Subject: DWH-Early Restoration- Essential Fish Habitat Consultation Initiation-Corpus Christi Artificial Reef Project-Texas
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Ms. Young,
Attached is the Essential Fish Habitat Assessment for the Corpus Christi Artificial Reef Project in Texas. This project is being proposed in the Deepwater Horizon Draft Phase III Early Restoration Plan and Programmatic Environmental Impact Statement. Please consider this our initiation of our Essential Fish Habitat consultation. If you anticipate this consultation requiring more than 30 days (March 24, 2014) please let me know.

If you have any questions or require additional information, please contact me at 409-621-1248 or at jamie.schubert@noaa.gov.
Thanks,

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Attachments:

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Essential Fish Habitat Assessment for Mid/upper Texas Coast Alternative Artificial Reef Project-in the Texas Waters of the Gulf of Mexico off of Corpus Christi, Nueces County, Texas (Corpus Reef Project)

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1.0 INTRODUCTION

The purpose of this document is to present the findings of the Essential Fish Habitat (EFH) assessment conducted for the proposed Expansion of the Corpus Christi Artificial Reef (MU-775) Alternative Project in Texas State Waters of the Gulf of Mexico (Corpus Reef Project) as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1996 (Magnuson-Stevens Act). The objectives of this EFH Assessment are to describe how the actions proposed by the Corpus Reef Project may affect EFH designated by the National Marine Fisheries Service (NMFS) and Gulf of Mexico Fisheries Management Council (GMFMC), for the area of influence of the project. According to the GMFMC, EFH within the Gulf of Mexico (Gulf) includes all estuarine and marine waters and substrates from the shoreline to the seaward limit of the Exclusive Economic Zone (EEZ). The proposed Corpus Reef Project will increase the amount of reef materials in a currently permitted artificial reef site (MU-775) located within Texas state waters in the Gulf of Mexico approximately 11 miles east of Packery Channel (near Corpus Christi Bay, Texas) (Figure 1). The reef site is permitted for 160 acres, but currently has materials in northwest quadrant and in the center of the permitted area (Figure 2). The proposed Project will place prefabricated concrete pyramids in the remaining portions of the 160-acre project area (Figure 3) onto sandy substrate at a water depth of 73 feet. The Corpus Christi Reef project will 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).

This assessment will include a description of the proposed action; a summary of EFH within the vicinity of the Corpus Reef; a description of each Fishery Management Plan; an analysis of the direct, indirect and cumulative effects on EFH for the managed fish species and their major food sources; our views regarding the effects of the proposed action; and proposed measures selected to minimize expected project negative effects.

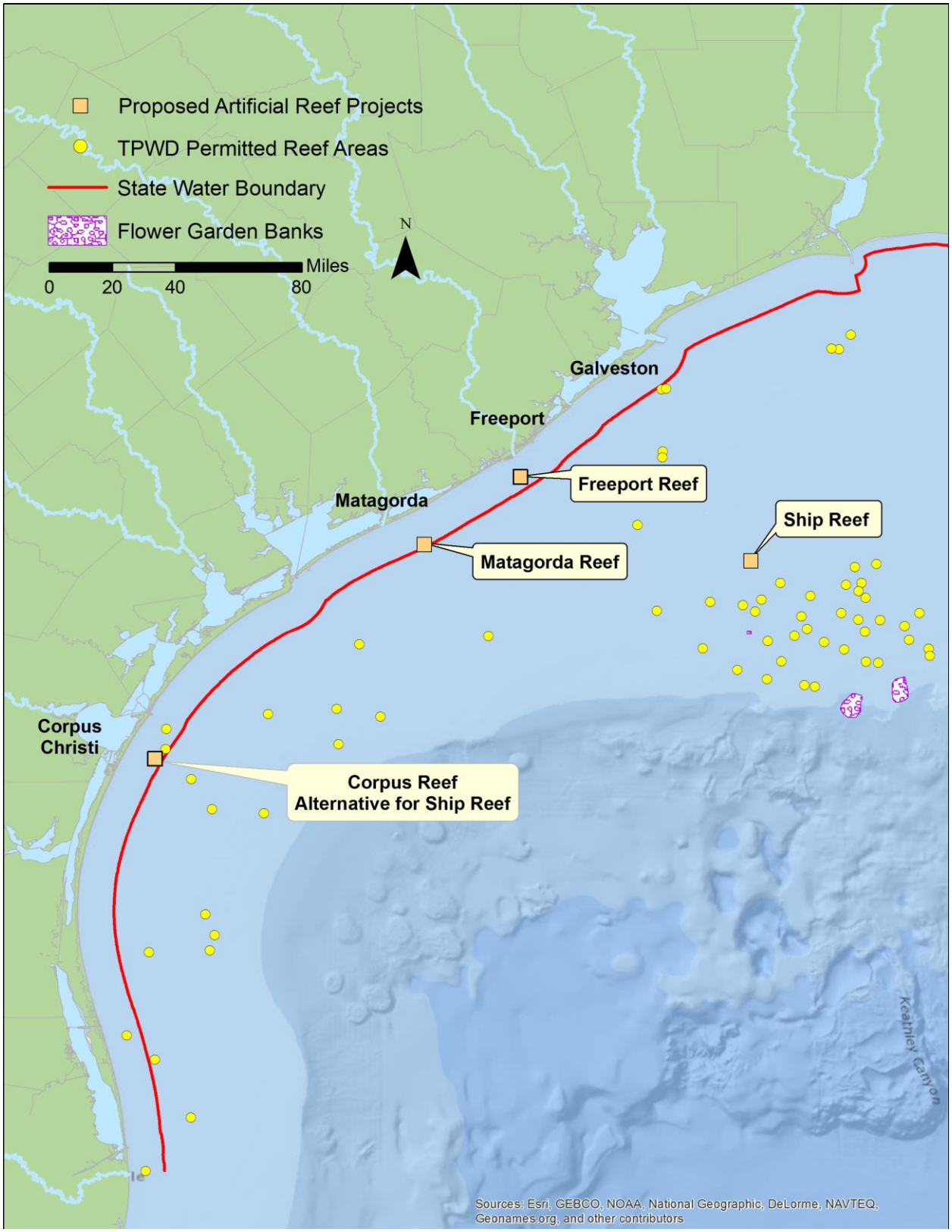

Figure 1. Proposed and existing artificial reef locations along the Texas coast in the Gulf of Mexico

2.0 PROJECT DESCRIPTION

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 Reef Project meets the requirements of the Texas Artificial Reef Act and the goals of the Texas Artificial Reef Fishery Management Plan.

The proposed Corpus Reef Project is located within the Gulf of Mexico in the Continental Shelf Mustang Island Block 775 (MU-775) offshore of Nueces County, Texas (Figure 1). The permitted reef area consists of 160 acres of 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). The reef site is 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 reef site is located in an area that provides easy access for local anglers, does not encroach on existing natural hard substrate, and can be promoted by the local government. 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.). Detailed surveys of the ocean bottom will be completed prior to the deployment of materials. Any hard outcrops or uneven surfaces identified by the surveys will be avoided during deployment of reef materials. During the placement process, pyramids will slowly be lowered via crane, bobcat or front-end loader, or other mechanical means onto the Gulf's floor, avoiding existing artificial reef structures.

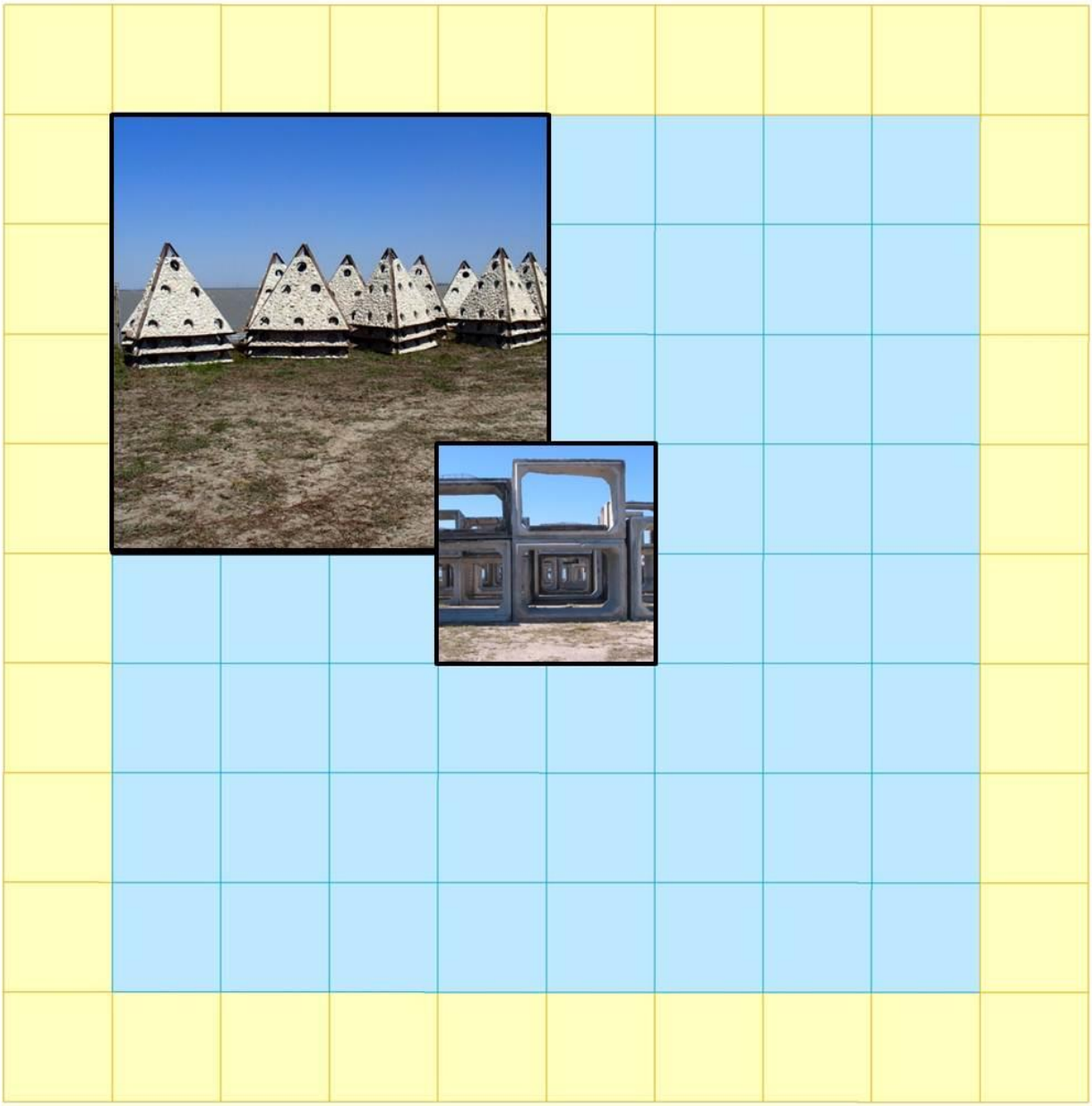

Figure 2. Diagram of the 160-acre Corpus Reef project area. Areas designated by the pictures received artificial reef materials from a separate contract in fall 2013. The yellow area is a buffer area that was avoided to make sure the reef materials were placed within the permitted reef area.

This project will deploy approximately 1,000 – 1,200 prefabricated concrete pyramids in the project area. Surveys of the project area will be conducted prior to project implementation to verify the location and avoid all hard bottom substrates and previously deployed artificial reef materials. The predesigned concrete pyramids will be complex and have a large surface area which will attract marine life (Figure 3). The prefabricated 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. This project will use similarly structured pyramids. Each pyramid should penetrate the substrate no more than 2 feet, and the structures will be randomly spaced over the 160-acre permitted reef in areas where there are no existing reefing materials.

Figure 3. An example of the prefabricated pyramid structures.

A dynamically positioned vessel (i.e., not anchored) will slowly deploy the pyramids by either lowering them into specific positions via crane, or pushing them off of the marine vessel via bobcat or front-end loader. During pyramid deployment, position is usually maintained visually by use of a temporary marker buoy attached to the first pyramid deployed. Based on previous artificial reef projects completed in Texas, it is anticipated that one crane barge, one or two tugboats, two forklifts, two excavators, and/or two small boats 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 will be used to verify the correct placement of materials in the project area to avoid impacts to the existing reef materials.

This Project includes monitoring efforts to ensure project designs are correctly implemented during construction. Multi-beam side-scan surveys will 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. In addition, a buoy will be installed to mark the artificial reef site per USCG requirements. 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.

Large-scale maintenance for the artificial reef will not be necessary as long as there is no significant movement of artificial reef materials, which is not expected to occur. This reef will require regular maintenance of the buoy marker (cleaning chain, replacing light, replacing or repairing buoy as needed). No ongoing maintenance beyond the annual surveys and buoy maintenance is anticipated. Monitoring and maintenance activities will be managed by the TPWD's Artificial Reef Program.

3.0 ESSENTIAL FISH HABITAT

The 1996 amendments to the Magnuson-Stevens Act set forth a mandate for NMFS, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. To achieve this goal, suitable fishery habitats need to be maintained. EFH in the project's area of effect is identified and described for various life stages of 55 managed fish and shellfish (GMFMC, 1998). A provision of the Magnuson-Stevens Act requires that FMC's identify and protect EFH for every species managed by a Fishery Management Plan (FMP) (U.S.C. 1853(a)(7)). There are FMP's in the Gulf of Mexico for shrimp, red drum, reef fishes, coastal migratory pelagics, and highly migratory species (e.g., sharks).

EFH is separated into estuarine and marine components. The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities),

including the sub-tidal vegetation (grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves)." The Corpus Reef project is within the marine system; there is no estuarine component to this project. Federally managed marine fish in the Gulf use a variety of offshore pelagic habitats including open waters, floating sargassum mats, hard bottom structures, and unvegetated soft bottom habitats across their various life stages from fertilized egg to spawning adults. The proposed Corpus Christi reef site includes EFH for the following federally managed fish species (See Table 1).

Table 1. EFH within the vicinity of the Corpus Reef Proposed Area of Effect

Management Unit	Life stage(s) Found at Location	FMP^
Highly Migratory Species (12 Species)		
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 (*Sciaenops ocellatus*)	Adult	Red Drum
Shrimp (3 Species)		
Brown Shrimp *(Penaeus aztecus)*	Eggs, Larvae, Adult, Spawning Adult	
White shrimp (Penaeus setiferus)	Eggs, Larvae, Adult, Spawning Adult	Shrimp
Pink shrimp (*Penaeus duararum*)	Eggs, Larvae, Adult, Spawning Adult	
Coastal Migratory Pelagics (1 Species)		
Cobia (*Rachycentron canadum*)	Larvae, Juvenile, Adult, Spawning Adult	Coastal Migratory Pelagics

Management Unit	Life stage(s) Found at Location	FMP^
Reef Fish (11 Species)		
Balistidae – Triggerfishes		
Gray triggerfish (*Balistes capriscus*)	Eggs, Adults, Spawning Adult	Reef
Carangidae – Jacks		
Greater amberjack (*Seriola dumerili*)	Eggs, Larvae, Spawning Adult	Reef
Almaco jack (*Seriola rivoliana*)	Eggs, Spawning Adult	Reef
Lutjanidae – Snappers		
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
Serranidae – Groupers		
Goliath grouper (*Epinephelus itajara*)	Adult	Reef
Yellowmouth grouper(*Mycteroperca interstitialis*)	Eggs, Larvae, Adult	Reef
Gag (*Mycteroperca microlepis*)	Adult	Reef

^FMP-Fisheries Management Plan, *HMS- Highly Migratory Species

4.0 MANAGED FISH SPECIES

The seasonal and year-round locations of designated EFH for the managed fisheries are depicted on the figures available on the NMFS website (http://sero.nmfs.noaa.gov/hcd/efh.htm) and species abundance maps, both inshore and offshore, are available on the National Ocean Service (NOS) website (http://ccma.nos.noaa.gov/products/biogeography/gom-efh/). EFH Tables for species managed by the Gulf of Mexico Fishery Management Council are found in Chapter 8 of the 2004 Final Environmental Impact Statement for the Generic Essential Fish Habitat Amendment. EFH figures for HMS are found in the 2009 amendments to the Consolidated Atlantic Highly Migratory Species Fisheries Management Plan. EFH for each managed fishery within the project's footprint is described below:

Highly Migratory Species – HMS may be found in large expanses of the world's oceans. Although many of the species frequent other oceans of the world, the Magnuson Stevens Act only authorizes the description and identification of EFH in federal, state, or territorial waters, including areas of the U.S. Caribbean, the Gulf of Mexico and the Atlantic coast of the United States, to the seaward limit of the U.S. Exclusive Economic Zone (waters 3 to 200 miles offshore). These areas are connected by currents and water patterns that influence the occurrence of HMS at particular times of the year. Due to habitat

specific requirements of each species, EFH for each HMS potentially occurring in the vicinity of the Corpus Reef is described below (EFH information from NMFS, 2009):

Scalloped Hammerhead Shark:

- This species is very common, large, schooling shark that occurs in warm coastal waters out to the continental shelf and seasonally migrates into the Gulf of Mexico. The project area is located in habitat for adult scalloped hammerhead sharks. The scalloped hammerhead shark is considered vulnerable to over-fishing due to its schooling habits which make them extremely susceptible to gillnet fisheries (HSMSD 2006).

Great Hammerhead Shark:

- The great hammerhead shark can be found in the warm coastal waters of the Gulf of Mexico to the outer continental shelf. This species is highly migratory. They are the largest of the hammerhead species and can reach lengths over 20 feet. The great hammerhead reaches maturity at approximately 6-8 years of age and typically gives birth every two years. Habitat for neonates and adults occurs within the project area. There is an ongoing overall decline of the population and NMFS is currently conducting an Endangered Species Act status review of the species.

Bull Shark:

- The bull shark is primarily found in the shallow coastal waters of the Gulf of Mexico and is commonly found in the estuaries and lower reaches of the tributaries adjacent to the Gulf. This species reaches maturity at approximately 6 years of age. Habitat for adult bull sharks occurs in the project area. Bull sharks are part of the large coastal shark management group that is considered overfished, and regulations are in place for commercial and recreational harvest of this species.

Atlantic Sharpnose Shark:

- This shark commonly inhabits warm-temperate and tropical waters of the Gulf of Mexico.. This species seasonally migrates inshore to offshore. They are found at depths up to 920 feet (280 m), but mostly remain in waters less than 32 feet (10 m) deep. Along with being common residents of the surf zone, the Atlantic sharpnose shark is also found in estuaries and harbors. Habitat for adult sharks occurs in the project area.

Bonnethead Shark:

- The bonnethead shark commonly inhabits the estuaries and shallow coastal waters of the Gulf of Mexico and typically feed in the surf zone and inlets. They usually occur at depths of 30 to 60 feet, but have been noted in waters up to 250 feet in depth. The bonnethead primarily forages on crustaceans, bivalves, and small fish. They quickly reach maturity and mate year round. Habitat for all life stages of the bonnethead occur in the project area.

Blacktip Shark:

- Blacktip sharks inhabit the shallow coastal waters and estuaries of the United States. In addition, they are found in offshore surface waters. The nursery areas are located in the inshore waters from South Carolina to Texas. Adults and juveniles can be found year round in groups feeding in shallow waters of the Gulf of Mexico. This species is fast growing and reaches maturity at approximately 4-5 years of age. They generally feed on fish and invertebrates. The blacktip shark is part of the larger coastal shark management group, but

does not have specific management measures in place. Habitat for all life stages of the blacktip occurs in the project area.

Spinner Shark:

- Spinner sharks inhabit inshore and offshore waters of the continental shelf in the Gulf of Mexico. They range in water depths of 0-328 feet. The spinner shark forms schools and is considered a highly migratory species in the Gulf of Mexico, moving inshore during spring and summer months to reproduce and feed. Spinner sharks reach maturity at approximately 5 to 7 feet in length. The spinner shark feeds primarily on pelagic fishes, stingrays, cuttlefish, squid, and octopi. They reproduce in the shallow waters of the Gulf. Habitat for all life stages of the spinner occur in the project area.

Lemon Shark:

- The lemon shark is commonly found in subtropical shallow water to depths of 300 feet. They inhabit coral reefs, mangroves, enclosed bays, sounds and river mouths. Lemon sharks can be found in oceanic water during migration but tend to stay along the continental shelf. Females and males reach sexual maturity around 6-7 years of age. The lemon shark preys on bony fish and crustaceans. Reproduction occurs in shallow water during the spring months and is followed by a 10-12 month gestation period. The young remain in these nursery grounds for several years. Habitat for adult and neonate lemon sharks occur in the project area.

Finetooth Shark:

- The finetooth shark resides in waters close to shore to depths of 32.8 feet. This species often forms large schools. Adults and juveniles are common in shallow coastal waters off Texas during the warm summer months and migrate south when surface water temperatures drop. Finetooth sharks are small in size with the average lengths for a male individual is 5.2 feet while a female is about 5.4 feet. Males reach maturity at about 3.9 feet in length and females mature at about 4.6 feet. They feed on small bony fishes and marine invertebrates including cephalopods and crustaceans. Habitat for all life stages of this species is present in the project area.

Dusky Shark:

- The dusky shark prefers warm temperate to tropical waters inshore and offshore. They are known to occur at the surface to depths as deep as 1,300 feet (Compagno, 1984). Males reach sexual maturity at approximately 19 years of age, and females mature at about 21 years of age. They reproduce every three years. Their diets include fish and squid. The dusky shark migrates seasonally to temperate waters. The species is identified as a “Species of Concern” and is globally vulnerable to long-line bycatch. Adult and juvenile dusky shark habitat occurs in the project area.

Tiger Shark:

- The tiger shark inhabits the coastal areas to the outer continental shelf of the Gulf of Mexico. It is one of the largest shark species occurring in the Gulf. Adults can reach over 18 feet in length and approximately 2,000 pounds. Adults generally reach maturity at approximately 9 feet. They spend their complete life cycle offshore. Habitat for neonates and adults occurs in the project area. Tiger sharks are part of the large coastal shark management group that is considered overfished, and regulations are in place for

commercial and recreational harvest of this species. Tiger shark habitat for juveniles and adults occurs in the project area.

Red Drum FMP - EFH for red drum consists of all Gulf of Mexico estuaries; waters and substrates extending from Vermilion Bay, Louisiana to the eastern edge of Mobile Bay, Alabama out to depths of 25 fathoms; waters and substrates extending from Crystal River, Florida to Naples, Florida between depths of 5 and 10 fathoms; waters and substrates extending from Cape Sable, Florida to the boundary between the areas covered by the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council between depths of 5 and 10 fathoms.

Shrimp FMP – EFH for shrimp consists of Gulf of Mexico waters and substrates extending from the US/Mexico border to Fort Walton Beach, Florida from estuarine waters out to depths of 600 feet (100 fathoms); waters and substrates extending from Grand Isle, Louisiana to Pensacola Bay, Florida between depths of 600 and 1,950 feet (100 and 325 fathoms); waters and substrates extending from Pensacola Bay, Florida to the boundary between the areas covered by the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council out to depths of 210 feet (35 fathoms), with the exception of waters extending from Crystal River, Florida to Naples, Florida between depths of 60 and 150 feet (10 and 25 fathoms) and in Florida Bay between depths of 30 and 60 feet (5 and 10 fathoms).

Coastal Migratory Pelagics FMP – EFH for coastal migratory pelagics consists of Gulf of Mexico waters and substrates extending from the US/Mexico border to the boundary between the areas covered by the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council from estuarine waters out to depths of 600 feet (100 fathoms). Managed fish in this fishery include king mackerel, Spanish mackerel, and cobia. Non-managed fish in this fishery include cero mackerel, little tunny, dolphin, and bluefish.

Reef Fish FMP – EFH for reef fish consists of Gulf of Mexico waters and substrates extending from the US/Mexico border to the boundary between the areas covered by the Gulf of Mexico Fishery Management Council and the South Atlantic Fishery Management Council from estuarine waters out to depths of 600 feet (100 fathoms).

5.0 ECOLOGICAL NOTES ON THE EFH FISHERIES AND SPECIES

5.1.1 Highly Migratory Species

Marine open-water habitats like those found at the Corpus Reef site provide EFH resources for various life stages of HMS. Sharks migrate through the Gulf to forage, feed and reproduce. The shark species discussed in this assessment generally feed on a variety of small fish (such as menhaden, seatrout, tilefish, and perch), shrimp, small sharks, and crabs (Adams and Paperno, 2007; Barry, 1996; Curtis, No Date; Bethea et. al., 2007).

5.1.2 Red Drum

In the Gulf, red drum occur in a variety of habitats, ranging from depths of about 130 feet offshore to very shallow estuarine waters. They commonly occur in Gulf's estuaries where they are associated with a variety of substrate types including sand, mud, and hardened bottom. Throughout the Gulf, red drum use the open waters and soft bottom habitats for foraging and spawning (GMMFC, 2004). The red drum prey on species of shrimp, blue crab, striped mullet, and pinfish. The GMFMC considers the nearshore and offshore waters including the project area to be EFH for the red drum. Schools of large red drum are

common in the deep waters of the Gulf of Mexico with spawning occurring in waters near the mouths of bays and inlets, and on the Gulf side of the barrier islands.

5.1.3 Shrimp

Shrimp use a variety of estuarine and marine habitats in the Gulf of Mexico. Brown shrimp are found within the estuaries to offshore depths of 361 feet (110 meters) throughout the Gulf; white shrimp inhabit estuaries and to depths of about 131 feet (40 meters) offshore in the coastal area extending from Florida's Big Bend area through Texas; pink shrimp inhabit the Gulf coastal area from estuaries to depths of about 213 feet (65 meters) offshore and is the dominant species off southern Florida. Brown and white shrimp are generally more abundant in the central and western Gulf, whereas pink shrimp are generally more abundant in the eastern Gulf. Royal red shrimp are not estuarine-dependent and spend their lives in depths of 600 to 1,800 feet (100 to 300 fathoms).

Brown Shrimp

Brown shrimp range from Florida to the northwestern coast of Yucatan in the Gulf. The range is not continuous and is marked by an apparent absence of brown shrimp along Florida's west coast between the Sanibel and the Apalachicola shrimping grounds. In the U.S. waters of the Gulf of Mexico, catches are high along the Texas, Louisiana, and Mississippi coasts. In estuarine areas, shrimp are typically found as postlarvae and juveniles in shallow vegetated habitats, but, occasionally, in silty sand and non-vegetated bottoms. Juveniles and sub-adults generally prefer shallow estuaries and marsh edges (plant-water interfaces). Sub-adults migrate from estuaries during outgoing high tides and adult brown shrimp typically inhabit Gulf waters from the Mean Low Water line to the continental shelf" (GMFMC, 2006). EFH exists for eggs, larvae, adults, and spawning adults stages of brown shrimp within the project area.

White Shrimp

White shrimp are offshore and estuarine dwellers, and are pelagic or demersal depending on their life stage. The eggs are demersal and larval stages are planktonic, and both occur in nearshore marine waters. Postlarval white shrimp become benthic upon reaching the nursery areas of estuaries, seeking shallow water with muddy-sand bottoms that are high in organic detritus. Juveniles move from estuarine areas to coastal waters as they mature. Adult white shrimp are demersal and generally inhabit nearshore Gulf waters in depths less than 100 feet on soft mud or silty bottoms. (GMFMC, 2006) Adult white shrimp and spawning habitat occurs within the project area. Fertilized eggs can also be found within pelagic waters of the project area.

Pink Shrimp

Juvenile pink shrimp inhabit most estuaries in the Gulf but are most abundant in Florida. Juveniles are commonly found in estuarine areas with SAV (submerged aquatic vegetation). Postlarve, juvenile, and subadults may prefer coarse sand/shell/mud mixtures. Adults inhabit offshore marine waters, with the highest concentrations in depths of 30 to 144 feet (GMFMC, 2006). Spawning occurs in nearshore waters over sand/shell bottoms in areas ranging from 9 - 48 meters deep. Thus, the project area provides EFH for adults, spawning adults, eggs, and larvae.

5.1.4 Coastal Migratory Pelagics

The managed coastal migratory pelagics in the Gulf include Spanish mackerel, king mackerel, and cobia. The king and Spanish mackerel are jointly managed between the GMFMC and the South Atlantic Fisheries Management Council.

The Corpus Reef Project is located in the western zone of the king mackerel range, which extends from Texas to the Alabama/Florida border. The western zone group of king mackerel winter in south Texas / Mexican waters and migrate north in the summer to their spawning grounds (NMFS, 2013) Adults are found over reefs, in coastal waters, and over the shelf edge in depths up to 656 feet. Generally they occur in water depths less than 260 feet. The eggs are pelagic and found offshore in water depths of 115 to 590 feet during the spring and summer months. Larvae of the king mackerel occur over the middle and outer continental shelves, primarily in the north central and northwestern Gulf of Mexico. Juveniles are found closer inshore. King mackerel are common to abundant in the waters near the project area. Like king mackerel cobia migrate south during the winter months and return north in the spring to their spawning grounds (GMFMC & SAFMC, 1983). King mackerel tend to feed on other fishes while cobia feed on fish and crustaceans. King mackerel and cobia utilize the pelagic waters in Continental Shelf Mustang Island Block 775 (MU-775) for feeding, foraging, resting and spawning grounds during spring and summer months.

5.1.5 Reef Fish

The reef fishes FMP considers triggerfish, jacks, wrasses, snappers, tilefish and groupers. Reef fish are often found as adults associated with coral reef, limestone, hard bottom, and artificial reef substrates.

Occasionally adults occur over sand, away from reefs, but these appear to be foraging individuals. There is some evidence that adults have restricted movement and do not display long migrations. Juveniles of many of the reef fish species are located in shallow, inshore areas associated especially with SAV beds and inshore reefs. There is a general tendency for older and larger fish to occur in deeper water extending to the edge of the continental shelf. Reef fish feed on a variety of invertebrates including shrimp, craps, amphipods, octopus, and squid. Larger reef fish also have a tendency to eat small fish and other larger food items. (GMFMC, 1981)

Reef fish utilize both pelagic and benthic habitats during their life cycle. A planktonic larval stage lives in the water column and feeds on zooplankton and phytoplankton. Juvenile and adult reef fish are typically demersal and usually associated with bottom topographies on the continental shelf that have high relief: i.e., coral reefs, artificial reefs, rocky hard-bottom substrates, ledges and caves, sloping soft-bottom areas, and limestone outcroppings. More detail on these habitat types is found in the Fishery Management Plan (FMP) for Corals and Coral Reefs (GMFMC and SAFMC, 1982). However, several species are found over sand and soft-bottom substrates. Juvenile red snapper are common on mud bottoms in the northern Gulf. Some juvenile snapper and grouper such as mutton, gray, dog, lane, and yellowtail snappers and jewfish, red, gag and yellowfin groupers have been documented in inshore seagrass beds, mangrove estuaries, lagoons, and larger bay systems (GMFMC, 1981). Planktonic larvae may be present in the water column within the project site, and juvenile and adult reef fish may use the EFH in the vicinity and within the Corpus Reef area for feeding, foraging, and resting year round. In addition, the area may be used for spawning for numerous reef fish.

6.0 ASSESSMENT OF EFH IMPACTS AND MITIGATIVE MEASURES

6.1 IMPACTS TO EFH

Conversion of Soft Bottom to Hard Bottom Habitat

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 160 acre project area's

existing natural soft bottom and sand habitat that is utilized by numerous federally managed fish species and replace it with hard bottom artificial reef substrate. Extensive acreages of soft bottom benthic habitats exist in the Gulf of Mexico, whereas hard bottom reef habitat is much more limited in acreage. The relative abundance of soft bottom habitat within the project area would not be significantly impacted due to the small footprint of each pyramid (10 ft. by 10 ft. by 10 ft.) and the anticipated 20-foot spacing between the pyramids. The total displacement for one quadrant of the reef site (40 acres or 1/4th of the reef site) would be 12,000 square feet for a 0.007% conversion from soft bottom to hard bottom within each 40 acre quadrant. The project will place materials within 3 quadrants of the 140 acre site for a total surface area conversion of 0.006% within the project site. While the project will cause adverse impacts to a small portion of the soft bottom EFH and species that utilize these habitats, the trade off is new hard bottom substrate that will be colonized by encrusting marine organisms to form an artificial reef community. Encrusting organisms will in turn provide a food source for herbivorous grazing fish including reef fish that utilize hard bottoms for feeding and growth. Following placement and settlement of the materials on the Gulf's floor, it is expected that the increase hard bottom structure will attract other predatory reef fish, migratory fish and sharks, mobile crustaceans and other invertebrates associated with offshore reefs and hard bottom habitats.

Temporary Increased Turbidity

The construction process involves placing hard structures on semi-firm bottoms adjacent to an existing artificial reef in the Gulf of Mexico. The placement of reefing materials on the soft bottom will increase turbidity beyond existing ambient levels as sediments are resuspended into the water column. Increased turbidity impacts to the water column can affect the use of the project area by marine dependent, juvenile and adult fish and adult shrimp species, which are common in the project area throughout the year.

The adverse turbidity impacts from placement of the reefing materials will be localized and temporary, affecting individuals and not entire populations. Since potential impacts will be minimal, localized and temporary, there are no expected permanent impacts at the population level since spawning, feeding, and resting occurs over broad areas in the Gulf of Mexico.

Increased Boat Traffic

Increased boat traffic in the vicinity of the Corpus Reef project during construction at the site may result in temporary adverse impacts to migratory species by disrupting use of the area for feeding and spawning. These impacts would be temporary and the impacted area would return to near baseline usage after project implementation. However, there may be an increase in boat traffic to the area after placement of the reef, but this would not exceed normal expected levels that the species encounter at existing reef sites.

Increased Recreational Fishing Pressure

Throughout the Gulf, artificial reefs are known to attract large numbers of recreationally valued fish species that utilize hard substrate to a distinct and highly recognizable location with vertical relief above the surrounding soft bottom habitats. Offshore fishermen are attracted to these sites in increased numbers, and fishing efforts are concentrated at these locations. However, due to the numerous artificial reef sites available in Texas waters, the Corpus Christi reef site will not increase fishing pressure on managed species. Rather, the additional artificial reefs will provide alternative fishing sites and redistribute a portion of the pressure from existing artificial reefs and hard bottom habitats (NOAA, 2012).

6.2 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Direct

Direct impacts will be limited to the area directly within the 160-acre footprint of the Corpus Reef. Sediments will be disturbed by placement of the reefing materials and turbidity will increase for a short time period after the materials are placed on the bottom. Adverse direct impacts from conversion of pelagic soft bottom habitat to artificial reef structure will be a permanent effect. However, due to the relative abundance of soft bottom habitat in the Gulf and the small footprint of conversion to hard bottom habitat, the project will not have significant impacts to EFH of managed fisheries. Increased turbidity and sedimentation caused by construction will be short term, and it is expected that ambient water quality conditions will be restored following cessation of work. Once the substrate materials are placed, a long-term beneficial impact is expected to offset the permanent effects due to the additional habitat diversity that will attract encrusting corals, shellfish, crustaceans, and reef fish and provide shelter and foraging habitat. Diverse substrate habitat is generally thought to be supportive of the managed fisheries' food webs and life cycles.

Indirect

Significant indirect adverse impacts are not expected in the short or long term. Long-term indirect beneficial impacts are expected to EFH resources in close proximity to the Corpus Reef project due to anticipated increases in use of this area by pelagic and migratory adult and juvenile fish as foraging grounds. The addition of the hard bottom substrate will provide increased habitat for reef fish, increased benthic production, and enhanced species diversity and richness within the project area (Cutler et al., 1997, Beaver et al., 2003).

Cumulative

Currently three artificial reef projects (Freeport, Matagorda, and Ship Reef) and one alternative artificial reef project (Corpus), if the Ship Reef is infeasible, are proposed to be created as part of the Phase II Early Restoration Plan compensation for lost recreational use caused by the Deepwater Oil Spill. The three projects in conjunction with ongoing management of existing artificial reefs in Texas waters will increase available hard substrate reef fish habitat and provide valuable recreational use opportunities for fishermen and scuba divers. The cumulative impact of these new reefs and the anticipated subsequent habitat utilization by reef fish, coastal pelagics, and highly migratory species will increase benthic productivity and habitat diversity in the project area (Beaver et al., 2003). In addition, the new offshore fishing availability will divert fishing pressure from the existing artificial reefs and hard bottom habitats to the newly created reefs.

6.3 PROPOSED MITIGATIVE MEASURES AND GUIDELINES FOR EFH PROTECTION

1. Reef Siting To Avoid Existing Hard Substrate

Texas Parks and Wildlife Department, in consultation with NMFS, will take all practicable precautions to minimize unavoidable negative impacts to EFH. A survey will be conducted prior to deployment of the reefing materials to identify the location of existing artificial reef materials and other existing hard structures that could potentially support coral or hard structure habitats. All existing artificial reef materials and other hard substrates will be avoided during placement of the reefing materials. Neither corals nor seagrasses exist in the project footprint.

2. Use of Best Management Practices (BMP)

Best management practices (BMPs) are measures to minimize and avoid all potential adverse impacts to EFH and protected species during the Corpus Reef project construction and monitoring. This conservation measure requires the use of BMPs during construction to reduce impacts from project implementation. BMPs shall include but are not limited to:

a. Monitors will be present that will be able to "Stop Work" if sea turtles, smalltooth sawfish, whales, or other federally protected species are in the area.
b. All sea turtle and smalltooth sawfish construction conditions will be followed.
c. On-site surveys will be conducted to identify hard bottom structures or outcrops before placement of the reefing materials. These areas will be avoided during deployment.
d. All provisions and stipulations identified during the consultations with USFWS and NMFS will be adhered to.

3. Follow Smalltooth Sawfish and Sea Turtle Standard NOAA conditions

The contractor will follow the NOAA's standard sea turtle and smalltooth sawfish conditions, as required under Endangered Species Section 7 consultations. The construction procedures outlined in these documents require boats to operate at idle speeds, ensure that contractors observe the construction area for smalltooth sawfish and sea turtles, and require monitoring for species in the area during construction. Following these guidelines will help minimize potential prop strikes and will help minimize impacts to individual fish species since boats will be moving slowly through the construction zone.

4. Monitoring Structure

Monitoring will be conducted before, during, and after project implementation to ensure compliance with project design including side-scan sonar to ensure proper placement of the pyramids. If immediate post-construction monitoring reveals that unavoidable impacts to EFH have occurred, appropriate coordination with regional EFH personnel will take place to determine appropriate response measures, possibly including mitigation. 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. If additional adaptive management of the reef is necessary after monitoring, all best management practices discussed above will be followed.

7.0 CONCLUSIONS

This project is designed to compensate for lost recreational fishing opportunities caused by the Deepwater Horizon oil spill, and is not intended to compensate for natural resource impacts to EFH or living marine resources. The project will provide new offshore fishing opportunities for recreational anglers. It is acknowledged that the construction of an artificial reef will result in a permanent loss of soft bottom EFH. However, soft bottom EFH is very abundant in the Gulf of Mexico. The creation of artificial reefs may provide benefits to some EFH by increasing habitat diversity through provision of hard structure utilized by federally managed highly migratory species, coastal pelagics, and reef fish. These benefits may include more diverse foraging habitat, increased cover for juveniles, and the potential for conditions favorable for encrusting benthic colonization (due to increased habitat structure).

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