception of deposition of earthen material at the proposed Plaquemines facility site. These projects may result in adverse effects to marine and estuarine fauna during construction activities; however, these effects would be expected to be short term and localized. Some of these adverse effects could be long-term if the facilities constructed disturb habitat. Five of these projects are marsh creation and restoration projects that would be expected to result in a long-

term benefit to living coastal and marine resources associated with the creation or enhancement of additional marsh habitat.

The environmental review for the Plaquemines Parish facility identified short-term and minor adverse impacts to marine and estuarine fauna during active over-land construction. These impacts would be reduced by BMPs that would be used to reduce or eliminate erosion and elevated turbidity during construction. Temporary and minor direct impacts to the bottom sediment and water column would result from the incidental suspension of substrate disturbed by equipment during the construction phase. Overall, impacts would be minor because of the small footprint of the intake/outfall structures in the waterways near both facilities. The primary operational impact to marine or estuarine species during operation of the proposed Plaquemines Parish facility would be impingement and/or entrainment in the renovated existing Mississippi River water pumping system and related piping systems. Potential impacts related to water resources associated with water intakes are considered minor, but long term because they would continue for the life of the proposed facility.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to living coastal and marine resources would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts to these resources because impacts from facility construction and operation would be minor.

Habitats

All of the projects identified in Table 9-17 are potential contributors to cumulative impacts on habitats. These projects may result in adverse effects to habitats during construction activities that remove vegetation or disturb soil; however, these effects would be expected to be short term and localized. Some of these localized adverse effects could be long-term if the facilities constructed permanently disturb habitat. Five of these projects are marsh creation and restoration projects that would be expected to result in a long-term benefit to habitat associated with the restoration.

The environmental review for the Plaquemines Parish facility noted that due to the extent of previous alterations of the site as well as current alterations associated with the processing and placement of earthen material, impacts to native vegetation communities from the proposed project are expected to be minor or non-existent and adverse environmental consequences to terrestrial wildlife and avian species would be minor. All proposed construction would be completed in areas previously impacted at the site.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to habitats would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts to habitats because impacts from facility construction would primarily be short-term with long-term impacts occurring within the facility footprint.

Socioeconomics and environmental justice

All of the projects identified in Table 9-17 are potential contributors to cumulative impacts to socioeconomics by contributing to job creation during the construction phase of the projects. Industrial and infrastructure projects would contribute to long-term benefits from job creation and increased economic activity. Restoration projects could increase recreational opportunities resulting from improved habitats. Construction and operation of the proposed Plaquemines Parish facility would result in beneficial economic effects from increased employment and from visitors.

Cumulative impacts to socioeconomics from the proposed Plaquemines Parish facility in combination with other past, present and reasonably foreseeable future actions are beneficial. There are no anticipated cumulative adverse impacts to environmental justice from the proposed Plaquemines Parish facility because there are no anticipated high and adverse impacts to any of the analyzed resource categories.

Aesthetics and Visual Resources

The five habitat restoration projects would provide long-term benefits to aesthetics and visual resources by improving the health of the marsh and restoring the natural landscape. Industrial and infrastructure projects would provide long-term adverse impacts to aesthetics and visual resources in areas where the facilities would contrast with the surrounding natural environment. It is anticipated that the proposed Plaquemines Parish facility would provide a positive benefit to aesthetics and visual resources by rehabilitating a hurricane-damaged building.

When the proposed Plaquemines Parish facility is analyzed in combination with other past, present and reasonably foreseeable future actions in Southeastern Plaquemines Parish, short and long-term cumulative adverse impacts to aesthetics and visual resources would likely occur. However, the Plaquemines Parish facility would not contribute substantially to cumulative adverse impacts to aesthetics and visual resources because the Plaquemines Parish facility would provide a benefit to aesthetics and visual resources.

Tourism and recreation

The five habitat restoration projects, operation of the Port of Venice, and elevating and partial paving of the Lake Hermitage Road would provide long-term benefits to tourism and recreation by improving recreational experiences and providing infrastructure that can support recreational activities such as charterboat fishing. It is anticipated that the proposed Plaquemines Parish facility would provide a minor benefit to tourism through the recreational and educational use of the project facilities.

Cumulative impacts to tourism and recreation from the proposed Plaquemines Parish facility in combination with other past, present and reasonably foreseeable future actions are beneficial.

9.9.7.5 Summary of Cumulative Impacts

Based on the above analysis of past, present and reasonably foreseeable future actions and the anticipated resources to be impacted by these actions (see Table 9-17), the proposed Plaquemines Parish facility would not substantially contribute to adverse cumulative impacts in the region for these resources.

9.9.8 References

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