DEEPWATER PORT LICENSE APPLICATION FOR THE BLUEWATER SPM PROJECT

VOLUME II – ENVIRONMENTAL EVALUATION

Section 8 – Wildlife and Protected Species

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LIST OF ACRONYMS

<	less than
>	greater than
µPa	micro Pascals
ac	acre
ATV	all-terrain vehicle
bbl.	million barrels
BCC	birds of conservation concern
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act of 1940
BMP	best management practices
BWTT	Bluewater Texas Terminal, LLC
CFR	Code of Federal Regulations
cm	centimeter
CWA	Clean Water Act of 1977
CZMA	Coastal Zone Management Act of 1972
dB	decibels
dBA	decibels on the A-weighted scale
DMPU	dredge management placement unit
DOT	Department of Transportation
DPS	distinct population segments
DWH	Deepwater Horizon
DWP	Deepwater Port
DWPA	Deepwater Port Act
E.O.	Executive Order
EEZ	Exclusive Economic Zone
EFH	essential fish habitat
EIS	environmental impact statement
Eo	elemental occurrence
ESA	Endangered Species Act of 1973
FFWCC	Florida Fish and Wildlife Conservation Commission
FMP	fishery management plans
FPSO	floating production storage and offloading facility
FR	Federal Register
ft	feet
GIWW	Gulf Intracoastal Waterway
GMFMC	Gulf of Mexico Fishery Management Council
GOM	Gulf of Mexico
ha	hectare
HAPC	habitat areas of particular concern
HDD	horizontal directional drill

IMO	International Maritime Organization
km	kilometer
LEDPA	Least Environmentally Damaging Practicable Alternative
m	meter
m/s	meters per second
m^2	square meter
m^3	cubic meter
MAOP	maximum allowed operating pressure
MARPOL	International Convention for the Prevention of Pollution from Ships
MBTA	Migratory Bird Treaty Act of 1918
mi	mile
mm	millimeter
MMPA	Marine Mammal Protection Act of 1972
MMS	Mineral Management Service
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act of 1969
nm	nautical mile
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRC	National Research Council
NRDA	Natural Resource Damage Assessment
NSA	noise sensitive area
NWR	National Wildlife Refuge
^oC	degrees Celsius
OCS	Outer Continental Shelf
^oF	degrees Fahrenheit
P.L.	Public Law
PINS	Padre Island National Seashore
PK	peak sound pressure
PLEM	pipeline end manifold
PPA	Pollution Prevention Act of 1990
PTS	permanent threshold shift
RHA	U.S. Rivers and Harbors Act of 1899
RMS	root mean square
ROW	right-of-way
SAV	submerged aquatic vegetation
SEAMAP	Southeast Area Monitoring and Assessment Program
SEL	sound exposure level
SELcum	cumulative sound exposure level
SPM	single point mooring
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality

TDA	Texas Department of Agriculture
TPWD	Texas Park and Wildlife Department
TSS	total suspended solids
TTS	temporary threshold shift
TXNDD	Texas Natural Diversity Database
WOTUS	Waters of the U.S.
U.S.	United States [of America]
U.S.C.	United States Code
USACE	U.S. Army Corps of Engineers
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VLCC	very large crude carriers
ZOI	zone of influence

8 Wildlife and Protected Species

This section discusses existing wildlife and protected species within the vicinity of the Bluewater Single Point Mooring (SPM) Project (Project) and the Alternative Project, and the anticipated environmental impacts associated with the construction, operation, and decommissioning of the Proposed Project and the Alternative Project. The detailed description of the Proposed and Alternative Project and the framework for the evaluation of environmental impacts is provided in Section 3: Project Description and Framework for Environmental Evaluation.

8.1 Applicable Laws and Regulations

The nature and scope of the Proposed Project requires the compliance of federal laws during construction and operation. Avoidance and minimization of environmental impacts must be considered during all phases of the Project. Several wildlife, both terrestrial and avian, as well as some plant species are eligible for protection under various federal laws. The Endangered Species Act (ESA) of 1973; Marine Mammal Protection Act of 1972 (MMPA), Pub. L. 92–522, 16 U.S.C. 1361; Invasive Species E.E. 13112; Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) as amended through October 11, 1996, 16 U.S.C. 1801, et. seq.; the Migratory Bird Treaty Act (MBTA) of 1918; the Bald and Golden Eagle Protection Act (BGEPA) of 1940; and NEPA, Pub. L. 91–190, 42 U.SC. 4321, *et.* seq. have elements that relate directly to the Project and were evaluated by evaluated by Bluewater Texas Terminal, LLC (BWTT) during planning, construction, and operation. A summary of each is given below.

8.1.1 State

The Texas legislature has authorized regulations associated with the management, regulation, and protection of native species of wildlife and plants that are listed as threatened or endangered in the State of Texas. These species include both game and non-game species in the State of Texas and regulations are enforced by the Texas Parks and Wildlife Department (TPWD) under Texas Administrative Code (TAC) 67 and 68, Sections 65.171 – 65.176 for animal species and TAC 88, Sections 69.01 – 69.9 for protected plant species. Under the TAC, TPWD prohibits the take, possession, transportation, or sale of any state-protected species listed as threatened or endangered without the issuance of a permit. Certain state-listed species are also protected under the federal ESA and are subject to regulations described below. The listing and recovery of threatened and endangered species including amphibian, bird, invertebrate, mammal, reptile, and plant species in the State of Texas is coordinated by the TPWD Wildlife Diversity Program; additionally, TPWD's inland Fisheries and Coastal Fisheries Division coordinate the protection and recovery of state-listed fish species.

8.1.2 Federal and International

8.1.2.1 Endangered Species Act

The ESA provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, and the conservation of the ecosystems on which they depend. A species is considered endangered if it is in danger of extinction throughout all or a significant portion of its range. A species is considered threatened if it is likely to become an endangered species within the foreseeable future. All species of plants and animals, except pest insects are eligible for listing as endangered or threatened. Congress defined species to include subspecies, varieties, and for vertebrates, distinct population segments (DPS). The ESA is administered by the U.S. Fish and Wildlife Service (USFWS) and the Commerce Department's National Marine Fisheries Service. The USFWS has authority over terrestrial and freshwater organisms, while the National Marine Fisheries Services (NMFS) are mainly marine. The USFWS is a bureau with the Department of the Interior. Their mission is to work with others to conserve, protect, and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people. Within the scope of this Project, they are responsible for enforcement of the ESA and MBTA. Other functions include enforcing federal wildlife laws, protecting endangered species, managing migratory birds, and conserving and restoring wildlife habitat such as wetlands.

The ESA also requires the designation of "critical habitat" for listed species. Critical habitat includes geographic areas that contain the physical or biological features that are essential to the conservation of the species and that may need special management or protection. Critical habitat may include areas that are not occupied by the species at the time of listing but are essential to its conservation.

8.1.2.2 Marine Mammal Protection Act

Under the MMPA of 1972 (16 U.S.C. 1361 et seq.), the Secretary of Commerce is responsible for the protection of all cetaceans (whales, porpoises, and dolphins) and pinnipeds (seals and sea lions), except walruses, and has delegated authority for implementing the MMPA to National Oceanic and Atmospheric Administration (NOAA) NMFS. Under Section 3 of the MMPA, all marine mammals are protected from "take" which is defined as "harass, hunt, capture, or kill or attempt to harass, hunt, capture, or kill any marine mammal," and "harassment" is defined as "any act of pursuit, torment, or annoyance that has the potential to injure marine mammal stock in the wild; or has the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering."

Substantial amendments were made to the MMPA in 1994 that allow for the incidental take of small numbers of marine mammals. NOAA identifies incidental take as activities other than commercial fishing that effect a small number, have no more than a negligible impact, and not have an unmitigated adverse impact on the stock for subsistence uses. Activities that are frequently identified as incidental take and therefore authorized include oil and gas development, geophysical surveys, and military training exercises. A separate Marine Mammal Protection Act assessment for the Proposed Project has been prepared and can be referenced in Appendix K.

8.1.2.3 Invasive Species, E.O. 13112, 64 FR 6183

This E.O. was issued to amend the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990, as amended (16 U.S.C. 4701 et seq.), Lacey Act, as amended (18 U.S.C. 42), Federal Plant Pest Act (7 U.S.C. 150 aa et seq.), Federal Noxious Weed Act of 1974, as amended (7 U.S.C. 2801 et seq.), ESA of 1973, as amended (16 U.S.C. 1531 et seq.), to further 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.

8.1.2.4 Magnuson-Stevens Fishery Conservation and Management Act - Essential Fish Habitat

The 1996 Sustainable Fishery Act amendments to the MSFMCA set forth provisions to identify and protect important habitats of federally managed marine and anadromous fish species. Under these provisions, federal agencies that fund, permit, or undertake activities that may adversely affect essential fish habitat (EFH) are required to consult with NOAA Fisheries regarding the potential effects of their actions on EFH. The MSFMCA established eight Fishery Management Councils responsible for protecting and managing certain fisheries within specific geographic jurisdictions. The councils are required to prepare fishery management plans (FMP) to regulate commercial and recreational fishing and to identify EFH for managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity" (16 U.S.C. 1802(10)).

8.1.2.5 Migratory Bird Treaty Act

The Gulf of Mexico (GOM) and coastal areas of Texas are crucial pathways for many birds along their migratory routes. The coastlines and nearby areas are known rest stops and temporary shelters during bird migrations. The MBTA makes it illegal for anyone to take any migratory bird or the parts, nests of eggs of such a bird. This extends to any species or families of birds that live, reproduce or migrate within or across any areas. The USFWS maintains a list of migratory species protected by the Act.

8.1.2.6 Bald and Golden Eagle Protection Act

The BGEPA prohibits anyone, without a permit, from "taking" eagle parts, nests, or eggs. The Act defines "take" as "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." "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 an injury, decrease in productivity or nest abandonment. Although the bald and golden eagles are not listed as threatened or endangered by the ESA, they both afford certain protections by federal law.

8.1.2.7 National Environmental Policy Act

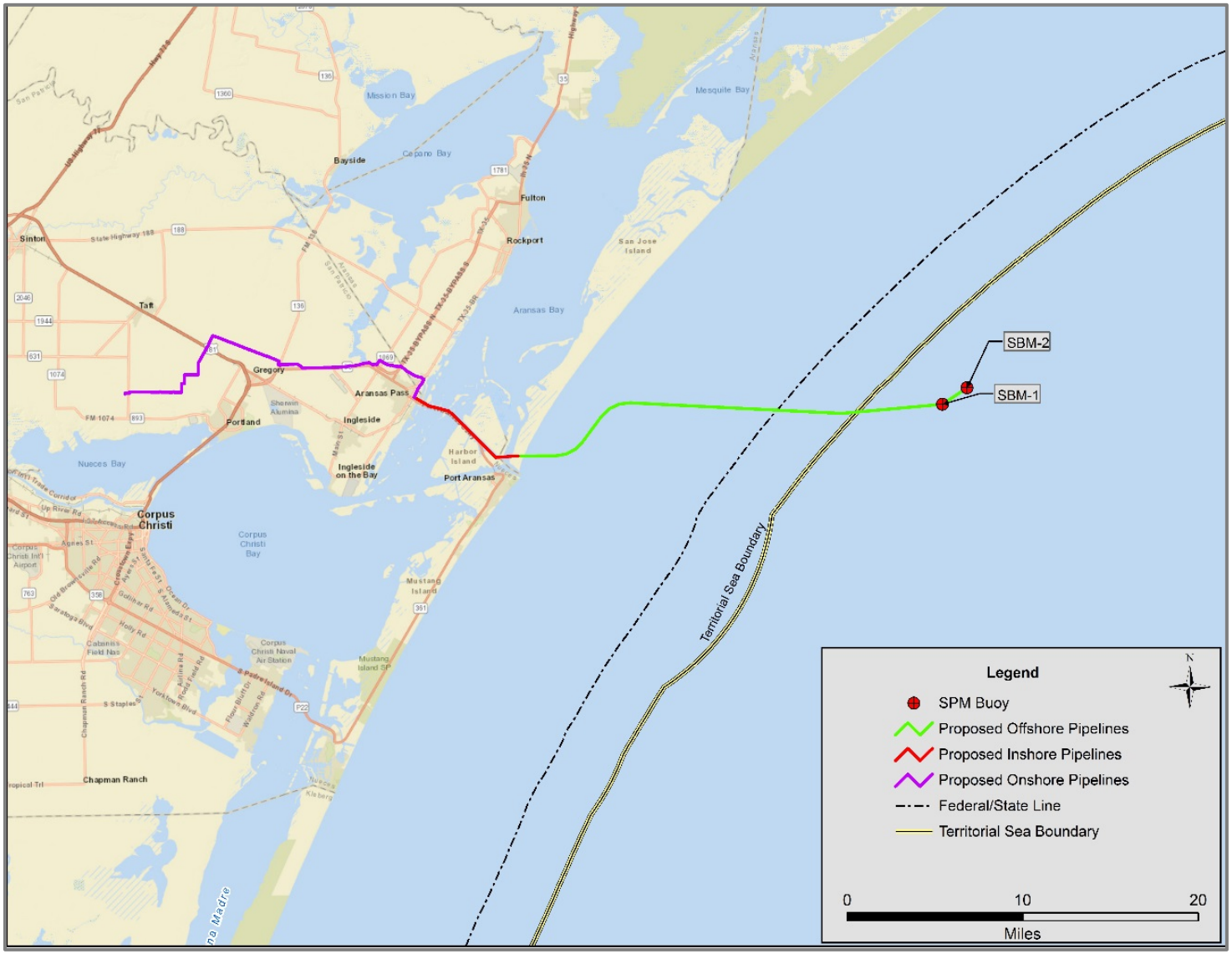
The NEPA requires all federal agencies to consider the potential environmental consequences of their proposals, document the environmental analysis, and make this information available to the public for comment prior to making a permit decision on any major federal action. Issuing permits for construction of the Project will qualify as a major federal action and trigger the requirement for NEPA analysis. Under the Deepwater Port Act of 1974 (DWPA), the U.S. Coast Guard (USCG) will initiate the NEPA process and have federal jurisdiction over the entire Project under NEPA. The USCG and Maritime Administration have determined that an environmental impact statement (EIS) will be prepared to support the NEPA process.

8.2 Proposed Project Impacts

8.2.1 Proposed Project Area

The Proposed Project area (Figure 8-1) considered for wildlife and protected species encompasses all aquatic and terrestrial habitats within the immediate vicinity of the Onshore Pipelines, Inshore Pipelines, Offshore Pipelines, and both SPM buoys (which make up the SPM buoy systems). The Onshore Pipelines will commence at a planned multi-use terminal facility located south of Taft, in San Patricio County, Texas. The Onshore Pipelines will traverse east from and continue through Aransas Pass, Texas, transitioning into the Inshore Pipelines at the western shore of Redfish Bay on the mainland. The Onshore Pipelines are generally within disturbed lands used for agriculture, but will cross ephemeral, intermittent, and perennial waterbodies as described in Section 5: Wetlands and Waters of the U.S. The Inshore Pipelines will occur in estuarine and marine waters between Redfish Bay and San Jose Island, opposite the City of Aransas Pass and including Aransas Channel. The Offshore Pipelines and SPM buoy systems will be in the marine waters of the GOM, offshore of San Jose Island to a point about 25.9 miles (mi) (41.7 kilometers [km]) from the closest onshore point.

Figure 8-1: Proposed Project Area



8.2.2 Proposed Project Area Existing Conditions

8.2.2.1 Fish

The marine habitats in the GOM, ranging from coastal marshes and estuaries to the deep-sea abyssal plain, support a diverse and abundant fish assemblage. The distribution of species is related to a variety of ecological factors, including salinity, primary productivity, and bottom substrate. These factors differ widely across the Gulf and between the inshore, nearshore, and offshore waters.

The Project will be located in freshwater, estuarine, and offshore habitats. Although freshwater waterbodies are crossed by the Onshore Pipelines, these waterbodies are predominantly ephemeral; therefore, no significant fisheries are anticipated and are not discussed further. The Inshore Pipelines will traverse estuarine bays between San Jose Island and the shore of the mainland. The Offshore Pipelines will begin at the seaward boundary of San Jose Island and extend to the SPM buoy systems at a depths of 88.5 to 89.5 feet (ft) (27.0 to 27.3 meters [m]. Fish species likely to be found in the vicinity of the Offshore Project Components are characterized as demersal and coastal pelagic; however, certain life stages of estuarine and reef species will also be present in the vicinity of the Offshore Project Components. Reef species are generally associated with coral reefs or hard-bottom habitat. Demersal species are those that feed on or near the seafloor. Coastal pelagic species can be found from the shoreline to the shelf edge in open waters. Each fish assemblage is further discussed below.

8.2.2.1.1 ESTUARINE FISHES

Approximately 42 percent of U.S. estuaries are in the GOM (U.S. Environmental Protection Agency [USEPA] 1999). Consequently, many fishes and invertebrates found in shelf waters are dependent on, or make use of, estuaries at some point in their life cycle (BOEM 2017). Most fish reside in estuaries during the late larval/early juvenile stage of development, resulting in commercial and recreational fisheries being estuarine-dependent (USEPA 1999). They tend to leave the estuaries as juveniles or subadults (once they are reproductive) and spawn at sea. Spawning activities typically are more concentrated in shallower waters during spring and summer, in response to warmer temperatures and variable salinity conditions. Eggs hatch in the waters of the open GOM, and the developing larvae become part of the offshore planktonic community. Under the influence of tides, currents, and winds, the young eventually arrive at the estuarine nursery grounds, where they feed, grow, and mature prior to migrating out to sea to repeat the spawning process. Most estuarine-dependent species grow rapidly and reach maturity in about one year; during that time, the young remain in the estuaries, taking advantage of the greater availability of food and protection that the estuarine habitats afford. They may remain in the estuary, migrate to sea to spawn (returning to the estuary between spawnings), or migrate from the shallow estuaries to spend the rest of their lives in the deeper waters of the GOM.

There is a nearly continuous estuarine ecosystem along the northern GOM coast, comprising 31 major estuarine systems (BOEM 2017). The inshore areas (landward of San Jose Island) between Corpus Christi and Aransas Bays are part of the Coastal Bend Bays and Estuaries complex. The complex includes barrier islands, tidal marshes, seagrass meadows, open bays, oyster and serpulid worm reefs, wind tidal flats, and freshwater marshes. This estuarine complex (which includes the upper Laguna Madre) is estimated to include 40 percent of the seagrasses in Texas (Byrnes et al. 2017).

8.2.2.1.2 REEF FISHES

Reef fishes are distributed widely in the GOM and occupy both pelagic and benthic habitats during their life cycle. Although juvenile and adult reef fish are typically demersal and associated with areas of higher relief (including artificial structures) on the continental shelf, several species can also be found over sand or soft-bottom substrates (e.g., juvenile red snapper [*Lutjanus campechanus]*) and in seagrass beds (e.g., juvenile snappers and groupers; GOM Fishery Management Council [GMFMC] 2004). The importance of artificial reefs to fishes is discussed in

Section 6: Aquatic Environment; the nearest artificial reef to the Proposed Project is Boatmen's Reef, about 5.7 mi (9.2 km) to the south.

A number of important reef fish species share the common life history characteristics of offshore spawning and transport of larvae inshore to settle in estuaries and seagrass meadows, where they spend the nursery phase, before recruiting to adult stocks offshore. Examples of estuarine-dependent reef fish are the gag (*Mycteroperca microlepis*) and the grey snapper (*Lutjanus griseus*). Other reef fish species are considered non-estuary dependent such as the red snapper and wenchman (*Pristipomoides aquilonaris*), which remain in offshore waters throughout their entire life cycle. Life histories for managed reef species that occur in the Project area are described in the EFH Assessment, which can be referenced in Appendix J.

8.2.2.1.3 DEMERSAL FISHES

The bottom-oriented, or demersal, fish fauna of the northwestern GOM are characterized by substrate composition and water depth (Gallaway 1981). Demersal fish assemblages are named by the dominant shrimp species found in the same sediment/depth regime. The dominant assemblages at the depths associated with the Project includes the white and brown shrimp assemblages.

The white shrimp (*Litopenaeus setiferus*) assemblage is found at depths of 0-66 ft (0-20 m). It is dominated by drums (Sciaenids), with the Atlantic croaker (*Micropogonias undulatus*) being the dominant species. Other abundant species include the Atlantic cutlassfish (*Trichiurus lepturus*), silver seatrout (*Cynoscion nothus*), star drum (*Stellifer lanceolatus*), sand seatrout (*Cynoscion arenarius*), Atlantic threadfin (*Polydactylus octonemus*), and hardhead catfish (*Arius felis*). As these assemblages were specifically identified for areas north of Matagorda Bay, the relative abundance of these species may vary at the Proposed Project site (Gallaway 1981). The brown shrimp assemblage is found at depths of 72 to 299 ft (22 to 91 m) (Gallaway 1981). The brown shrimp assemblage consists of species such as the longspine porgy (*Stenotomus caprinus*), sea robins (Triglidae), and dwarf goatfish (*Upeneus parvus*) (Gallaway 1981). Phillips and James (1988) identify the highest density of demersal fishes on the Texas shelf at depths between 240 and 269 ft (73 and 82 m). Similar to the white shrimp assemblage noted above, inshore Texas fisheries were noted as being dominated by Atlantic croaker, silver seatrout, and southern kingfish (*Menticirrhus americanus*) (Phillips and James 1988).

8.2.2.1.4 COASTAL PELAGIC FISHES

Coastal pelagic fish inhabit shelf waters of the GOM throughout the year. The distribution of most species depends on water column structure, which varies seasonally and spatially. These species can be divided into two groups: the large predatory species (e.g., mackerels, dolphinfish, jacks) and the smaller planktivorous species (e.g., Gulf menhaden, round scad [*Decapterus punctatus*], anchovies [Engraulidae]). Both groups form schools, undergo migrations, grow rapidly, mature early, and exhibit high fecundity. Spawning adults, eggs, and larvae occur over the continental shelf in pelagic waters; juveniles often occur in estuaries and coastal waters. Some species, such as Spanish mackerel (*Scomberomorus maculatus*), Gulf menhaden, anchovies, and herrings (Clupeidae), form large schools. Others, such as cobia (*Rachycentron canadum*), form small schools or travel singularly. The smaller coastal pelagic species often are preyed upon by the larger species, as well as by piscivorous (fish-eating) birds (BOEM 2017).

Some coastal pelagic species (especially Spanish sardine [*Sardinella aurita*], round scad, blue runner [*Caranx crysos]*, king mackerel [*Scomberomorus cavalla*], and cobia) show an affinity for vertical structure and often are observed around natural or artificial structures, where they are classified best as transients rather than true residents (BOEM 2017). Most of the large-bodied, predatory coastal pelagic species are important to commercial or recreational fisheries. King and Spanish mackerel, cobia, and jacks (Carangidae) are sought by the charter and recreational fisheries in the region. The major coastal pelagic families occurring in the waters covered by the Proposed Project are presented in Table 8-1.

Table 8-1: Major Coastal Pelagic Families Occurring in the Vicinity of the Proposed Project

Family	Common Name	Trophic Level	
		Predatory	Planktivorous
Carcarhinidae	Requiem sharks	X	
Elopidae	Ladyfish	X	
Engraulidae	Anchovies		X
Clupeidae	Herring		X
Scombridae	Mackerel and tuna	X	
Carangidae	Jacks and Scads	X	
Mugilidae	Mullet		X
Pomatomidae	Bluefish	X	
Rachycentridae	Cobia	X	

Source: BOEM 2017.

8.2.2.1.5 IMPACTS OF SOUND ON FISH

Sound can have both physical and behavioral impacts on fish. Fish produce and use sounds in a variety of behaviors, including reproduction, protection of territory, and aggression, and are able to detect a range of frequencies (Popper and Hastings 2005). Studies have shown that the sound waves from pile-driving may result in injury or trauma to fish and other animals with gas filled cavities, such as swim bladders, lungs, sinuses, and hearing structures, and may result in mortality (Popper and Hastings 2009, Popper and Hastings 2005). Other impacts of exposure to continuous and impulsive sounds may include damage to the ear, startle responses, avoidance, or lack of responsiveness to biologically relevant sounds due to masking (Popper and Hastings 2005). NOAA Fisheries uses 150 decibels (dB) at a reference pressure of 1 micro Pascal (µPa) (dB re 1 µPa) as the threshold for behavioral effects on fish species of particular concern, citing that noise levels in excess of 150 dB re 1 µPa root mean square (RMS) can cause temporary behavior changes (startle and stress) that could decrease a fish's ability to avoid predators (NMFS 2017; see Section 13.2.2.2).

8.2.2.1.6 ESSENTIAL FISH HABITAT

As required by the MSFMCA, an EFH Assessment has been developed for the Proposed Project to include a description of the Proposed Project, an analysis of the potential impacts on both the managed species and their designated EFH, and proposed mitigation measures selected to minimize expected Project effects. The EFH Assessment is included as Appendix J and is summarized below.

Marine fisheries in the Proposed Project area are under primary jurisdiction of the GMFMC, established under authority of the MSFMCA. The GMFMC works together with NMFS to manage commercially and recreationally important marine fish stocks and to prepare FMPs for target species. The GMFMC defines six FMPs for the GOM: shrimp, red drum, reef fish, coastal migratory pelagics, corals, and spiny lobster. In addition, NMFS' Highly Migratory Species Division manages an FMP for highly migratory species (sharks, tuna, billfish, and swordfish), as they cross domestic and international boundaries. Corals and spiny lobster do not occur in the Proposed Project area and are therefore not addressed further. Many of the managed species are economically important as commercial and recreational fisheries. Five shrimp species are managed under the Shrimp FMP, the most abundant of which are brown and white shrimp. Adult shrimp are found over soft-bottom estuarine, inshore, and offshore habitats throughout the GOM. Most species occur at depths up to 328 ft (100 m); however, royal red shrimp occur in deeper water (GMFMC 2004). Red drum occur throughout the GOM in a variety of habitats ranging from shallow

estuarine waters to depths of approximately 131 ft (40 m) offshore; they range from the Atlantic coast to Mexico. They are common in the majority of GOM estuaries, existing in a dynamic range of substrates including seagrass, sand, mud, and oyster reefs. This species can survive in waters ranging from freshwater to highly saline water; no optimum salinity has been determined. Reef fish include species that live on or near coral reef or hard-bottom habitat, such as snapper, grouper, tilefish, bass, triggerfish, and other species groups (GMFMC 2004).

Coastal migratory pelagic species include king mackerel, Spanish mackerel, and cobia; these species occur in the coastal and continental shelf waters throughout the GOM and to the northeastern U.S. Each of these species occurs in nearshore and pelagic open water (GMFMC 2004). NMFS' Highly Migratory Species Division manages an FMP for highly migratory species (sharks, tuna, billfish, and swordfish) as they cross domestic and international boundaries. These species use a variety of habitats throughout the GOM (NOAA 2017).

Habitat areas of particular concern (HAPC) are localized areas of EFH that are ecologically important, sensitive, stressed, and/or rare areas. Although designated HAPCs have no regulatory protections above all other EFH, projects impacting HAPCs may be more scrutinized, and may be subject to additional conservation measures (NOAA 2015). The Proposed Project will not impact any designated HAPCs and the closest one (Stetson Bank within Flower Garden Banks National Marine Sanctuary) is about 143 mi (230 km) east of the SPM buoy systems.

To develop EFH for the fisheries, the GMFMC and NOAA Fisheries categorized substrates and biogenic features by zone and type. Habitat zones include estuarine (bays, estuaries, and waters inshore of barrier islands), nearshore (marine waters less than 60 ft [18 m] deep), and offshore (marine waters greater than (>) 60 ft [18 m] deep). Habitat types are further classified into 12 categories that are distributed across the estuarine, nearshore, and offshore zones (Table 8-2) (GMFMC 2004). Based on review of publicly available data and the results of side-scan sonar, the habitats present in the Proposed Project area include submerged aquatic vegetation (SAV), oyster reefs, and estuarine wetlands (including mangroves) within and along Redfish and South Bays; and *Sargassum*, soft bottoms (including sand/shell bottoms), and the water column within nearshore and offshore zones. These habitats are described in detail in Section 6: Aquatic Environment and Appendix J: Essential Fish Habitat Assessment.

Table 8-2: EFH Habitat Types in the Proposed Project Area

Habitat Type	Associated Terms	Description	Presence within the Proposed Project Area
Submerged Aquatic Vegetation (SAV)	Seagrasses, benthic algae	Marine and vascular plants found in shallow estuaries and some nearshore habitats (Williams and Heck 2001). Algae may be epiphytic or may grow attached to shell/rubble. This habitat provides important nursery habitat for numerous species.	Inshore
Mangroves	--	Communities of halophytic trees and shrubs in typically soft sediments with regular tidal inundation, some freshwater inputs, and low to moderate wave energy. Found where the sea meets land and contain terrestrial and aquatic elements.	Inshore
Drift algae	Sargassum	Floating mats of seaweed that travels through the GOM with the currents and supports a diverse assemblage of marine organisms.	Offshore
Emergent marshes	Tidal wetlands, salt marshes, tidal creeks, rives/streams	Vegetated wetlands with typically soft sediments, regular tidal inundation, some freshwater inputs, and low to moderate wave energy. Found where the sea or body of water meets land and contain terrestrial and aquatic elements.	Inshore
Soft bottoms	Mud, clay, silt	Areas where the bottom sediments are soft mud, clay, or silt. Shrimp and many demersal species of fish often actively select for this substrate type.	Inshore / Offshore
Sand / shell bottoms	Sand	Areas where the bottom sediments consist of soft sand and/or shell. Generally included in the term “soft-bottom”.	Inshore / Offshore
Hard bottoms	Live hard bottoms, low- and high-relief irregular bottoms	Subtidal hard-bottom communities, usually submerged rocky outcroppings. Generally dominated by epifaunal organisms (e.g., sponges, corals, hydroids).	No
Oyster reefs	--	Aggregations of live and dead oysters with associated flora and fauna. Occur in intertidal and subtidal areas where salinities are relatively high. Estuaries with suitable substrate, calm and continuous water flow, and low sedimentation are ideal for development.	Inshore
Banks / shoals	--	Submerged ridges or bars of bottom sediment (such as sand) that rises from the water bottom to near the surface.	No
Reefs	Reefs, reef halos, patch reefs, deep reefs	Hermatypic (hard) and ahermatypic (soft) coral assemblages that dominate a habitat.	No
Shelf edge/slope	Shelf edge, shelf slope	The continental slop is a transitional environment influenced by processes of both the shelf, which ends at roughly the 200-m isobath, and the deep sea. The shelf/slope transition zone occurs between depths of 492 ft (150 m) and 1,476 ft (450 m)	No

Source: GMFMC 2016.

In addition to those habitat zones and types described in Table 8-2, the GMFMC divided the GOM into five ecoregions to further refine species distribution. The Proposed Project is located in the nearshore and offshore areas of Ecoregion 5, which covers an area from Freeport, Texas to the U.S./Mexico border. A total of 35 species managed by the GMFMC are identified as occurring within the nearshore and offshore habitats of Ecoregion 5, including 4 shrimp species, the red drum, 15 reef fish species, 3 coastal migratory pelagic fish species, and 12 highly migratory species (see Tables 8-3 and 8-4). An assessment of impacts on EFH for managed species and figures depicting EFH in the Proposed Project area are included in Appendix J.

Table 8-3: GMFMC Managed Fishes Identified in Ecoregion 5 by Life Stage

Common Name	Scientific Name	Life Stage				
		Eggs	Larvae	Juveniles	Adults	Spawning Adults
Shrimp						
Brown Shrimp	*Farfantepenaeus aztecus*	x	x	x	x	x
Pink Shrimp	*Farfantepenaeus duorarum*	x	x	x	x	x
White Shrimp	*Litopenaeus setiferus*	x	x	x	x	x
Royal Red Shrimp	*Pleoticus robustus*	N/A	N/A	N/A	x	x
Red Drum						
Red Drum	*Sciaenops ocellatus*	x	x	x	x	x
Reef Fish						
Queen Snapper	*Etelis oculatus*	--	--	--	--	--
Mutton Snapper	*Lutjanus analis*	--	--	--	--	--
Blackfin Snapper	*Lutjanus bucanella*	--	--	--	--	--
Red Snapper	*Lutjanus campechanus*	x	x	x	x	x
Cubera Snapper	*Lutjanus cyanopterus*	--	--	--	--	--
Gray (Mangrove) Snapper	*Lutjanus griseus*	--	--	--	x	x
Lane Snapper	*Lutjanus synagris*	x	x	x	x	x
Silk Snapper	*Lutjanus vivanus*	--	--	--	--	--
Yellowtail Snapper	*Ocyurus chrysurus*	--	--	--	--	--
Wenchman	*Pristipomoides aquilonaris*	x	x	x	x	x
Vermilion Snapper	*Rhomboplites aurorubens*	x	x	x	x	x
Speckled Hind	*Epinephelus drummondhayi*	--	--	--	--	--
Goliath Grouper	*Epinephelus itajara*	x	x	x	x	x
Yellowedge Grouper	*Hyporthodus flavolimbatus*	x	x	x	x	x
Red Grouper	*Epinephelus morio*	--	--	--	--	--

Table 8-3: GMFMC Managed Fishes Identified in Ecoregion 5 by Life Stage

Common Name	Scientific Name	Life Stage				
		Eggs	Larvae	Juveniles	Adults	Spawning Adults
Warsaw Grouper	*Epinephelus nigritus*	x	x	x	x	x
Snowy Grouper	*Epinephelus niveatus*	--	--	--	--	--
Nassau Grouper	*Epinephelus striatus*	--	--	--	--	--
Black Grouper	*Mycteroperca bonaci*	--	--	--	--	--
Yellowmouth Grouper	*Mycteroperca interstitalis*	x	x	x	x	x
Gag	*Mycteroperca microlepis*	--	--	--	x	x
Yellowfin Grouper	*Mycteroperca venenosa*	--	--	--	--	--
Scamp Grouper	*Mycteroperca phenax*	--	--	--	--	--
Goldface Tilefish	*Caulolatilus crysops*	--	--	--	--	--
Blueline Tilefish	*Caulolatilus microps*	--	--	--	--	--
Tilefish	*Lopholatilus chamaeleonticeps*	x	x	x	x	x
Greater Amberjack	*Seriola dumerili*	x	x	x	x	x
Lesser Amberjack	*Seriola fasciata*	x	x	x	x	x
Almaco Jack	*Seriola rivoliana*	x	x	x	x	x
Banded Rudderfish	*Seriola zonata*	--	--	--	--	--
Gray Triggerfish	*Balistes capriscus*	x	x	x	x	x
Hogfish	*Lachnolaimus maximus*	--	--	--	--	--
Coastal Migratory Pelagic Fishes						
King Mackerel	*Scomberomorus cavalla*	x	x	x	x	x
Spanish Mackerel	*Scomberomorus maculatus*	--	x	--	--	--
Cobia	*Rachycentron canadum*	x	x	x	x	x

Key:
"—" Indicates that the species is not identified as occurring in Ecoregion 5 for the indicated life stage.
"X" Indicates the species is identified as occurring in Ecoregion 5 for the indicated life stage.
"N/A" Indicates that data is not available for the species at the indicated life stage.
Sources: GMFMC 2016, NMFS 2019a.

Table 8-4: Highly Migratory Species Potentially Occurring in the Proposed Project Area by Life Stage

Common Name	Scientific Name	Spawning / Eggs / Larvae[a]	Neonates[a]	Juveniles	Adults
Sailfish	*Istiophorus platypterus*	-	N/A	x	x
Scalloped Hammerhead Shark	*Sphyrna lewini*	N/A	x	--	--
Blacktip Shark	*Carcharhinus limbatus*	N/A	x	x	x
Bull Shark	*Carcharhinus leucas*	N/A	x	x	x
Lemon Shark	*Negaprion brevirostris*	N/A	x	x	--
Sandbar Shark	*Carcharhinus plumbeus*	N/A	--	--	x[b]
Spinner Shark	*Carcharhinus brevipinna*	N/A	x	x	x
Whale Shark	*Rhincodon typus*	N/A	x[b]	x[b]	x[b]
Bonnethead Shark	*Sphyrna tiburo*	N/A	x	x	x
Atlantic Sharpnose Shark	*Rhizoprionodon terraenovae*	N/A	x	x	x
Blacknose Shark	*Carcharhinus acronotus*	N/A	--	x	x
Finetooth Shark	*Carcharhinus isodon*	N/A	x	x	x

[a] The earliest life stages for billfishes are eggs and larvae; the earliest life stage for most sharks is the neonate.

[b] Although the Proposed Project does not cross EFH for this life stage, it is located in the immediate vicinity of the Proposed Project.

"-" Indicates that the species is not identified as occurring in Ecoregion 5 for the indicated life stage.

"x" Indicates that the species is identified as occurring in Ecoregion 5 for the indicated life stage.

"N/A" Indicates that data is not available for the species at the indicated life stage.

Source: NMFS 2019a.

8.2.2.2 Marine Mammals

Twenty-eight species of marine mammals (Table 8-5) are known to occur, at least occasionally, in waters of the GOM (BOEM 2017). With one species exception, all of these mammals belong to the order Cetacea. Of the 28 species of marine mammal occurring in the GOM, 7 belong to the suborder Mysticeti (baleen whales), and 21 belong to the suborder Odontoceti (toothed whales). The exception, the West Indian manatee (*Trichecus manatus*) and its subspecies, the Florida manatee (*Trichehus manatus latirostris*), belong to the order Sirenia. All of these species are protected by the MMPA, and seven are further protected by the ESA of 1973; species protected under the ESA are specifically discussed in Section 8.2.2.7.

Only two of the non-endangered mammal species are known to regularly inhabit the shallow shelf waters in the Proposed Project area: the Atlantic spotted dolphin (*Stenella frontalis*) and the bottlenose dolphin (*Tursiops truncatus*). A third species, the rough-toothed dolphin (*Steno bredanensis*) is most likely to be found in deeper waters but has been identified in shelf waters near the Proposed Project location. These three species are discussed further below. The remaining non-endangered marine mammal species that occur in the GOM are found in depths deeper than that of the Proposed Project and are considered unlikely to occur in the Project area. A separate Marine Mammal Protection Act assessment for the Proposed Project has been prepared and can be referenced in Appendix K.

Table 8-5: Marine Mammals Occurring in the Northern Gulf of Mexico				
Common Name	**Scientific Name**	**Protection**	**Occurrence**	**Abundance and Occurrence in the GOM**
Order Cetacea				
Suborder Mysticeti (baleen whales)				
Blue Whale	*Balaenoptera musculus*	ESA (E), MMPA	Distributed in sub-polar to sub-tropical latitudes worldwide. Migrates toward polar waters in spring. While found in coastal waters, they are thought to occur generally more offshore than other whales.	An occasional visitor in U.S. waters in the Western North Atlantic, which could occur as far south as Florida and the GOM; however, the southern limit of the species' range is unknown and the population of this stock is small (perhaps between 400 and 600 individuals). Given the potential to occur in coastal waters, the species could occur in the Proposed Project area.
Bryde's whale	*Balaenoptera edeni*	MMPA (strategic stock), proposed endangered under the ESA	Occurs in tropical, sub-tropical, and warm temperate waters worldwide.	No confirmed sightings of Bryde's whales have been documented in the north central or western GOM since NMFS began surveys in the early 1990s such that NMFS indicates that the species almost exclusively occurs in the northeastern GOM. Therefore, the species is not expected to occur in the Proposed Project area. The abundance of the northern GOM stock is 33.
Fin whale	*Balaenoptera physalus*	ESA (E), MMPA	Distributed in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes; less common in the tropics. Most migrate from the Arctic and Antarctic feeding areas in the summer to tropical breeding and calving areas in the winter.	An estimated 2,700 fin whales occur in the North Atlantic and GOM; individuals occur in deep, offshore waters but have also been observed in continental shelf waters. Given the potential to occur in continental shelf waters, the species could occur in the Proposed Project area.
Humpback whale	*Megaptera novaeanglia*	ESA (E), MMPA	Distributed throughout all major oceans from the equator to sub-polar latitudes. Not expected to occur in the northern and western GOM.	The Gulf of Maine stock of humpback whales, which winters in the West Indies where the majority of whales are found in the waters of the Dominican Republic, is the nearest population to the Proposed Project; however, individuals occasionally occur in nearshore waters of the GOM during the winter and could occur in the Proposed Project area. The population size is unknown.
Minke whale	*Balaenoptera acutorostrata*	MMPA	Distributed in temperate, tropical, and high latitude waters. Common and widely distributed throughout the Atlantic Exclusive Economic Zone. Prefer the continental shelf from spring to fall; prefer oceanic waters from fall to spring.	Most abundant in New England during the spring to fall period of occurrence on the continental shelf, and occur in lower latitudes (which may include the GOM) in winter. The abundance of the Canadian East Coast stock, which extends to the GOM, is estimated at 2,591 individuals. Given the species is most abundant in New England waters when occurring on the continental shelf, the species is not expected to occur in the Proposed Project area.

Table 8-5: Marine Mammals Occurring in the Northern Gulf of Mexico				
Common Name	**Scientific Name**	**Protection**	**Occurrence**	**Abundance and Occurrence in the GOM**
Sei whale	*Balaenoptera borealis*	ESA (E), MMPA	Distributed in sub-tropical, temperate, and sub-polar waters. May unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. May migrate toward lower latitudes during winter and higher latitudes during summer.	The movements of sei whales are not well known; however, individuals prefer temperate waters in the mid-latitudes and are typically observed in deeper waters far from the coastline. However, they occasionally enter shallower, more inshore waters. The Nova Scotia stock of sei whales is estimated at 357 individuals; NMFS does not track a GOM stock of this species. Therefore the species may occur in the Proposed Project area.
Suborder Odontoceti (toothed whales and dolphins)				
Atlantic spotted dolphin	*Stenella frontalis*	MMPA	In the GOM, occur primarily along the continental shelf at 33 to 656 ft (10 to 200 m) deep, to the continental slope at 1,641 ft (500 m).	Likely to occur in the Proposed Project area. The current population size is unknown, but abundance estimates from data through 2004 included 37,611 individuals in the northern GOM.
Blainville's beaked whale	*Mesoplodon densirostris*	MMPA	Oceanic species; prefers temperate and tropical waters > 1,641, ft (500 m) deep.	Known to occur in the oceanic GOM; there have been 4 documented standings and 2 sightings in the northern GOM and observations occur at depths greater than 1,649 ft (500 m). Given the depth range of the species, it is not expected to occur in the Proposed Project area. The abundance in the GOM most recently estimated for Blainville's and Gervais' beaked whales is 149.
Bottlenose dolphin	*Tursiops truncatus*	MMPA	Western coastal stock occurs outside of bays and estuaries, and in GOM waters less than 20 m deep, from the Laguna Madre to the Florida Keys.	Likely to occur in the Proposed Project area. The abundance for stocks that may occur in the Proposed Project area are estimated at 20,161 animals (Western Coastal Stock), 51,192 animals (Continental Shelf Stock), 80 animals (Laguna Madre), and 58 animals (Nueces Bay/Corpus Christi Bay).
Clymene dolphin	*Stenella clymene*	MMPA	Endemic to tropical and sub-tropical waters of the Atlantic. Prefers deep, oceanic waters off the continental shelf in the GOM, west of the Mississippi River.	Not expected to occur in the Proposed Project area, since sightings in the GOM occur primarily in the deeper waters off the continental shelf (i.e., beyond the 200-m isobath), west of the Mississippi River. The abundance in the GOM is estimated to be 129 individuals.
Cuvier's beaked whale	*Ziphius cavirostris*	MMPA	Oceanic species; prefers waters > 1,641 ft (500 m) deep.	Known to occur in the oceanic GOM; observations of beaked whales in the northern GOM occur at depths greater than 1,649 ft (500 m). Given the depth range of the species, it is not expected to occur in the Proposed Project area. The abundance in the northern GOM is estimated to be 74 individuals

Table 8-5: Marine Mammals Occurring in the Northern Gulf of Mexico

Common Name	Scientific Name	Protection	Occurrence	Abundance and Occurrence in the GOM
Dwarf sperm whale	*Kogia simus*	MMPA	Distributed worldwide in temperate to tropical waters. Prefer oceanic waters in northern GOM.	Known to occur in the oceanic GOM; given the occurrence within oceanic (not continental shelf) waters, this species is not expected to occur in the Proposed Project area. The abundance in the GOM of dwarf and pygmy sperm whales, which are difficult to distinguish, is estimated to be 186 individuals.
False killer whale	*Pseudorca crassidens*	MMPA	Distributed worldwide in warm temperate and tropical oceans. In the northern GOM, this species prefers deep, oceanic waters.	Known to occur in the oceanic waters of the GOM; most sightings are documented in the eastern GOM. Given the occurrence within oceanic (not continental shelf) waters, this species is not expected to occur in the Proposed Project area. Data for abundance of this species is greater than 8 years old and therefore, unknown.
Fraser's dolphin	*Lagenodelphis hosei*	MMPA	Distributed worldwide in tropical waters. In the northern GOM, this species prefers oceanic waters > 656 ft (200 m) deep.	Sightings in the GOM have occurred in oceanic waters greater than 656 ft (200 m). The abundance in the GOM is unknown and this species was not identified within the GOM during surveys conducted in 2009. Given the depth range of the species and limited sightings, it is not expected to occur in the Proposed Project area.
Gervais' beaked whale	*Mesoplodon europaeus*	MMPA	Distributed worldwide in temperate and tropical waters of the world oceans. Prefers oceanic waters in the GOM > 1,641 ft (500 m) deep.	Known to occur in the oceanic GOM; there have been 16 documented strandings in the GOM and observations occur at depths greater than 1,649 ft (500 m). Given the depth range of the species, it is not expected to occur in the Proposed Project area. The abundance in the GOM most recently estimated for Blainville's and Gervais' beaked whales is 149.
Killer whale	*Orcinus orca*	MMPA	Distributed worldwide from tropical to polar regions. In the northern GOM, the killer whale prefers oceanic waters ranging from 840 to 8,701 ft (256 to 2,652 m).	Sightings in the GOM have been documented in waters with a depth range from 840 to 8,701 ft (256 to 2,652 m). The northern GOM stock is estimated to be 28 individuals. Given the lack of occurrence data in continental shelf waters (with only 3 occurrences documented, the most recent in 1987), the species is not expected to occur in the Proposed Project area.
Melon-headed whale	*Peponocephala electra*	MMPA	Distributed worldwide in tropical to sub-tropical waters. In the northern GOM, this species prefers oceanic waters west of Mobile Bay, Alabama that are > 2,625 ft (800 m) deep.	Sightings in the GOM have been documented in waters with a depth greater than 2,626 ft (800 m). Therefore, the species is not expected to occur in the Proposed Project area. The abundance in the GOM is estimated to be 2,235 individuals.

Table 8-5: Marine Mammals Occurring in the Northern Gulf of Mexico

Common Name	Scientific Name	Protection	Occurrence	Abundance and Occurrence in the GOM
Pantropical spotted dolphin	*Stenella attenuata*	MMPA	Distributed worldwide in tropical and certain sub-tropical oceans. In the northern GOM, this species prefers oceanic waters.	Occurrence is documented throughout oceanic waters greater than 656 ft (200 m) deep in the GOM. Given the depth range of the species, it is not expected to occur in the Proposed Project area. The abundance in the GOM is estimated to be 50,880 individuals.
Pygmy killer whale	*Feresa attenuata*	MMPA	Distributed worldwide in tropical and sub-tropical waters. In the northern GOM, pygmy killer whales prefer oceanic waters.	Sightings in the GOM have been documented primarily in oceanic waters. Given the lack of occurrence data in continental shelf waters, the species is not expected to occur in the Proposed Project area. The abundance in the GOM is estimated to be 152 individuals.
Pygmy sperm whale	*Kogia breviceps*	MMPA	Distributed worldwide in temperate to tropical waters. In northern GOM, the pygmy sperm whale prefers oceanic waters during all seasons.	Known to occur in the oceanic GOM; given the occurrence within oceanic (not continental shelf) waters, this species is not expected to occur in the Proposed Project area. The abundance in the GOM of dwarf and pygmy sperm whales, which are difficult to distinguish, is estimated to be 186 individuals.
Risso's dolphin	*Grampus griseus*	MMPA	Distributed worldwide in tropical to warm temperate waters. In the northern GOM, Risso's dolphin prefers oceanic waters but is concentrated in waters along the continental slope during all seasons.	Occurrence is documented throughout oceanic waters greater than 656 ft (200 m) deep in the GOM. Given the depth range of the species, it is not expected to occur in the Proposed Project area. The abundance in the GOM is estimated to be 2,442 individuals.
Rough-toothed dolphin	*Steno bredanensis*	MMPA	Distributed worldwide in tropical to warm temperate waters. In the northern GOM, this species occurs in oceanic waters averaging 640 ft (195 m) deep and sometimes along the continental shelf.	Occur in oceanic, and, to a lesser extent, continental shelf waters in the northern GOM. Most observations have occurred in oceanic waters greater than 656 ft (200 m). The species could occur in the Proposed Project area given observations along the continental shelf. The abundance of the GOM is estimated to be 624; however, this is believed to be an underestimated approximation.
Short-finned pilot whale	*Globicephala macrorhynchus*	MMPA	Distributed worldwide in tropical to temperate waters. In the northern GOM, the short-finned pilot whale occurs primarily on the continental slope during all seasons.	Occur throughout the oceanic GOM, individuals are typically observed along the continental slope and therefore not expected to occur in the Proposed Project area. The best abundance estimate for the northern GOM is estimated at 2,415 individuals.

Table 8-5: Marine Mammals Occurring in the Northern Gulf of Mexico

Common Name	Scientific Name	Protection	Occurrence	Abundance and Occurrence in the GOM
Sperm whale	*Physeter macrocephalus*	ESA (E), MMPA	Distributed worldwide, but generally prefer waters deeper than 1,641 ft (500 m).	Occurs in deep waters throughout the oceanic GOM; therefore, the species is not expected to occur in the Proposed Project area. The population of the GOM stock is estimated to be 763 individuals.
Spinner dolphin	*Stenella longirostris*	MMPA	Distributed worldwide in tropical to temperate oceanic waters. In the northern GOM, the spinner dolphin is located generally east of the Mississippi River.	Occur throughout the oceanic GOM; documented sightings are in the eastern GOM and at depths greater than 328 ft (100 m). The best abundance estimate for the northern GOM is estimated at 11,441 individuals. The species is not expected to occur in the Proposed Project area, given that documented occurrences are in the eastern GOM.
Striped dolphin	*Stenella coeruleoalba*	MMPA	Distributed worldwide in tropical to temperate oceanic waters. In the northern GOM the striped dolphin prefers oceanic waters.	Occur throughout the oceanic GOM; given the occurrence within oceanic (not continental shelf) waters, this species is not expected to occur in the Proposed Project area. The best abundance estimate (from 2009) for the GOM is estimated at 1,849.
Sowerby's beaked whale	*Mesoplodon bidens*	MMPA	Prefers northern temperate waters of the northern Atlantic. In the GOM considered extralimital due to only 1 reported stranding throughout its history.	The Western North Atlantic stock ranges from New England waters up to the ice pack but is considered rare in Canada. Sightings have occurred south to the central-eastern coast of Florida, along the shelf edge and deeper waters. One stranding record for the west coast of Florida in 1989. As the species is considered extralimital to the GOM and does not occur over shelf waters where known, it is not anticipated in the Proposed Project area.
Order Sirenia (sea cows)				
Florida manatee	*Trichechus manatus latirostris*	ESA (E), MMPA	Distributed throughout the northeastern GOM. Prefers riverine and shallow nearshore waters where temperatures are above 63 degrees Fahrenheit (°F) with abundant seagrasses, water hyacinth, and aquatic weeds.	May occur in nearshore waters in the Proposed Project area. The range-wide population of this species is estimated at 1,300 individuals.

Sources: Fulling et al. 2003, Byrnes et al. 2017, Hayes et al. 2017a,b, NMFS 2012, 2018 a,b,c, USFWS 2019a, Waring et al. 2011, 2013, 2015, 2016.

8.2.2.2.1 ATLANTIC SPOTTED DOLPHIN

The Atlantic spotted dolphin (*Stenella frontalis*) is common in the northern GOM, where it is found in shallow continental shelf waters (32 ft [10 m] deep) down to slope waters less than 1,640 ft (500 m) deep. The species occurs in two forms that may be distinct subspecies; however, only the larger, heavily spotted form is known to occur in the GOM. Evidence has further supported predominantly independent populations within the GOM, one of which primarily occupies the shelf waters from the Texas/Mexico border to the Florida panhandle, and the other of which is concentrated over the western shelf of Florida (see Figure 8-2). The current population size is unknown, but abundance estimates from data through 2004 included 37,611 individuals in the northern GOM (Waring et al. 2016).

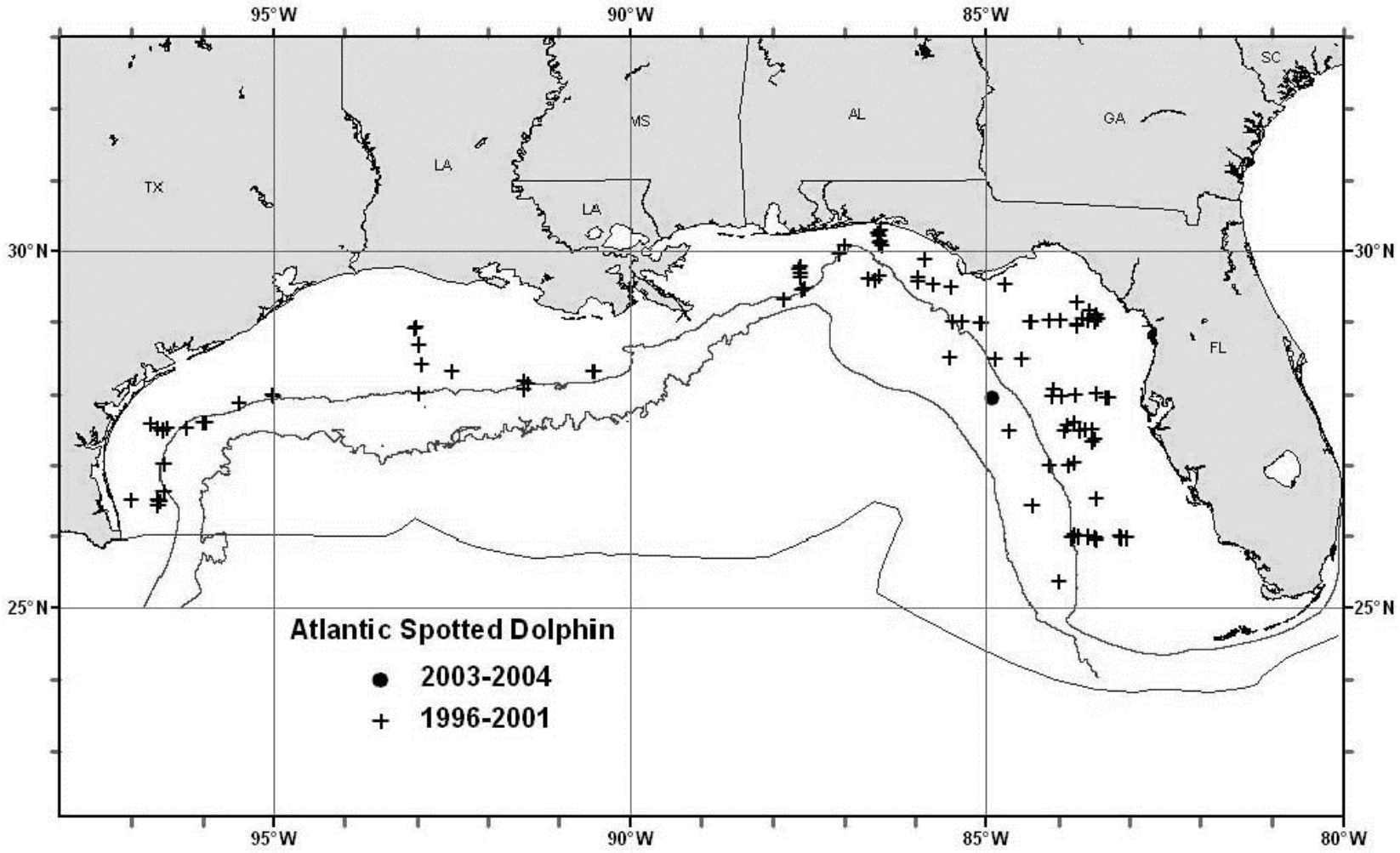
8.2.2.2.2 BOTTLENOSE DOLPHIN

The bottlenose dolphin (*Tursiops truncatus*) is commonly found in most tropical, temperate, and sometimes cooler waters across the world. Within the GOM, bottlenose dolphins are classified as one of 36 different stocks according to their habitat and general location. The various stocks occur in bays/estuaries, coastal areas, on the continental shelf, and in oceanic waters. The two stocks most likely to occur in the nearshore and Offshore Project waters include the Western Coastal Stock and the Continental Shelf Stock. The two stocks most likely to occur in the inshore waters of the Proposed Project area include the Copano/Aransas/San Antonio/Redfish/Espiritu Santo Bay and the Nueces Bay/Corpus Christi Bay Estuary Stock.

The Western Coastal Stock is defined as those dolphins that occur between the shore, barrier islands (in this case Mustang and San Jose Islands), or outer bay boundaries, out to the 66-ft (20-m) isobath from the Texas/Mexico border to the Mississippi River delta (see Figure 8-3). The Continental Shelf Stock includes those dolphins occurring between the 66-ft (20-m) and 656-ft (200-m) isobaths across the entire northern GOM (see Figure 8-4). The degree of overlap between the two stocks is unknown, but genetic studies have shown significant differences between them. The best population estimates for these two stocks are 20,161 animals (Western Coastal Stock) and 51,192 animals (Continental Shelf Stock). Neither stock is considered "strategic" under the MMPA, which indicates that human-caused mortality does not exceed the potential biological removal level (i.e., human-caused mortalities do not preclude a stock's ability to reach or maintain its optimum sustainable population (Waring et al. 2016).

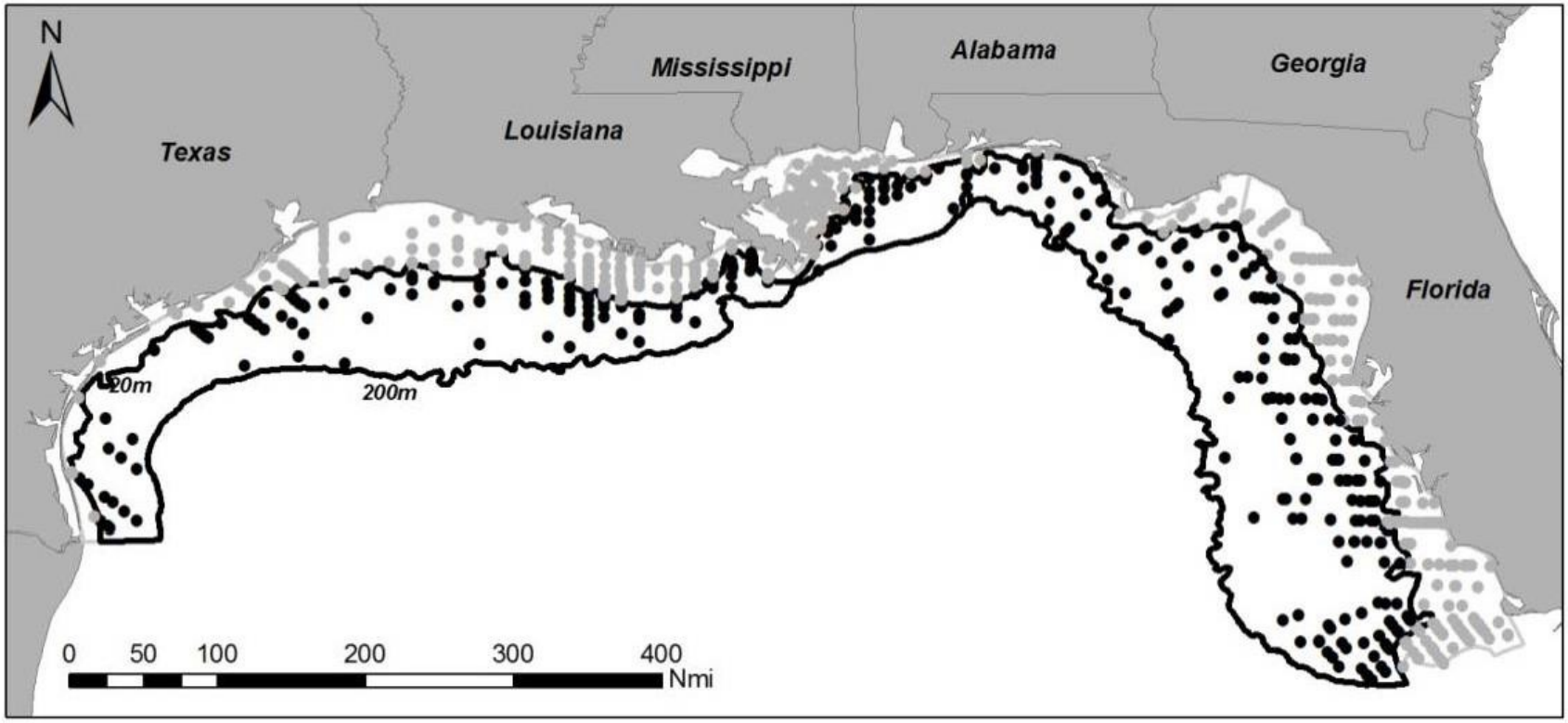
In addition to nearshore and offshore stocks, bottlenose dolphins distributed throughout the bays, sounds, and estuaries of the GOM have been identified as 31 individual stocks. These inshore stocks are generally believed to have year-round residencies in their respective estuarine waters with limited or no interbreeding and intermixing between stocks; recent analysis indicates that there may also be multiple, demographically-independent populations within a given estuarine stock, particularly those in larger bays and estuaries. Resident animals are also believed to have limited movements through passes to the GOM. The best population estimates for these two stocks are 55 animals (Copano/Aransas/San Antonio/Redfish/Espiritu Santo Bay) and 58 animals (Nueces Bay/Corpus Christi Bay). NMFS considers 30 of the 31 inshore stocks (all but the Sarasota Bay/Little Sarasota Bay stock) to be strategic stocks based on their small/unknown populations, which indicates that a relatively few mortalities and serious injuries could exceed the potential biological removal level (NMFS 2018b).

Figure 8-2: Distribution of Atlantic Spotted Dolphins Sighted During 1996 - 2004



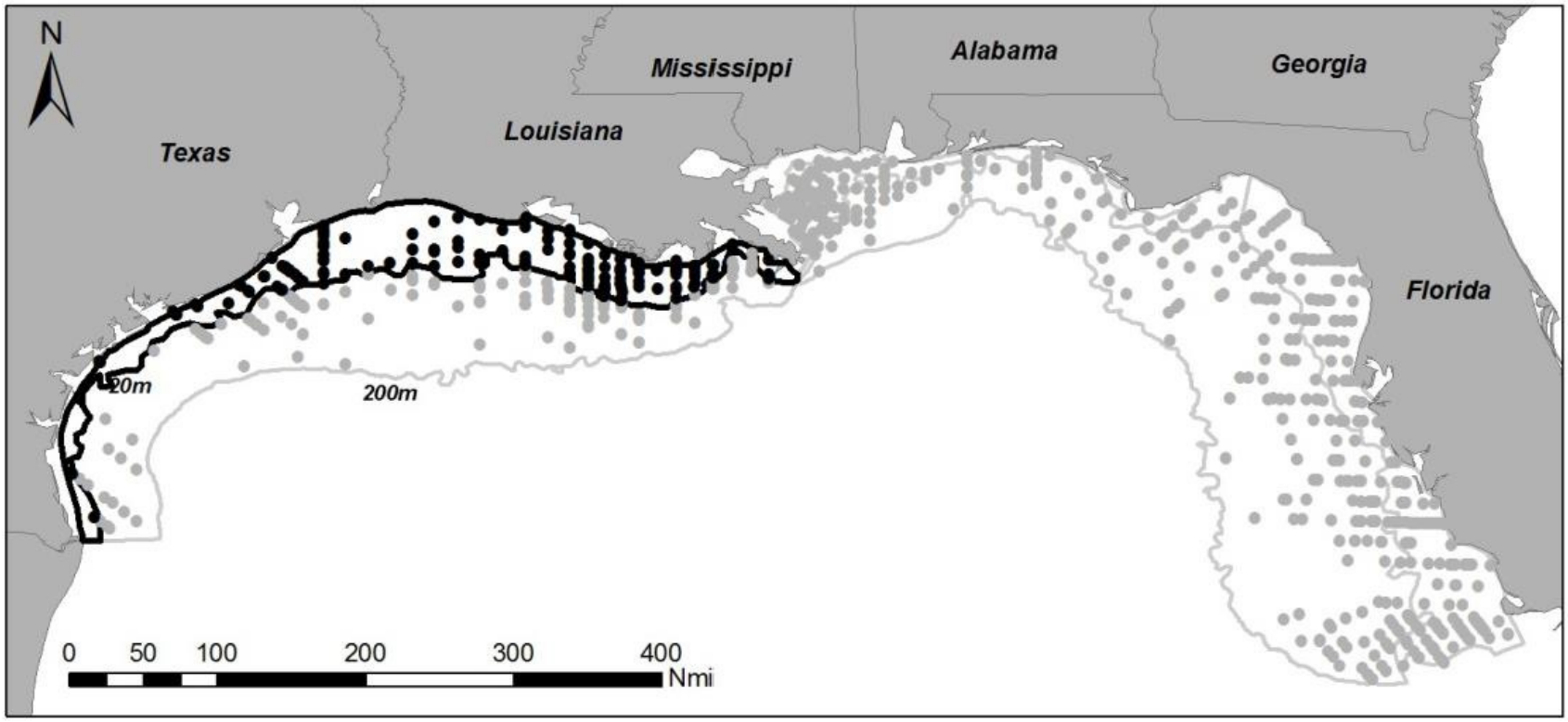
Source: Waring et al. 2016

Figure 8-3: Distribution of the Western Coastal Stock of Bottlenose Dolphins 2011 - 2012



Source: Waring et al. 2016

Figure 8-4: Distribution of the Continental Shelf Stock of Bottlenose Dolphins 2011 – 2012



Source: Waring et al. 2016

8.2.2.2.3 ROUGH-TOOTHED DOLPHIN

The rough-toothed dolphin (*Steno bredanensis*) is distributed throughout the world in tropical to warm temperate oceanic waters, and to a lesser extent within continental shelf waters (see Figure 8-5; Hayes et al. 2017a). The GOM population is considered its own management stock, although there is currently no information to identify differentiation from the Atlantic stock, nor to determine if there is more than one GOM stock. The current northern GOM stock is estimated at 624 individuals. Generally, the rough-toothed dolphin prefers northern GOM waters, with depths averaging 640 ft (195 m) (Hayes et al. 2017a). Although this species may occur in shelf waters, its preferred depths make it unlikely to occur with any regularity in the immediate Proposed Project area.

8.2.2.2.4 IMPORTANCE OF SOUND FOR MARINE MAMMALS

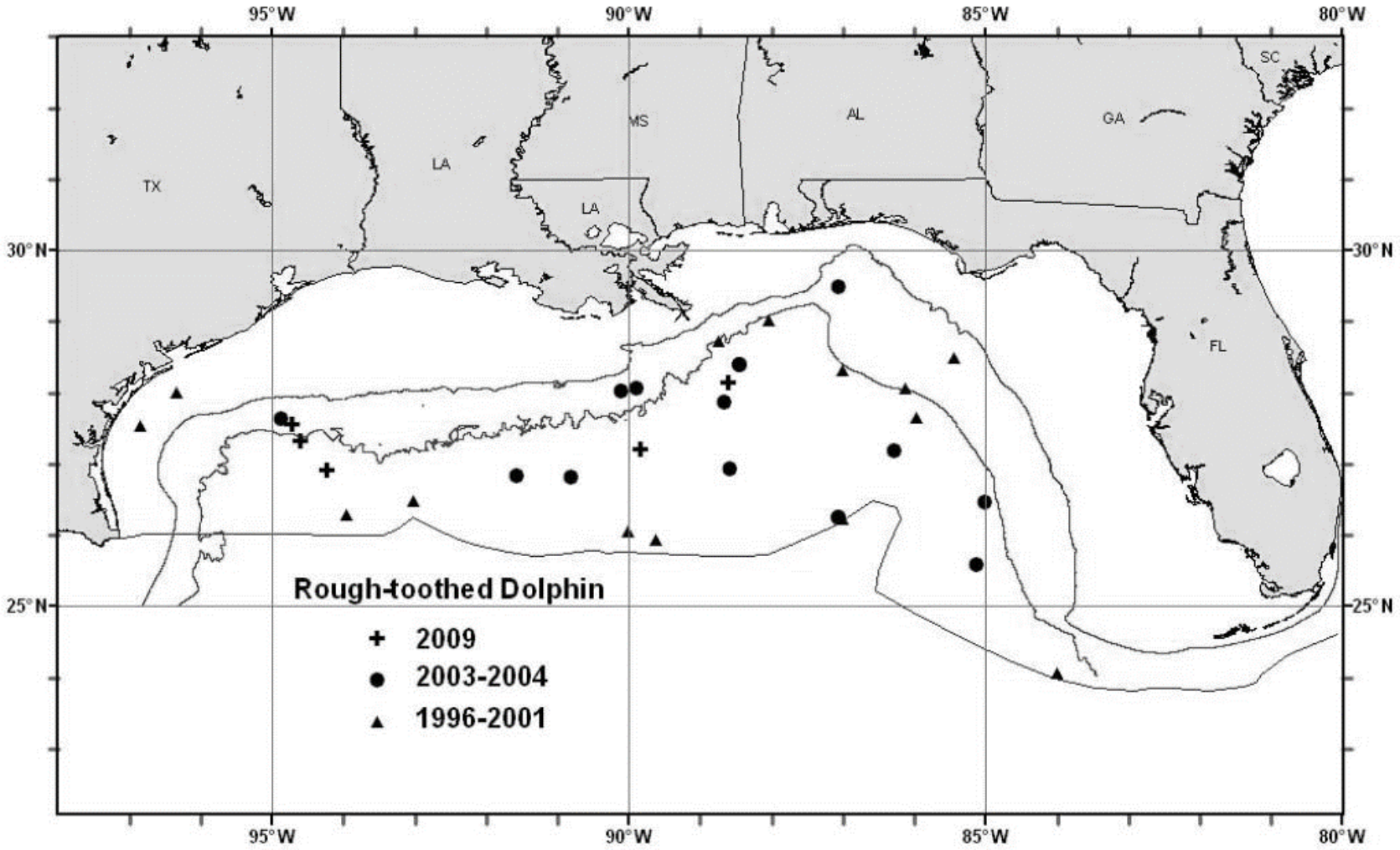
Marine mammals are very sensitive to sounds in the ocean, both natural and human-made. Marine mammals produce and hear a broad range of sounds to navigate and communicate because the oceans are much more transparent to sound than to light (National Research Council [NRC] 2003). Each species has an auditory threshold dictating the frequencies that can be heard. Increases in background noise often interfere with, or "mask," noises that generally can be heard by an individual (Richardson et al. 1995). Masking occurs when both the signal and the masking noise have similar frequencies and overlap or occur very close together, decreasing the ability of an individual to hear other sounds (NRC 2003, NMFS 2003). Masking becomes a problem when it covers biologically significant sounds, such as the call of a calf or conspecific, or the sound of a predator or hazard (NMFS 2003).

When exposed to noise, marine mammals can experience a variety of behavioral and physical effects. Behavioral effects may include a change in dive duration and frequency, vocalizations, migration routes, and general movements. The duration and extent of the behavioral effects are influenced by the hearing sensitivity of the individual, as well as by its age, sex, current activity, past exposure to the noise, and the presence of dependent offspring. Behavioral effects of an individual are also influenced by the characteristics of the sound, such as the frequency and intensity, and the location and duration of the sound (NRC 2003).

Exposure to noise also can result in physical injury to marine mammals in the form of temporary and permanent threshold shifts (TTS and PTS), hemorrhage, and death (NMFS 2003). TTS occurs when an individual is exposed to a sound for a period, causing the hair cells within the ear to become fatigued and change shape. When that occurs, the individual temporarily loses hearing in that range for a certain period, depending on the duration and level of sound exposure (NRC 2003). Exposure that occurs above a certain sound level and duration may cause the hair cells to become permanently damaged, resulting in PTS, or a permanent loss of hearing over a certain frequency range (NRC 2003). As with general changes in behavior, the level and durations of sound exposure that cause TTS and PTS are species-specific.

As previously discussed, the MMPA prohibits the "take" of marine mammals, which is defined as the harassment, hunting, or capturing of marine mammals, or the attempt thereof. "Harassment" is defined as any act of pursuit, annoyance, or torment, and is further categorized as either Level A or Level B harassment. Level A harassment is defined as "any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild." Level B harassment is considered any act that has the potential to disturb a marine mammal or marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering.

Figure 8-5: Distribution of the Rough-toothed Dolphins Between 1996 and 2009



Source: Waring et al. 2016

In April 2018, NMFS released an update to its Technical Guidance for Assessing the Impact of Anthropogenic Sound on Marine Mammals (NMFS 2018c). The Technical Guidance provides underwater acoustic thresholds for the onset of PTS and TTS. PTS and TTS thresholds are dependent upon noise type (impulsive or continuous) and marine mammal hearing group. For impulsive sounds, the dual metric acoustic thresholds are presented as a flat or unweighted peak sound pressure (PK [flat]) and hearing group frequency weighted cumulative sound exposure level (SEL_{cum}) for impulsive sounds. NMFS considers onset of PTS (or TTS) to have occurred when either one of the two metrics is exceeded (whichever comes first). For non-impulsive (continuous) sounds, there is a single SEL_{cum} threshold; however, if a non-impulsive sound has the potential of exceeding the PK sound pressure level thresholds associated with impulsive sounds, these thresholds should also be considered. The acoustic thresholds for mid- and low-frequency cetaceans (i.e., those that may occur in the Proposed Project vicinity) are presented in Table 8-6.

Table 8-6: Acoustic Harassment Sound Levels for Marine Mammals

Marine Mammal Injury / Effect	Cumulative Sound Exposure Level (SEL_{cum}) (dB re 1 μPa^2s)[a]	Root Mean Square Sound Level (dB RMS) (dB re 1 µPA)[b]	Peak Sound Level (dB re 1 µPA)[c]
Temporary threshold shift for impulsive / non-impulsive noise[d,e]	170/178 [e]	--	224/ --
Permanent threshold shift for impulsive / non-impulsive noise[d,e]	185/198[e]	--	--
Behavioral Effects for impulsive / non-impulsive noise	--	160/120	230/ --

[a] The cumulative sound exposure level is the energy accumulated over multiple strikes or continuous vibration over a period of time.

[b] The root mean square exposure level is the square root of the average squared pressures over the duration of a pulse and represents the effective pressure and intensity produced by a sound source.

[c] Peak sound pressure level is the largest absolute value of instantaneous sound pressure.

[d] Use of impact hammers is considered impulsive noise; use of vibratory hammers is considered non-impulsive noise.

[e] The injury threshold is the general level for temporary or permanent threshold shift onset for mid-frequency cetaceans (including dolphins) as identified by NOAA Fisheries (2018c); however, threshold shifts are influenced by the frequency of noise received and a cumulative sound exposure exceeding this level may not cause a threshold shift if outside the range of hearing.

μPa^2s = micropascal-squared seconds

Source: NMFS 2018a,c.

8.2.2.3 Benthic Community

The benthic community generally consists of two groups: infauna (animals that live in the substrate) and epifauna (animals that live on or are attached to the substrate). The distributions of these animals are typically influenced by sediment composition or grain size but also by temperature, salinity, and distance from shore (Mineral Management Service [MMS] 2002). Illumination, food availability, currents, tides, and wave shock also play a role in the distribution of benthic fauna. Benthic organisms are valuable indicators of water/sediment pollution and construction-related perturbations. They also transfer large amounts of food energy to the higher trophic levels. These relatively immotile infauna can provide evidence of habitat changes related to construction operations through changes in their presence and abundance.

In February and March of 2019, BWTT conducted surveys of four irregularly-shaped polygons, which together encompassed all waters crossed by the Inshore Pipelines. The study areas covered a total of 288 acres (ac), as depicted in Figures 1 through 3 of Appendix I. The resources identified eight resource or substrate types within the study area including 0.4 ac (0.2 ha) of oyster bed, 77.5 ac (31.4 ha) of unconsolidated bottom, and 12.4 ac (5.0 ha) of special aquatic site – mudflat or land.

8.2.2.3.1 INSHORE

As previously discussed, estuaries are highly productive aquatic environments that sustain important shellfish and finfish species; the benthic community helps to support the high biomass within the estuaries by its place in the estuarine food web; high benthic production greatly enhances an estuary's ability to serve as a nursey ground for juvenile nekton. The Inshore Pipelines will cross through Redfish Bay, which is between Aransas Bay on the east and Corpus Christi Bay on the west. In past studies, Aransas Bay reported mean abundances between 800 and 2,500 organisms/square meter (m^2), with the relative level of diversity decreasing toward the inner shelf of the bays (University of Texas Marine Science Institute 2015). Corpus Christi Bay mean abundances ranged from 1,750 to 5,000 organisms/m^2 and collected a total of 331 species (Holland et al. 1975, Armstrong 1987). Minimum abundances in both bays were found in the late/summer fall, whereas higher abundances were found during winter (and also spring in Aransas Bay). The most abundant benthic fauna identified in both Aransas and Corpus Christi Bays were *Mediomastus californiensis* and *Streblospio benedicti*, both of which are polychaetes (Holland et al. 1975, Armstrong 1987).

BWTT conducted benthic sampling in early 2019 to determine the macroinfaunal community in the Proposed Project area. A total of nine stations were sampled along the Proposed Project route, including four stations along the route of the Inshore Pipelines and five stations along the Offshore Pipelines. The inshore stations had a density of 666.7 to 4,633.3 organisms/m^2. The highest density was associated with the station closest to the mainland. The two most dominant species in inshore waters were the *M. californiensis* and *S. benedicti*, consistent with previous studies. The benthic survey report, including a full list of identified species, is provided as Appendix L.

Epifauna identified in the Aransas and Corpus Christi Bays included brown and white shrimp, blue crab (*Callinectes sapidus*), lesser blue crab (*Callinectes similis*), mantis shrimp (*Squilla empusa*), roughback shrimp (*Trachypenaeus similis*), mud crab (*Neopanope texana*), and grass shrimp (*Palaemonetes* spp.). The studies indicate that the abundance of benthic fauna within the Texas coast estuaries increases as you move from the more freshwater to the more saline estuaries (Armstrong 1987).

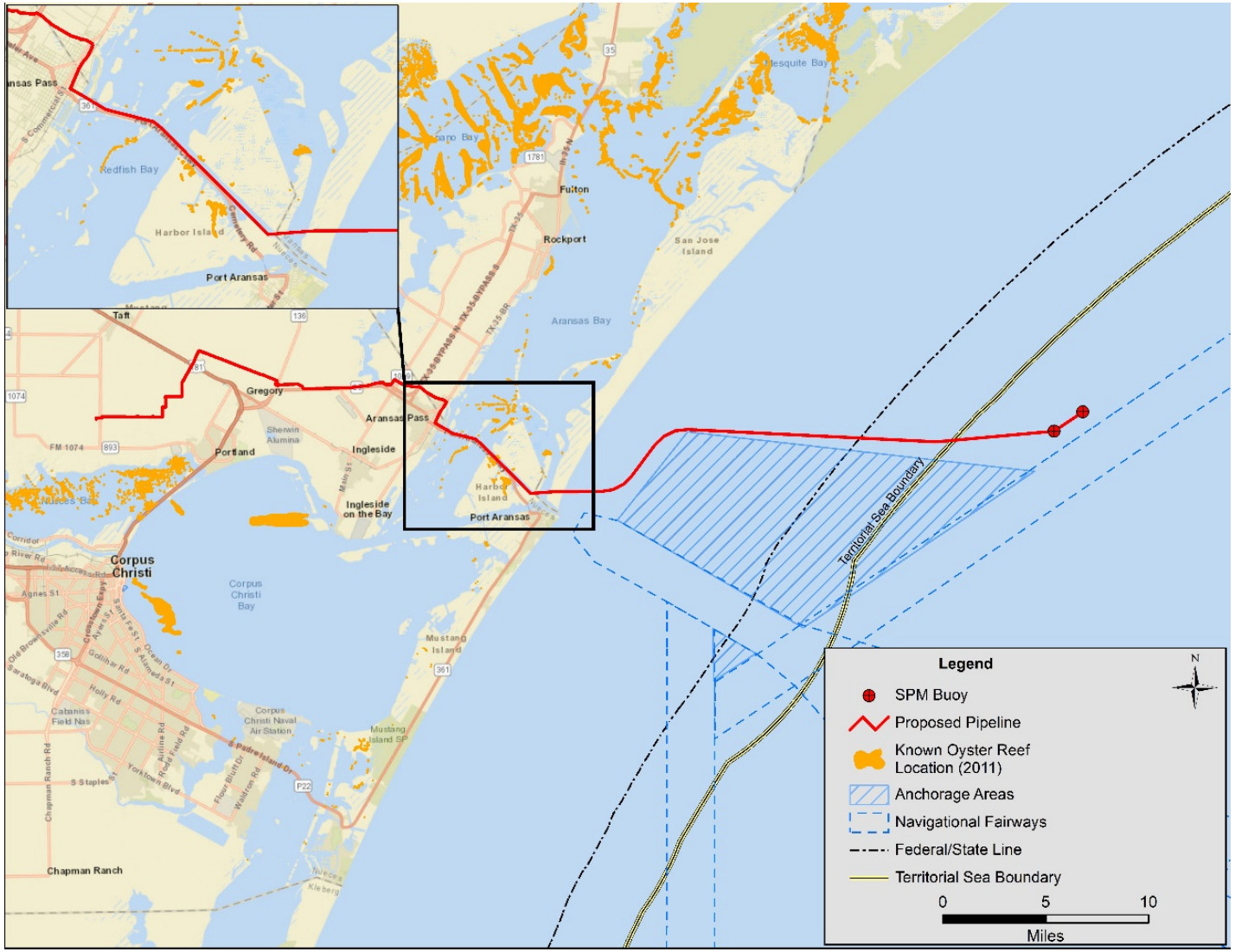
NOAA's GOM Data Atlas identifies oyster reefs intermittently within Redfish Bay (Figure 6-3 in Section 6: Aquatic Environment). The Inshore Pipelines will cross approximately 0.4 ac (3.6 hectare [ha]) of known oyster beds; however, the pipelines will be installed through Redfish Bay using HDD construction methods (see Figure 8-6).

8.2.2.3.2 OFFSHORE

Infaunal communities on the continental shelf are generally dominated by polychaete worms (bristleworms), followed by crustaceans and mollusks. Epifaunal communities include crustaceans, echinoderms, mollusks, hydroids, sponges, and soft and hard corals. Shrimp and demersal fish are also closely associated with benthic communities (MMS 2002). Species diversity varies significantly between habitat types. Species and individual abundances are generally higher in medium sand substrates in water less than 197 ft (60 m) and lower in finer sediments and deeper water. Species diversity is highest in habitats with medium to coarse sands and lower in habitats with finer sands that are in water depths over 197 ft (60 m) (MMS 2000).

The major benthic habitat of the northern GOM consists of a soft muddy bottom. On the Texas-Louisiana continental shelf, densities of benthic organisms are greatest nearshore and decrease with distance offshore and water depth (Phillips and James 1988). This trend in densities may relate to the gradient in sediment size described above. Nematodes, harpacticoid copepods, and kinorhynchs are the predominant taxa that dominate the smaller benthic fauna (meiofauna) in the GOM (Phillips and James 1988; Rowe 2017).

Figure 8-6: Oyster Reefs in the Proposed Project Vicinity



Source: BOEM 2019.

Sediment sampling conducted along the Proposed Project route indicates that the inshore sediments are primarily composed of silty sand and sandy silts containing small amounts of clay. Additionally, sampling points located ranged from 0.0172 to 0.2123 millimeters (mm) in the inshore waters. Table 6-2 in Section 6: Aquatic Environment provides the grain size of sampled sediments; sediment chemistry data are provided in Appendix C. Sampling stations are depicted in Figure 2 of Appendix C.

Macrobenthic species include polychaetes, crustaceans, and mollusks. Average densities of microbenthic fauna on the south Texas continental shelf decline with depth and range from about 2,900 individuals per square meter in nearshore areas to 390 individuals per square meter on the outer shelf (Phillips and James 1988). Polychaetes dominate, followed by amphipod crustaceans and bivalve mollusks (Rowe 2017).

Sampling was conducted at five offshore stations for microbenthic infauna, including one at each SPM buoy system and three along the Offshore Pipelines. No individuals were identified at the SPM buoy system 2 station and the SPM buoy system 1 station has a density of 66.7 organisms/m^2. The three Offshore Pipeline Stations had densities ranging from 600 to 800 organisms/m^2. The dominant species were the *Magelona uebelackerae* (a polychaete) and the *Ampelisca agassizi* (an amphipod). The full list of identified species is provided in Appendix L.

Megabenthic fauna (those organisms > 1 centimeter [cm] in size) includes squids, penaeid shrimp, large crabs, stomatopods, and demersal fishes. Maximum densities of demersal fish on the Texas shelf occur between depths of 239 and 269 ft (73 and 82 m) (Phillip and James 1988). Many megabenthic species are mobile, and life stages can vary with the seasons. For example, brown and white shrimp spawn offshore and migrate to estuarine habitat as postlarvae (GMFMC 2004).

8.2.2.4 Planktonic Species

As previously noted, the phytoplankton community consists of plankton and zooplankton, each of which are discussed below. Ichthyoplankton (fish eggs and larvae) are a specific subset of the zooplankton.

8.2.2.4.1 PHYTOPLANKTON

Phytoplankton are microscopic plants that photosynthesize and are a keystone for the marine food chain. They are generally found drifting within surface waters across the world and are impacted by a variety of physical and biological factors including, but not limited to, prevailing ocean currents, mixing, nutrient loading, and temperature. Phytoplankton have a major impact on the near-surface nutrient concentrations within the photic zone, being largely responsible for the primary production in the ocean (Qian et al. 2003). Alterations in the phytoplankton community composition can therefore lead to negative ecological impacts on entire ecosystems. Harmful algal blooms, areas of hypoxia, eutrophication, and decreases in nutrient availability are all consequences of changes in phytoplankton communities (Hallegraeff 2010). It is generally assumed that all the phytoplankton is consumed by the zooplankton, except for brief periods during major plankton blooms (GMFMC 2004).

Shelf phytoplankton and zooplankton (see Section 6.2.2) are more abundant, productive, and seasonally variable than the deep Gulf plankton. This is due primarily to changes in salinity, increases in available nutrients, vertical mixing, and zooplankton predation on the continental shelf (MMS 2002). Light and nutrients (particularly nitrogen) are the two primary factors controlling phytoplankton production on the continental shelf (MMS 2007). In GOM-wide studies of chlorophyll-a, which is an indicator of primary productivity, 13 regions were identified as having a distinct pattern of chlorophyll-a when compared to other areas over a period of 11 years (1997 to 2008). The inner shelf waters of the Texas coast (the area of the Proposed Project) showed a peak in chlorophyll-a between December and April; the outer shelf reached its maximum concentrations in December and January (Salmeron et al. 2011).

8.2.2.4.2 ZOOPLANKTON

Similar to phytoplankton, zooplankton are vital to the food web, linking primary production to higher tropic levels and clearing detrital organic matter out of surface layers and channeling it to deepwater biota through excretion and exoskeleton molting . Most zooplankton undergo diurnal vertical migrations, swimming up to surface waters (less than 164 ft [50 m]) at night and descending to deeper depths during the day (generally to depths of 328 ft [100 m] or shallower) (Byrnes et al. 2017).

Zooplankton densities are highest in nearshore habitat and decrease with distance offshore (Flint and Rabalais 1980). The abundance of zooplankton offshore is likely limited by the availability of phytoplankton (the primary food supply), while nearshore, where plankton are more abundant, zooplankton may be limited by predation (Flint and Rabalais 1980). In the GOM on the Texas-Louisiana shelf, zooplankton densities range from about 166 to 1.5 million individuals per cubic meter (m^3) (Phillips and James 1988). On the continental shelf, in addition to phytoplankton, suspended organic detritus particles transported by rivers or re-suspended from benthic sediments supplements the food supply. Water circulation patterns and breeding seasons also may play a significant role in determining seasonal zooplankton distribution (Phillips and James 1988).

Zooplankton on the south Texas continental shelf were quantified as part of the South Texas Outer Continental Shelf (OCS) study between 1975 and 1977 (Flint and Rabalais 1980). The zooplankton of the Texas-Louisiana shelf is very diverse, including many species of protozoans, heteropods, pteropods and copepods, as well as larval forms of a variety of animals. The majority of holoplanktonic organisms (species that spend their entire lives in the water column) are copepods, which constitute between 39 and 72 percent of zooplankton abundance on the south Texas shelf. Along the south Texas shelf, zooplankton abundance was found to vary greatly among nearshore and offshore stations. Flint and Rabalais documented an average of 3,496 individuals per m^3 at nearshore stations and 1,055 individuals per m^3 at offshore stations along the south Texas shelf. In offshore waters zooplankton abundance peaked in the winter and were lowest in the spring and fall (Flint and Rabalais 1980, Phillips and James 1988).

8.2.2.4.3 ICHTHYOPLANKTON

The larval planktonic stage of many fish species is referred to as ichthyoplankton. Ditty et al. (1988) summarized information from over 80 studies on ichthyoplankton in the northern GOM and reported 200 fish species from 61 families. The larval stage can range in duration from 10 to 100 days. Year-class strength in adult populations of fish and invertebrates largely depends on variability in survival and transport of pelagic larvae. The distribution of fish larvae depends on spawning behavior of adults, hydrographic structure, and transport at a variety of scales, duration of the pelagic period, behavior of larvae, and larval mortality and growth (BOEM 2012).

For most of the year in the north central GOM, densities of ichthyoplankton are highest at the surface and decrease with depth (Shaw et al. 2001); however, larvae may migrate vertically within the water column (Muhling et al. 2013). Water temperature has a major influence on the structure of larval fish assemblages (MMS 2002). Larval densities typically are lowest during winter, increase during the spring, peak during the summer, and decline during the fall. Table 8-7 presents the seasonality and peak seasonal occurrence of larval fishes in the northern GOM. Most larvae are expected to be present in the Proposed Project area from spring through early fall. In addition to the seasonal variations, many ichthyoplankton taxa are collected within specific depth ranges (see Table 8-8). Those species occurring in depths shallower than 164 ft (50 m) are most likely to occur in the vicinity of the Proposed Project. A

Table 8-7: Seasonality and Peak Seasonal Occurrence of Larval Fishes (<10 mm standard length) in the Northern GOM

Family (common name)	Taxa (common name)	Scientific Name	Months of Occurrence[a]											
			J	F	M	A	M	J	J	A	S	O	N	D
Herring and Menhaden[a]	Gulf menhaden	*Brevoortia patronus*	*	*	X	X					X	X	X	*
	Round herring	*Etrumeus teres*	*	*	*	X	X	X					X	X
	Scaled sardine[b]	*Harengula jaguana*			X	X	*	*	*	*	X	X	X	
	Atlantic thread herring[b]	*Opisthonema oglinum*			X	X	*	*	*	*	X	X	X	
Anchovy[a]	Striped	*Anchoa hepsetus*	X	X	*	*	*	*	*	*	*	X	X	X
	Bay	*Anchoa mitchilli*	X	X	*	*	*	*	*	*	*	X	X	X
	Longnose	*Anchoa nasuta*	X	X	*	*	*	*	*	*	*	X	X	X
Sea Bass and Grouper	Sand perch	*Diplectrum formosum*	X	X	X	X	*	*	*	*	X	X	X	X
	Pygmy sea bass	*Serraniculus pumilio*					X	*	*	*	*	X	X	
Large-tooth flounders	Dusky flounder[b]	*Syacium papillosum*					X	*	*	*	*	X	X	
Left-eye flounders[b]	NA	*Bothus spp*[b]	X			X	X	X	X	X	X	X	X	X
Tonguefish	NA	*Symphurus spp* [b]	X	X	X	X	X	X	X	X	X	X	X	X
Cusk eels[b]	NA	*Ophidion spp.*	X	X	X	X	X				X	X	X	X
Wormfishes	NA	*Microdesmus spp.*			X	X	X	X	X	X	X	X	X	X
Jacks, scads, pompanos, and relatives	Blue runner	*Caranx crysos*			X	X	X	*	*	*	X	X	X	
	Atlantic bumper[b]	*Chloroscombrus chrysurus*				X	X	*	*	*	*	X		
	Round scad	*Decapterus punctatus*			X	*	*	*	*	*	*	X	X	
	Rough scad	*Trachurus lathami*	*	*	X	X	X						X	X
	Dolphin	*Coryphaena hippurus*					X	X	X	X	X	X	X	
Snapper	Red	*Lutjanus campechanus*				X	X	*	*	*	X	X	X	
	Gray	*Lutjanus griseus*				X	X	*	*	*	X	X	X	
	Lane	*Lutjanus synagris*				X	X	*	*	*	X	X	X	
Majorras, Porgies	Pigfish	*Orthopristis chrysoptera*	X	X	*	X	X							
	Sheepshead	*Archosargus probatocephalus*	X	*	*	*	X							
	Pinfish	*Lagodon rhomboides*	*	*	X	X						X	X	*
Drums, Croakers, Seatrout[b]	Sand seatrout[b]	*Cynoscion arenarius*		X	*	*	X	X	*	*	X	X		
	Spotted seatrout[b]	*Cynoscion nebulosus*		X	X	*	*	*	*	*	X	X		
	Silver seatrout[b]	*Cynoscion nothus*					X	X	X	X	*	*	X	
	Spot	*Leiostomus xanthurus*	*	X	X	X						X	X	*
	NA	*Menticirrhus spp.* [b]		X	X	X	X	X	X	X	X	X	X	X
	Atlantic croaker	*Micropogonias undulatus*	*	X	X	X					X	*	*	*
	Red drum[b]	*Sciaenops ocellata*								X	*	*	X	

Table 8-7: Seasonality and Peak Seasonal Occurrence of Larval Fishes (<10 mm standard length) in the Northern GOM

Family (common name)	Taxa (common name)	Scientific Name	Months of Occurrence[a]											
			J	F	M	A	M	J	J	A	S	O	N	D
Spadefish	Atlantic spadefish	*Chaetodipterus faber*				X	X	*	*	*				
Mackerels, Tunas, Wahoo	Bullet mackerel	*Auxis rochei*	X	X	X	X	*	*	*	*	*	X	X	
	Little tunny	*Euthynnus alletteratus*				X	*	*	*	*	*	X	X	
	Skipjack tuna	*Euthynnus pelamis*				X	X	X	X	X	X	X		
	King mackerel	*Scomberomorus cavalla*					X	X	X	*	*	X	X	
	Spanish mackerel	*Scomberomorus maculatus*				X	X	X	X	*	*	X		
	Bluefin tuna	*Thunnus thynnus*				X	X	X						
Butterfish	Gulf butterfish	*Peprilus burti*	*	*	*	X	X	X	X	X	X	X	*	*

a X = Seasonality; * = Peak Seasonal Occurrence.

b These taxa were identified as one of the 20 most prevalent taxa at the offshore location of the Proposed Project (see Table 8-9). Seasonal distribution was not available for each identified taxon.

Source: Ditty et al. 1988.

Table 8-8: Primary Depth Distribution of Larval Fishes (<10 mm) in the Northern GOM[a]

Common Name	Scientific Name	Depth				
		<25 m	<50 m	<100 m	50–200 m	>150 m
Sheepshead	*Archosargus probatocephalu*[b]	x				
Atlantic spadefish	*Chaetodipterus faber*	x				
Atlantic bumper[c]	*Chloroscombrus chrysurus*	x				
Sand seatrout[c]	*Cynoscion arenarius*	x				
Spotted seatrout	*C. nebulosus*[b]	x				
Pigfish	*Orthopristis chrysoptera*	x				
Atlantic harvestfish	*Peprilus paru*	x				
Black drum	*Pogonias cromis*[b]	x				
Anchovies	*Anchoa spp.*		x			
Gulf menhaden	*Brevoortia patronus*[b]		x			
Gulf black sea bass	*Centropristis striata*		x			
Sand perch	*Diplectrum formosum*		x			
Scaled sardine[c]	*Harengula jaguana*		x			
Pinfish	*Lagodon rhomboides*[b]		x			
Spot	*Leiostomus xanthurus*[b]		x			
Atlantic croaker	*Micropogonias undulatus*[b]		x			
Atlantic thread herring[c]	*Opisthonema oglinum*		x			
Spanish sardine	*Sardinella aurita*		x			

Table 8-8: Primary Depth Distribution of Larval Fishes (<10 mm) in the Northern GOM[a]

Common Name	Scientific Name	Depth				
		<25 m	<50 m	<100 m	50–200 m	>150 m
Spanish mackerel	*Scomberomorus maculatus*		x			
Pygmy sea bass	*Serraniculus pumilio*		x			
Round scad	*Decapterus punctatus*			x		
Gulf butterfish	*Peprilus burti*			x		
Frigate/bullet mackerel	*Auxis sp.*				x	
Blue runner	*Caranx crysos*				x	
Round herring	*Etrumeus teres*				x	
Bonito	*Euthynnus alletteratus*				x	
Red barbier	*Hemanthias vivanus*				x	
Red snapper	*Lutjanus campechanus*				x	
King mackerel	*Scomberomorus cavalla*				x	
Rough scad	*Trachurus lathami*				x	
Skipjack tuna	*Euthynnus pelamis*					x
Sailfishes	*Istiophorus spp.*					x
Swordfish	*Xiphias gladius*					x

a Depths are those reported at which more than 75 percent of larvae were collected.

b Estuarine-dependent larvae.

c These taxa were identified as one of the 20 most prevalent taxa at the offshore location of the Proposed Project (see Table 8-9). Depth distribution was not available for each identified taxon.

Source: Ditty et al. 1986.

Plankton surveys have been conducted in the GOM as part of the Southeast Area Monitoring and Assessment Program (SEAMAP) since 1982[1]. Plankton are collected using both a neuston net and a bongo net. The neuston net has a 3.3- x 6.6-ft (1- x 2-m) mouth opening and a mesh size of 0.04 inch (0.950 mm). This net is fished at a depth of 1.6 ft (0.5 m) along the surface of the water. The bongo net has a 23.6-inch (60-cm) mouth opening and carries 0.01-inch (0.33-mm) mesh netting. The bongo net is fitted with a flowmeter that allows the volume of water filtered during the tow to be measured. This net is fished from approximately 3.28 to 16.4 ft (1 to 5 m) off the bottom to the water's surface and yields a sample from the water column that is integrated over depth.

Ichthyoplankton abundance for the Proposed Project area was determined using data provided by NMFS from the summer/fall plankton collections. Data were available along the Texas coast from 1986 to 2014 (GSMFC 2018). SEAMAP Station B233 is in close proximity to the location of the Proposed Project and is the only station with a 30- by 30-nautical miles (nm; 56- by 56-km) block centered on the Proposed Project; therefore, Station B233 was the only station assessed to determine local ichthyoplankton abundance (see Figure 8-7). Based on the bongo net data from the 26 samples taken over 24 years, the average observed abundance of eggs (including a 3 times nest extrusion multiplier) was 55,645 per million gallons (range 4,461 to 166,255) and the average abundance of larvae was 86,492 per million gallons (range 10,275 to 300,454)Within these samples, a total of 111 taxa of fish, as well

[1] An Ichthyoplankton Assessment describing the NOA NMFS SEAMAP sampling and analysis is provided as Appendix U.

as a category for unidentified fish, were collected; 20 taxa made up over 95 percent of the collection (see Table 8-9); eggs are not identified to taxa. As noted in Table 8-7, species abundance varies throughout the year and the prevalence and diversity of species will likely change depending on the seasons; however, as peak occurrence for most species is in the summer/fall months, the overall abundance of ichthyoplankton will likely decrease in cooler months.

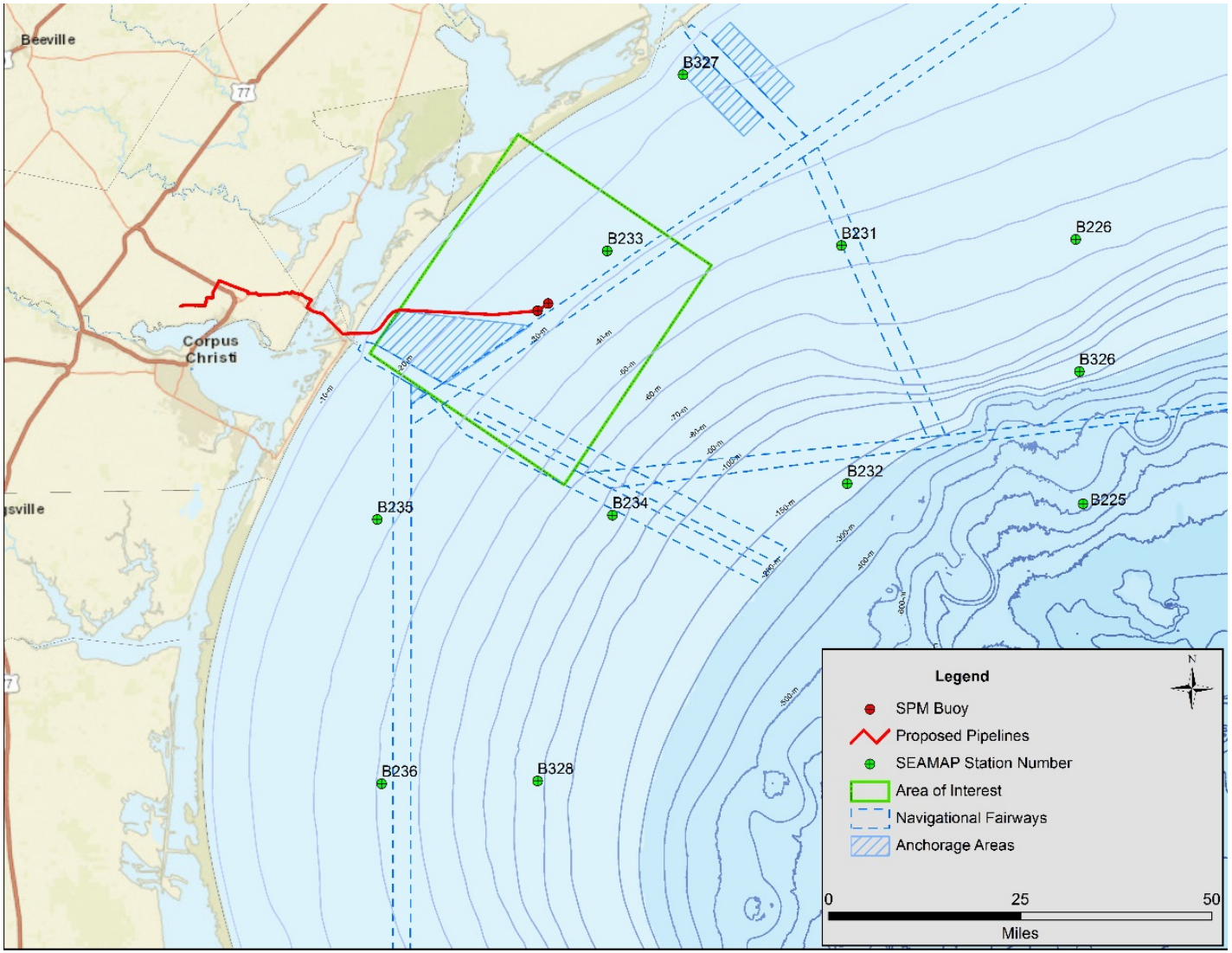
Table 8-9: Dominant SEAMAP Taxa Occurring in the Proposed Project Area

Common Name	Taxa Level and Taxa	Samples of Occurrence (No.)	Average No. of Larvae at Station B233 per Million Gallons
Anchovies and sardines	Family: Engraulidae	24	34,481
Gobies	Family: Gobiidae	23	10,196
Dusky flounder	Species: Syacium papillosum	11	6,942
Atlantic bumper	Species: Chloroscombrus chrysurus	21	4,784
Sand seatrout	Species: Cynoscion arenarius	13	3,744
Tonguefish	Genus: Symphurus	18	3,133
Silver seatrout	Species: Cynoscion nothus	8	1,279
Herrings and anchovies	Order: Clupeiformes	14	1,244
N/A	N/A: Unidentified fish	20	1,131
Atlantic thread herring	Species: Opisthonema oglinum	12	1,029
King croakers	Genus: Menticirrhus	18	1,019
Wormfishes	Family: Microdesmidae	20	836
Cusk eels	Family: Ophidiidae	17	705
Lizardfishes	Family: Synodontidae	6	704
Drums and croakers	Family: Sciaenidae	15	651
Large-tooth flounders	Genus: Syacium	9	595
Red drum	Species: Sciaenops ocellatus	9	551
Scaled sardine	Species: Harengula jaguana	12	427
Codlets	Genus: Bregmaceros	13	360
Left-eye flounders	Family: Bothidae	7	283
Total Dominant Taxa		*26*	*74,094*
Total		**26**	**86,492**

a SEAMAP data identifies each species to the lowest practicable taxa, therefore, a specific species may be included in multiple taxonomic groupings. For example, the sand seatrout (Cynoscion arenarius) is a member of the genus Cynoscion; therefore, some portion of the larvae per million gallons attributed to the genus Cynoscion may be sand seatrout that were not identified to a species level.

Source: GSFMC 2018.

Figure 8-7: Location of SEAMAP Samples in the Vicinity of the Proposed Project



Source: BOEM 2019

8.2.2.5 Marine and Coastal Birds

Over 400 species of birds have been reported in the northern GOM (BOEM 2012). The northern GOM contains a diverse range of birds that are classified into six general categories including seabirds, shorebirds, wetland birds, waterfowl, passerines, and raptors. As seen in Table 8-10, seabirds, shorebirds, wetland birds, and waterfowl are known to utilize marine and coastal habitats such as those in the vicinity of the offshore and nearshore areas of the Proposed Project area; whereas passerines and birds of prey utilize terrestrial habitats, such as those encountered in the onshore and inshore portions of the Proposed Project area.

Table 8-10: Marine and Coastal Bird Groups in the Vicinity of the Proposed Project

Category	Common Name	Representative Species	General Description
Seabirds	Gulls and terns, Phalaropes, Frigatebirds, Pelicans, Tropicbirds, Gannets and boobies, Storm-petrels, Shearwaters	Ring-billed gull, laughing gull, common tern, Caspian tern, Magnificent frigatebirds, brown pelican, northern gannet	Spend a large portion of life on or over water and are found both offshore and within coastal waters of the northern GOM where they feed on fish and invertebrates. Most inhabit waters of the continental shelf and adjacent coastal and inshore areas of estuarine and neritic ecoregions.
Shorebirds	Plovers, oystercatchers, stilts and avocets, sandpipers, snipes, and allies	Semipalmated plover, American oystercatcher, willet, black-necked stilt	Generally, small wading birds that feed on invertebrates living in shallow waters along beaches, mudflats, sand bars, and other areas.
Wetland birds	Bitterns, egrets, and herons, storks, Ibises and spoonbills, cranes, limkins, rails, coots, and gallinules, cormorants, grebes	Great blue heron, snowy egret, wood stork, white ibis, sandhill Crane, sora, American coot, double-crested cormorant, pied-billed grebe, horned grebe.	Inhabit most coastal aquatic habitats in the northern GOM, including freshwater swamps, brackish and saltwater wetlands, and embayments. Year-round residents of the GOM coastal areas with colonial or solitary nesting behaviors.
Waterfowl	Ducks, geese, and swans, and loons.	Blue-winged teal, mallard, red-breasted merganser, ring-necked duck, bufflehead, surf scoter, common loon	Inhabit coastal waters, beaches, flats, sandbars, and wetland habitats throughout the northern GOM. Known to forage on surface and SAV and aquatic invertebrates.
Passerines	Perching birds	Warblers, swamp sparrow, thrushes, marsh wren, boat-tailed grackle	Although the northern GOM provides habitat for this species, most are winter residents that move into the GOM in the fall from northern latitudes.
Raptors	Birds of prey	Osprey, bald eagle	Inhabit terrestrial habitat where they forage on small mammals; however, the bald eagle and osprey are known as year-round residents in the GOM.

Source: BOEM 2012.

Many of the bird species encountered in the GOM utilize the Gulf as a migratory pathway each year. Migrant birds in route to the neotropics and breeding in eastern North America cross the GOM directly or move north/south by traversing the GOM or Florida peninsula (BOEM 2012). From March to May, these birds migrate in large flocks that may exceed 2 million and depend on coastal habitats for food to store fat reserves prior to crossing the GOM (USGS 2005, TPWD 2005). During overwater flights, bird's often use offshore structures including those associated with oil and gas operations for rest stops or temporary shelter from inclement weather patterns (BOEM 2012).

Other, year-round residents such as herons, egrets, pelicans, and other wetland birds utilize the GOM and its coastal resources for colonial nesting. These species utilize small coastal islands and beaches that contain salt and brackish waters to construct nests from local vegetation (MMS 1989). Colonial nesting sites are often used year after year by wetland birds and are abandoned only after major disturbances such as hurricanes or tropical storms. Bird species living in these areas generally feed on fish and invertebrates occurring within the shallow swamps, waterways, and wetlands where colonies are established. Colonial nesting waterbirds are highly susceptible to habitat loss and degradation following disturbance of their habitats which is difficult to repair or replace.

Many species utilizing coastal resources and nearshore waters are also federally listed as threatened and/or endangered species within the Proposed Project area. Species listed under the ESA are discussed further in Section 8.2.2.7

A database search was requested from the TPWD Texas Natural Diversity Database (TXNDD) for any elemental occurrences of sensitive or threatened and endangered species (including bird colonies and rookeries). Numerous historic wading bird colonies were reported in the Proposed Project area, including rookeries located immediately north of Stedman Island (within about 650 ft of historic rookeries). However, no rookery were identified past the year 2000 and no currently active rookeries are known to be present within 1,000 ft of the Proposed Project.

Table 8-11 contains a list of migratory birds and migratory birds of conservation concern (BCC) that may occur within the Proposed Project area. BCCs are a subset of protected birds under the MBTA that include all species, subspecies, and populations of migratory non-game birds that are likely to become candidates for listed under the ESA without additional conservation protections. BCCs are identified by the USFWS on a regional level, by Bird Conservation Regions (BCRs). The Onshore Pipelines will be wholly located within BCR 37 (Gulf Coastal Prairie). While this is not an exhaustive list of all the species that may occur, it is representative of the avian species that may occur within the Proposed Project area and may be affected by the Proposed Project.

Table 8-11: Representative Migratory Bird Species Occurring Within the Proposed Project Area

Species	Bird of Conservation Concern	Breeding Dates	Dominant Location
American oystercatcher (*Haematopus palliatus*)	Yes	April 15 to August 31	Inshore
Audubon's oriole (*Icterus graduacauda*)	No	April 15 to September 20	Inshore
Bald eagle (*Haliaeetus leucocephalus*)	Yes	September 1 to July 31	Inshore/Offshore
Black rail (*Laterallus jamaicensis*)	Yes	March 1 to September 15	Inshore
Black skimmer (*Rynchops niger*)	Yes	May 20 to September 15	Inshore/Offshore
Brown pelican (*Pelecanus occidentalis*)	No	January 15 to September 30	Inshore/Offshore
Burrowing owl (*Athene cunicularia*)	No	March 15 to August 31	Inshore
Cassin's sparrow (*Aimophila cassinii*)	No	August 2 to October 10	Inshore
Clapper rail (*Rallus crepitans*)	No	April 10 to October 31	Inshore
Common loon (*Gavia immer*)	No	April 15 to October 31	Offshore
Common tern (*Sterna hirundo*)	No	May 10 to September 10	Inshore
Curve-billed thrasher (*Toxostoma curvirostre*)	No	February 15 to August 15	Inshore
Double-crested cormorant (*Phalacrocorax auritus*)	No	April 20 to August 31	Inshore/Offshore
Gull-billed tern (*Gelochelidon nilotica*)	Yes	May 1 to July 31	Inshore
Harris's hawk (*Parabuteo unicinctus*)	e	March 1 to August 10	Inshore
Herring gull (*Larus argentatus*)	No	April 20 to August 31	Inshore

Table 8-11: Representative Migratory Bird Species Occurring Within the Proposed Project Area			
Species	**Bird of Conservation Concern**	**Breeding Dates**	**Dominant Location**
Hooded oriole (*Icterus cucllatus*)	No	April 20 to August 15	Inshore
King rail (*Rallus elegans*)	No	May 1 to September 5	Inshore
Least tern (*Sterna antillarum*)	Yes	April 20 to September 10	Inshore
Prothonotary warbler (*Protonotaria citrea*)	Yes	April 1 to July 31	Inshore
Reddish egret (*Egretta rufescens*)	Yes	March 1 to September 15	Inshore
Royal tern (*Thalasseus maximus*)	No	April 15 to August 31	Inshore
Seaside sparrow (*Ammodramus maritimus*)	Yes	May 10 to August 20	Inshore
Sooty tern (*Onychoprion fuscatus*)	No	March 10 to July 31	Offshore
Swallow-tailed kite (*Elanoides forficatus*)	Yes	March 10 to June 30	Inshore
Willet (*Tringa semipalmata*)	No	April 20 to August 5	Inshore
Varied bunting (*Passerina versicolor*)	No	April 25 to September 30	Inshore
Wilson's plover (*Charadrius wilsonia*)	Yes	April 1 to August 20	Inshore
Source: USFWS 2019a, USFWS 2008.			

8.2.2.6 Invasive Species

As described in E.O. 13112, an invasive species is a non-native species whose introduction is likely to cause economic, environmental, or human health harm. Invasive species include noxious plants (as identified by the U.S. Department of Agriculture [USDA]) and exotic insects and animals (as identified by TPWD). These species lack natural predators, competitors, and/or disease in their introduced environment and are able to succeed under these favorable conditions. Once established, these species rapidly spread and overtake entire ecosystems which can lead to a decrease in the biodiversity of an area (Texas Invasives 2019a).

8.2.2.6.1 ONSHORE

Texas Department of Agriculture (TDA) and USDA both maintain lists of invasive plants occurring in Texas and potentially in the Proposed Project area while TPWD maintains a list of Prohibited Species. Some plant species occur on both lists while others do not. The Noxious and Invasive Plants named by the TDA are found in the TAC Section 19.300). The current lists have 26 species as "Noxious" and 4 listed as "Invasive." The USDA utilizes the National Invasive Species Information Center to maintain list of invasive plant species. There federal list of invasive plants currently includes 66 terrestrial plants and 16 aquatic species (USDA 2017). Many of these species are known to occur in Texas; however only 12 of these species are known to occur in the Gulf Prairies and Marshes ecoregion. Of these 12, five have a known presence in San Patricio and/or Aransas Counties, Texas where the Proposed Project is located (see Table 8-12). Invasive aquatic plants have been included in Table 8-12 below as they could occur within wetland habitats within the Proposed Project area.

Table 8-12: Invasive Species Potentially Present in the Proposed Project Area

Common Name	Scientific Name	Known Presence in the Proposed Project Vicinity[a]
Invasive Aquatic Plants[b]		
Mosquito fern	*Azolla pinnata*	No
Killer algae	*Cailerpa taxifolia*	No
Rooted water hyacinth	*Eichhornia azurea*	No
Hydrilla	*Hydrilla verticillata*	No
Miramar weed	*Hygrophila polysperma*	No
Swamp morning glory	*Ipomoea aquatica*	No
Afican elodea	*4Lagarosiphon major*	No
Asian marshweed	*Limnophila sessiliflora*	No
Broadleaf paper bark tree	*Melaleuca quinquenervia*	No
Arrowleaf false pickerelweed	*Monochoria hastata*	No
Heartshape false pickerelweed	*Monochoria vaginalis*	No
Ducklettuce	*Ottelia alismoides*	No
Arrowhead	*Sagittaria sagittifolia*	No
Giant salvinia	*Salvinia auriculata*	No
Giant salvinia	*Salvinia biloba*	No
Giant salvinia	*Salvinia herzogii*	No
Giant salvinia	*Salvinia molesta*	No
Wetland niteshade	*Solanum tampicense*	No
Exotic bur-reed	*Sparganium erectum*	No
Invasive Terrestrial Plants[b]		
Giant salvinia	*Salvinia molesta*	No
Chinese tallow tree	*Triadica sebifera*	No
Salt cedar	*Tamarix ramosissima*	Yes
Deep-rooted sedge	*Cyperus entrerianus*	Yes
Brazilian peppertree	*Schinus terebinthifolius*	Yes
Chinaberry tree	*Melia azedarach*	Yes
Japanese honesuckle	*Lonicera japonica*	No
Chinese privet	*Ligustrum sinense*	No
Common water hyacinth	*Eichhornia crassipes*	No
Alligatorweed	*Alternanthera philoxeroides*	No
Trifoliate orange	*Poncirus trifoliata*	No
Guineagrass	*Urochloa maxima*	Yes

a Yes indicates known presence in San Patricio or Aransas Counties, Texas.

b Source: USDA 2017, Introduced, Invasive, and Noxious Plants. Available at https://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/downloads/weedlist.pdf. Accessed March 5, 2019.

c Source: Texas Invasives 2019b. Gulf Coast Prairies and Marshes. Available at: https://www.texasinvasives.org/i101/ecoalert_detail.php?ecoregion_id=2. Accessed March 5, 2019.

In addition to the invasive plant species listed above, invasive and exotic animal species such as the feral hog (*Sus scrofa*) may occur in within the Onshore Project area. The feral hog was introduced by Spanish explorers over 300 years ago as a food source for settlers. This species is rapidly expanding across Texas due to intentional releases, improved habitat, increased management, and a high reproductive potential. This omnivorous species is opportunistic in its feeding habitats and generally lives from 5 to 8 years. Feral hogs are considered a problematic species in Texas due to a lack of predator species, the significant habitat damage they cause by way of rooting and wallowing, and the direct and indirect competition they have with all other wildlife species.

8.2.2.6.2 INSHORE

Wetland and aquatic invasive species in coastal Texas may compete with native animals and plants for food and space. As discussed above, these species lack natural predators and are able to become established and multiply at rapid rates. Aquatic invasive species can reduce the ability of streams to convey water, displace native plant communities, interfere with boat traffic, affect water quality, and significantly degrade aquatic habitats (TPWD 2019a). Aquatic invasive species are included in Table 8-12, above. The primary concern for aquatic plant species along the Texas coast is Giant Salvinia; however, according to available county data from the USDA, this species does not occur within Aransas or San Patricio Counties, Texas (Texas Invasives 2019b).

8.2.2.6.3 OFFSHORE

Non-native fish, shellfish, and aquatic plants pose a threat to native species as they compete with existing species for available ecosystem resources. Generally, these species lack regional or natural enemies which will maintain normal population dynamics. Therefore, invasive species are able to easily multiply and overtake the environment. There are several known invasive species in the vicinity of the Proposed Project (TPWD 2019b). Marine-based invasive species occurrences are increasing within the GOM due to their transport occurring in ballast water exchanges and hull fouling. Known invasive species within the GOM include the brown mussel (*Perna perna*) the Australian spotted jellyfish (*Phyllorhiza punctata*), and the Asian green mussel (*Perna viridis*) (TPWD 2019b).

The brown mussel is a native of South Africa, Brazil, and Venezuela that is believed to have entered Texas waters through the hulls of marine vessels. This fouling organisms which has been observed as occurring between 25,000 to 30,000 per square mi has spread from the Texas coastline to platforms as far as 16 mi (25.8 km) off Port Aransas and to areas of Corpus Christi Bay (TPWD 2019b). The Australian spotted jellyfish arrived in the GOM through the Panama Canal during ship crossings. This species is a mass producer that can produce up to 300 individuals from one egg. The Australia spotted jellyfish eats algae, plankton, fish eggs, and small fish species. Additionally, this species directly impact the commercial shrimping industry by clogging shrimp nets during operations. At certain times, this species has been known to clog estuaries from Mobile Bay to the Mississippi River and eat all zooplankton within the water column (TPWD 2019b). Although not in the vicinity of the Proposed Project, the Asian green mussel and lionfish have been observed on the Atlantic side of Florida and have the potential to spread in the GOM. There are few regulatory enforcements currently in place to control the spread of these species; however, managing for these species has become a focus of local and state governments (TPWD 2019b).

Very large crude carriers (VLCC) may use ballast pumps to maintain appropriate draft levels and improve navigation; during loading at the SPM buoy systems. If invasive species were unknowingly transported in the ballast tanks, they could be introduced into the GOM. As required by USCG Regulations under 33 Code of Federal Regulations (CFR) 151.1510, vessels equipped with ballast tanks must implement one of five options to control nonindigenous species in Waters of the U.S. (WOTUS). Examples of these strategies include retaining ballast water on board, minimizing discharge or uptake at certain times and locations, and exchanging ballast water with mid-ocean seawater. Ships that have operated outside of the U.S. Exclusive Economic Zone must either retain their ballast water on board or undergo a mid-ocean (> 200 nm [230 mi or 370 km] from shore/water depth > 6,561 ft [2,000 m]) ballast water exchange in accordance with applicable regulations. The International Maritime Organization has adopted this regulation and requires each vessel to install and operate a ballast water

management system. Other applicable laws, programs, and regulations require ships to limit the concentration of living organisms in ballast water; wash anchors and anchor chains to remove organisms at their point of origin; remove fouling organisms; and clean ballast tanks regularly. Because VLCCs will be subject to U.S. regulations to prevent the introduction of invasive species, impacts will be negligible.

8.2.2.7 Federally Listed Species

In order to facilitate compliance with the ESA, BWTT has assessed the list of federally threatened and endangered species for Aransas, Nueces, and San Patricio Counties, Texas, available at the USFWS Information for Planning and Conservation website (USFWS 2019a), and the NMFS' list of threatened and endangered species in Texas waters (NMFS 2019b). The USFWS Critical Habitat Map was also utilized, which provides spatial data for active proposed and final critical habitat for threatened and endangered species (USFWS 2019b).

Those species listed as a candidate for federal listing, threatened, or endangered by the USFWS or NMFS were assigned to one of three categories of possible effect. The evaluation of impacts to species is limited to the Proposed Project area and does not assess the impacts to the species or their habitats at regional or global levels. The effects determinations include:

- *May affect, is likely to adversely affect*—adverse effects to listed species may occur as a direct or indirect result of the Proposed Project, and the effect is not discountable, insignificant, or beneficial.
- *May affect, is not likely to adversely affect*—the Proposed Project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial.
- *No effect*—the Proposed Project will not affect federally listed species or critical habitat.

BWTT conducted a field reconnaissance of the Proposed Project area in January and February 2019. No federally protected species were observed in the survey area during field surveys; however, potential habitat for ten species was observed in the vicinity of the Proposed Project (See Table 8.13 and Appendix M and N for the Threatened and Endangered Species Reports). The Proposed Project area was also evaluated for potential habitat for bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) as they are protected by the BGEPA. Field surveys indicated that there was no suitable habitat for bald or golden eagles. Additionally, a TXNDD data request reported no known elemental occurrences of either species in the vicinity of the Proposed Project. Therefore, the Proposed Project will have *No effect* on the bald or golden eagle.

Table 8-13 describes the federally listed species that occur in the Proposed Project area, their preferred habitat, and determination of effect. Federally listed species with a determination of "no effect," as documented in Table 8-13, are not discussed further. In addition, while the interior least tern (*Sterna antillarum)* was identified by the USFWS as potentially occurring in San Patricio and Nueces Counties, the USFWS (2019a) indicated that the species only needs to be considered for wind related projects, and the species is not included in the TPWD (2019c) annotated list of rare species for San Patricio or Nueces Counties, Texas. Therefore, it is not addressed further. Additional information on federally listed species is included in the Draft Biological Assessment, which is included as Appendix P.

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]				
Species	**Federal Status**	**State Status**	**Habitat Description**	**Effect Determination**
Fish				
Oceanic whitetip shark (*Carchharhinus longimanus*)	T		Found throughout tropical and sub-tropical waters. This species is a pelagic species, generally preferring offshore habitats in the open ocean along the OCS of near ocean islands in waters with depths greater than 600 ft (182.9 m, NOAA 2019a).	*No effect*. The Proposed Project is located in offshore waters with depths of approximately 88.5 to 89.5 ft (27.0 to 27.3 m) which will not be preferred by this species.
Giant manta ray (*Manta birostris*)	T		This species is a migratory pelagic species that prefers sparse, highly fragmented habitats within tropical, sub-tropical, and temperate marine waters. Populations within the GOM are small and sparely distributed; however, a population of this species occurs within the Flower Garden Banks National Marine Sanctuary. These filter feeders are known near the Yucatan Peninsula as well as other areas of the GOM (NOAA 2019b,c)	*May affect, not likely to adversely affect*. A known population of this species is within the GOM and could transit the area; however, given the distance of known populations of this species, it is unlikely they will be impacted by the Proposed Project.
Marine Reptiles				
Green sea turtle (*Chelonia mydas*)	T	T	Known within Gulf and bay systems. Prefer shallow water seagrass beds, open water between feeding and nesting areas, and barrier island beaches. Adults are herbivorous, feeding on sea grass and sea weed while juveniles are omnivorous, feeding on marine invertebrates early and increasingly on sea grasses and sea weeds as they mature. Nesting occurs from March to October with peak activity in May and June (USFWS 2019c).	*May affect, not likely to adversely affect*. Historic TXNDD elemental occurrences have been reported within the Proposed Project area and known nesting occurs in the general Project area.
Hawksbill sea turtle (*Eretmochelys imbricata*)	E	E	Known within Gulf and bay system in warm shallow waters, especially in rocky marine environments, such as coral reefs and jetties; juveniles are found generally in floating mats of sea plants. This species feeds on sponges, jellyfish, sea urchins, mollusks, and crustaceans. Nesting occurs April through November (USFWS 2019d).	*May affect, not likely to adversely affect*. Although this species is known to occur in the GOM, no TXNDD occurrences were reported in the vicinity of the Proposed Project area; however, potential impacts associated with noise inadvertent vessel strikes, and impacted *Sargassum* could impact this species.

[2] Aransas, San Patricio, and Nueces Counties, Texas

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]				
Species	**Federal Status**	**State Status**	**Habitat Description**	**Effect Determination**
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	E	E	Known within Gulf and bay systems. Adults prefer the shallow waters of the GOM and feed primarily on crabs, snails, claims, other crustaceans, and plants. Juveniles generally feed on *Sargassum* and their associated fauna. Nesting period from April through August (USFWS 2019e).	*May affect, not likely to adversely affect.* Not known to nest in the Proposed Project area, but may use offshore waters for transit.
Leatherback sea turtle (*Dermochelys coriacea*)	E	E	Known within Gulf and bay systems. This omnivorous species prefers jellyfish and nests from March to August (USFWS 2019f).	*May affect, not likely to adversely effect..* Historically nested in the Proposed Project area and may transit through the Offshore Project area; however, this species is usually found in deep ocean waters.
Loggerhead sea turtle (*Caretta caretta*)	T	T	Known within Gulf and bay system primarily for juveniles. Adults are primarily pelagic. This omnivorous species prefers mollusks, crustaceans, and coral for feeding and nests from April through November (USFWS 2019g).	*May affect, not likely to adversely affect.* Historic TXNDD elemental occurrences have been in the Proposed Project area and known nesting occurs in the general Project area.
Marine Mammals				
West Indian Manatee (*Trichechus manatus*)	E	T	Utilizes coastal habitats such as bays and the mouths of rivers; however, Texas waters of the GOM area the very western extent of their range (USFWS 2019h).	*No effect.* The Proposed Project is located along the western extent of the range of this species and all inshore waters will be crossed by HDD.
Bryde's whale (*Balaenoptera edeni*)	PE		Occurs in tropical, sub-tropical, and warm temperate waters worldwide, including the northwestern and central GOM (NOAA 2019d).	*No effect.* No confirmed sightings of Bryde's whales have been documented in the north central or western GOM since NMFS began surveys in the early 1990s.
Blue whale (*Balaenoptera musculus*)	E		Distributed in sub-polar to sub-tropical latitudes worldwide. Migrates toward polar waters in spring. While found in coastal waters, they are thought to occur generally more offshore than other whales. An occasional visitor in U.S. waters in the Western North Atlantic, which could occur as far south as Florida and the GOM; however, the southern limit of the species' range is unknown and the population of this stock is small (perhaps between 400 and 600 individuals).	*May affect, not likely to adversely affect.* Individuals can occasionally occur in coastal waters and may occur in the Proposed Project area.

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Fin whale (*Balaenoptera physalus*)	E		Distributed in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes; less common in the tropics. Most migrate from the Arctic and Antarctic feeding areas in the summer to tropical breeding and calving areas in the winter (NOAA 2019e).	*May affect, not likely to adversely affect.* Most likely occurs in deeper waters but is occasionally known to occur in coastal waters.
Sei whale (*Balaenoptera borealis*)	E		Distributed in sub-tropical, temperate, and sub-polar waters. May unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. May migrate toward lower latitudes during winter and higher latitudes during summer (NOAA 2019f).	*May affect, not likely to adversely affect.* Due to the random occurrence of this species in an area, there is the potential that they could occur in the Proposed Project area.
Humpback whale (*Megaptera novaeanglia*)	E		Distributed throughout all major oceans from the equator to sub-polar latitudes. Not expected to occur often in the northern and western GOM. The Gulf of Maine stock of humpback whales, which winters in the West Indies where the majority of whales are found in the waters of the Dominican Republic, is the nearest population to the Proposed Project. The population size is unknown.	*May affect, not likely to adversely affect.* Individuals can occasionally occur in nearshore waters of the GOM during the winter and could occur in the Proposed Project area.
Sperm whale (*Physeter macrocephalus*)	E		Distributed worldwide, but generally prefer waters deeper than 1,641 ft (500 m, NOAA 2019g).	*No effect*. The Proposed Project is located in offshore waters with maximum depths of approximately 88 ft (26.8 m) which will not be preferred by this species.
Birds				
Attwater's greater prairie-chicken (*Tympanuchus cupido attwateri*)	E	E	Prefers coastal prairie grasses such as little bluestem, big bluestem, Indiangrass, and switchgrass. Require both tall and short grasses within their habitat and generally lek in areas containing bare ground or short grasses (TPWD 2019c).	*No effect*. Terrestrial habitat within the Proposed Project area consists primarily of cleared industrial, residential, and agricultural habitat. Therefore, the Attwater's greater prairie-chicken is not anticipated to occur in the Proposed Project area.
Northern apolomado falcon (*Falco femoralis septentrionalis*)	E	E	Prefers open areas, specifically savanna and open woodlands with scattered trees or shrubs. Also known to occur in grassy plains and valleys containing intermittent mesquite, yucca, and cactus. Known to utilize former nests of birds constructed of sticks. Nesting is known to occur on Matagorda Island and near Brownsville, Texas; the coastal region between these populations (including the Proposed Project area) is not known to include nesting pairs (USFWS 2014).	*May affect, not likely to adversely affect.* The closest known populations occur near Brownsville, Texas; within the Aransas NWR; and on San Jose Island. No nests or occurrences were observed during field surveys; however, since they are known to occur in the area, the Proposed Project could temporarily impact species.

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Piping plover (*Charadrius melodus*)	T	T	Wintering migrant along the Texas Gulf Coast and is known to occur along beaches and bayside mud or salt flats (TPWD 2019d).	May affect, not likely to adversely effect. Critical habitat for the piping plover is present; however, impacts to this area will be avoided through the implementation of HDD drilling techniques.
Red knot (*Calidris canutus rufa*)	T	T	Migrate April to June and prefers coastal areas along tidal flats and beaches, herbaceous wetlands, and tidal flat/shore habitats (TPWD 2019c).	May affect, not likely to adversely affect. Although potential habitat is present within the Proposed Project area, impacts will be avoided through the implementation of HDD drilling techniques.
Whooping crane (*Grus americana*)	E	E	Migrant species known throughout the state to the coast. Winters within the marshes of Aransas, Calhoun, and Refugio counties in Aransas NWR (TPWD 2019e and USFWS 2019j).	*May affect, not likely to adversely affect.* A population winters in Aransas NWR, which is located about 17 mi (27 km) from the Proposed Project; some suitable habitat occurs in the Proposed Project area.
Terrestrial Mammals				
Gulf coast jaguarundi (*Herpailurus yagouraroundki cacomitli*)	E	E	Prefers thick brushlands near water. Species has a 60 to 75-day gestation period with litters sometimes twice annually in March and August or beginning of the rainy season and end of the dry season (TPWD 2019f).	*No effect.* Historic records of this species were reported by TPWD within the TXNDD data, near McCampbell's slough. However, the last observation documented in the Proposed Project area is from 1991. Potentially suitable habitat near this waterbody will be avoided by implementing HDD construction methods.
Ocelot (*Leopardus pardalis*)	E	E	Prefers dense chaparral thickets and mesquite-thorn scrub and live oak mottes. Avoids open areas and breeds from June to November when young are also raised (TPWD 2019g).	*No effect.* Habitat in the Proposed Project area is generally disturbed agricultural or developed land unsuitable for the ocelot.
Invertebrates				
Golden orb (*Quadrula aurea*)	C	T	Found in sand and gravel substrates, occasionally in substrates of mud. Found in standing or fast-flowing waters of the Guadalupe, San Antonio, Lower San Marcos, and Nueces River basins (TPWD 2019c).	*No effect*. Although lentic and lotic waterbodies occur in the Proposed Project area, impacts to these waterbodies will be avoided through the implementation of HDD construction methods,

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Lobed star coral (*Orbicella annularis*)	T		This reef-building coral grows in varying colony shapes in response to differing light conditions. It lives in the western Atlantic Ocean, and is the most abundant species of reef-building coral in the Caribbean (NOAA 2019i).	*No effect*. The Proposed Project is outside of the species' range.
Mountainous star coral (*Orbicella faveolata*)	T		Identified as occurring off the State of Florida (NatureServe 2019a).	*No effect*. The Proposed Project is outside of the species' range.
Boulder star coral (*Orbicella franksi*)	T		Identified as occurring off the State of Florida (NatureServe 2019b).	*No effect*. The Proposed Project is outside of the species' range.
Elkhorn coral (*Acropora palmata*)	T/PE		Elkhorn coral can be found in shallow water throughout the Caribbean and in the United States in the Florida Keys and along the east coast of Florida north to Broward County. The species is currently listed as threatened but is Proposed for reclassification as endangered (NMFS 2019d).	*No effect*. The Proposed Project is outside of the species' range.

Table 8-13: Federally Listed Threatened and Endangered Species in Proposed Project Area[2]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Flowering Plants				
Slender rush-pea (*Hoffmannseggia tenella*)	E		Historically known to occur in Nueces and Kleberg Counties along remnant native prairie habitats that have not been tilled or developed. This species prefers patches of short-grass native prairies adjacent to intermittent and perennial waterbodies. (USFWS 2019k)	*No effect.* Terrestrial habitat within the Proposed Project area consists primarily of cleared industrial, residential, and agricultural habitat. Therefore, the slender rush-pea is not anticipated to occur in the Proposed Project area.
South Texas ambrosia (*Ambrosia cheiranthifolia*)	E		Historically known to occur in Cameron, Jim Wells, Kleberg, and Nueces Counties, Texas. Prefers low elevations, along well drained soils associated with sub-tropical woodland communities along openings of coastal prairies and savannas. (USFWS 2019l)	*No effect.* Terrestrial habitat within the Proposed Project area consists primarily of cleared industrial, residential, and agricultural habitat. Therefore, the south Texas Ambrosia is not anticipated to occur in the Proposed Project area.

E = Endangered; T= Threatened; C = Candidate Species

* Indicates listed marine

Source: USFWS 2019a, TPWD 2019c, NMFS 2019a, NMFS 2019c, BOEM 2017.

8.2.2.7.1 FISHES

GIANT MANTA RAY

The Offshore Pipelines and SPM buoy systems are within the range of the federally threatened giant manta ray. The giant manta ray is a migratory pelagic ray species that occurs in sparse, highly fragmented populations across tropical, sub-tropical, and temperate marine waters. This species is highly migratory and a seasonal visitor along productive coastlines with regular upwelling within oceanic island groups and near offshore pinnacles or seamounts. This species is generally solitary but will aggregate at sites to feed and mate. This filter feeder feeds primarily on planktonic organisms including, but not limited to, decapods, mysids, copepods, and shrimp. Giant manta rays occur at a wide range of depths; although they feed in waters with depths less than 33 ft (10 m), recent studies have recorded this species exceeding depths of 3,281 ft (1,000 m) (NOAA 2019c).

Current threats to this species include overutilization for commercial purposes, being targeted for commercial catch, and indirectly being affected as bycatch for commercial fishing operations. Although this species occurs across the Atlantic in isolated areas and along the Yucatan Peninsula, a small population of giant manta rays is also known within the Flower Garden Banks National Marine Sanctuary, approximately 160 mi (257.5 km) northeast of the SPM buoy systems within Project area (NOAA 2019b). Given the distance of known populations, but the potential for the species to occur along vessel transit routes and in other areas of the northern GOM, the Proposed Project *may affect, but is not likely to adversely affect*, the giant manta ray.

8.2.2.7.2 MARINE REPTILES

There are five sea turtle species listed by USFWS as having the potential to occur in the counties associated with the action areas (USFWS 2019a). These five species include the Atlantic hawksbill sea turtle, the leatherback sea turtle, the Kemps' ridley sea turtle, the green sea turtle, and the loggerhead sea turtle (Table 8-13). All but the Kemp's ridley sea turtle have global distributions in either the tropics, subtropics, or temperate waters (NOAA 2019h). The Kemp's ridley sea turtle distribution is limited to the GOM, though juveniles may be found along the U.S. Atlantic coast (Meylan 2006, Dixon 2014, TXNDD 2019). In Texas, these species can be found along south Texas inshore and nearshore coastal waters. Juveniles, males, or non-breeding females may occur all along the inshore and nearshore coastal waters. During adult non-nesting and juvenile stages, these species occur in pelagic, coral reefs, or nearshore coastal areas for foraging and breeding.

For these five species, nesting occurs on coastal beaches. Primary nesting areas for all species are located outside of Texas, however, all five species have documented nests at the Padre Island National Seashore (PINS) located approximately 40 mi (64 km) south of the coastal portion of the Proposed Project area. These species exhibit site fidelity, returning to the same nesting area annually and across generations. Although there are slight temporal differences in the specific nesting dates for each species, nesting occurs between March and November, with peak activities from May through July. The Atlantic hawksbill sea turtle and leatherback sea turtle are rare in Texas with only one nesting record for each species located at the PINS (Dixon 2014, TXNDD 2019). There are very few sightings of these species in nearshore marine environments (Landry no date).

GREEN SEA TURTLE

The green sea turtle is currently federally listed as threatened. On April 6, 2016, the USFWS and NMFS published a final rule to list the green sea turtle population as 11 DPS that qualify as unique species for the purposes of listing under the ESA (81 FR 20057). As a result, the range-wide listing status was revoked and, in its place, eight DPSs were listed as threatened and three DPSs were listed as endangered. Green sea turtles occurring off the coast of Texas are part of the North Atlantic DPS, which is listed as threatened. Although critical habitat has been designated for the North Atlantic DPS it is located off Puerto Rico and will not be affected by the Proposed Project.

Green sea turtles are generally found in shallow waters inside bays, inlets, and reefs with an abundance of seagrass and algae. As one of the more coastal species of sea turtle, adult green sea turtles forage primarily on seagrass

and marine algae. Green sea turtles can exhibit high nesting site fidelity, which can lead to common migratory routes between feeding grounds and nesting beaches. Green sea turtles nest on open, sloping beaches with minimal disturbance. After emerging from the nest, hatchlings swim offshore and remain there for a number of years, where they are sometimes associated with *Sargassum* mats for food and shelter (USFWS 2019c). During 2018, all green sea turtle nests in Texas were identified on North Padre, Padre, and South Padre Islands, south of the Proposed Project area (National Park Service [NPS] 2019). The Inshore and Offshore Project waters are within the range of the federally threatened green sea turtle. Nesting occurs from June through September (USFWS 2019c).

Current threats to the green sea turtle include the commercial harvest for eggs and meat, disease (Fibropapillomatosis) which impacts the skin and internal organs of this species, degradation of nesting habitat associate with coastal development or beach armoring, disorientation of hatchings result from artificial lighting, degradation of foraging habitat, nest predation, marine pollution and debris, vessel strikes, and incidental take associated with channel dredging and commercial fishing (USFWS 2019c).

A TXNDD search reported elemental occurrences of this species within 1 mi of the Proposed Project area, within Redfish Bay. HDD construction methods will be implemented within Redfish Bay, and all inshore waters to avoid impacts to this species and area seagrasses. Impacts on the beaches of San Jose Island will also be avoided by HDD. However, given the potential for inadvertent vessel strikes during construction and/or operation, and impacts to *Sargassum* within the Proposed Project area, the Proposed Project *may affect, but is not likely to adversely affect* the green sea turtle.

HAWKSBILL SEA TURTLE

The Inshore and Offshore Pipelines as well as the SPM buoy systems are within the range of the federally endangered hawksbill sea turtle. This species generally occurs in rocky areas, coral reefs, shallow coastal areas, lagoons or ocean islands, and narrow creeks or passes. They generally prefer shallow waters less than 65 ft (20 m). Hatchlings are often occur in pelagic environments within *Sargassum* mats where they can feed on a variety of floating flora and fauna within the *Sargassum*. Nesting occurs between April and November on undisturbed deep-sand beaches within the tropics (USFWS 2019d).

Current threats to the hawksbill sea turtle is primarily from the illegal human exploitation of the hawksbill sea turtle shell, nest predation by native and non-native predators, degradation of foraging habitat, watercraft strikes, incidental takes from commercial fishing operations, and marine pollution and debris (USFWS 2019d). Although the species is not currently known to nest in the Proposed Project area or occur in inshore waters, it may be present in offshore waters as it feeds, rests, and travels. Given the potential for inadvertent vessel strikes during construction and/or operation, and impacts to *Sargassum* within the Proposed Project area, the Proposed Project *may affect, but is not likely to adversely affect* the hawksbill sea turtle.

KEMP'S RIDLEY SEA TURTLE

The federally endangered Kemp's ridley sea turtle primarily inhabits coastal waters in the northwestern Atlantic and the GOM. Adult and sub-adult Kemps ridley sea turtles occupy nearshore habitats containing muddy to sandy substrates where food sources (crab, fish, jellyfish, and mollusks) are readily available. Hatchlings and juveniles, however, occur in pelagic environments within *Sargassum* mats where they can feed on a variety of floating flora and fauna within the *Sargassum* (USFWS 2019e). No critical habitat has been designated for this species.

The majority of this species nests at one of three beaches in Mexico from April to July; however, nesting also occurs along the Texas coast. PINS, and the adjacent South Padre Island, represented the most prominent nesting location in the United States of America (U.S.) during the 2018 nesting season where 181 nests were documented. Nesting turtles were also identified along San Jose Island (12 nests) and Mustang Island (14 nests) during the 2018 nesting season (NPS 2019; please note that these are preliminary data). Current threats to this species include

human activities including the direct harvest of adults and eggs as well as the incidental capture as bycatch associated with commercial fishing operations (USFWS 2019e).

The Inshore and Offshore Pipelines as well as the SPM buoy systems are within the range of the federally endangered Kemp's ridley sea turtle. No elemental occurrences of this species were reported by TPWD during the TXNDD search; however, due to the reported occurrences of nesting turtles by the National Park Service, this species is known to occur in the vicinity of the Proposed Project area. HDD construction methods will be implemented within Redfish Bay, and all inshore waters to avoid impacts to this species and area seagrasses. Impacts on the potential nesting beaches of San Jose Island will also be avoided by HDD. However, given the potential for inadvertent vessel strikes during construction and/or operation, and impacts to *Sargassum* within the Proposed Project area, the Proposed Project *may affect, but is not likely to adversely affect* the green sea turtle.

LEATHERBACK SEA TURTLE

The Inshore and Offshore Pipelines as well as the SPM buoy systems are within the range of the federally endangered leatherback sea turtle; however, this species prefers pelagic habits and is known to be the most pelagic of all sea turtles. Leatherback sea turtles feed primarily on soft-bodied animals such as jellyfish and sea squirts; however, they are also known to consume sea urchins, crustaceans, fish, and floating seaweed. Nesting occurs from March to July on beaches backed with vegetation that are sloped so that distance to dry sand is minimal (USFWS 2019f). Nesting occurs March to July.

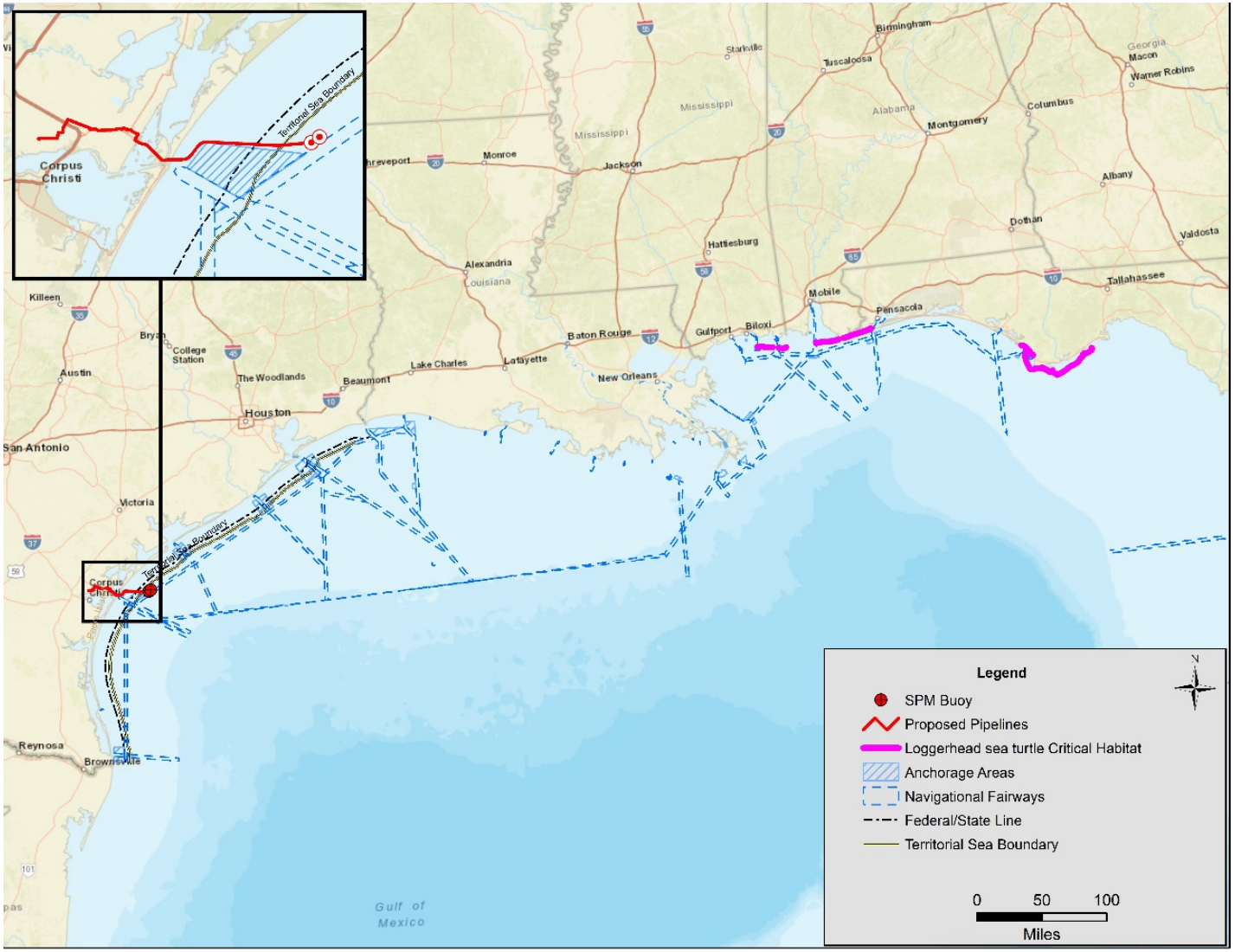
Current threats to the leatherback sea turtle include human exploitation of eggs and meat, incidental take by commercial fisheries, degradation of nesting habitat resulting from coastal development, disorientation resulting from artificial lighting, nest predation, degradation of foraging habits, vessel strikes, and marine pollution and debris. No elemental occurrences of this species were reported by TPWD during the TXNDD search and no nesting is anticipated to occur in the Proposed Project area. However, leatherback sea turtles could occur in the vicinity of the Offshore Components. Given the potential for inadvertent vessel strikes during construction and/or operation, the Proposed Project *may affect, but is not likely to adversely affect* the leatherback sea turtle.

LOGGERHEAD SEA TURTLE

The Northwest Atlantic Ocean DPS of loggerhead sea turtles is federally listed as threatened. This species occurs throughout the world in temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. The loggerhead sea turtle can migrate significant distances between foraging areas, breeding areas, and nesting locations. They can be found in inshore areas such as bays, ship channels, large river mouths, and salt marshes as well as hundreds of miles offshore. Loggerhead sea turtles feed on mollusks, crustaceans, fish, conchs, and other marine animals (USFWS 2019g, NOAA 2019i). Young loggerheads occur in the open ocean and are often found in association with *Sargassum* mats, while juveniles and adults reside in coastal areas in between reproductive migrations, when females return to their natal beach to nest. In the U.S., loggerheads can generally be found nesting from Texas to Virginia, though the major nesting concentrations occur in Florida, Georgia, South Carolina, and North Carolina (USFWS 2019g). During the 2018 nesting period, six loggerhead nests were identified along the Texas coast, including three in the PINS (NPS 2019). Nesting of this species occurs from April through September, peaking in June and July across the southeastern U.S. Coast (USFWS 2019g).

Critical habitat for the Northwest Atlantic Ocean DPS was designated in 2014 to protect both marine and terrestrial habitats. While the terrestrial critical habitat is restricted to the Florida coast, critical marine habitat includes *Sargassum* habitats, for the protection of post-hatchlings and juveniles. As *Sargassum* forms floating mats and travels with the Loop Current in the GOM, critical habitat was established to account for the edge of the Loop Current (see Figure 8-8; NOAA 2014).

Figure 8-8: Loggerhead Critical Habitat Map



Source: BOEM 2019.

Current threats to the loggerhead sea turtle include the degradation of nesting habitat associated with coastal development and beach armoring; disorientation of hatchlings associated with artificial lighting; nest predation by predators (native and non-native); loss of foraging habitat; marine pollution and debris; as well as vessel strikes and incidental take during channel dredging and commercial trawling, longline, and gill net fisheries (USFWS 2019g).

The Inshore and Offshore Pipelines, as well as the SPM buoy systems, are within the range of the federally threatened loggerhead sea turtle. One elemental occurrence of the loggerhead turtle was reported by TPWD in the TXNDD database search, indicating the loggerhead sea turtle, and potential habitat, could be found in the vicinity of the Proposed Project Components; however, HDD construction methods will be implemented in these areas to avoid impacts to this species. Therefore, the Proposed Project *may affect, but is not likely to adversely affect* the loggerhead sea turtle.

IMPACTS OF SOUNDS ON SEA TURTLES

Only a few studies exist that have examined the role of hearing ecology for sea turtles (Mrosovsky, 1972, Samuel et el. 2005, Nunny et al., 2008, Ferrara et al. 2014). As with other species of turtles that have recently been identified as using sound to communicate, sea turtles may also use sound in this manner (Ferrara et al. 2014). Very little is known about the extent to which sea turtles use their auditory environment, and the habitats in which they occur changes the passive acoustics with each ontogenetic habitat shift For instance, the inshore environment where juvenile and adult sea turtles may reside for feeding and resting, is noisier than the open ocean habitat where hatchlings occur; this inshore environment is dominated by low-frequency sound (Hawkins and Myrberg, 1983), and, in areas of high traffic, virtually constant low-frequency noises from shipping, recreational boating, and seismic surveys compound the potential for acoustic impact (Hildebrand 2005).

Sound can have both physical and behavioral impacts on sea turtles. As described above for fish, studies have shown that the sound waves from pile-driving may result in injury or trauma to sea turtles and other animals with gas filled cavities, such as, lungs, sinuses, and hearing structures (Popper et al. 2014, Popper and Hastings 2005). Sea turtles may also exhibit startle reactions in response to noise or avoid important feeding, mating, or nesting habitat when anthropogenic noise is present in the vicinity (BOEM 2012). However, limited data are available describing the effects of intense sounds on marine turtles. A few case studies have been attempted which documented avoidance reactions to seismic signals at levels between 166 and 179 dB re 1 µPa (Moein et al., 1995; McCauley et al., 2000); however, both of these studies were completed in artificial settings that limited the turtles' abilities to seek avoidance. Moein et al. (1995) did observe a habituation effect to the airguns; the animals stopped responding to the signal after three presentations. This lack of behavioral response could be a result of TTS and PTS (reductions in hearing sensitivity).

Other impacts of exposure to continuous and impulsive sounds may include damage to the ear or lack of responsiveness to biologically relevant sounds due to masking (Popper et al. 2014). NOAA Fisheries uses 166 dB re 1 µPa as the threshold for behavioral effects sea turtles and 180 dB re 1 µPa as the threshold for injury (NMFS 2017; see Section 8.2.3.3.2).

8.2.2.7.3 MARINE MAMMALS

There are six endangered or threatened marine mammal species, as well as one species that is proposed for listing, which could occur within the Proposed Project area. These include blue whale, Bryde's whale, fin whale, humpback whale, sei whale, sperm whale, and Florida manatee. The blue whale, humpback whale, sei whale, and fin whale were given the effect determination of "may effect, but not likely to adversely affect" and thus are discussed in further detail below. As indicated in Table 8-13, few of these species are considered to potentially occur in the Proposed Project vicinity. However, only the fin whale, sei whale, sperm whale, and Bryde's whale are identified as occurring in Texas waters (NMFS 2019b). A more detailed discussion of federally listed whales, including those

for which have determined the Proposed Project will have no effect (the sperm whale and Bryde's whale), is provided in Appendix K: Marine Mammal Protection Act Assessment.

BLUE WHALE

Blue whales are distributed in sub-polar to sub-tropical latitudes worldwide, and migrate toward polar waters in the spring. Although found in coastal waters, they generally occur farther offshore. The blue whale is an occasional visitor in U.S. waters in the Western North Atlantic, which could occur as far south as Florida and the GOM; however, the southern limit of the species' range is unknown and the population of this stock is small (perhaps between 400 and 600 individuals; Waring 2011). Given the potential to occur in coastal waters, the species could occur in the Project area.

Underwater noise threatens whale populations, interrupting their normal behavior and driving them away from areas important to their survival. Increasing evidence suggests that exposure to intense underwater sound in some settings may cause some whales to strand and ultimately die (NMFS 2015). Drilling for oil and gas generally produces low-frequency sounds with strong tonal components in frequency ranges in which large baleen whales communicate. There are few data on the noise from conventional drilling platforms, but recorded noise from an early study of one drilling platform and three combined drilling production platforms found that noise was so weak it was almost undetectable alongside the platform at Beaufort scale sea states of three or above. The strongest tones were at low frequencies, near 5 hertz (Hz) (Richardson et al. 1995).

Given that blue whales are typically observed in deeper waters, it is unlikely that this species will occur in the Proposed Project area; however, blue whales occasionally enter shallower waters and could enter the waters near the SPM buoy systems. If a blue whale were to occur in the Proposed Project vicinity, the greatest potential for impacts will be due to vessel strikes and noise associated with pile-driving during construction. In addition, marine mammals in the vicinity could be exposed to oil in the event of an oil spill during operation of the SPM buoy systems. The potential impacts and mitigation for these activities are further discussed in Section 8.5 and Appendix K: Marine Mammal Protection Act Assessment.

Given the low likelihood of occurrence in the Proposed Project area and BWTT's proposed mitigation (including use of applicable Notices to Lessees (NTLs) and pending consultation with NMFS regarding pile-driving noise), we conclude that the Proposed Project *may affect but is not likely to adversely affect* the blue whale.

HUMPBACK WHALE

Humpback whales are distributed throughout all major oceans from the equator to sub-polar latitudes; however, The Gulf of Maine stock of humpback whales, which winters in the West Indies where the majority of whales are found in the waters of the Dominican Republic, is the nearest population to the Project. Therefore, the species is not likely to occur in the Project area; however, individuals could be present in the vicinity of the Proposed Project during winter (Waring 2015, NMFS 2012). The population size is unknown (Waring 2015).

Given that wintering humpback whales are most commonly found in the waters of the Dominican Republic, it is unlikely that this species will occur in the Proposed Project area; however, humpback whales occasionally enter the Gulf of Mexico and could enter the waters near the SPM buoy systems during winter. If a humpback whale were to occur in the Proposed Project vicinity, the greatest potential for impacts will be due to vessel strikes and noise associated with pile-driving during construction. In addition, marine mammals in the vicinity could be exposed to oil in the event of an oil spill during operation of the SPM buoy systems. The potential impacts and mitigation for these activities are further discussed in Section 8.5 and Appendix K: Marine Mammal Protection Act Assessment.

Given the low likelihood of occurrence in the Proposed Project area and BWTT's proposed mitigation (including use of applicable Notices to Lessees (NTLs) and pending consultation with NMFS regarding pile-driving noise), we conclude that the Proposed Project *may affect but is not likely to adversely affect* the humpback whale.

SEI WHALE

Sei whales have a cosmopolitan distribution and occur in sub-tropical, temperate, and sub-polar waters around the world. This species may unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. Populations of sei whales, like other rorquals, may seasonally migrate toward the lower latitudes during the winter and higher latitudes during the summer (NMFS 2015).

The movements of sei whales are not well known; however, individuals prefer temperate waters in the mid-latitudes and are typically observed in deeper waters far from the coastline (NOAA 2019f). However, they occasionally enter shallower, more inshore waters (Hayes 2017a). The Nova Scotia stock of sei whales is estimated at 357 individuals; however, NMFS does not track a GOM stock of this species (Hayes 2017a).

Given that sei whales are typically observed in deeper waters, it is unlikely that this species will occur in the Proposed Project area; however, sei whales occasionally enter shallower waters and could enter the waters near the SPM buoy systems. If a sei whale were to occur in the Proposed Project vicinity, the greatest potential for impacts will be due to vessel strikes and noise associated with pile-driving during construction. In addition, marine mammals in the vicinity could be exposed to oil in the event of an oil spill during operation of the SPM buoy systems. The potential impacts and mitigation for these activities are further discussed in Section 8.5 and Appendix K: Marine Mammal Protection Act Assessment.

Given the low likelihood of occurrence in the Proposed Project area and BWTT's proposed mitigation (including use of applicable Notices to Lessees (NTLs) and pending consultation with NMFS regarding pile-driving noise), we conclude that the Proposed Project *may affect but is not likely to adversely affect* the sei whale.

FIN WHALE

Fin whales are the second-largest species of whale, with a maximum length of about 75 ft (22 m) in the Northern Hemisphere, and 85 ft (26 m) in the Southern Hemisphere. Fin whales are found in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes (Davis et al. 2002). They are less common in the tropics. They occur year-round in a wide range of locations, but the density of individuals in any one area changes seasonally. Most migrate from the Arctic and Antarctic feeding areas in the summer to tropical breeding and calving areas in the winter. The location of winter breeding grounds is not known. Fin whales travel in the open seas, away from the coast, so they are difficult to track (NMFS 2015). There are an estimated 2,700 fin whales in the North Atlantic and GOM (NOAA 2019e). NMFS manages the Western North Atlantic stock of fin whales, and individuals have been documented in continental shelf waters during aerial surveys (Hayes 2017b).

While typically found in deep, offshore waters, and occurrence in the Proposed Project area is unlikely, fin whales have been observed in continental shelf waters and it is possible that a fin whale could transit the Proposed Project area. If a fin whale were to occur in the Proposed Project vicinity, the greatest potential for impacts will be due to vessel strikes and noise associated with pile-driving during construction. In addition, marine mammals in the vicinity could be exposed to oil in the event of an oil spill during operation of the SPM buoy systems. The potential impacts and mitigation for these activities are further discussed in Section 8.5 and Appendix K: Marine Mammal Protection Act Assessment.

Given the low likelihood of occurrence in the Proposed Project area and BWTT's proposed mitigation (including use of applicable NTLs and pending consultation with NMFS regarding pile-driving noise), we conclude that the Proposed Project may affect but is not likely to adversely affect the fin whale.

8.2.2.7.4 BIRDS

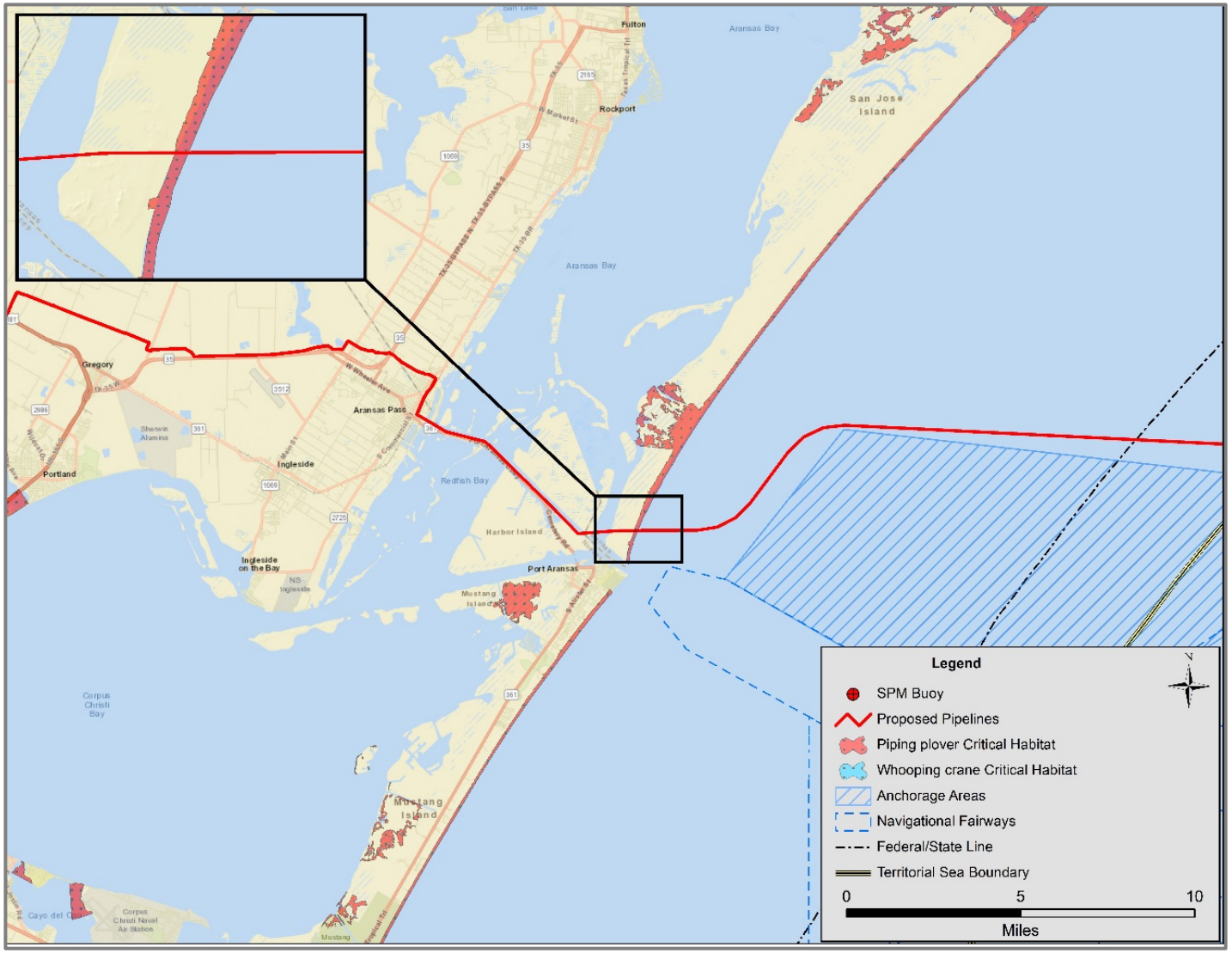
PIPING PLOVER

Piping plovers are small shorebirds that migrate from northern breeding grounds to southern and eastern wintering grounds. Piping plovers are listed as endangered in their breeding grounds, which are located on the northern Great Plains, in the Great Lakes, and along the Atlantic coast of the U.S. and Canada. Wintering habitat for each of the breeding populations is shared and stretches from the coast of North Carolina to Texas; and into Mexico, the Bahamas, and the West Indies. Piping plovers are listed as threatened in all non-breeding habitat, including in the vicinity of the Proposed Project. During the winter, they use a mosaic of habitat patches, including sand spits, small islands, tidal flats, ephemeral pools, and seasonally emergent seagrass beds. Critical habitat has been designated for two of the three breeding grounds (excluding the Atlantic coast population) and for 141 units of wintering habitat from North Carolina to Texas. Critical wintering habitat supports roosting, foraging, and sheltering activities (USFWS 2015).

Plovers typically begin migrating south in July or August and stay in the wintering grounds between February and May. In Texas, piping plovers generally begin arriving in mid-July and most have left by mid-May. They feed on insects, crustaceans, and other small marine animals. When not feeding, they roost in sheltered spots, such as behind driftwood or small dunes. Critical habitat for the piping plover is depicted in Figure 8-9. Current threats to the piping plover include habitat alteration and destruction due to recreational, residential, and commercial developments along beach habitat. Additionally, reservoir construction, channel excavation and dredging and activities which impact the flow regimes of rivers have greatly reduced available habitat for this species (TPWD 2019d).

Multiple elemental occurrences for this species were reported by the TPWD TXNDD search, one of which was along the bayside flats of San Jose Island. Additionally, critical habitat for the piping plover is present in the vicinity of the Proposed Project, on the GOM side of San Jose Island. Direct impacts on critical habitat, and other suitable foraging habitat, will be avoided by HDD construction methods. Although noise levels will increase in critical habitat during where the entry location for HDD 1; however, the estimated sound level increase during HDD construction at the nearest critical habitat will be 2.4 decibels on the A-weighted scale (dBA), which is less than the 3 dB limit for a perceptible change to humans. Given the negligible change and short (up to 9-week-long) period for HDD construction, sound level impacts on this habitat will be temporary and negligible. Additional detail regarding noise impacts is included in Section 13: Meteorology, Air Quality, and Noise. Therefore, the Proposed Project *may affect, but is not likely to adversely affect* the piping plover.

Figure 8-9: Piping Plover and Whooping Crane Critical Habitat in the Proposed Project Vicinity



Source: BOEM 2019

RED KNOT

The red knot, a shorebird, was federally listed as threatened in 2015. It breeds and nests in arctic tundra habitats located as far north as the Canadian Artic; however, it utilizes sandy coast habitats, from the U.S. Gulf Coast and into South America for migration and wintering (Cornell Lab of Ornithology 2019a, USFWS 2019i). The red knot generally migrates into the south between July and October and returns to the northern breeding grounds between April and June (TPWD 2019c). They feed on clams, mussels, and other invertebrates. In addition, the red knot generally roosts along sandy beaches and feeds along intertidal sandy mud areas. Primary threats to this species include coastal development, shoreline stabilization, dredging, and anthropogenic disturbances which may impact availability of food sources (USFWS 2019i).

Element occurrences of the red knot were not identified in the Proposed Project area; however, if present, individuals could occur along beaches crossed by the Inshore Pipelines. Direct impacts on potentially suitable habitat will be avoided by HDD construction and, as described above for the piping plover, noise impacts will be temporary and negligible. Therefore, the Proposed Project *may affect, but is not likely to adversely affect* the piping plover.

WHOOPING CRANE

The federally endangered whooping crane has three wild populations, including the Aransas-Wood Buffalo National Park population, which is the only remaining self-sustaining wild population. This population nests at and near the Wood Buffalo National Park in Canada and winters in coastal marshes at the Aransas NWR on the southern coast of Texas (USFWS 2019j). Migrations to the Aransas NWR begin in mid-September, arriving around November, and leave the NWR in late March or early April. Wintering habitat includes salt flats and marshes, swales and ponds present within areas of coastal prairie, and cropland adjacent to these habitats (TPWD 2019e, Cornell Lab of Ornithology 2019b). The whooping crane feeds on benthic organisms located within shallow coastal waters including blue crabs, clams, frogs, minnows, small birds, berries, and some rodents (TPWD 2019e). The Aransas NWR population will eat aquatic organisms, small reptiles and mammals, plant material, and waste grains from agricultural fields (Cornell Lab of Ornithology 2019b). The biggest threats to the species are power lines, illegal hunting, and habitat loss (TPWD 2019e).

The Aransas NWR is about 17 mi (27 km) from the closest point of the Onshore Pipelines and is about 25 mi (40 km) from the offshore SPM buoy systems. Some suitable wintering habitat may be present within the footprint of the Proposed Project, where grassland and wetlands are present. If whooping cranes were present at the time of construction for the Onshore and Inshore Pipelines, construction within these habitats will temporarily displace them to nearby habitat. However, given the lack of breeding/nesting in the southern U.S., and the limited potential habitat present within the pipeline right-of-way (ROW), the Proposed Project *may affect, but is not likely to adversely affect* the whooping crane.

8.2.2.8 State-Listed Species

In addition to the federally listed species, or those that are under review for federal listing, the State of Texas provides protections for those species listed as state endangered or state threatened. The TPWD annotated county lists of rare species for counties crossed by the Proposed Project includes 26 state-listed threatened and endangered species (see Table 8-14 and Appendix O for the State Listed T&E Species Report). Additionally, TPWD maintains the TXNDD to manage and disseminate scientific evidence on rare species, native plant communities, and animal aggregations in the State of Texas. A TXNDD search was conducted for Nueces, Aransas, and San Patricio Counties, where the Alternative Onshore and Inshore Pipelines will be located (TXNDD 2019). The results of this database search reported elemental occurrences (Eos) for federally listed species, as discussed in Section 8.2.2.7. No other listed state threatened, or endangered species Eos were listed within 2 mi (3.2 km) of the Proposed Project area.

Existing habitats within the Proposed Project area include agricultural land, developed land, forested land, open land, open water, and wetlands (shrub/forested, including mangroves, and emergent). Agricultural land includes active and rotated cropland. Due to low diversity and frequent disturbance this land does not provide high-quality habitat for cover or nesting, but does provide feeding opportunities for several species. Irrigation ditches, ponds, and shallow open water areas may provide habitat for shorebirds, wading birds, and waterfowl.

Open lands include herbaceous uplands (uplands dominated by grasses and forbs) are often used for cattle grazing/ranching, which may be used by various wildlife species for foraging. Areas more dominated by low-lying shrubs or undisturbed cover types provide foraging and nesting habitat.

Forested uplands include areas dominated by deciduous hardwood trees including live oak containing a moderately open canopy intermingled with shrubs and herbaceous grasses.

Developed lands include residential and industrial areas that are highly developed and contain minimal non-native herbaceous grasses such as Bermudagrass (*Cynodon dactylon*).

Open water habitat in the Proposed Project area consists of larger waterbodies, such as Aransas Pass Ship Channel, as well as ponds, streams, and irrigation canals. Wildlife typically associated with open water and linear aquatic habitat includes wading birds, waterfowl, and other species dependent upon an aquatic environment.

Wetland habitat in the Proposed Project area, includes emergent and scrub-shrub (including mangrove) estuarine wetlands and emergent and scrub-shrub palustrine (freshwater) wetlands, as well as sparsely vegetated mudflats. Wetlands typically support a diverse ecosystem that provide nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species including waterfowl, wading birds, raptors, mammals, reptiles, and amphibians.

Of the 26 species listed as threatened or endangered in San Patricio, Aransas, and Nueces Counties, the Proposed Project will have *no effect* on 8 of the species and *is not likely to adversely affect* the remaining 18 of the species (see Table 8-14). Although these 18 species contain potential habitat in the vicinity of the Proposed Project area, BWTT will implement Best Management Practices (BMPs) during construction including:

- minimizing impacts to wetlands, depressions, and riverine habitats;
- implementing HDD construction methods to cross waterbodies; and
- installing erosion control devices or fencing to direct animal movement away from construction activities.

Additionally, prior to construction, BWTT will consult with the TPWD for guidance on any necessary protective measures for state-listed species that may occur in the Proposed Project area. Therefore, impacts on state-listed species are not anticipated to be significant.

Table 8-14: State-Listed Threatened and Endangered Species in Project Counties[3]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Amphibians and Reptiles				
Black-spotted newt (*Notophthalmus meridionalis*)	--	T	Generally found in wet to periodically wet areas including arroyos, canals, ditches, or shallow depressions. Aestivates during dry periods and is known within the Gulf Coastal Plain south of the San Antonio River.	*No effect*. Suitable habitat is limited to the freshwater aquatic habitat on San Jose Island. Impacts to this area will be avoided through the implementation of HDD construction methods.
Sheep frog (*Hypopachus variolosus*)	--	T	Occurs primarily within grassland and savanna habitat and prefers moist sites within arid climates.	No effect. No suitable habitat is located within the Proposed Project area.
South Texas siren (*Siren sp.1*)	--	T	Generally found in wet to periodically wet areas including arroyos, canals, ditches, or shallow depressions. Aestivates during dry periods but requires moisture to remain. Breeds February to June and is found in south Texas, south of the Balcones Escarpment.	*No effect.* No suitable habitat is located within the Proposed Project area. Additionally, a TXNDD search reported no known E.O.s in the Proposed Project area for this species.
Texas horned lizard (*Phrynosoma cornutum*)	--	T	Prefer open, arid to semi-arid regions containing sparse vegetation including grass, cactus, and scattered scrub-shrub. Prefer soils that are sandy to rock in texture. Known to burrow into soils, rodent burrows, or beneath rocks when inactive.	*May affect, not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines; however, sandy soils near beaches could be utilized by the species..
Texas scarlet snake (*Cemophora coccinea lineri*)	--	T	Prefers mixed hardwood scrub located atop sandy soils. Feed on reptilian eggs and is active April to September.	*May affect, not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines. A TXNDD search reported a known E.O within 6 miles of the Project area. Additionally, sandy soils preferred by this species are prevalent within the Project area.
Texas tortoise (*Gopherus berlandieri*)	--	T	Prefers open brush containing a grassy understory. Bare ground and open grasslands are avoided. Occupy shallow depressions at the base of shrubs or cactus, occasionally underground in burrows or beneath objects. Active March through November and breed April to November.	*No effect*. Terrestrial habitat within the Proposed Project area consists primarily of cleared industrial, residential, and agricultural habitat.

[3] San Patricio, Nueces, and Aransas Counties, Texas

Table 8-14: State-Listed Threatened and Endangered Species in Project Counties[3]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Timber rattlesnake (*Crotalus horridus*)	--	T	Found in swamps, floodplains, upland pine and deciduous woodlands, riparian areas, and abandoned farmlands. Prefers sandy soil or black clay and dense vegetation such as palmetto.	*No effect.* The Proposed Project is located outside of the known range for this species. Additionally, no suitable habitat is located within the Proposed Project area.
Texas indigo snake (*Drymarchon melanurus erebennus*)	--	T	Found in Texas south of the Guadalupe River and Balcones Escarpment. Prefer thornbush-chaparral woodlands of south Texas, specifically dense riparian corridors. Thrive in suburban and irrigated croplands if not harmed by human interaction. Require moist microhabitats including rodent burrows for shelter.	*No effect*. Thornbush-chapparal woodland habitat is not present within the Proposed Project area.
Birds				
American peregrine falcon (*Falco peregrinus anatum*)	--	T	Species is a year-round resident in west Texas and is known to nest in tall cliff eyries. Occupies a wide range of habitats during migration including urban areas along coastal and barrier islands. This low-altitude migrant prefers stopovers along leading landscape edges including lake shores, coastlines, and barrier islands	*No effect.* Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines.
Bald eagle (*Haliaeetus leucocephalus*)	--	T	Found primarily near rivers and large lakes. This species generally nests within tall trees or along cliffs near water.	*Not likely to cause a take*. Minimal potentially suitable habitat will be crossed by the Onshore Pipelines.
Eskimo curlew (*Numenius borealis*)	--	E	Historic species that prefers grasslands, pastures, plowed fields, and infrequently marshes or mudflats.	*No effect*. This species has been extirpated from the region. Additionally, a TXNDD search reported no known E.O.s in the Proposed Project area for this species.
Botteri's sparrow	--	T	This species prefers grassland and coastal prairies intermingled with shrubs and trees. Generally prefers tall grasses for nesting	*No effect.* Additionally, a TXNDD search reported no known E.O.s in the Proposed Project area for this species.
Peregrine falcon (*Falco peregrinus*)	--	T	Both subspecies are known migrants across Texas and winter along the coast and farther south.	*May affect, not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines.

Table 8-14: State-Listed Threatened and Endangered Species in Project Counties[3]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Reddish egret (*Egretta rufescens*)	--	T	Resident of the Texas Gulf Coast; known to occur in brackish marshes and shallow salt ponds or tidal flats. Nests on the ground, in trees, or bushes along dry coastal islands containing brushy thickets of yucca and prickly pear.	*May affect, not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines and no known EO's are in the Project area.
Sooty tern (*Onychoprion fuscatus*)	--	T	Primarily found in flight. Does not dive; however, it snatches small fish and squid as it flies or hovers over water. Breeds from April to July.	*May affect, not likely to adversely affect*. Minimal potentially suitable habitat will be crossed by the Onshore and Inshore Pipelines; however, portions of San Jose island contain potential breeding habitat for this species.
Swallow-tailed kit (*Elanoides forfivatus*)	--	T	This species prefers lowland forested regions, especially swampy areas. This species may also occur along open woodlands; marshes; and along rivers, lakes and ponds. Known to nest in tall trees along clearings of forest edges consisting of pine, cypress, or deciduous tree species.	*No effect.* Minimal potentially suitable habitat will be crossed by the Onshore Pipelines.
Texas Botteri's sparrow (*Peucaea botterii texana*)	--	T	This ground nesting species prefers grasslands and short-grass plains containing intermittent bushes or shrubs such as sagebrush, mesquite, and yucca.	*No effect.* Minimal potentially suitable habitat will be crossed by the Onshore Pipelines.
White-faced ibis (*Plegadis chihi*)	--	T	Prefers freshwater marshes, sloughs, and irrigated rice fields; however, is known to occur in both brackish and saltwater habitats. Nests within marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats	*May affect, not likely to adversely affect. .* This species is a permanent resident along the Texas Gulf Coast within coastal wetland habitats. Impacts on potentially suitable habitat will be avoided by HDD.
White-tailed hawk (*Buteo albicaudatus*)	--	T	Occurs near the coast along prairies, cordgrass flats, and scrub-live oak. Further inland, this species is known to occur on prairies, mesquite and oak savannas, and mixed savanna-chaparral habitat. Breeds March to May	*No effect.* Terrestrial habitat within the Proposed Project area consists primarily of cleared industrial, residential, and agricultural habitat.
Wood stork (*Mycteria americana*)	--	T	Forages in prairie ponds, flooded pastures and fields, ditches, and other shallow bodies of standing water (including salt water). Communal rooster that is found in tall snags, sometimes associated with other wading birds. Breeds in Mexico and moves to the Gulf States in search of mud flats and other wetlands. Formerly nested in Texas; however, no breeding records have occurred since 1960.	*May affect, not likely to adversely affect*. The Proposed Project area does not contain preferred habitat for this species; however, it could utilize saltwater or brackish habitats during overflights. Impacts on potentially suitable foraging habitat will be avoided by HDD.

Table 8-14: State-Listed Threatened and Endangered Species in Project Counties[3]

Species	Federal Status	State Status	Habitat Description	Effect Determination
Fishes				
Opossum pipefish (*Microphis brachyurus*)	--	T	Brooding adults found in fresh to low-salinity waters. Young move or are carried into more saline waters after birth in southern coastal areas.	*May affect, not likely to adversely affect.* All inshore waters and waters adjacent to the offshore coastlines will be crossed via HDD but could be subject to inadvertent returns.
Smalltooth sawfish (*Pristis pectinata*)	--	E	Young are found close to shore in muddy and sandy substrates, seldom descending to depths greater than 32 ft (10 m); young are also found in protected bays, on shallow banks, and in estuaries or river mouths. Adults are found in various habitats with varying salinity and temperature regimes and at various depths. Generally, this species feeds on a variety of fish species and crustaceans.	*No effect.* All inshore waters and waters adjacent to the offshore coastlines will be crossed via HDD but could be subject to inadvertent returns. Additionally, this species has been extirpated from this region.
Mammals[a]				
Black bear (*Ursus americanus*)	--	T	Know to occur in bottomland hardwoods and large tracts of inaccessible forested habitat.	*No effect*. No bottomland hardwoods or inaccessible forested habitat occur within the Proposed Project area.
Louisiana black bear (*Ursus americanus luteolus*)	--	T	Transient species that prefers bottomland hardwoods and large tracts of inaccessible forested habitat.	*No effect*. No bottomland hardwoods or inaccessible forested habitat occur within the Proposed Project area.
White-nosed coati (*Nasua narica*)	--	T	Found in woodlands, riparian corridors, and canyons. Most occurrences in Texas are believed to be transient from Mexico. Diurnal and crepuscular species that is gregarious and forages on the ground or in trees.	*No effect.* No woodlands or significant riparian corridors, or canyons are present in the Proposed Project area.
Southern yellow bat (*Dasypterus ega*)	--	T	This species is generally associated with tall species such as palms (*Sabal mexicana*) in Brownsville, which provide daytime roosting habitat. Breeds in late winter and is insectivorous.	*No effect.* No tall forested areas containing species such as palms occur within the Proposed Project area.

a TPWD also identifies the red wolf as potentially occurring in the Proposed Project area; however, it is extirpated and therefore not assessed (TPWD 2019c).

8.2.3 Proposed Project Construction Impacts

As discussed in Section 3: Project Description and Framework for Environmental Evaluation, the environmental consequences of the Proposed Project will vary in duration and significance. Four levels of impact duration were considered: temporary, short-term, long-term, and permanent. Temporary impacts generally occur during construction, with the resource returning to pre-construction conditions almost immediately afterward. Short-term impacts are considered to be those that may continue for up to 3 years following construction. Impacts are considered long-term if the resource will require more than 3 years to recover. A permanent impact could occur as a result of any activity that modified a resource to the extent that it will not return to pre-construction conditions during the life of the Proposed Project, such as within the footprint of Project. When determining the significance of an impact, we consider the duration of the impact, the geographic and biological context in which the impact will occur, and the magnitude and intensity of the impact. The duration, context, and magnitude of impacts vary by resource and therefore significance varies accordingly. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Proposed Project that were used to evaluated environmental consequences in the following sections.

8.2.3.1 Onshore

Construction of the Onshore Pipelines will result in vegetation clearing within the 125-ft-wide (38.1-m-wide) construction ROW. This clearing will impact wildlife habitat, including wetlands, native upland, and disturbed or non-native communities. All habitat crossed by the Onshore Pipelines are herbaceous or scrub-shrub and these cleared habitats are expected to return to pre-construction conditions within about one to three growing seasons. During construction, wildlife will likely avoid areas of active construction due to the increase in noise, light, and human and vehicular presence. However, wildlife are expected to return to adjacent, undisturbed areas once construction has been completed. As no sensitive habitats have been identified within the footprint of the Onshore Pipelines, and the disturbed habitat will be predominantly within areas containing industrial development or other developed land, impacts on wildlife are anticipated to be temporary to short-term and negligible.

Activities associated with construction could also cause turbidity and sedimentation within streams that are crossed using open-cut methods; however, BWTT is proposing to cross all major streams with HDD installation methods, avoiding direct impacts on the stream beds and banks. BWTT will also use silt fencing, mats, hay bales, and a Storm Water Prevention Plan to minimize the potential for sedimentation in waterbodies. While unlikely, fuel spills and inadvertent returns from HDD drilling activities will also be possible during onshore construction; these impacts will be minimized through implementation of BWTT's Spill Prevention, Control, and Countermeasure Plan and Inadvertent Return Contingency Plan.

8.2.3.2 Inshore

The Inshore Pipelines will be constructed using a combination of HDD and open-cut methods. All open water areas within inshore habitat will be crossed using HDD construction methods; this method will result in impacts at the entry and exit points of the drill, which are located at upland locations, but will generally avoid impacts between the two points. As direct impacts on open water areas and shorelines will be avoided by HDD construction methods, impacts on seagrasses, oyster beds, and aquatic wildlife and protected species will also be avoided.

Although HDD construction generally minimizes impacts on sensitive resources, there is the potential for an inadvertent return of drilling fluids, during which HDD drilling mud forces through fractures in the overlying material and discharges to the surface. As the drilling fluid will follow the path of least resistance, fluids may come to the surface over the Offshore Pipelines, or in a nearby area. Although an inadvertent return is possible, HDD drilling mud is a benign, non-toxic substance composed primarily of bentonite clay. The substance is denser than seawater and will settle on the seafloor after discharge, resulting in the smothering of benthic organisms that are within the affected area. In the case of any inadvertent return, BWTT will implement its Project-specific HDD Inadvertent Returns Contingency Plan, which includes measures to prevent, detect, and mitigate for inadvertent

releases of drilling fluid. Although small vessels may be used within inshore waters to monitor for potential inadvertent returns, BWTT will restrict vessels in shallow waters to airboats, johnboats, shallow water boats, or trolling motors, as able, to avoid impacts on seagrasses from propeller scars, as recommended by TPWD.

The Inshore Pipelines will be installed using open-cut trenching across Stedman Island, Harbor Island, and an inland portion of San Jose Island. Trenching on Stedman and Harbor Islands will be adjacent to existing disturbance (e.g., roads and power lines) and will not disturb any high-quality habitat. Further, BWTT will install appropriate erosion controls along its construction ROW to avoid inadvertent sedimentation into the adjacent bays and channels. The Harbor Island Booster Station will also be placed on Harbor Island, resulting in the permanent conversion of vegetated habitat to an industrial site. Given the already disturbed nature of these islands, it is anticipated that limited wildlife habitat is present; however, any wildlife present on the islands will experience temporary to short-term, negligible impacts, as discussed above for the Onshore Pipelines.

San Jose Island will be the staging area for two HDDs, one of which crosses the confluence of the Aransas and Lydia Ann Channels and one of which will cross the seaward shore of San Jose Island to a point about 3,900 ft (1,189 m) offshore where pipeline installation by jetting will begin. Between the two staging areas, about 4.5 ac (1.8 ha) of terrestrial habitat (including 3.2 ac [1.3 ha] of palustrine emergent wetland) will be cleared for installation of about 1,100 ft (335.3 m) of trenching and placement of the HDD drilling equipment. As San Jose Island is privately managed for wildlife purposes, it is assumed to provide suitable habitat for various types of wildlife and is known to provide suitable wintering habitat for piping plover and potentially suitable habitat for nesting sea turtles. As discussed in Section 13: Meteorology, Air Quality, and Noise, piping plover critical habitat is designated along the beach of San Jose Island (which is also potential sea turtle nesting habitat) and will be affected by HDD construction noise. However, the estimated sound level increase during HDD construction at the nearest critical habitat will be 2.4 dBA, which is less than the 3 dB generally identified as a perceptible change in noise (see Table 13-6 of Section 13: Meteorology, Air Quality, and Noise). Given the negligible change in noise levels, lack of piping plover nesting that occurs in Texas, and short (up to 9-week-long) period for HDD construction, sound level impacts on this habitat will be temporary and negligible.

8.2.3.3 Offshore

8.2.3.3.1 OFFSHORE PIPELINE INSTALLATION

The most sensitive portion of the Offshore Pipelines route is near shore, where it passes through shallow water and makes landfall on San Jose Island. To avoid impacts on the coast of the barrier island, which includes estuarine wetlands and sensitive coastal dune habitat, the Offshore Pipelines will be installed by HDD, avoiding the shoreline of San Jose Island, and the adjacent shallow waters to a point about 3,900 ft (1,189 m) offshore of the shoreline. From this point, the Offshore Pipelines will cross soft-bottom habitats to the terminus at pipeline end manifold (PLEM) 2, about 17.0 mi (27.4 km) offshore. Offshore Pipeline installation will be completed using a submersible pipeline jetting sled operated from an anchored pipe laying barge, and will occur over a 15-month period. The pipelines will be buried a minimum of 3 ft (0.9 m) below the sediment surface. Operation of the sled will redeposit some material over the pipeline, but full backfilling will occur naturally.

Installation of the Proposed Offshore Pipelines in soft-bottom habitat will produce a turbidity plume within the immediate vicinity of construction. During installation of the Offshore Pipelines seabed sediments will be suspended in the water column as a result of pipeline installation activities until they settle onto the seabed. This process usually last in the order of magnitude of hours, depending on the type of construction, sediment characteristics, and hydrographic conditions. Turbidity refers to the insoluble, suspended particulates that impede the passage of light through water by scattering and absorbing light energy. As further described in, Section 4: Water Quality and BWTT's TSS model results presented in Appendix D, impacts will be temporary and minor, with suspended sediment levels along the trench generally returning to pre-construction levels within 1-2 days. TSS concentrations will be highest in the immediate area of the trench and will dissipate with distance from the trench,

returning to ambient levels within a maximum distance of about 2.1 mi (3.5 km). As these suspended sediments settle, they have the potential to adversely affect fish eggs and juvenile fish survival, benthic community diversity and health, foraging success, and suitability of spawning habitat. Sediments in the water column could be deposited on nearby substrates, burying benthic invertebrates. Based on conservative model assumptions, sedimentation exceeding 0.04-inch-thick will be limited to within 250 ft of the Offshore Pipelines, and the layer of sediment deposited on the seafloor will decrease with distance. Over time, any difference in deposition thickness will be reduced by ongoing hydrodynamic forces; therefore, impacts will be temporary, but localized and negligible (see Appendix D). Suspended sediments resettle following disturbance; coarser sediments generally fall out and resettle quickly, while finer sediments generally remain suspended for longer periods of time, and thus may travel farther from the Proposed Project workspaces. As such, the sensitivity to disturbance from construction of a pipeline offshore is assessed as very low, as the turnover time is short and hence the recoverability to impacts is high. Furthermore, the installation of the SPM anchor leg mooring piles will be completed pneumatically. As such, only minor impacts to these sediments will be required, thereby resulting in minimal total suspended solids (TSS) concentrations during installation. Because there are not hard structures such as reefs, or sensitive aquatic habitats located in the vicinity of the Proposed Project area offshore, and sedimentation deposited around the construction area will not impact sensitive biological resources. Suspended sediments will be similar in composition and chemistry to surrounding sediments in the Proposed Project area and therefore will not cause any impacts to sediment composition or quality in the area around the construction area. As the benthic community is generally less motile, it will likely be reduced in species richness, species abundance, and biomass through direct mortality. This will reduce the amount of prey available for fish species in the Proposed Project area; however, because the marine soft-bottom habitat is highly variable and experiences frequent natural disturbances, any disturbance to the seafloor environment will have an initial impact, but the affected habitat should recover rapidly (generally less than 1 year, although possibly up to 3 years) by recruitment from the surrounding community (Brooks et al. 2004). Therefore, impacts are anticipated to be minimal and short- term.

Impacts due to increased turbidity and suspended solid levels on pelagic nekton will vary by species and life stage. For example, planktonic life stages (eggs and larvae) of macrofauna are most likely to be directly affected by a temporary increase in turbidity and potential decrease in dissolved oxygen concentrations. They are less mobile and are therefore more susceptible to decreased habitat quality than more mobile juveniles and adults, which can move to more favorable areas. Increased turbidities during trenching and jetting will temporarily cause a reduction in predation efficiency for local fish. Effects of extended elevated turbidities have been shown to reduce feeding rates by 20 percent and to reduce the efficiency of fish foraging (Gardner 1981). If fish are required to forage for longer amounts of time to compensate for increased turbidity, they increase the probability of encountering predators (Gerritsen and Strickler 1977). It is expected that mobile nekton species will be displaced temporarily from the construction area but will return to the area almost immediately following construction. As previously discussed, the only marine mammals expected to occur in the vicinity of the Offshore Pipelines are dolphins. Dolphins are highly mobile and are unlikely to be adversely affected by localized increases in turbidity and sedimentation.

Sediments along the continental shelf of the GOM generally consist of riverine sediments of the Mississippi River Delta as well as terrigenous muds and sand. Sediments are an important component of the offshore environment; however, the presence of elevated concentrations of contaminants within these sediments can significantly impact organisms and offshore ecosystems (Byrnes et al. 2017). Contaminant bioavailability is dependent on sediment characteristics, including concentrations of total organic carbon and acid-volatile sulfide (USEPA 1999). Chemicals commonly found in the northern GOM that may have negative biological impacts include heavy metals such as lead, mercury, arsenic, cadmium, silver, nickel, tin, chromium, zinc, and copper. Other known compounds which may impact the offshore environment include polycyclic aromatic hydrocarbons, polychlorinated biphenyls, and pesticides. Some chemicals are acutely toxic, resulting in death of the animal; others may have chronic toxicity effects, affecting growth or reproduction. As described above, toxic chemicals can affect both ecological and

human receptors as they bioaccumulate and are transferred through food chains (USEPA 1999). Construction activities such as jetting and anchoring will result in the re-suspension of sediments in the water column for a period of time; however, as further discussed in Section 4: Water Quality and Appendix C, no exceedances of the Texas Commission on Environmental Quality's (TCEQ) or NOAA's guidelines regarding sediment concentrations of contaminants were documented for sediment samples collected along the Offshore Pipelines or at the SPM buoy systems.

8.2.3.3.2 DEEPWATER PORT PILE-DRIVING AND INSTALLATION

The seafloor in the Offshore Project area is a soft-bottom environment; no hard-bottom habitat is present within the Proposed Project area. To minimize impacts associated with offshore construction, the SPM buoy systems and associated components will be fabricated at controlled onshore facilities (the specific locations of which will depend on the selected vendor) and delivered to the site by barge; fabrication will occur at controlled facilities in various countries depending on the vendor selected during final design. Similarly, 24 anchor piles will be prefabricated on land prior to installation by industry acceptable practices at the offshore location. Once installed, the anchor chains will be attached to the piles, and subsequently to the applicable SPM buoy systems. In addition, 10 PLEM foundation piles will be prefabricated on land and installed offshore to anchor the applicable PLEM to the seafloor. These construction activities will be of limited duration and are not anticipated to cause long-term adverse effects to the biological community.

Approximately 700 square ft (0.02 ac) of soft-bottom habitat will be permanently removed within the footprint of the SPM buoy systems components. Any non-motile fauna in the footprint of the SPM buoy systems will be lost during installation. Mobile organisms that are displaced during construction are expected to quickly return following construction. With the exception of the benthic community underlying the SPM buoy systems' footprint, the benthos is expected to rapidly recover following construction (Brooks et al. 2004). Impacts beyond the permanent footprint of the Proposed Project are anticipated to be short-term.

Construction and installation of the SPM buoy systems components will result in an increase in turbidity in the water column within and adjacent to the Proposed Project footprint; however, this effect is expected to be localized and limited to the time of facility placement. Deposition of suspended sediments in soft-bottom habitats is expected to occur over a short distance from active construction and cover a small area relative to the total habitat available. Overall, the increased turbidity and sedimentation is considered a temporary and negligible impact given the extent of locally available soft-bottom and water column habitat.

Some installation activities will continue 24 hours a day and require continuous lighting. Lights in the form of navigational beacons will also be required. Although lighting may attract fishes, and their predators, to the construction area, resulting impacts are expected to be temporary and negligible.

NOISE EFFECTS

Temporary underwater noise during construction will result from installation of the pipelines (including vessel activity and jetting to bury the Offshore Pipelines after they are laid on the seafloor) and construction of the SPM buoy systems (including vessel activity and pile-driving). Underwater noise may be generated by continuous sources, such as vessels in transit, and short, intense (impulse) sources, such as pile-driving. In addition, airborne noise generated by the Proposed Project could impact terrestrial wildlife and marine and coastal birds in the Proposed Project area; a detailed description of the airborne noise sources associated with construction of the Proposed Project is included in Section 13: Meteorology, Air Quality, and Noise.

Fundamentals of Underwater Sound

As described in Section 13.2.2.2, sound is a physical disturbance in a medium, such as air or water, which can be detected by a human or animal ear. Sound pressure levels (intensity) are measured in units of dB with respect to a reference pressure value on a logarithmic scale; the reference pressure in water is 1 µPa at 3 ft (1 m).

Sound travels much faster through water than through air (about 1,500 meters per second [m/s] in water and about 330 m/s in air) (OSPAR Commission 2009). As sound spreads away from the source, the acoustic intensity is reduced. The difference between the measured sound pressure level at the source and at a receiver some distance away is known as transmission loss (OSPAR Commission 2009). The way that sound travels away from a source may be affected by water depth, bathymetry, salinity, and temperature (OSPAR Commission 2009).

The RMS sound pressure is the standard measurement used for continuous underwater sound (Hildebrand 2009). The RMS exposure level represents the effective pressure and intensity produced by a sound source; it is the square root of the average squared pressures over the duration of a pulse. Impulsive sounds, such as pile-driving, may be presented as the peak sound pressure level (the largest absolute value of instantaneous sound pressure). To measure exposure to a sound over time, the sound exposure level (SEL) incorporates both the sound level and duration. The cumulative SEL(SEL_{cum}) measures the sound energy accumulated over a period of time.

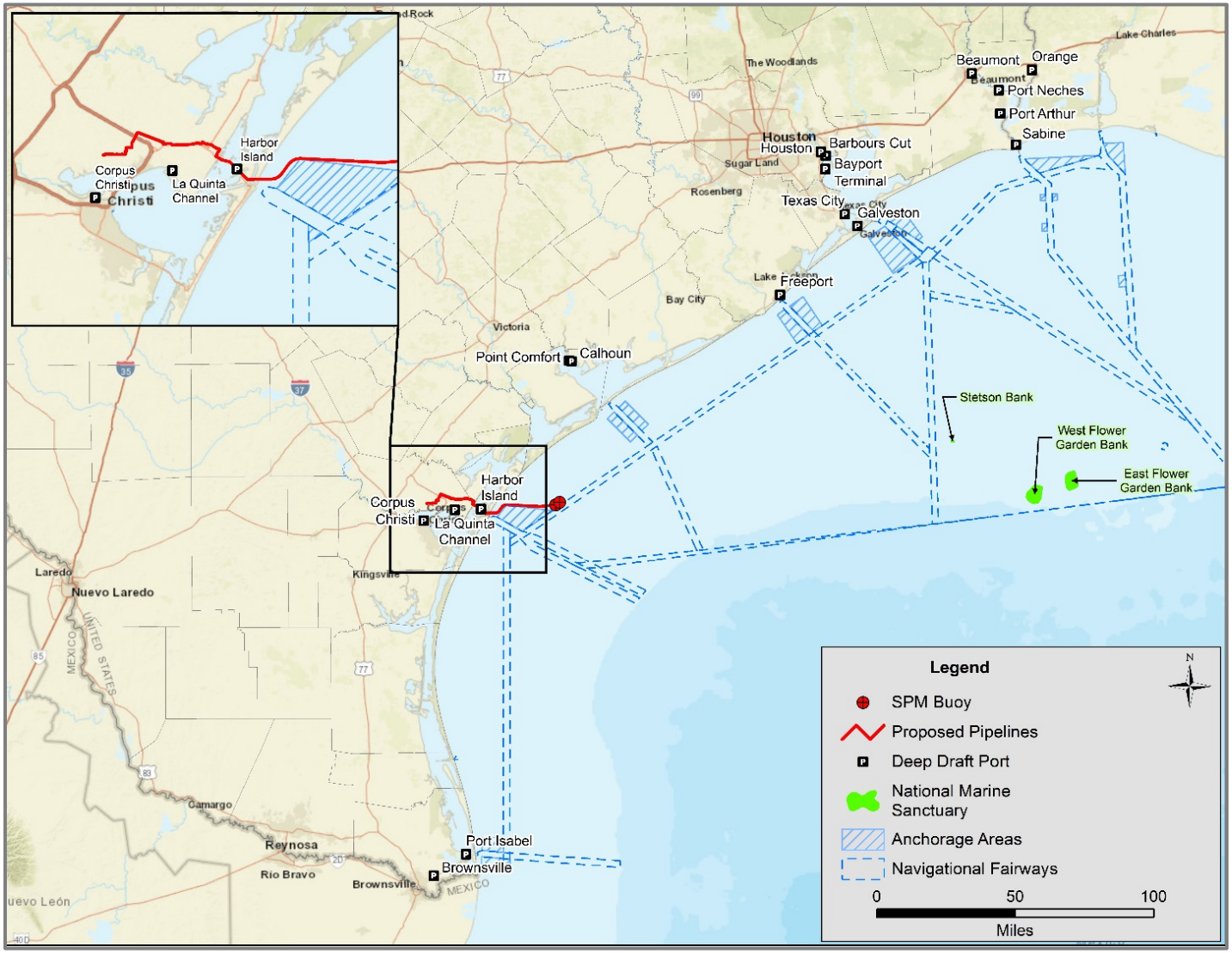
Ambient Underwater Sound

Ambient underwater sound sources in the GOM and inshore waters include natural sources (such as wind-driven waves, tidal currents, and marine mammals) and anthropogenic (manmade) sources. Anthropogenic underwater noise in the GOM originates from a variety of activities including shipping traffic, seismic surveys, explosions (such as from platform removal), and oil and gas production and development (BOEM 2012). Similarly, anthropogenic noise is inshore waters is likely to be generated by vessel traffic in the Gulf Intercoastal Waterway (GIWW) and the smaller local channels. As with airborne noise, ambient underwater noise varies over time due to changes in the intensity and abundance of noise sources. In addition, noise generated from each of these sources may be transient, or may occur over an extended time.

Vessel traffic generates low-frequency sounds that can travel considerable distances; ambient underwater sound in the 10 to 500 Hz range is mostly due to vessel traffic (Tyack 2008, Hildebrand 2009). Ambient sound in the mid-frequency range of 500 to 25,000 Hz is primarily due to sound from breaking waves, bubble formation and collapse, and spray; the intensity of sound in this frequency range increases with wind speed (Tyack 2008, Hildebrand 2009). Higher frequency sounds attenuate quickly and are primarily generated by thermal sound, which is the sound of the random movement of water molecules (Hildebrand 2009). Biological sounds associated with a host of mammals, fishes, and invertebrates can generate noise in a broad frequency range, from 1 to > 100,000 Hz (Simmonds et al. 2003). For example, echolocation clicks of the bottlenose dolphin are in the high frequency range (110,000 to 130,000 Hz), while blue whales emit low-frequency calls (10 to 15 Hz); Simmonds et al. 2003.

Noise produced by ships is the dominant source of anthropogenic sound in the sea (Tyack 2008). Vessel sound is primarily generated by propeller cavitation (the formation of air bubbles, followed by their collapse), propulsion machinery (engine noise), and the flow of water over the hull, and flexing of the hull (Marine Mammal Commission 2007). Vessel traffic is concentrated along major commercial shipping lanes and near major ports, and sound generated by vessel traffic is transient at any given location. However, low-frequency sounds, such as those generated by large ships, can propagate great distances with little attenuation (Marine Mammal Commission 2007, Hildebrand 2009). Therefore, shipping sound contributes to ambient noise across ocean basins (Hildebrand 2009). Shipping lanes in the vicinity of the Proposed Project are depicted in Figure 8-10. Vessels in the Proposed Project area may include commercial vessels in the GOM traveling along shipping fairways or calling at the nearby Port of Corpus Christi, commercial vessels traveling in the GIWW across inshore waters, and smaller, recreational boats in both the inshore bays and the GOM. Vessel traffic is discussed in detail in Section 14: Navigation, Safety, and Security.

Figure 8-10: Navigation Fairways and Ports



Source: TXDOT 2019.

The intensity of sound produced by vessels is generally greater for larger ships, and as vessel speed and load size increases. In addition, larger vessels produce sound in a lower frequency range than small boats. Typical sound levels range from 150 dB re: 1 µPa for tugboats to between 185 and 190 dB re: 1 µPa for a supertanker (Jasny 2005). The contribution of shipping to ambient noise in the ocean has increased by between 10 and 12 dB over the past few decades (McDonald et al. 2006, Andrew et al. 2002). While these data were not collected in the GOM, similar ambient noise increases have likely occurred due to global increases in commercial shipping (BOEM 2012).

While shipping is the predominant source of anthropogenic underwater sound, other sources may include marine seismic surveys, explosions, and oil and gas development (such as the operation of platforms). Marine seismic surveys use an air-gun or air-gun array to generate an energy wave that, when directed at the ocean floor, creates a pattern of reflected waves that map layers below the ocean surface. Sound generated by seismic surveys are in a range of 215 to 255 dB re: 1 µPa, with the majority of sound generated in the low-frequency range, as summarized by Simmonds et al. (2004). The removal of offshore structures using explosions generates sudden, impulsive sound; peak broadband sound levels measured for underwater explosions are near 280 dB re: 1 µPa (Simmonds et al. 2004). While blasting is not planned for the Proposed Project (see Section 8.2.5), the practice is used for other ongoing projects in the GOM.

Underwater sounds generated from the operation of fixed structures, such as oil and gas platforms common in the GOM, are estimated to range between about 20 and 40 dB above background levels within the low (30-300 Hz) frequency range at a distance of about 100 ft (31 m) from the structure (Gales 1982). Since equipment is placed on above-water decks and the surface area of the platform in contact with the water is limited, underwater sound from platforms on metal legs is expected to be relatively low (BOEM 2012). Helicopters used to transport supplies and workers to offshore oil and gas facilities also generate underwater sound; however, most sound is reflected by the surface of the ocean and noise from helicopters is transient (Richardson et al. 1995). Underwater sound levels range from 101 to 109 dB re: 1 µPa, and helicopter sound has been documented to be detectible for less than 1 minute under water (Richardson et al. 1995).

NMFS recognizes the sound level for "effective quiet" or the safe exposure level at which risks for impacts on marine organisms are low (NMFS 2018c). While defining the sound level of effective quiet for all species groups is not possible due to a lack of available data, we have assumed a conservative level of 150 dB re 1µPa SEL (NMFS 2017, NMFS 2018c). While measurements of background sound levels are not available in the Proposed Project area, we assume that sound from construction of the Proposed Project below the 150 dB level of effective quiet will not harass marine organisms.

Continuous Noise

Installation of the Offshore Pipelines in the GOM will be conducted by jetting, using a pipe laying barge and support vessels. Underwater pipeline installation will progress along the route such that construction at any one location is of short duration, and pipe laying may occur up to 24 hours per day. Underwater sound levels from pipe laying have been measured to be a mean of 130.5 dB re: 1 µPa at a distance of 0.9 mi (1.5 km); that measurement includes a pipe laying fleet of nine vessels and is similar to the sound levels generated by other commercial vessels (Johansson and Anderson 2012). Installation of the Offshore Pipelines will require a pipe laying barge and 2 to 3 support vessels and is therefore expected to produce a lower sound level. Sound levels associated with vessels used for underwater trenching have been shown to be similar to sound generated by other commercial vessels (Johansson and Anderson 2012). As described in Section 8.3.3.3, the Proposed Project is in an area subject to noise impacts by commercial vessels operating in the shipping fairways in the GOM. Underwater HDD activity offshore of San Jose Island may cause transient underwater noise in the immediate vicinity of the pipelines; however, underwater noise will be limited to the 8-week HDD construction period. Because the underwater sound levels associated with installation of the pipelines will be temporary, limited to the period of active construction, and consistent with similar activity in the Proposed Project vicinity, underwater noise impacts will be minor.

The most prevalent sources of continuous underwater sound associated with installation of the SPM buoy systems will be the vessels used for construction, during construction activity and transit. Construction vessels will be in the 164 – 328 (50 – 100 m) size class, and sound levels for each vessel will likely range between 160 and 180 dB re: 1 µPa (Richardson et al. 1995, OSPAR Commission 2009).

Vessel traffic will temporarily increase during construction of the SPM buoy systems for the transportation of supplies and construction crews over the 16-week-long construction period for the SPM buoy systems and components. Given the amount of vessel traffic in the GOM, the noise associated with construction and supply vessels transiting to the offshore facilities will have a negligible contribution to total ambient underwater sound levels. Similarly, nearshore vessel activity will be generally concentrated in established shipping channels and near industrial port areas, and will be consistent with the existing noise environment in those areas. Therefore, impacts from underwater sound due to Project construction, including vessel activity, will be negligible and are unlikely to affect biological resources in the Proposed Project area.

Impulsive Sounds

Pile-driving will be used for installation of 24 anchor piles for the SPM buoy systems and 10 PLEM foundation piles, and will occur in depths of 88.5 to 89.5 ft (27.0 to 27.3 m). The intensity of sound produced during pile-driving is dependent on the material and size of the pile, depth of water, and method of pile- driving. The 10, 18-inch (0.5-m)-diameter piles and 24, 72-inch (1.8-m)-diameter piles will all be installed using an impact hydraulic hammer for the anchor piles of the SPM buoy systems. Pile-driving will occur over the 16-week installation timeframe for the SPM buoy systems, and only one pile will be driven at a time. A detailed description of pile-driving and installation required for the Proposed Project is included in Appendix A.

NMFS has established thresholds for physical and behavioral effects of underwater noise due to sound generated from pile-driving activity on fish, sea turtles, and marine mammals (NMFS 2018a,c). Effects levels for marine mammals are based on hearing groups, which have different generalized hearing frequency ranges; low-frequency (baleen whales) and mid-frequency (dolphins, toothed whales, beaked whales, and bottlenose whales) cetaceans could occur in the vicinity of pile-driving (NMFS 2018a). Table 8-15 summarizes the Proposed Project-related pile-driving sound level impacts and these behavioral effects levels.

Table 8-15: Estimated Sound Levels from Underwater Pile-driving and Effects Levels for Marine Species

Pile-driving Activity or Effect Level	Cumulative Sound Exposure Level (SEL_{cum}) (dB re 1 µPa2s)	Root Mean Square Sound Level (dB RMS) (dB re 1 µPA)	Peak Sound Level (dB re 1 µPA)
18-inch-diameter concrete piles at 33 ft (10 m) away	155[a]	166	185
72-inch-diameter CISS piles at 33 ft (10m) away	182[a]	189	214
Sea Turtles			
Sea Turtle Injury	187/234	--	206
Sea Turtle Behavioral Effects	--	160	--
Marine Mammals			
Low-frequency cetaceans (baleen whales)			
Injury (Temporary Threshold Shift for impulsive/non-impulsive noise)[b,c]	168/179	--	213/ --
Injury (Permanent Threshold Shift for impulsive/non-impulsive noise)[b,c]	183/199	--	219/ --
Mid-frequency cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)			
Injury (Temporary Threshold Shift for impulsive/non-impulsive noise)[b,c]	170/178	--	224/ --
Injury (Permanent Threshold Shift for impulsive/non-impulsive noise)[b,c]	185/198	--	230/ --
All species			
Marine Mammal Behavioral Effects (impulsive/non-impulsive noise)[a]	--	160/120	--
Fish			
Injury Onset (all sizes)	--	--	206
Injury Onset, >2 grams (impulsive/non-impulsive noise)	187/234	--	--
Injury Onset, <2 grams (impulsive, non-impulsive noise)	183/191	--	--

a These measurements are single strike sound exposure levels, rather than cumulative levels.

b Use of impact hammers is considered impulsive noise; other continuous sound is considered non-impulsive noise.

c The injury threshold is the general level for temporary or permanent threshold shift onset for cetaceans by hearing frequency group as identified by NOAA Fisheries (2018c); however, threshold shifts are influenced by the frequency of noise received and a cumulative sound exposure exceeding this level may not cause a threshold shift if outside the range of hearing.

Source: NMFS 2018c, NMFS 2019

By using a standard transmission loss constant (15 dB) to account for attenuation over distance, as defined by NMFS, a zone of influence (ZOI), the area in which pile-driving sound exceeds the thresholds, was identified for pile-

driving related impacts on each species group. The ZOIs were calculated using the estimated sound levels for the 72-inch (1.8 m)-diameter proxy piles, which will have a greater sound level impact than the smaller 18-inch (0.5-m)-diameter piles, and are therefore a conservative estimate of Project impacts. Table 8-16 identifies the distance at which sound levels from pile-driving will attenuate to the effects levels described in Table 8-15. Impacts by species are included below. Figures 8-11 and 8-12 depict the estimated ZOIs for injury and behavioral effects on sea turtles and marine mammals, respectively; Figure 8-13 depicts the estimated ZOIs for fish injury (based on approximate pile locations). Additional discussion on the method of calculating the ZOIs is provided in Appendix K: Marine Mammal Protection Act Assessment.

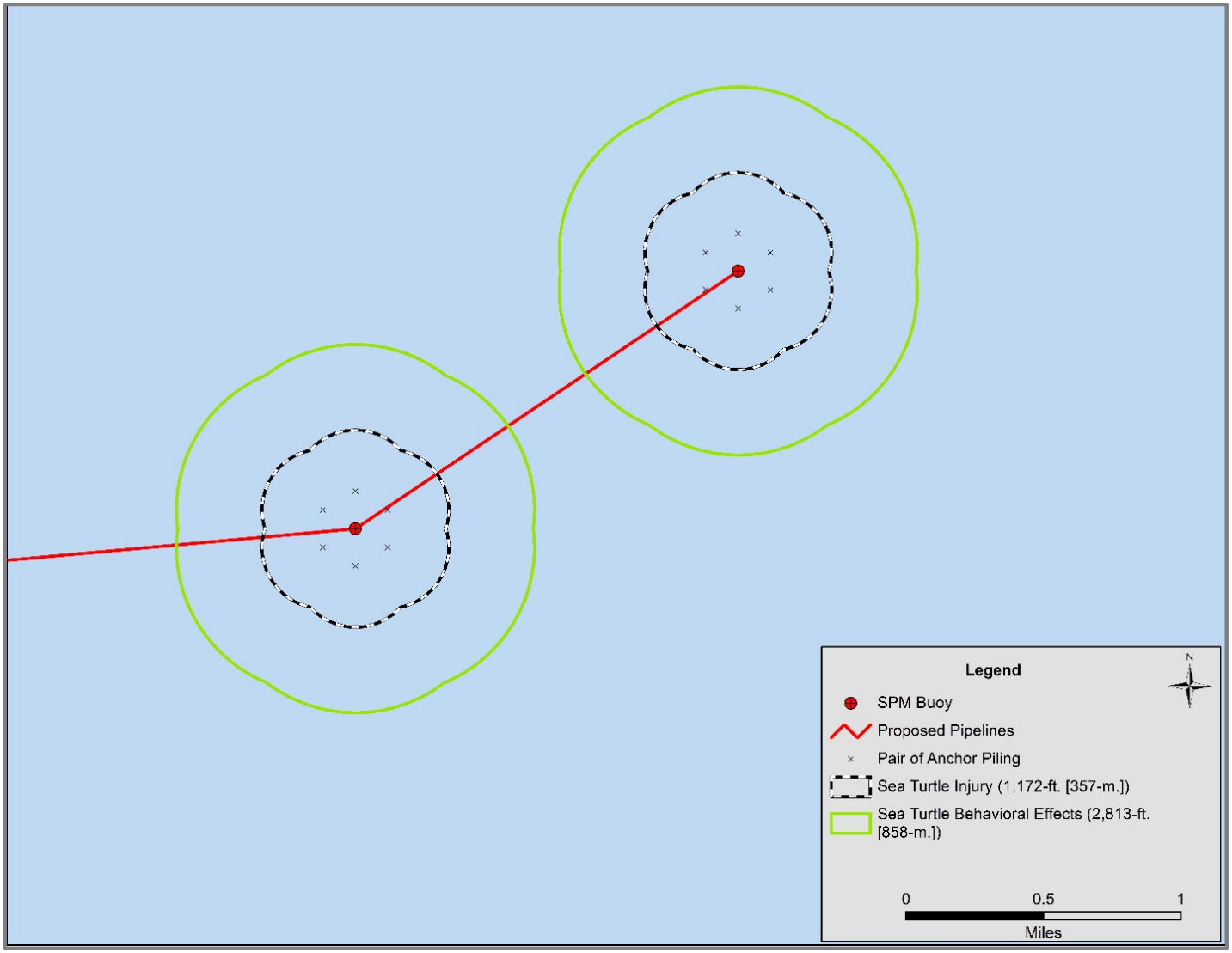
Table 8-16: Estimated ZOI for Sound Levels from Underwater Pile-driving for Marine Species

Pile-driving Activity or Effect Level	Zone of Influence for Impulsive Sounds (ft [m])[a]		
	Cumulative Sound Exposure Level (SEL_{cum}) (dB re 1 µPa²s)	**Root Mean Square Sound Level (dB RMS) (dB re 1 µPA)**	**Peak Sound Level (dB re 1 µPA)**
Sea Turtles			
Sea Turtle Injury	1,172 (357)	--	112 (34)
Sea Turtle Behavioral Effects	--	2,814 (858)	--
Marine Mammals			
Low-frequency cetaceans (baleen whales)			
Injury (Temporary Threshold Shift for impulsive noise)[a]	NA	--	NA
Injury (Permanent Threshold Shift for impulsive noise)[a]	1,364 (416)	--	16 (5)
Mid-frequency cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)			
Injury (Temporary Threshold Shift for impulsive noise)[a]	NA	--	NA
Injury (Permanent Threshold Shift for impulsive noise)[a]	49 (15)	--	NA
All species			
Marine Mammal Behavioral Effects (impulsive noise)	--	2,814 (858)	--
Fish			
Injury Onset (all sizes)	--	--	112 (34)
Injury Onset (>2 grams)	1,172 (357)	--	--
Injury Onset (<2 grams)	2,165 (660)	--	--
Behavioral Effects		13,061 (3,981)	

a The injury threshold is the general level for temporary or permanent threshold shift onset for cetaceans by hearing frequency group as identified by NMFS (2018b); however, threshold shifts are influenced by the frequency of noise received and a cumulative sound exposure exceeding this level may not cause a threshold shift if outside the range of hearing.

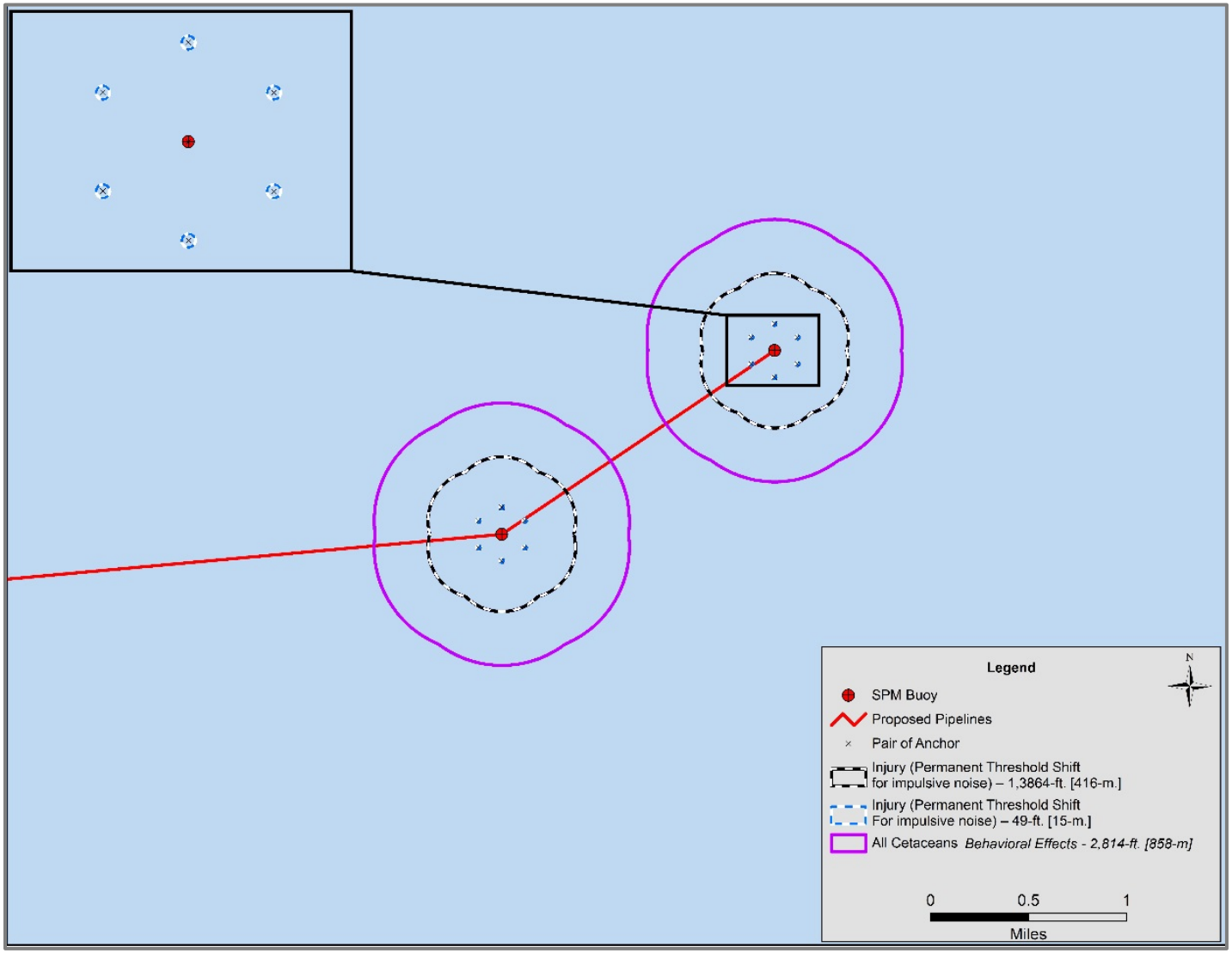
Source: NMFS 2018a,c

Figure 8-11: Zones of Influence for Effects on Sea Turtles due to Pile-driving



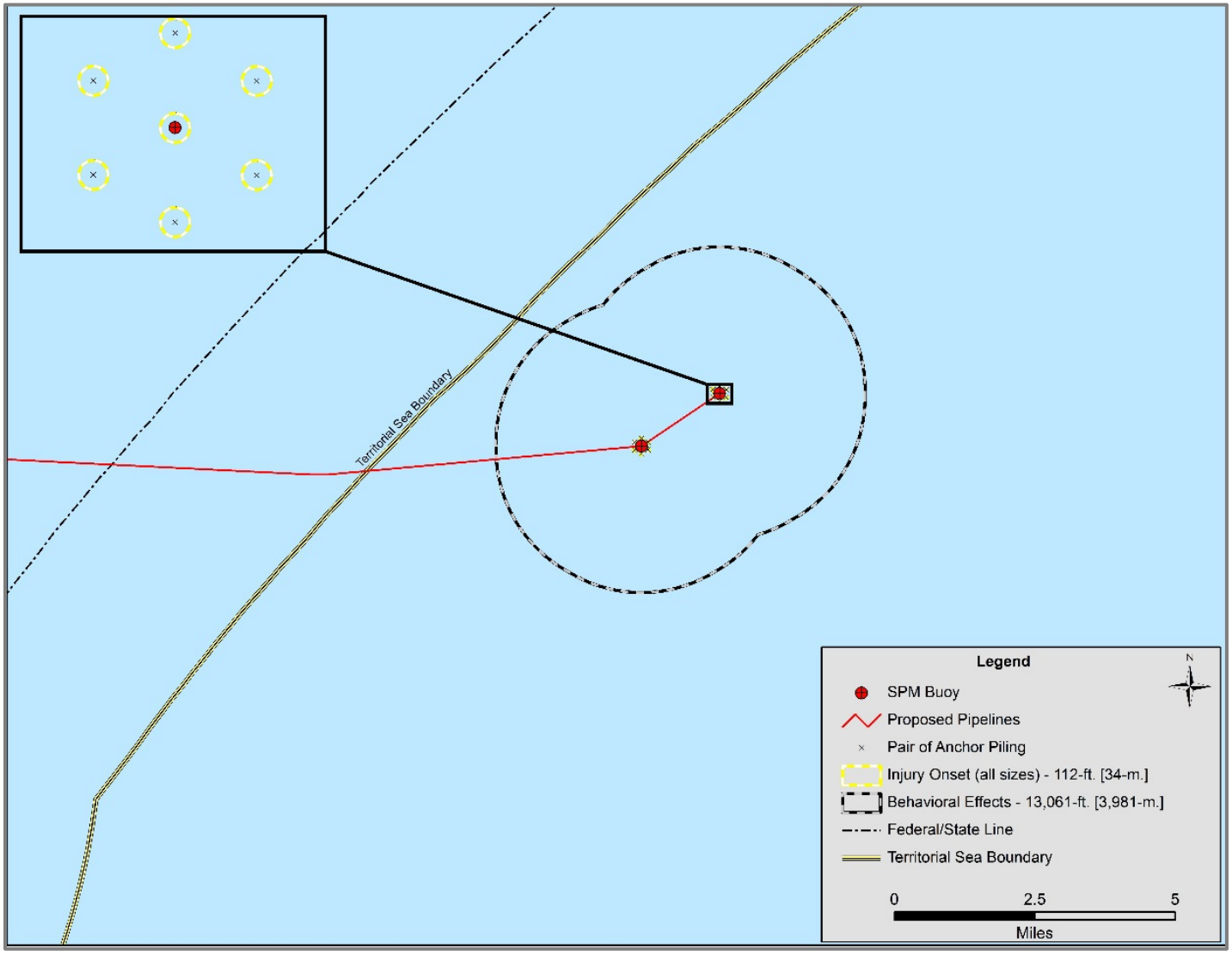
Sources: NMFS 2018a,c

Figure 8-12: Zones of Influence for Effects on Marine Mammals due to Pile-Driving



Sources: NMFS 2018a,c

Figure 8-13: Zones of Influence for Effects on Fish due to Pile-Driving



Sources: NMFS 2018a,c

In addition to pile-driving, the SPM buoy systems are required to be equipped with a nautical hazard prevention device, or a foghorn; requirements for foghorns are detailed in 33 Code of Federal Regulations 67. The foghorn will be mounted to the top of the SPM buoy systems approximately 16.5 ft above the surface of the water. It will produce intermittent sound (likely a two-minute blast followed by 18 seconds of silence) and may produce source levels of 134 dBA at 1 m. Using standard sound attenuation over distance, and assuming no attenuation due to damping, we estimate that in-air sound could be perceived as moderate to loud up to 0.5 mi from the SPM buoy systems but will attenuate over distance (see Table 8-17).

Table 8-17: Estimated Fog Horn Sound Levels at Select Distances

Equipment	Sound Pressure Level (SPL) (dBA) at 3.3 ft [1 m])	SPL (dBA) at 500 ft (152.4 m)	SPL (dBA) at 1,000 ft (305 m)	SPL (dBA) at 0.5 mi (0.8 km)	SPL (dBA) at 17.0 mi (27.4)
Foghorn	134	90	84	76	45

Species-Specific Impacts

Installation of the Proposed Pipelines and SPM buoy systems will result in an increase in airborne and underwater noise, which will be most pronounced at the sites of the HDDs on San Jose Island, and at the SPM buoy systems, about 17.0 mi (27.4 km) offshore. Sources of continuous noise, such as underwater pipeline installation and vessel activity, will have a negligible contribution to total ambient underwater sound levels, as described above. Noise from support vessels (and vessels in general) are dependent on the size and speed, with larger, faster vessels creating more noise (BOEM 2017). Although increases in underwater noise from transiting vessels could mask important biological sounds, they will be temporary in nature. Therefore, impacts from and underwater sound due to these continuous sources will be negligible and are unlikely to result in temporary noise levels that are injurious to marine species. However, impulsive sound from pile-driving will exceed thresholds established by NOAA for the protection of marine species, and impacts are addressed by species group in greater detail below. Sources and levels of airborne noise, which may affect marine and coastal birds, are addressed in Section 13: Meteorology, Air Quality, and Noise.

Fish

As described in Section 8.3.1.3 sound from pile-driving that exceeds the injury thresholds may result in injury or mortality to fish. Pile-driving for the Proposed Project will produce peak sounds above the injury threshold up to 112 ft (34 m) from the source, although impacts may occur at further distances if fish remain in the exposure zone for longer periods of time (see Table 8-16). Noise-related disturbance resulting in behavioral effects could occur over a greater distance. As described above, this estimate represents a conservative, worst-case estimated of the ZOI since some of the piles that will be installed for the Proposed Project are of a smaller diameter than the 72-inch-diameter piles used. In addition, the transmission loss constant used to estimate the ZOI may be conservative, since transmission loss depends on many physical factors including depth and bathymetry.

As estimated sound levels for pile-driving exceed the threshold for behavioral effects and injury to fishes, pile-driving activities could result in the mortality, injury, or disturbance of fishes that are present in the vicinity of pile-driving activity. Because pile-driving for the Proposed Project will be limited to the 16-week period required for construction of the SPM buoy systems, and given the small size of the injury ZOI for peak sound level, impacts are expected to be temporary and minor, and will not result in population-level effects.

Sea Turtles

Noise from pile-driving will be audible to sea turtles in the Proposed Project vicinity; potential physical and behavioral effects on sea turtles are described above. Noise created by pile-driving at the SPM buoy systems is

expected to exceed the levels of behavioral and physical effects designated by NMFS for the protection of sea turtles (as described in Tables 8-15 and 8-16).

By using a standard transmission loss constant of 15 to account for attenuation over distance, we estimate that the distance to the behavioral RMS level for sea turtles is about 2,814 ft (858 m; NMFS 2018c). The distance to the injury threshold is about 1,172 ft (327 m). As the ZOI for sea turtles is too large to be effectively monitored, BWTT will ensure proper coordination with NMFS to identify what additional measures will need to be implemented during pile-driving to minimize impacts on sea turtles. Any such mitigation will also minimize the potential impacts of underwater noise on marine fishes.

In addition to pile-driving, construction of the SPM buoy systems may require helicopter transits between shore and the Proposed Project site and the use of fog horns. Helicopter overflights in close proximity to sea turtles may elicit a startle response and temporary disruption of behavior (BOEM 2017). These impacts are anticipated to be temporary and minor for any sea turtles transiting under the helicopter's path.

The effects of airborne noise, such as fog horns, on sea turtles is not widely studied and no thresholds for behavioral effects or injury have been established for airborne noise on sea turtles. It is anticipated that, during inclement weather with low visibility, effects of fog horns on individuals in close proximity to the SPM buoy systems may cause behavioral effects, including startle responses upon commencement of fog horn blasts, as well as changes in dive duration and frequency, migration routes, and general movements. However, no injury or other significant effects are anticipated based on use of the fog horn.

Marine Mammals

As described in Section 8.3.1.3, sound is important to marine mammals, and noise can result in a variety of behavioral and physical effects. Noise associated with pile-driving can adversely affect marine mammals if the sound is very loud or occurs close to them. Noise from pile-driving will be audible to marine mammals in the Proposed Project vicinity. Noise created by pile-driving at the SPM buoy systems is expected to be approximately 182 dB re 1 µPa SEL with a peak sound level of 214 214 dB re 1 µPa without mitigation, which is above the levels of harassment and injury designated by NMFS for the protection of marine mammals (as described in Table 8-15).

Underwater pile-driving will exceed the thresholds for injury (PTS) on mid-frequency cetaceans (including dolphins, as well as toothed, beaked, and bottlenose whales) within a ZOI estimated to extend about 49 ft (15 m) from pile-driving activities. BWTT will use biological monitors during pile-driving activities and will cease pile-driving if a marine mammal is identified within the injury zone; pile-driving will not restart until the mammal had left the area of its own accord, thereby avoiding injury. In addition, underwater pile-driving will exceed the thresholds for PTS on low-frequency cetaceans (baleen whales) within a ZOI estimated to extend about 1,364 ft (416 m) from pile-driving activities. However, as it is highly unlikely that these baleen whales will be present on the continental shelf in the vicinity of the Proposed Project during the short period of pile-driving (a period of 16 weeks), BWTT believes that the potential for impact on baleen whales through pile-driving noise is so small as to be discountable.

The threshold for marine mammal behavioral effects will be exceeded in a ZOI extending about 2,814 ft (858 m) from pile-driving activities. As the ZOIs for marine mammal behavioral effects and low-frequency cetacean injury are too large to be effectively monitored, BWTT will ensure proper coordination with NMFS to identify what additional measures, if any, will need to be implemented during pile-driving to minimize impacts on marine mammals.

In addition to pile-driving, helicopter overflights in close proximity to local marine mammals may elicit a startle response, abrupt dives or turns, or other changes in behavior as the aircraft approaches (BOEM 2017); however, these impacts are anticipated to be temporary and minor. As described above for sea turtles, the effects of airborne noise on marine mammals are not widely studied and no thresholds for behavioral effects or injury have

been established; therefore, individual responses to intermittent fog horn use is anticipated to be similar to that described for helicopter noise.

Marine and Coastal Birds

Temporary increases in noise associated with installation of the Proposed Project facilities, including airborne noise from pile-driving, could result in temporary impacts on birds in the vicinity of construction. Because marine birds are highly mobile, they will likely avoid areas of active construction such that impacts will be negligible. Given the distance from shore, noise will not impact coastal birds.

Studies of the effects of helicopter overflight on waterbirds have shown temporary behavioral response to low-altitude overflight, ranging from assuming an alert posture to taking flight, with responses decreasing in magnitude as overflight elevation increases, and rapid resumption of the behaviors exhibited prior to the overflight (Komenda-Zehnder et al. 2003). A review of studies which look at the effects of helicopter disturbance on seabirds and shorebirds indicates that the use of helicopters for the Proposed Project is likely to result in no significant impact to marine and coastal birds (see Table 8-18).

Table 8-18: Effects of Helicopter Disturbance on Seabirds and Shorebirds: A Summary of Studies

Bird species	Distance of Helicopter above Bird Population	Effect	Paper
Common Murres	15-366 m (50-1,200 ft)	Flush	Rojek et al. 2007
	15-457 m (50-1500 ft)	Head-bob	
	122-305 m (400-1000 ft)	No response	
Common Murres, Kittiwakes	150 m (500 ft) above sea level, 100 m (330ft) above cliff	No significant effect on Murres and Kittiwakes	Dunnet 1977
Brunnnich's guillemots, kittiwakes	500-6,000 m (1,640-19,670 ft)	Non-breeding birds left colony at these distances	Fjeld et al. 1988
	<2,000 m (6,560 ft)	Non-breeding birds always disturbed	
Glaucous gull, Arctic Tern	150-300 m (500-1,000 ft)	Flushing from nest, disrupt nest behavior	Gollop et al. 1974 (cited in NPS 1995)
Great Egret, Snowy Egret, Louisiana Heron	60 and 120m (200 and 390 ft)	90% of birds did not respond or looked up. Flushed birds return within 5 min	Kushlan 1979
Oystercatcher, Bar-tailed Godwit, Curlew	<250 m (820 ft)	Oystercatchers were most tolerant of overflights; 27-52% of flocks disturbed	Visser 1986 (cited in Smit & Visser 1993)
	<1,500 m (4,920 ft)	Oystercatchers were most tolerant of overflights; 73-86% of flock disturbed	
Waterbirds (includes small percentage of Grebes, Cormorants, Herons, Gulls)	80-450 m (260-1,480 ft)	Minimum disturbance altitude was 450 m (1,480 ft) for the helicopter	Komenda-Zehnder et al. 2003

Adapted from Hoang 2013

Although the source level of a fog horn at the SPM buoy systems will likely have a louder source level than transiting helicopters, seabirds in proximity to the Proposed Project will be restricted to those migrating through the area or resting/foraging on the water. Startle reactions may occur upon start-up of the fog horn during inclement weather, but it is not anticipated that significant effects on nearby marine and coastal birds will occur

due to the lack of sensitive biological activities likely to be occurring. At distances approaching land, where there is the potential for marine and coastal birds to be nesting, the received sound levels will likely be imperceptible or negligible compared to ambient background noises.

8.2.3.3.3 HYDROSTATIC TESTING

Once the pipelines are installed they will be cleaned using a cleaning pig and hydrostatically tested in accordance with the Department of Transportation (DOT) safety standards at 49 CFR 192 and applicable permit conditions to verify their integrity and ensure their ability to withstand the maximum allowed operating procedure (MAOP). Hydrostatic testing will be conducted in segments and consists of capping the ends of a pipe section, filling the pipeline with water, pressurizing the pipeline, and maintaining that test pressure for a minimum of 8 hours. After testing is completed, the line will be depressurized, and the water discharged. Any necessary chemical treatment of the hydrostatic test water prior to discharge will be in accordance with applicable permits. Hydrostatic testing of two 30-inch-diameter pipelines will require approximately 5.0 million gallons of seawater.

During hydrostatic testing, water will be pumped into the pipe and filtered through a mesh screen (typically a 100-micron mesh screen with an opening of 0.0059 inches [0.15 mm]) to prevent debris and foreign material from entering the pipeline. The mesh screening is likely to preclude impingement/entrainment of larger and more mobile fish that could withstand the water withdrawal rates; however, ichthyoplankton and some juvenile fish may become entrained in/impinged on the screens. Any organisms entrained into the pipelines during hydrostatic testing are anticipated to be lost prior to discharge.

As previously discussed, NOAA's SEAMAP sampling stations near the Proposed SPM buoy systems location (see Figure 8-7) had an average of 55,645 eggs and 86,492 larvae in one million gallons of seawater; however, to be conservative, SEAMAP densities are generally multiplied by 3 to account for net extrusion. Therefore, using the adjusted, conservative egg and larvae densities, the use of 5.0 million gallons (18,927 m^3) of seawater will result in the loss of approximately 278,225 eggs and 432,460 larvae (all taxa combined). The loss of planktonic organisms associated with hydrostatic testing is not believed to result in a reduction in fish or prey species at the population-level; therefore, the food web and fisheries populations will incur a negligible adverse impact through water intakes during construction.

8.2.3.3.4 CONSTRUCTION VESSEL OPERATIONS

The presence of construction vessels traveling to and from the Deepwater Port (DWP) components could affect the faunal community through vessel strikes, inadvertent spills of contaminants, and an increase in lost marine debris.

Increased vessel traffic increases the likelihood of collision between ships and marine mammals, resulting in possible injury or death to some animals. Most species of non-threatened and non-endangered marine mammals in the GOM are the smaller delphinids that often choose to ride the bow waves of nearby vessels and seem adept at avoiding injury. However, a study by Nowacek et al. (2001) identified changes in the behavior of bottlenose dolphins in the presence of vessels. These behavioral changes included longer interbreath intervals, decreased interanimal distance, changes in heading, and increased swimming speeds.

To minimize the potential for impacts on marine mammals, BOEM NTL No. 2016-G01, Vessel Strike Avoidance and Injured/Dead Protected Species Reporting, will be followed by all Project construction and support vessels. The NTL states that a distance of 148 ft (45 m) or greater should be maintained between vessels and the smaller cetaceans. The NTL also specifies reduced speeds of 10 knots when traveling near groups of cetaceans and a travel path parallel to that of the animals. In compliance with the NTL, vessel personnel will report any sightings of injured or dead marine mammals to the appropriate authorities. Given the high mobility of the dolphin species potentially occurring in the Proposed Project area, and with adherence to NTL No. 2016-G01, the increase in vessel traffic

associated with port construction is not expected to directly impact non-threatened and non-endangered marine mammals.

The increase in vessel traffic could also lead to additional pollution within the water column in the form of routine discharges and inadvertent spills. Although impacts on water quality from routine discharges will affect the marine water column in offshore environments, the discharges will be in accordance with applicable regulations, will be localized, and will dissipate quickly given the dilution capacity of the GOM.

Potential spills of construction-related fuels and chemicals can result in adverse impacts to local water quality, which may affect fauna in the immediate vicinity of a spill. Each of the vessels involved in Project construction will operate in accordance with USCG and International Maritime Organization (IMO) International Convention for the Prevention of Pollution from Ships (MARPOL) requirements to minimize the potential for a release of oils and/or chemicals to the GOM. A Project-specific spill response plan will be developed prior to construction, which will identify measures to prevent, contain, and clean up any inadvertent spills. Each vessel operator will monitor its own operations and will have sorbent materials available to contain and clean up a release, should one occur. Therefore, significant impacts related to spills and releases are not anticipated. In the highly unlikely event of a diesel spill, the diesel fuel will immediately begin dissipating. Because diesel fuel is a mixture of relatively light hydrocarbons, spreading, evaporation, dispersion, and dissolution will occur rapidly, and virtually the entire volume of fuel will have dissipated within 12 to 24 hours (International Tanker Owners Pollution Federation Limited 2002). Furthermore, no oil or mixtures containing more than 15 parts of oil per million may be discharged within 50 mi (80 km) offshore (MARPOL 73/78).

Marine mammals, sea turtles, and fish can ingest or become entangled in marine debris that is lost from fishing vessels and offshore activities associated with oil and gas development. Although up to 49 percent of marine debris is considered to be from land-based sources, incidental debris loss from service vessels and OCS structures also contributes to the debris in the GOM (BOEM 2017). About 13 percent of debris found at PINS, south of the Proposed Project area, has been attributed to offshore oil and gas activity (Miller et al. 1995). Plastic bags and plastic fragments are the most commonly reported debris items in the digestive tracts of cetaceans. Per U.S. and MARPOL regulations, no solid debris may be discharged from OCS structures and vessels (30 CFR 250.40 and MARPOL, Annex V, P.L. 100-220 [101 Statute 1458]). To further minimize the potential for lost debris during offshore construction activities, BWTT will adhere to NTL No. 2015-BSEE-G03, Marine Trash and Debris Awareness and Elimination. This NTL states, among other things, that marine discharge of trash and debris is prohibited under 30 CFR 250.300, that prominent placards regarding marine debris and trash disposal be placed in relevant areas, and that offshore employees and contractors must complete marine trash and debris awareness training at the start of employment and annually thereafter. With adherence to the NTL and applicable federal regulations, impacts on wildlife and protected species from debris lost as a result of Project construction is anticipated to be negligible.

8.2.4 Proposed Project Operation Impacts

Impacts on wildlife and protected species during operation of the Proposed Project will generally be limited to the presence of the SPM buoy systems, port calls by the VLCCs (16 per month), the sporadic transit of support vessels and helicopters to and from the offshore port, and the presence of the restricted zones. Once installed, the pipelines will be buried a minimum of 3 ft (0.9 m) below the seafloor; no additional impacts will be incurred during operations. Although not anticipated to occur, a release of petroleum products from the SPM buoy systems or pipelines will also impact the aquatic environment.

8.2.4.1 Onshore

Operation and maintenance of the pipeline corridor during normal operation will be conducted within the existing pipeline corridor and existing access roads. Maintenance activities vary by type, frequency, duration, intensity,

and the degree of planning that precedes implementation. As no permanent aboveground facilities are Proposed as part of the Onshore Project Components, planned operational and maintenance activities will be limited to vegetation maintenance and ROW inspections. Any activities related to pipeline maintenance, if necessary, will occur on an "as-needed" basis. Most operational activities are relatively minor in scale or intensity.

Vegetative management involves removing trees or brush, trimming or topping trees or brush, mowing grasses and other herbaceous vegetation, controlling weeds within the 75-ft-wide permanent ROW, and reseeding bare soils with native grasses and forbs. Vegetation management is most often accomplished by mechanical means (e.g., cutting, shredding, grubbing, and mowing), but may include the application of low-volume basal or foliar-applied herbicides. Vegetation management may involve pedestrian traffic and the use of all-terrain vehicles (ATV), passenger vehicles, chainsaws, skid-steers, hydro-axes, tractors with rotary or flail mowers, chipper trucks, lift trucks, dump trucks, backhoes, and similar machinery. The frequency of vegetation management per varies between 2 and 5 years, and may not be required in certain areas with naturally low-growing, herbaceous vegetation. Patrols and inspections are routine activities to regularly assess the condition of Project facilities. Personnel drive the ROW in ATVs/UAVs or pick-ups to perform inspections.

As discussed for construction, vegetation maintenance during operations will impact wildlife habitat through an increase in noise and human and vehicular presence. However, wildlife are expected to return to the ROW and adjacent areas immediately upon cessation of these activities. Therefore, impacts on wildlife are anticipated to be temporary to short-term and negligible. Further, no operational impacts or vegetation maintenance is anticipated within the streams crossed by the Onshore Pipelines.

8.2.4.2 Inshore

No impacts on inshore fisheries will occur through operation of the Inshore Project Components as the Inshore Pipelines will be buried under the bed of the bays and channels. Operational maintenance of the Inshore Pipelines along Stedman Island, Harbor Island, and San Jose Island will be similar to that discussed in Section 8.3.2.1, for the Onshore Pipelines. As San Jose Island is managed for wildlife, it is likely that periodic disturbance from vegetation maintenance at that location will result in higher impacts on wildlife species when compared to Stedman and Harbor Islands; however, all impacts are expected to be short-term and negligible due to the periodic and limited nature of the activities.

The Harbor Island Booster Station is a permanent aboveground facility that will permanently convert 19 ac (7.7 ha) of vegetated habitat to an industrial facility. Lighting at the facility is anticipated to be similar to the industrial facilities currently operating on Harbor Island and is not anticipated to result in significant impacts on wildlife. Operational noise could affect localized animal behavior, and cause wildlife species to move away from the noise or relocate to avoid the sound. However, given the limited wildlife habitat likely present on Harbor Island and the negligible impact on sound levels at noise sensitive areas (NSA) less than 1 mi from the site, the increased noise will result in permanent, but negligible impacts on wildlife. See Section 13: Meteorology, Air Quality, and Noise for additional discussion on noise produced by the Harbor Island Booster Station.

8.2.4.3 Offshore

8.2.4.3.1 DEEPWATER PORT PRESENCE

Once constructed, the SPM buoy systems components will act as an artificial hard structure, allowing sessile invertebrates with a substrate on which to attach. Oil and gas platforms in the GOM have been found to be colonized by a diverse array of microorganisms, algae, and sessile invertebrates including barnacles, oysters, mussels, soft corals (bryozoans, hydroids, and octocorals), sponges, and hard corals (Gallaway and Lewbel 1982). In addition, the SPM buoy systems and components attaching it to the seafloor will likely cause fishes to congregate, creating a locally diverse fish assemblage. Because of the hard structure provided for marine species

in an area of otherwise ubiquitous soft-bottom habitat, the presence of the Proposed Project structures is considered a permanent, beneficial impact.

The SPM buoy systems will require operational lighting for 24-hour operations, as well as navigational beacons. Project lighting may cause behavioral changes in nearby fauna, including attraction of predator and prey species. Bright lights on turtle nesting beaches can be detrimental to sea turtles because they can cause an alteration in critical nocturnal turtle behavior such as adult nest site selection and returning to the sea, as well as hatchling movement to the sea (Witherington and Martin 1996). USFWS and NOAA Fisheries have indicated that the lights on similar DWPs may attract sea turtle hatchlings, exposing them to risk of impingement on the intake screens for water intakes. However, the SPM buoy systems will be about 17.0 mi (27.4 km) from the closet potential nesting beaches. Consequently, sea turtle hatchlings are not expected to encounter the DWP and the Proposed lighting is expected to have no effect on sea turtles.

Lighting is known to be a concern for trans-GOM migratory birds. Many neotropical birds migrate from Mexico to North American by crossing the GOM nonstop over 575 mi (925.4 km) of open water in the spring and fall. The Proposed SPM buoy systems will be located near the western edge of this migratory pathway; thus, many of these trans-GOM migrants may encounter the Proposed DWP. These birds are known to be attracted to artificial lighting on offshore facilities, and artificial light can disrupt bird migration patterns. Measures will be taken to minimize the amount of total lighting used on the Proposed DWP to that required for safety, such that impacts will be permanent, but minor. To reduce the disruptive effects of lighting, all lighting at the DWP should be shielded toward the water to keep the dispersion of light to a minimum. The shields will prevent the lights from shining skyward, instead directing the light to shine only on work areas. Shielded lighting has resulted in significant reductions in bird mortality.

Each SPM buoy system will be attached to the seafloor via anchor chains attached to piles (12 of each). As the buoy is floating and will move with the waves, currents, and VLCC activity, the anchor chains will also move, resulting in scour in areas where the anchor chains may drag on the seafloor. Although this chain sweep will occur throughout the life of the Port, resulting in continual disturbance of the benthic community within and immediately adjacent to the chains, the buoy will be limited to a swing circle with a radius of 125 ft (38.1 m). Given the small footprint of the swing circle, the continual disturbance to the benthic community is considered negligible.

One potential benefit associated with installation of the SPM buoy systems is its potential to function as artificial hard-bottom, providing a surface area for epifaunal colonization. As previously discussed, artificial reefs and manmade structures like jetties, pilings, groins and breakwaters provide a unique habitat for hard-bottom taxa and associated nekton, particularly in areas previously void of hard substrate.

8.2.4.3.2 NOISE EFFECTS

Airborne noise generated by the Proposed Project could impact terrestrial wildlife and marine and coastal birds in the Proposed Project area; however, impacts on ambient noise from airborne sources are expected to be permanent and negligible in the Proposed Project area. A detailed description of the airborne noise sources associated with operation of the Proposed Project is included in Section 13: Meteorology, Air Quality, and Noise. During operations, underwater noise from the pipelines will be limited to the sound of liquid flow underwater. Ongoing operation of equipment on the SPM buoy systems, as well as loading and support vessel activity, will also generate noise. Sources and levels of underwater noise are addressed below.

Fluids, such as oil and gas, flowing through pipelines generate sound levels that are related to flow velocity. Measurements of a 10-inch-diameter natural gas pipeline conducted by Glaholt et al. (2004) indicated gas pipeline noise is of low intensity. While similar data are not available for oil pipelines, sound levels from operation of the pipeline are not anticipated to exceed ambient levels. The pipelines will be buried approximately 3 ft (0.9 m) below

the seafloor; burial will have a damping effect on any flow-related sound. Operation of the buried pipelines is not expected to impact ambient underwater sound levels.

While measurements of underwater sound levels from SPM buoy systems similar to the Proposed Project are not available, underwater sound levels generated by floating production storage and offloading facilities (FPSO), which gather oil and gas from multiple sub-sea wells, store, and offload the product to shuttle tankers, have been quantified. Erbe et al. (2013) estimate the mean underwater sound level associated with FPSOs to be 181 dB re: 1 µPa, which is similar to the sound levels associated with large commercial vessels that operate in the GOM (Richardson et al. 1995). Given the greater scope of activity on an operating FPSO, underwater sound levels generated during Project operations are expected to be lower. As described in Section 8.3.1.3, underwater sounds generated from the operation of fixed structures are estimated to range between about 20 and 40 dB above background levels. The sound levels associated with operation of the Proposed Project are expected to be similar. The underwater noise associated with the Proposed Project will result in a permanent, localized increase in noise levels.

Cumulatively, the operational noise will result in a permanent increase in ambient noise levels in the immediate vicinity of the SPM buoy systems, which could result in masking of biologically important sounds and behavioral modifications to individuals or groups within range, likely in the form of area avoidance. However, impacts are unlikely to result in noise levels that are injurious to marine species.

In addition to continuous operation of equipment at the facilities, intermittent service vessel activity for supply and VLCCs calling at the SPM buoy systems (about 192 times per year). Noise from vessels will be transient in the immediate Project vicinity, limited to the time when they are approaching, loading, and leaving the SPM buoy systems. A minimum of two support tugs and one hose-handling boat will be present during mooring operations at each SPM buoy system. Support vessels, are expected to be between 279 and 180 ft (55 and 85 m) long. Underwater sound levels of these small ships range from 170 to 180 dB re: 1 µPa at a distance of 1 m (3 ft) (Richardson et al. 1995). VLCCs are expected to be the size of large commercial vessels and supertankers, ranging from about 443 to 1,116 ft (135 to 340 m) long; similarly sized vessels produce underwater sound levels at low frequencies ranging between 169 and 198 dB: 1 µPa, and can exceed 205 dB re: 1 µPa for broadband sound levels (Richardson et al. 1995). VLCCs that will call at the SPM buoy systems are similar to other vessels operating in the GOM, as described in Section 8.3.1.3. Further, vessels transiting to the SPM buoy systems will generally use established shipping lanes. No significant increase in vessel traffic is anticipated in the Proposed Project area, and therefore underwater noise impacts from vessel traffic during operations will be negligible.

8.2.4.3.3 VLCC TRANSIT

The primary threat to marine mammals resulting from vessel transits in shipping lanes in the GOM will be an increased risk of vessel strikes while VLCCs and support vessels are underway. In areas of intense ship traffic, marine mammals can experience propeller or collision injuries. Vulnerability to collision with VLCCs will be greatest while whales and other marine mammals feed, swim, and rest near the surface of the water. VLCCs push a considerable bow wave when underway on the open ocean because of their design and large displacement tonnage. This wave pushes water, flotsam, and other small objects away from the vessel. Dolphins are known to ride the bows of traveling vessels, positioning themselves in such a manner so that they are lifted up and pushed forward by the circulating water generated by a vessel's bow pressure (Wursig 2009); however, dolphins are also at risk of vessel strikes in the presence of large and small vessels.

The VLCCs and support vessels traveling to the SPM buoy systems will use established and well-traveled shipping lanes. In addition, BWTT will provide the operators of VLCCs with NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS 2008) and request that these measures be used when transiting to and from the SPM buoy systems. Based on the whales' characteristics and habitat requirements, and because BWTT will provide vessel operators with NMFS' recommended strike avoidance measures, ship strikes are not anticipated.

8.2.4.3.4 VLCC WATER USE

During facility operations, VLCCs will require the uptake and discharge of seawater for cooling of engines, pumps and other equipment, and in support of hoteling operations. Vessels will be required to meet all standards of discharge water quality and volumes while at the DWP. Water quality impacts resulting from vessel discharges is discussed in Section 4: Water Quality. The water column will be disturbed via the intake and discharge of water, as could any pelagic or planktonic species present in the immediate area of these activities. Benthic communities in the Proposed Project vicinity are not expected to be affected by operation of the Proposed Project due to the depth of the water in which it will be located. As VLCCs will remain offshore, no impacts on inshore habitats will occur.

The estimated amount of water withdrawn due to vessel use is estimated to be about 1.04 billion gallons per year, representing only a small fraction of the amount of water available within the Proposed Project area. Seawater will be pulled in through near-surface sea chests covered with a wide mesh. Typically, seawater will be drawn in through the lower sea chest, which is located toward the bottom of the vessel, approximately 66 ft (20 m) below the water surface for a VLCC based on fully loaded draft A lesser portion of water withdrawal might occur through the upper sea chests, which are typically located approximately 6 ft (2 m) higher than the lower sea chests. The mesh openings, although relatively large (up to 1.4 inches; Couts, Moore, and Hewitt 2003), will preclude entrainment of most adult pelagic species. Intake velocities for cooling water intakes typically remain below 0.5 ft/sec, which will be low enough to allow adult and juvenile fish to avoid being caught in the inflow of the screens, thus minimizing entrainment effects (USEPA 2001). However, planktonic organisms will likely be entrained and entrained eggs and larvae are assumed to experience 100 percent mortality. Factors that affect the numbers of individuals that are impinged or entrained include: the distance of the water intake from shore; depth of the water intake; through-screen intake velocity; screen size; pumping capacity; differences in life history; distribution patterns of organisms; quality and availability of habitat; and water quality at the intake (GBNEP-30 1993, Saila et al. 1997). In addition, the number of eggs and larvae entrained depends on the distribution of eggs and larvae, which is highly variable and related to the distribution of spawning adults (Gledhill and Lyckowski-Shultz 2000).

According to the SEAMAP data, average observed abundance in the sampling area are 7.62 larvae and 4.92 eggs per 3.3 ft^3 (1 m^3). The potential entrainment of fish eggs and larvae was obtained by multiplying densities observed during the SEAMAP studies by three to account for net extrusion. That adjusted density (22.86 larvae and 14.76 eggs per 3.3 ft3 [1 m^3], or 86,492 larvae and 55,911 eggs per million gallons) was multiplied by the estimated annual intake volume of seawater by VLCCs at the DWP (1.04 billion gallons). According to these calculations, approximately 90.0 million larval fish and 57.9 million fish eggs may be entrained through the VLCC systems or impinged on the intake screens each year. As identified in Table 8-9, the predominant taxa will include Engraulidae (46.5 percent of the observed abundance), Gobiidae (13.8 percent), dusky flounder (9.4 percent), and Atlantic bumper (6.5 percent). However, these estimates assume that the abundance of larvae observed in the summer/fall will be present during all months of the year, that all larvae observed within the depth-integrated samples will be at the depth of the VLCC water intakes, and that the VLCCs will be present and operating year-round at the DWP. Although eggs are not identified to species/taxa, it is assumed that the eggs present in the Proposed Project area will be similar to those taxa identified in the larval dataset. As previously noted, the peak seasonality of most species is during the summer and fall months (see Table 8-7), and some larvae occur at different depths and/or exhibit vertical migrations throughout the water column, which may result in migration to waters deeper or shallower than the intake structures at various times throughout each 24-hour period (Sogard et al. 1987, Lyczkowski-Shultz and Steen 1991). Therefore, the impingement/entrainment estimates noted above likely overestimate the abundance of larvae that could become entrained within the VLCC systems at the DWP.

Although the number of eggs and larvae that will be annually entrained appears high, many fish species are broadcast spawners that release a high number of eggs that are subject to high mortality rates. Some of the most prevalent taxa identified in the SEAMAP data include two families that are part of a larger order of fish

(Clupeiformes), as identified in the hierarchical structure below. These fishes are broadcast spawners that, upon maturity, release high numbers of eggs (Carpenter 2002).

Order: Clupeiformes

Family: Engraulidae

- Species: Bay Anchovy (*Anchoa mitchilli*): 45,110 eggs/female/year
- Species: Broad-striped anchovy (*Anchoa hepsetus*): 1,298 eggs/gram of female body weight/year

Family: Clupeidae

- Species: Gulf menhaden (*Brevoortia patronus*): 37,000 to 151,000 eggs/female per batch (multiple batches per year)
- Species: Scaled herring (*Harengula jaguana*): 5,563 to 52,753 eggs/female/year
- Species: Atlantic thread herring (*Opisthonema oglinum*): 13,638 to 67,888 eggs/female/year

As the natural mortality rates of eggs and larvae are high, the relatively small volume of seawater intake and discharge associated with VLCC intakes is not anticipated to result in population-level effects to ichthyoplankton. The overall effect of the water intake and discharge is expected to be permanent but minor.

Discharges from vessel cooling water systems are heated discharges, with the temperature of the discharge typically in the range of 5 to 10 °F (3 to 6 degrees Celsius [°C]) higher than the temperature of seawater initially withdrawn. This discharge will result in a heated plume that will return to ambient temperatures as it moves away from the tanker. Dilution and dispersion will limit the impacts from discharge to be minor and localized impacts. Further, the VLCCs and support vessels will be equipped with water and wastewater treatment systems that will ensure that discharges comply with applicable USCG and MARPOL requirements for marine vessel discharges, such that they will not result in any significant impacts on the quality of the water column habitat.

8.2.4.3.5 INADVERTENT PRODUCT RELEASES

The probability of a major crude oil spill is extremely low (see Section 14: Navigation, Safety, and Security). The major elements of the Proposed Project that could leak crude oil include: the SPM buoy systems, the Offshore Pipelines from shore to the SPM buoy systems, and the flexible hoses connecting the pipelines to the SPM buoy systems and the SPM buoy systems to the loading tankers. At the SPM connection point during connecting/disconnecting operations, the SPM hoses will connect directly to the manifold on the VLCC, thereby minimizing the potential for crude oil residue releases.

SEA TURTLES

In the event of an oil spill, some individual sea turtles would likely be exposed to the resulting oil on the surface, in the water column, in Sargassum habitat along convergence zones, and where volatile organic compounds and oil droplets enter the air over unweathered oil. Nesting females, eggs, and hatchlings may be exposed in the event that sandy beaches become fouled with oil during the nesting season. In addition to impacts on individual sea turtles, a spill could degrade sea turtle habitats including the shelf and marine waters of the GOM, SAV, *Sargassum*, and sandy beaches (see Section 4: Water Quality, and Section 6: Aquatic Environment]).

Sea turtles may be exposed to oil via inhalation, ingestion, and dermal contact (Deepwater Horizon [DWH] Natural Resource Damage Assessment [NRDA] Trustees 2016). Sea turtles breathe at the ocean surface, where they may inhale volatile petroleum compounds where they are most highly concentrated and where the greatest amount of oil would likely occur (DWH NRDA Trustees 2016). Sea turtles may ingest oil-contaminated water and prey, and oil compounds may be transferred to developing embryos from adult females (DWH NRDA Trustees 2016). In addition, potentially due to indiscriminate feeding behavior in convergence zones where young turtles may

consume anything floating, sea turtles are known to ingest petroleum (Shigenaka 2010; DWH NRDA Trustees 2016).

Oiled sea turtles and turtles breathing at the surface of oiled surface waters are at risk for aspiration on oil and oil compounds, and inhalation exposure may result in inflammation and lung congestion (DWH NRDA Trustees 2016). While few studies assess the toxicological effects of oil on sea turtles, ingestion may result in dehydration and decreased digestive function (Mitchelmore et al. 2017). Dermal contact and physical fouling with oil can impact the diving ability of sea turtles, which may contribute to physical exhaustion, suffocation, and potential thermal stress (Stacy 2012). If not rehabilitated, heavily oiled sea turtles are typically subject to mortality.

In addition, oil spill response activities including vessel traffic and beach cleanup can impact sea turtles. For example, sand removal and heavy traffic on nesting beaches can result in the loss of nests or hatchlings and compaction of sand over nests, which may affect hatchling emergence (Shigenaka 2010). Relocation of nests or capture and release of hatchlings may mitigate these impacts (Shigenaka 2010).

Following the DWH oil spill, the DWH NRDA Trustees estimate between 4,900 and 7,600 juvenile and adult sea turtle mortalities; larger numbers of small juveniles were also lost; and foregone production of adult sea turtles may have population-level effects (2016). During the DWH oil spill, 3.2 million barrels (bbl.) of oil were released into the GOM over a period of 87 days; however, the worst-case scenario spill associated with the Proposed Project would release a total of 120,770 bbl. over 10 days. Upon release, the oil would immediately begin to weather and evaporate, and the level, timeframe, and large geographic area of oil exposure that affected sea turtles and other resources during the DWH oil spill would not occur. However, sea turtles present in the vicinity of an oil spill could be impacted and, because of the threatened and endangered status of these species, any loss would be significant. While direct mortality of sea turtles could occur in the immediate area of a spill where concentrations of contaminants and the potential for fouling would be highest, impacts would occur over a short period and the population-level injury estimated by the DWH NRDA Trustees following that incident would not occur.

Spilled oil, moving along ocean currents, can coat *Sargassum* floating on the ocean surface. Floating oil tends to collect and drift in drift lines along the same convergent currents that transport *Sargassum*; therefore, oil may become concentrated in the same areas as *Sargassum,* resulting in greater exposure (DWH NRDA Trustees 2016). Oil-coated Sargassum also may cause stress to sea turtles and other organisms near the surface due to thermal stress resulting from a heat build-up of the dark surface coated with oil (NOAA 2018). Following the DWH oil spill, the surface area of *Sargassum* habitat was shown to be reduced, resulting in a loss of *Sargassum* habitat (DWH NRDA Trustees 2016). Oiling of *Sargassum* also exposes the organisms using that habitat to higher concentrations of contaminants and (Powers et al. 2013).

MARINE MAMMALS

In the event of an oil spill, some individual marine mammals would likely be exposed to the resulting oil on the surface, in the water column, and where volatile organic compounds and oil droplets enter the air over unweathered oil. Dolphins and whales have been observed swimming in oil-contaminated waters, and would not necessarily avoid a large spill if it were to occur (Dias et al. 2017). In addition to impacts on marine mammals, a spill could degrade their habitats including the shelf and marine waters of the GOM.

Exposure pathways for marine mammals include inhalation, ingestion, and dermal contact (DWH NRDA Trustees 2016). Marine mammals breathe, rest, and swim at the surface, where the greatest amount of oil would likely occur (DWH NRDA Trustees 2016). Marine mammals near the surface of large oil spills may inhale volatile petroleum compounds, where they are the most highly concentrated (Geraci 1990 in NRC 2003, Takeshita et al. 2017). While foraging in the water column, droplets of oil may be ingested along with contaminated prey; some marine mammals (such as bottlenose dolphins) also forage in sediments, which could become contaminated. When marine mammals pass through floating oil, their skin can become fouled (NRC 2003).

Inhalation of volatile petroleum compounds may result in inflammation and lung congestion (Geraci & St. Aubin 1990 as cited by Dias et al. 2017). Oil that comes into contact with the skin of marine mammals may result in skin and eye irritation, and can foul the baleen of large whales (NMFS 2018a). Ingestion can lead to gastrointestinal injury, vomiting, and absorption of oil into the body tissues (Takeshita et al. 2017). As summarized by Schwacke et al., studies of bottlenose dolphins following the DWH oil spill found evidence of poor health, reproductive failure, and increased mortality; health effects included lung disease and an impaired stress response (2017).

Recent research following the DWH oil spill has found that long-term, chronic effects of oil exposure can result in decreased survival and lowered reproductive success (Takeshita et al. 2017). As described above for sea turtles, the level, timeframe, and large geographic scale of oil exposure that affected marine mammals during the DWH oil spill would not occur for the worst-case scenario spill for the Proposed Project. Further, airborne volatile petroleum compounds, such as benzene, would be dispersed within a short distance of the oil. If a marine mammal were present during an oil spill, it would be impacted and could sustain impacts as described above; however, the population-level injury estimated by the DWH NRDA Trustees following that incident would not occur.

MARINE AND COASTAL BIRDS

Marine and coastal birds that occur in the Proposed Project area would likely be exposed to oil in the event of a spill due to direct contact with oil in affected habitats including surface waters, beaches, and wetlands. Birds may be exposed to oil due to direct contact, ingestion of oil during preening of fouled feathers, and ingestion of contaminated prey (DWH NRDA Trustees 2016). Birds may also inhale volatile components of oil if present. If areas of heavy oiling coincide with rookeries or habitats in which birds congregate, large numbers of individuals may be affected. Seabirds (including pelicans and cormorants), waterfowl, and bald eagles are considered to be highly vulnerable to impacts from oil spills due to their behavior characteristics (for example, frequent diving for food or prolonged roosting on the water surface; NOAA-ORR 1992).

Oiling can affect the waterproofing and insulating ability of feathers, reducing a bird's ability to swim, float, or fly (DWH NRDA Trustees 2016). If water penetrates the feathers, birds may experience mortality due to hypothermia; starvation and drowning could also result (Leighton 1990). In addition, ingestion and inhalation of oil can result in cell damage, immune suppression, anemia, heart abnormalities, and reduced gastrointestinal function; these impacts may affect growth, organ function, and reproductive effects (DWH NRDA Trustees 2016). Bird embryos are particularly sensitive to oil, and may die due to suffocation if the egg is covered in oil or due to toxic effects from smaller quantities of oil penetrating the shell (Leighton 1990; DWH NRDA Trustees 2016).

In the event of an operational spill resulting from the Proposed Project, birds in the immediate vicinity of the release or in contaminated habitats could experience direct mortality or other, sub-lethal effects. The greatest potential impacts of a spill associated with the Proposed Project would be expected offshore near the SPM buoy systems, where the density of avifauna is low. In addition, birds are mobile, and some species, such as gulls, may be able to avoid oiled habitats (NOAA-ORR 1992). Upon release, the oil would immediately begin to weather and evaporate, reducing the potential for impacts on birds. The localized, short-term, adverse impact of the worst-case scenario oil spill associated with the Proposed Project would likely result in mortality and other impacts on individual birds; however, it is not expected to result in population-level effects.

BENTHIC COMMUNITY

Benthic infauna and epifauna, as well as closely associated demersal fish and shrimp, that occur in the Proposed Project area would likely be exposed to oil in the event of a spill due to direct contact with oil and/or contaminated sediments, if released by the pipelines at the seafloor; via contaminated marine snow (aggregations of marine articles that sink from the surface or water column to the sea floor); or via contaminated food (DWH NRDA Trustees 2016). Many benthic organisms are not highly mobile and may be unable to avoid contaminated habitats. Further, *Sargassum* impacted by oil and dispersants would sink from the surface to the seafloor within 24 to 48 hours (Powers et al. 2013). This this sinking allows oil to migrate to mesopelagic and benthic communities (NOAA

2018, Powers et al. 2013). As the *Sargassum* begins to sink through the water column, oil and dispersants are dissolved and significantly reduce the amount of oxygen within the water column. This leads to indirect injury and mortality to aquatic organisms as well as benthic organisms due to hypoxic conditions within the water column and on the seafloor as the mats decompose (Powers et al 2013, Fisher et al. 2016).

Impacts of oil toxicity on marine organisms (including benthic invertebrates) include impaired feeding mechanisms and growth rates, reduced fecundity, developmental abnormalities, and reduced reproductive effort (Capuzzo et al. 1988, NRC 2003). Exposures to sufficiently high concentrations of oil can lead to mortality. Long-term exposure can result in changes in the reproductive and developmental potential of benthic organisms, resulting in population-level changes (Capuzzo et al. 1988, NRC 2003). Changes in the recruitment and density of benthic organisms may occur following a spill; decreased toxicity is associated with population recovery as the localized concentrations of petroleum hydrocarbons decrease post-spill (NRC 2003).

Following the DWH oil spill, analysis of long-term population data did not identify significant changes in aquatic invertebrate or fishery populations (DWH NRDA Trustees 2016). In the event of an operational spill resulting from the Proposed Project, benthic organisms in the immediate vicinity of the release or in contaminated habitats could experience direct mortality or other, sub-lethal effects. The localized, short-term, adverse impact of the worst-case scenario oil spill associated with the Proposed Project would not be significant.

OTHER MARINE SPECIES (FISH AND PLANKTON)

As described in Section 4: Water Quality, Section 5: Wetlands and Waters of the U.S., and Section 6: Aquatic Environment, the water column, coastal wetlands, Sargassum, respectively, and other habitat used by fish in the Proposed Project area could become contaminated in the event of an oil spill. Residual oil on beach sediments has also been demonstrated to have toxic effects on fish embryos and eggs (NRC 2003). Fish (including ichthyoplankton) may become exposed to oil present in contaminated habitats; in addition, fish may be exposed through consumption of contaminated prey. Eggs of many fish species remain suspended in the water near the surface and could become exposed to oil at the surface.

Oil spills in shallow or confined water (such as enclosed freshwater or brackish ponds) may result in the mortality of large numbers of juvenile and adult fish; however, in open water, impacts on fish are typically limited as juvenile and adult fish are mobile and able to minimize exposure to oil (NOAA-ORR 2018). Early life stages of fish are typically more sensitive to oil toxicity than adults (DWH NRDA Trustees 2016, NRC 2003). Contact with surface oil or with dissolved hydrocarbons can result in the mortality of fish embryos and larvae (Carls and Rice 1990). As summarized by the DWH NRDA Trustees, toxicity studies conducted after the DWH spill found that the surface mixture of water and oil is toxic to early life stages of fish and invertebrates in the GOM, and that exposure to ultra-violet (UV) light increases toxicity (2016).

Sub-lethal exposure of eggs is associated with decreased larval size and yolk reserves, which may reduce larval survival (Carls and Rice 1990). Other sub-lethal effects on fish may include reduced growth, immune suppression, developmental effects (including impaired cardiovascular development), and reduced swim performance (see summaries in DWH NRDA Trustees 2016 and NRC 2003). These impacts can reduce an individual's survivorship and reproduction.

In the event of an operational spill resulting from the Proposed Project, eggs, and larvae in the immediate vicinity of the spill would likely be subject to oil-induced mortality. Mortality rates for ichthyoplankton are naturally high, and therefore the localized mortality associated with a spill is not expected to affect fishery populations. Following the DWH oil spill, analysis of long-term population data did not identify significant changes in fishery populations (DWH NRDA Trustees 2016). Given the scale of the worst-case scenario spill associated with the Proposed Project would be small in comparison with the DWH spill, significant, population- level effects are not anticipated. Pelagic and demersal fish are unlikely to be exposed to concentrations sufficient to result in mortality, although fish within

contaminated habitats could be subject to sub-lethal, toxic effects. Therefore, the localized, short-term, adverse impact of the worst-case scenario oil spill associated with the Proposed Project would not be significant.

As described above for ichthyoplankton, in the event of a spill, phytoplankton and zooplankton in the vicinity of the incident would likely be exposed to oil in the water column, particularly near the surface slick. While direct mortality of plankton would likely occur in the immediate area of a spill where concentrations of contaminants would be highest, impacts would occur over a short-term period and localized mortality is not anticipated to have significant population-level effects.

8.2.4.3.6 SUPPORT VESSEL MOORING AND ANCILLARY OPERATIONS

Support vessels will regularly transit from shore to the SPM buoy systems and between the SPM buoy systems and incoming VLCCs. In addition, a minimum of two supply tugs and a hose-handling boat will be onsite at each operating SPM buoy system. The presence of additional vessels traveling to and from the DWP components could affect the faunal community through vessel strikes, inadvertent spills of contaminants, and an increase in lost marine debris; however, the potential for these impacts will be mitigated as discussed in Section 8.3.2.3 and are not anticipated to significantly affect faunal communities.

8.2.4.3.7 RESTRICTED OPERATIONS ZONE

The safety zones established for the SPM buoy systems and VLCCs will restrict non-Project-related activities within approximately 939 ac (380 ha) of the marine environment which will otherwise be available for fishing opportunities. In addition, the hard structures associated with the SPM buoy systems will provide new structure for epifaunal colonization and fisheries recruitment over time; therefore, as the safety zone will prohibit fishing activities, this new habitat and faunal community will be protected from fishing pressures, representing a permanent and beneficial, but minor impact.

8.2.5 Proposed Project Decommissioning Impacts

8.2.5.1 Onshore/Inshore

At the end of its useful life (50 years), the Proposed Project will be decommissioned. Decommissioning of the Proposed Onshore and Inshore Pipelines will consist of purging the pipe of crude oil liquids and filling them with water. Similar to hydrostatic testing, as described in 8.3.1.5, ichthyoplankton present within any seawater used for flooding will be lost, but this loss is not believed to result in a reduction in fish or prey species at the population-level and the impact will therefore be negligible. No decommissioning activities are anticipated to occur in onshore or inshore waterbodies. The Harbor Island Booster Station will be dismantled and removed; removal activities will be similar in scope to those discussed for the station's construction and will have minimal impacts on area wildlife. Once the Harbor Island Booster Station has been decommissioned, the terrestrial habitat will be restored and will be available for wildlife use.

8.2.5.2 Offshore

The Offshore Pipelines (from a point about 3,900 ft [1,188.7 m] offshore) will be removed, as will the SPM buoy systems. Decommissioning of the Offshore Pipelines will consist of divers to cut sections of the pipe and a heavy lift vessel to retrieve the cut segments from the seafloor for offsite disposal. The SPM buoy systems will be removed using divers and offshore cranes. The Offshore Components will be generally be disconnected and hauled to shore for proper disposal. The anchor piles will either be removed by vibration or cutting the piles 15 ft (4.6 m) below the mudline. The removal by vibration involves utilizing a vibrating hammer to loosen and remove the pile, as opposed to the impact hammer that will drive in piles during construction. A crane will be attached to the top of the pile and will apply tension to retrieve the piling at the surface. Removal by cutting, which is standard practice in the GOM, involves the jetting and removal of the seafloor materials around each pile to facilitate the cut; deeper portions of the pile are left in place, buried below the seafloor. Either removal option will result in increased turbidity and sedimentation adjacent to the activity; however, given the small amount of area impacted and the

duration of impacts (approximately 25 days for removal of the anchor piles), these impacts will be minor and temporary.

Decommissioning of the SPM buoy systems is expected to disturb both pelagic and soft-bottom habitats, as well as transient areas of *Sargassum*. Removal of the SPM buoy systems' structures and Offshore Pipelines will cause a temporary increase in turbidity to both the lower water column and the seafloor, but will have minimal impacts on fauna and their habitat. However, loss of the hard-bottom components in the offshore environment will result in loss of the epifaunal community that had likely colonized the structures, resulting in a permanent and adverse, but minor impact. Once removed, the decrease in this prey base and the loss of structure will likely result in any congregated mobile species dispersing from the area as it returns to its pre-construction state. The planned decommissioning sequence is provided in Appendix A; however, a decommissioning plan will be prepared prior to any decommissioning activities taking place. It is estimated that decommissioning will take approximately 5 months to complete.

Regulated intakes/discharges from vessels and vessel traffic may affect the upper water column and associated faunal assemblages. Noise will be localized where Proposed Project Components were removed. Blasting will not be required during decommissioning. Adverse impacts on wildlife and protected resources from removal of the Proposed Project Components will be similar to those discussed for construction and are considered minor and temporary.

8.2.6 Summary of Proposed Project Impacts

8.2.6.1 Proposed Project Construction Impacts

8.2.6.1.1 FEDERALLY LISTED SPECIES

BWTT assessed potential impacts to 28 federally listed threatened and endangered species within Aransas, San Patricio, and Nueces Counties, Texas. Of these, 14 species are not anticipated to occur in the habitats crossed by the Proposed Project; therefore, the Proposed Project would have no effect on these species. The Proposed Project may affect, but is not likely to adversely affect the remaining 14 species. Marine sea turtles are known to occur and/or nest within the vicinity of the Proposed Project. BWTT will avoid impacts to nesting habitat through the implementation of HDD construction methods; however, these species have the potential to be impacted from inadvertent vessel strikes, inadvertent releases, impacts to *Sargassum*, and noise during construction and operation of the Proposed Project. Threatened and endangered marine mammals and fish are known to occur within deeper coastal waters; however, they are occasionally identified within shallower coastal waters such as those of the Project area. Although unlikely to occur in the Proposed Project area, these species could be impacted by vessel strikes and noise impacts during all phases of the Proposed Project. Impacts from pile-driving noise are anticipated to have the highest potential impacts marine fauna, but BWTT will implement appropriate mitigation for this potential impact through coordination with NMFS. Further, federally listed bird species are known to occur and have preferred habitat within the Proposed Project area. Known critical habitat for the piping plover (and suitable beach habitat for sea turtles) occurs in the Proposed Project area; however, impacts to this habitat would be avoided through the implementation of HDD construction methods.

8.2.6.1.2 STATE-LISTED SPECIES

BWTT assessed potential impacts to 26 state-listed threatened and endangered species within Aransas, San Patricio, and Nueces Counties, Texas. Of these, the Proposed Project would have no effect on 18 species due to lack of preferred habitat and lack of TXNDD-reported elemental occurrences in the vicinity of the Proposed Project area. The Proposed Project may affect, but is not likely to adversely affect the remaining 8 state-listed threatened and endangered species, which may occur in the Proposed Project area, but for which impacts will be minimized or avoided through HDD construction methods.

8.2.6.1.3 ONSHORE

Construction of the Onshore Pipelines will result in vegetation clearing and stream crossings within the 125-ft-wide (38.1-m-wide) construction ROW. This construction will impact wildlife and aquatic habitat, including wetlands, streams, native upland, and disturbed or non-native communities. No sensitive habitats have been identified within the footprint of the Proposed Onshore Pipelines. All vegetated habitats crossed by the Onshore Pipelines are herbaceous or scrub-shrub and these cleared habitats are expected to return to pre-construction conditions within about one to three growing seasons. Streams crossed by open-cut would be temporarily affected by turbidity and sedimentation; streams crossed by trenchless methods (HDD or bore) would generally be avoided and the potential for an inadvertent return would be minimized through implementation of BWTT's Project-specific HDD Inadvertent Returns Contingency Plan. During construction, wildlife will likely avoid areas of active construction due to the increase in noise, light, and human and vehicular presence. However, wildlife are expected to return to adjacent, undisturbed areas once construction has been completed such that impacts will be temporary to short-term and negligible.

8.2.6.1.4 INSHORE

The Inshore Pipelines will be constructed using a combination of HDD and open-cut methods. All open water areas within inshore habitat will be crossed using HDD construction methods; this method will result in impacts at the entry and exit points of the drill, which are located at upland locations, but will generally avoid impacts between the two points. As direct impacts on open water areas and shorelines will generally be avoided by HDD construction methods, impacts on seagrasses, oyster beds, and aquatic wildlife and protected species will also be avoided. In addition, BWTT will restrict vessels in shallow waters to airboats, johnboats, shallow water boats, or trolling motors, as able to avoid impacts on seagrasses from propeller scars, as recommended by TPWD.

The Inshore Pipelines will be installed using open-cut trenching across terrestrial habitats, but will predominantly be adjacent to existing disturbance. The Harbor Island Booster Station will permanently remove vegetated habitat; however, it is anticipated that limited wildlife habitat is present. About 38.8 ac (15.7 ha) of terrestrial habitat will be cleared along San Jose Island, which is privately managed for wildlife purposes; although the beaches provide suitable habitat for piping plovers and nesting sea turtles, they will not be directly affected by construction. Any wildlife present on the islands will experience temporary to short-term, negligible impacts, as discussed above for the Onshore Pipelines.

8.2.6.1.5 OFFSHORE

OFFSHORE PIPELINE INSTALLATION

The Offshore Pipelines will be installed by HDD to a point about 3,900 ft (1,189 m) offshore of the shoreline at which point they will be installed by jetting for 26.4 mi (42.5 km), until reaching the SPM buoy systems. The pipelines will be buried a minimum of 3 ft (0.9 m) below the sediment surface. Impacts from turbidity and sedimentation associated with pipeline jetting will be temporary and minor, with suspended sediment levels along the trench generally returning to pre-construction levels within 1 to 2 days. TSS concentrations will be highest in the immediate area of the trench and will dissipate with distance from the trench, returning to ambient levels within a maximum distance of about 2.1 mi (3.5 km), an area in which no hard-bottom or sensitive habitats have been identified. As the benthic community is generally less motile, it will likely be reduced in species richness, species abundance, and biomass through direct mortality; however, recovery of the affected habitat is anticipated within 3 years, and as such, is considered minor and short- term.

DEEPWATER PORT PILE-DRIVING AND INSTALLATION

To minimize impacts associated with offshore construction, the SPM buoy systems and associated components (including 34 piles) will be fabricated at controlled onshore facilities and delivered to the site by barge. Installation activities for these components will be of limited duration and are not anticipated to cause long-term adverse effects to the biological community, although 700 square ft (0.02 ac) of soft-bottom habitat (and affected biota)

will be permanently lost. Increased turbidity and sedimentation from placement of the Offshore Components is considered a temporary and negligible impact given the extent of locally available soft-bottom and water column habitat. Some installation activities will continue 24 hours a day and require continuous lighting. Lights in the form of navigational beacons will also be required. Although lighting may attract fishes, and their predators, to the construction area, resulting impacts are expected to be temporary and negligible.

Temporary underwater noise during construction will result from installation of the pipelines (including vessel activity and jetting to bury the Offshore Pipelines after they are laid on the seafloor) and construction of the SPM buoy systems (including vessel activity and pile-driving). Underwater noise may be generated by continuous sources, such as vessels in transit, and short, intense (impulse) sources, such as pile-driving. In addition, airborne noise generated by the Proposed Project could impact terrestrial wildlife and marine and coastal birds in the Proposed Project area. The most impactive construction noise will be in-water pile-driving, which will exceed injury and behavioral thresholds for marine mammals, sea turtles, and fish. However, BWTT will ensure proper coordination with NMFS to identify additional measures that should be implemented during pile-driving to minimize impacts on these species, such that impacts are minimized to the extent practicable. Increases in noise associated with installation of the Proposed Project facilities, including airborne noise from pile-driving, could result in temporary impacts on birds in the vicinity of construction; however, birds are highly mobile and will likely avoid areas of active construction, such that impacts will be negligible.

HYDROSTATIC TESTING

Hydrostatic testing of two 30-inch-diameter pipelines will require approximately 5.0 million gallons (18,927 m^3)of seawater, which would entrain or impinge approximately 278,225 eggs and 432,460 larval fish; however, this loss is not believed to result in a reduction in fish or prey species at the population-level; therefore, the food web and fisheries populations will incur a negligible adverse impact through water intakes during construction.

CONSTRUCTION VESSEL OPERATIONS

The presence of construction vessels traveling to and from the Offshore Components could affect the faunal community through vessel strikes, inadvertent spills of contaminants, and an increase in lost marine debris. Increased vessel traffic increases the likelihood of collision between ships and marine mammals, resulting in possible injury or death to some animals. For all Project construction or support vessels, BWTT will require implementation of BOEM NTL No. 2016-G01, Vessel Strike Avoidance and Injured/Dead Protected Species Reporting, which includes measures for reduced speeds and maintained distances between vessels and observed marine mammals. Therefore, the increase in vessel traffic associated with port construction is not expected to directly impact non-threatened and non-endangered marine mammals. Similarly, BWTT will adhere to applicable regulations and NTL No. 2015-BSEE-G03, Marine Trash and Debris Awareness and Elimination to minimize the potential for lost marine debris, which will result in negligible impacts on marine life from lost debris.

Any discharges from construction vessels will be in accordance with applicable regulations, will be localized, and will dissipate quickly given the dilution capacity of the GOM. Similarly, potential spills of construction-related fuels and chemicals may affect fauna in the immediate vicinity of a spill; however, BWTT vessels will adhere to MARPOL requirements to minimize the potential for spills and will implement a Project-specific spill response plan to further prevent, contain, and clean up any inadvertent spills. Therefore, significant impacts related to spills and releases are not anticipated.

8.2.6.2 Proposed Project Operation Impacts

8.2.6.2.1 ONSHORE

Operation and maintenance of the pipeline corridor during normal operation will be restricted to vegetative management over the 75-ft-wide permanent ROW on an as-needed basis. Vegetation maintenance during operations will impact wildlife habitat through an increase in noise and human and vehicular presence. However,

wildlife are expected to return to the ROW and adjacent areas immediately upon cessation of these activities, such that impacts are anticipated to be temporary to short-term and negligible. No operational impacts or vegetation maintenance is anticipated within the streams crossed by the Onshore Pipelines.

8.2.6.2.2 INSHORE

No impacts on inshore fisheries will occur through operation of the Inshore Project Components as the Inshore Pipelines will be buried under the bed of the bays and channels. Operational maintenance of the Inshore Pipelines along terrestrial habitats will be similar to that discussed for the Onshore Pipelines, and are expected to be short-term and negligible due to the periodic and limited nature of the activities. The Harbor Island Booster Station will permanently convert 19 ac (7.7 ha) of vegetated habitat to an industrial facility, and will indirectly impact adjacent areas from increased lighting and noise. However, given the limited wildlife habitat likely present on Harbor Island and the negligible impact on sound levels at NSA less than 1 mi from the site, the increased noise will result in permanent, but negligible impacts on wildlife.

8.2.6.2.3 OFFSHORE

DEEPWATER PORT PRESENCE

Once constructed, the SPM buoy systems' seafloor components will act as an artificial hard structure, providing a permanent, beneficial impact by allowing sessile invertebrates with a substrate on which to attach in an otherwise ubiquitous soft-bottom habitat. Lighting may cause behavioral changes in nearby fauna, including attraction of predator and prey species, as well as trans-GOM migratory birds; however, measures will be taken to minimize the amount of total lighting used on the Proposed DWP to that required for safety, such that impacts would be permanent, but minor. Anchor chain scour will also occur within each SPM buoy system's swing circle (radius of 125 ft [38.1 m]), but this continual disturbance to the benthic community is considered negligible.

NOISE EFFECTS

Airborne noise generated by the Proposed Project could impact terrestrial wildlife and marine and coastal birds in the Proposed Project area; however, impacts on ambient noise from airborne sources are expected to be permanent and negligible in the Proposed Project area. Underwater sounds generated from the operation of the Offshore Components are estimated to range between about 20 and 40 dB above background levels, which will result in a permanent, localized increase in noise levels. Operation of the buried pipelines is not expected to impact ambient underwater sound levels. No significant increase in vessel traffic is anticipated in the Proposed Project area, and therefore underwater noise impacts from vessel traffic during operations will be negligible.

VLCC TRANSIT

The primary threat to marine mammals resulting from vessel transits in shipping lanes in the GOM will be an increased risk of vessel strikes while VLCCs and support vessels are underway. The VLCCs and support vessels traveling to the SPM buoy systems will use established and well-traveled shipping lanes. In addition, BWTT will provide the operators of VLCCs with NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS 2008) and request that these measures be used when transiting to and from the SPM buoy systems. As such, ship strikes are not anticipated.

VLCC WATER USE

During facility operations, VLCCs will require the uptake and discharge of seawater for cooling of engines, pumps and other equipment, and in support of hoteling operations. The water column will be disturbed via the intake and discharge of water, as could any pelagic or planktonic species present in the immediate area of these activities. Benthic communities in the Proposed Project vicinity are not expected to be affected by operation of the Proposed Project due to the depth of the water in which it will be located.

The estimated amount of water withdrawn due to vessel use is estimated to be about 1.04 billion gallons per year, which is estimated to entrain or impinge 90.0 million larval fish and 57.9 million fish eggs at the port each year, all

of which are expected to be lost. Although the number of eggs and larvae that will be annually entrained appears high, many fish species are broadcast spawners that release a high number of eggs that are subject to high mortality rates; therefore, the overall effect of the water intake and discharge is expected to be permanent but minor. Discharges from the VLCCs, some of which will have altered properties (e.g., temperature, DO, pH), will comply with applicable USCG and MARPOL requirements for marine vessel discharges, such that they will limit impacts from discharge to be minor and localized impacts.

INADVERTENT PRODUCT RELEASES

In the event of an inadvertent spill, the probability of which is extremely low, marine species could be directly and indirectly affected, with impacts ranging from area avoidance to mortality, depending on the duration and type of exposure. The worst-case scenario spill associated with the Proposed Project would release a total of 120,770 bbl. over 10 days. While direct mortality of individuals could occur in the immediate area of a spill where concentrations of contaminants and the potential for fouling will be highest, impacts will occur over a short period and the population-level injury, such as those estimated by the DWH NRDA Trustees following that incident, would not occur.

SUPPORT VESSEL MOORING AND ANCILLARY OPERATIONS

Support vessels will regularly transit from shore to the Proposed Project area and could affect wildlife and protected species as discussed for construction, but are not anticipated to significantly affect faunal communities.

RESTRICTED OPERATIONS ZONE

The safety zones established for the SPM buoy systems and VLCCs will restrict non-Project-related activities within approximately 939 ac (380 ha) of the marine environment which will otherwise be available for fishing opportunities. In addition, the hard structures associated with the SPM buoy systems will provide new structure for epifaunal colonization and fisheries recruitment over time; therefore, as the safety zone will prohibit fishing activities, this new habitat and faunal community will be protected from fishing pressures, representing a permanent and beneficial, but minor impact.

8.2.6.3 Proposed Project Decommissioning Impacts

8.2.6.3.1 ONSHORE/INSHORE

At the end of its useful life (50 years), the Proposed Project will be decommissioned. Decommissioning of the Proposed Onshore and Inshore Pipelines will consist of purging the pipe of crude oil liquids and filling them with water, which could result in negligible impacts on ichthyoplankton if seawater were used. No decommissioning activities are anticipated to occur in onshore or inshore waterbodies. Removal of the Harbor Island Booster Station will be similar in scope to that discussed for construction and will have minimal impacts on area wildlife. Once the Harbor Island Booster Station has been decommissioned, the terrestrial habitat will be restored and will be available for wildlife use.

8.2.6.3.2 OFFSHORE

The Proposed Project Components associated with the offshore SPM buoy systems and pipelines will be disassembled and brought to shore, which will have similar impacts to that discussed for construction. However, loss of the hard-bottom components in the offshore environment will result in loss of the epifaunal community that had likely colonized the structures, resulting in a permanent and adverse, but minor impact.

8.3 Alternative Project Impacts

The Alternative Project would include installation of approximately 48.6 mi (78.2 km) of dual, 30-inch-diameter pipeline and the offshore SPM buoy systems located in 87 ft (27 m) of water, within the Exclusive Economic Zone (EEZ). Impacts on wildlife and protected species would occur in terrestrial or aquatic habitats crossed in the onshore environment or are in inshore (Corpus Christi Bay) or offshore (seaward of Mustang Island) locations;

those impacts are discussed below. Refer to Appendix A: Construction, Operation and Decommissioning Procedures, for a detailed description of techniques, procedures, and phases of the Alternative Project that were used to evaluated environmental consequences in the following sections

8.3.1 Alternative Project Area

The Alternative Project would include Onshore, Inshore, and Offshore Pipelines as well as two offshore SPM buoy systems. The 23.1-mi- (37.2-km-) long Alternative Onshore Pipelines would commence at the same point as the Proposed Onshore Pipelines and would traverse the same route for approximately 13.5 mi (21.7 km) prior to diverging to the southeast and following existing disturbance through agricultural and herbaceous or scrub-shrub lands, interspersed with smaller areas of developed and residential lands. The Onshore Pipelines would end at Ingleside on the Bay within an industrial landscape and transition to the Alternative Inshore Pipelines at the shore of Corpus Christi on the mainland. The Alternative Inshore Pipelines would traverse Corpus Christi Bay for 8.4 mi (13.5 km) and would reach landfall at Mustang Island, crossing undeveloped lands interspersed with oil and gas facilities and residences. The Offshore Pipelines, commencing just landward of Mustang Island's beach would transit offshore for about 17.1 mi (27.5 km) to the Alternative Project's SPM buoy systems, approximately 18.9 mi (30.4 km) southwest of the Proposed Project's SPM buoy systems. Due to the proximity of the Alternative Project area to the Proposed Project area, the Alternative Onshore Pipelines would generally be within similar habitats. The Alternative Onshore Pipelines would cross seven freshwater waterbodies including one perennial waterbody (Kinney Bayou), five canals/ditches, and one manmade waterbody. None of these waterbodies have any designated aquatic life uses or impairment classifications.

8.3.1.1 Fish

As discussed for the Proposed Project, the Alternative Project would be located in freshwater, estuarine, and offshore habitats. Although freshwater waterbodies are crossed by the Alternative Onshore Pipelines, these waterbodies are predominantly ditches/canals; therefore, no significant fisheries are anticipated and are not discussed further. The Alternative Inshore Pipelines would occur in estuarine and marine waters between Ingleside on the Bay and Mustang Island and Alternative Offshore Pipelines would be within marine waters of the GOM. The Alternative Offshore Pipelines would begin at the seaward boundary of Mustang Island and extend to the Alternative SPM buoy systems.

8.3.1.1.1 ESTUARINE FISHES

The Alternative Project Components would be located in a regionally similar location to the Proposed Project. Therefore, estuarine fishes associated with the Alternative Project Components would be similar to those described for the Proposed Project.

8.3.1.1.2 REEF FISHES

The Alternative Project Components would be located in a regionally similar location to the Proposed Project. Therefore, reef fishes associated with the Alternative Project Components would be similar to those described for the Proposed Project. As described in Section 6, Aquatic Environment, the nearest artificial reef (Lonestar Reef) is located approximately 0.2 mi (0.3 km) south of the Alternative Offshore Pipelines.

8.3.1.1.3 DEMERSAL FISHES

As discussed for the Proposed Project, demersal fish fauna of the northwestern GOM are characterized by substrate composition and water depth (Gallaway 1981). The Alternative Inshore and Offshore Project would be located within soft-bottom silty sand along the seaward extend of the Alternative Project, but the sediments would transition to coarse and fine-grained sand as they approach the shoreline (Florida Fish and Wildlife Conservation Commission [FFWCC] 2019; see Figure 6-4 in Aquatic Environment). Due to the similarities in benthic habitats and water depth associated with the Alternative Project Components to the Proposed Project Components, demersal

fish species occurring within the Alternative Project area would be similar to those discussed for the Proposed Project.

8.3.1.1.4 COASTAL PELAGIC FISHES

The Alternative Project Components would be located in a regionally similar location to the Proposed Project. Therefore, reef fishes associated with the Alternative Project Components would be similar to those described for the Proposed Project.

8.3.1.1.5 IMPACTS OF SOUND ON FISH

Impacts of sound on fish associated with the Alternative Project would be the same as those described for the Proposed Project.

8.3.1.1.6 ESSENTIAL FISH HABITAT

Due to the regionally similar location with Ecoregion 5, the EFH types and managed species present in the Alternative Project area would be the same as those described for the Proposed Project area, with the exception of artificial reefs. Lonestar Reef is location 0.2 mi (0.3 km) from the Alternative Project. The Alternative Project would not impact any designated HAPCs and the closest one (Stetson Bank) is about 143 mi (230 km) east of the SPM buoy systems.

8.3.1.2 Marine Mammals

The Alternative Project would be located in a similar area to the Proposed Project; therefore, marine mammals protected under the MMPA (including seven protected by the ESA of 1973) occurring within the Alternative Project area would be identical to those described for the Proposed Project.

8.3.1.3 Benthic Community

8.3.1.3.1 INSHORE

The benthic community present within Corpus Christi Bay is discussed in Section 8.2.1.3. NOAA's GOM Data Atlas did identify oyster reefs intermittently within the Alternative Project area (Figure 6-8 in Section 6: Aquatic Environment). The closest known reef area is approximately 1.8 mi (2.9 km) from the Alternative pipelines (Figure 8-14).

8.3.1.3.2 OFFSHORE

According to available data from the Florida Fish and Wildlife Conservation Commission – Fish and Wildlife Research Institute, the Alternative Inshore Pipelines and SPM buoy systems would be within soft-bottom silty sands at the seaward extent of the Alternative Project, but the sediments transition to coarse and fine-grained sand as they approach the shore (FFWCC 2019; see Figure 6-4). Due to these similar benthic conditions, macrobenthic and megabenthic species would be similar to those discussed for the Proposed Project.

8.3.1.4 Planktonic Species

Existing conditions, abundances, and densities of phytoplankton, zooplankton, and ichthyoplankton, within the Alternative Project area would be similar to that discussed for the Proposed Project area.

8.3.1.5 Marine and Coastal Birds

Species of seabirds, shorebirds, wetland birds, waterfowl, passerines, and raptors within the Alternative Project area would be the same as those described for the Proposed Project. A database search was requested from the TPWD TXNDD for any elemental occurrences of sensitive or threatened and endangered species (including bird colonies and rookeries). Four historic rookeries (from 1992 or before) are recorded within the vicinity of the Alternative Project, including one on the dredge management placement unit (DMPU) island; one on Shamrock Island; and one on Mustang Island. However, no active rookeries are identified within the Alternative Project area.

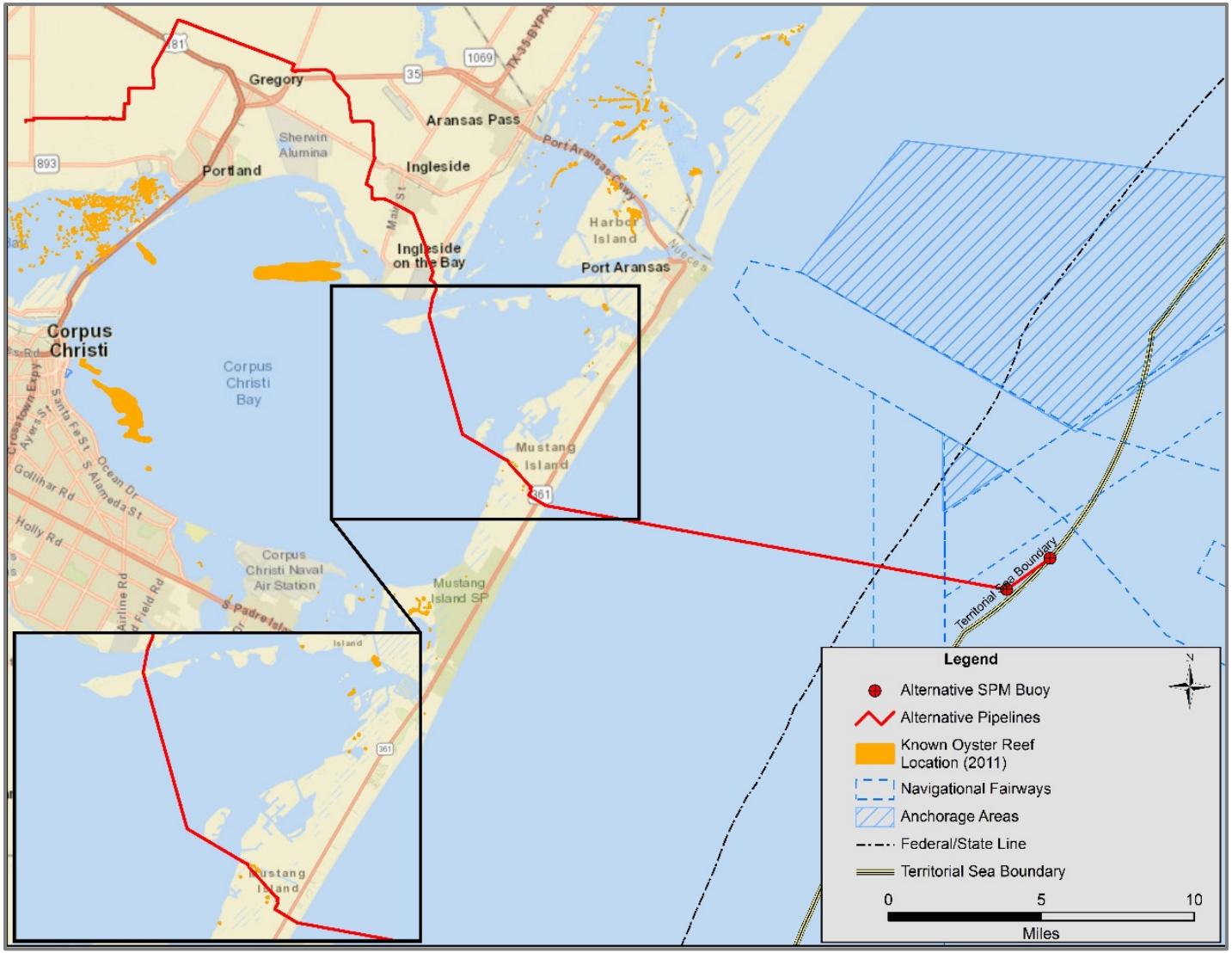
8.3.1.6 Invasive Species

Invasive species associated with the Alternative Project would be the same as those discussed for the Proposed Project.

8.3.1.7 Federal Listed Species

Table 8-19 describes the federally listed species that occur in the Alternative Project area, their preferred habitat, and our determination of effect. Federally listed species with a determination of "*no effect*" as documented in Table 8-19, are not discussed further.

Figure 8-14: Oyster Reefs in the Alternative Project Vicinity



Source: BOEM 2019.

Table 8-19: Federally Listed Threatened and Endangered Species in San Patricio, and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Fish				
Oceanic whitetip shark (*Carchharhinus longimanus*)	T	--	Found throughout tropical and sub-tropical waters. This species is a pelagic species, generally preferring offshore habitats in the open ocean along the OCS of near ocean islands in waters with depths greater than 600 ft (182.9 m, NOAA 2019a).	*No effect*. The Alternative Project is located in offshore waters with depths of approximately 88.5 to 89.5 ft (27.0 to 27.3 m) which would not be preferred by this species.
Giant manta ray (*Manta birostris*)	T	--	This species is a migratory pelagic species that prefers sparse, highly fragmented habitats within tropical, sub-tropical, and temperate marine waters. Populations within the GOM are small and sparely distributed; however, a population of this species occurs within the Flower Garden Banks National Marine Sanctuary. These filter feeders are known near the Yucatan Peninsula as well as other areas of the GOM (NOAA 2019b,c)	*May affect, not likely to adversely affect*. A known population of this species is within the GOM and could transit the area; however, given the distance of known populations of this species, it is unlikely they would be impacted by the Alternative Project.
Marine Reptiles				
Green sea turtle (*Chelonia mydas*)	T	T	Known within Gulf and bay systems. Prefer shallow water seagrass beds, open water between feeding and nesting areas, and barrier island beaches. Adults are herbivorous, feeding on sea grass and sea weed while juveniles are omnivorous, feeding on marine invertebrates early and increasingly on sea grasses and sea weeds as they mature. Nesting occurs from March to October with peak activity in May and June (USFWS 2019c).	*May affect, not likely to adversely affect*. Historic TXNDD elemental occurrences have been reported within the Alternative Project area and known nesting occurs in the general area.
Hawksbill sea turtle (*Eretmochelys imbricata*)	E	E	Known within Gulf and bay system in warm shallow waters, especially in rocky marine environments, such as coral reefs and jetties; juveniles are found generally in floating mats of sea plants. This species feeds on sponges, jellyfish, sea urchins, mollusks, and crustaceans. Nesting occurs April through November (USFWS 2019d).	*May affect, not likely to adversely affect*. Although this species is known to occur in the GOM, no TXNDD occurrences were reported in the vicinity of the Alternative Project area; however, potential impacts associated with noise inadvertent vessel strikes, and impacted *Sargassum* could impact this species.

Table 8-19: Federally Listed Threatened and Endangered Species in San Patricio, and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Kemp's Ridley sea turtle (*Lepidochelys kempii*)	E	E	Known within Gulf and bay systems. Adults prefer the shallow waters of the GOM and feed primarily on crabs, snails, claims, other crustaceans, and plants. Juveniles generally feed on *Sargassum* and their associated fauna. Nesting period from April through August (USFWS 2019e).	*May affect, not likely to adversely affect.* Not known to nest in the Alternative Project area, but may use offshore waters for transit.
Leatherback sea turtle (*Dermochelys coriacea*)	E	E	Known within Gulf and bay systems. This omnivorous species prefers jellyfish and nests from March to August (USFWS 2019f).	*May affect, not likely to adversely affect..* Historically nested in the Alternative Project area and may transit through the Offshore Alternative Project area; however, this species is usually found in deep ocean waters.
Loggerhead sea turtle (*Caretta caretta*)	T	T	Known within Gulf and bay system primarily for juveniles. Adults are primarily pelagic. This omnivorous species prefers mollusks, crustaceans, and coral for feeding and nests from April through November (USFWS 2019g).	*May affect, not likely to adversely affect*. May affect, not likely to adversely affect. Historic TXNDD elemental occurrences have been in the Alternative Project area.
Marine Mammals				
West Indian Manatee (*Trichechus manatus*)	E	T	Utilizes coastal habitats such as bays and the mouths of rivers; however, Texas waters of the GOM area the very western extent of their range (USFWS 2019h).	*No effect.* The Alternative Project is located along the western extent of the range of this species.
Bryde's whale (*Balaenoptera edeni*)	PE	--	Occurs in tropical, sub-tropical, and warm temperate waters worldwide, including the northwestern and central GOM (NOAA 2019d).	*No effect.* No confirmed sightings of Bryde's whales have been documented in the north central or western GOM since NMFS began surveys in the early 1990s.
Blue whale (*Balaenoptera musculus*)	E		Distributed in sub-polar to sub-tropical latitudes worldwide. Migrates toward polar waters in spring. While found in coastal waters, they are thought to occur generally more offshore than other whales. An occasional visitor in U.S. waters in the Western North Atlantic, which could occur as far south as Florida and the GOM; however, the southern limit of the species' range is unknown and the population of this stock is small (perhaps between 400 and 600 individuals).	*May affect, not likely to adversely affect.* Individuals can occasionally occur in coastal waters and may occur in the Alternative Project area.

Table 8-19: Federally Listed Threatened and Endangered Species in San Patricio, and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Fin whale (*Balaenoptera physalus*)	E	--	Distributed in deep, offshore waters of all major oceans, primarily in temperate to polar latitudes; less common in the tropics. Most migrate from the Arctic and Antarctic feeding areas in the summer to tropical breeding and calving areas in the winter (NOAA 2019e).	*May affect, not likely to adversely affect.* Most likely occurs in deeper waters but is occasionally known to occur in coastal waters.
Sei whale (*Balaenoptera borealis*)	E	--	Distributed in sub-tropical, temperate, and sub-polar waters. May unpredictably and randomly occur in a specific area, sometimes in large numbers. These events may occur suddenly and then not occur again for long periods of time. May migrate toward lower latitudes during winter and higher latitudes during summer (NOAA 2019f).	*May affect, not likely to adversely affect.* Due to the random occurrence of this species in an area, there is the potential that they could occur in the Alternative Project area.
Humpback whale (*Megaptera novaeanglia*)	E		Distributed throughout all major oceans from the equator to sub-polar latitudes. Not expected to occur often in the northern and western GOM. The Gulf of Maine stock of humpback whales, which winters in the West Indies where the majority of whales are found in the waters of the Dominican Republic, is the nearest population to the Alternative Project. The population size is unknown.	*May affect, not likely to adversely affect.* Individuals can occasionally occur in nearshore waters of the GOM during the winter and could occur in the Alternative Project area.
Sperm whale (*Physeter macrocephalus*)	E	--	Distributed worldwide, but generally prefer waters deeper than 1,641 ft (500 m, NOAA 2019g).	*No effect*. The Proposed Project is located in offshore waters with maximum depths of approximately 89.5 ft (27.3 m) which would not be preferred by this species.
Birds				
Northern apolomado falcon (*Falco femoralis septentrionalis*)	E	E	Prefers open areas, specifically savanna and open woodlands with scattered trees or shrubs. Also known to occur in grassy plains and valleys containing intermittent mesquite, yucca, and cactus. Known to utilize former nests of birds constructed of sticks. Nesting is known to occur on Matagorda Island and near Brownsville, Texas; the coastal region between these populations (including the Alternative Project area) is not known to include nesting pairs (USFWS 2014).	*May affect, not likely to adversely affect.* The closest known populations occur near Brownsville, Texas; within the Aransas NWR; and on San Jose Island. No nests or occurrences were observed during field surveys; however, since they are known to occur in the area, the Alternative Project could temporarily impact species.

Table 8-19: Federally Listed Threatened and Endangered Species in San Patricio, and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Piping plover (*Charadrius melodus*)	T	T	Wintering migrant along the Texas Gulf Coast and is known to occur along beaches and bayside mud or salt flats (TPWD 2019d).	*May affect, not likely to adversely effect.* Critical habitat for the piping plover is present; however, impacts to this area would be avoided through the implementation of HDD drilling techniques.
Red knot (*Calidris canutus rufa*)	T	T	Migrate April to June and prefers coastal areas along tidal flats and beaches, herbaceous wetlands, and tidal flat/shore habitats (TPWD 2019c).	*May affect, not likely to adversely affect.* Although potential habitat is present within the Alternative Project area, impacts would be avoided through the implementation of HDD drilling techniques.
Whooping crane (*Grus americana*)	E	E	Migrant species known throughout the state to the coast. Winters within the marshes of Aransas, Calhoun, and Refugio counties in Aransas NWR (TPWD 2019e and USFWS 2019j).	*May affect, not likely to adversely affect.* A population winters in Aransas NWR, which is located about 27 mi (43 km) from the Alternative Project; some suitable habitat occurs in the Alternative Project area.
Terrestrial Mammals				
Gulf coast jaguarundi (*Herpailurus yagouraroundki cacomitli*)	E	E	Prefers thick brushlands near water. Species has a 60 to 75-day gestation period with litters sometimes twice annually in March and August or beginning of the rainy season and end of the dry season (TPWD 2019f).	*No effect.* No preferred habitat occurs within the Alternative Project area.
Ocelot (*Leopardus pardalis*)	E	E	Prefers dense chaparral thickets and mesquite-thorn scrub and live oak mottes. Avoids open areas and breeds from June to November when young are also raised (TPWD 2019g).	*No effect.* Habitat in the Alternative Project area is generally disturbed agricultural or developed land unsuitable for the ocelot.
Invertebrates				
Golden orb (*Quadrula aurea*)	C	T	Found in sand and gravel substrates, occasionally in substrates of mud. Found in standing or fast-flowing waters of the Guadalupe, San Antonio, Lower San Marcos, and Nueces River basins (TPWD 2019c).	*No effect*. Although lentic and lotic waterbodies occur in the Alternative Project area, impacts to these waterbodies would be avoided through the implementation of HDD construction methods.

Table 8-19: Federally Listed Threatened and Endangered Species in San Patricio, and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Lobed star coral (*Orbicella annularis*)	T	--	This reef-building coral grows in varying colony shapes in response to differing light conditions. It lives in the western Atlantic Ocean, and is the most abundant species of reef-building coral in the Caribbean (NOAA 2019i).	*No effect*. The Alternative Project is outside of the species' range.
Mountainous star coral (*Orbicella faveolata*)	T	--	Identified as occurring off the State of Florida (NatureServe 2019a).	*No effect*. The Alternative Project is outside of the species' range.
Boulder star coral (*Orbicella franksi*)	T	--	Identified as occurring off the State of Florida (NatureServe 2019b).	*No effect*. The Alternative Project is outside of the species' range.
Elkhorn coral (*Acropora palmata*)	T / P E	--	Elkhorn coral can be found in shallow water throughout the Caribbean and in the U.S. in the Florida Keys and along the east coast of Florida north to Broward County. The species is currently listed as threatened but is proposed for reclassification as endangered (NMFS 2019d).	*No effect*. The Alternative Project is outside of the species' range.
Flowering Plants				
Slender rush-pea (*Hoffmannseggia tenella*)	E	--	Historically known to occur in Nueces and Kleberg Counties along remnant native prairie habitats that have not been tilled or developed. This species prefers patches of short-grass native prairies adjacent to intermittent and perennial waterbodies. (USFWS 2019k)	*No effect.* Terrestrial habitat within the Alternative Project area consists primarily of cleared industrial, residential, and agricultural habitat. Therefore, the slender rush-pea is not anticipated to occur in the Alternative Project area.
South Texas ambrosia (*Ambrosia cheiranthifolia*)	E	--	Historically known to occur in Cameron, Jim Wells, Kleberg, and Nueces Counties, Texas. Prefers low elevations, along well drained soils associated with sub-tropical woodland communities along openings of coastal prairies and savannas. (USFWS 2019l)	*No effect.* Terrestrial habitat within the Alternative Project area consists primarily of cleared industrial, residential, and agricultural habitat. Therefore, the south Texas Ambrosia is not anticipated to occur in the Alternative Project area.

E = Endangered; T= Threatened; C = Candidate Species.

* Indicates listed marine.

Source: USFWS 2019a, TPWD 2019c, NMFS 2019a, NMFS2019c, BOEM 2017.

8.3.1.8 State-Listed Species

The TPWD annotated county lists of rare species for counties crossed by the Alternative Project includes 25 state-listed threatened and endangered species (see Table 8-20). A TXNDD search was conducted for Nueces and San Patricio Counties, where the Alternative Onshore and Inshore Pipelines would be located (TXNDD 2019). The results of this database search reported Eos for federally listed species, as discussed in Section 8.2.1.7. No other listed state threatened, or endangered species element occurrences were listed within 2.0 mi (3.2 km) of the Alternative Project area.

Existing habitats within the Alternative Project area are similar to those discussed for the Proposed Project.

Of the 25 species listed as threatened or endangered in San Patricio, Aransas, and Nueces Counties, the Alternative Project would have *no effect* on 8 of the species and *may affect, but would be unlikely to adversely affect* remaining 17 (see Table 8-20). Although these 17 species contain potential habitat in the vicinity of the Alternative Project area, BWTT would implement BMPs during construction including:

- minimizing impacts to wetlands, depressions, and riverine habitats;
- implementing HDD construction methods to cross waterbodies;
- installing erosion control devices or fencing to direct animal movement away from construction activities.

Additionally, prior to construction, BWTT would consult with the TPWD for guidance on any necessary protective measures for state-listed species that may occur in the Alternative Project area. Therefore, impacts on state-listed species are not anticipated to be significant.

Table 8-20: State-Listed Threatened and Endangered Species in San Patricio and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Amphibians and Reptiles				
Black-spotted newt (*Notophthalmus meridionalis*)	--	T	Generally found in wet to periodically wet areas including arroyos, canals, ditches, or shallow depressions. Aestivates during dry periods and is known within the Gulf Coastal Plain south of the San Antonio River.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Indigo snake (*Drymarchon melanurus*)	--	T	Prefers thornbrush-chaparral woodlands of southern Texas, particularly dense riparian corridors. Known to occur south of the Guadalupe River and Balcones Escarpment.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore Pipelines.
Sheep frog (*Hypopachus variolosus*)	--	T	Occurs primarily within grassland and savanna habitat and prefers moist sites within arid climates.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
South Texas siren (*Siren sp.1*)	--	T	Generally found in wet to periodically wet areas including arroyos, canals, ditches, or shallow depressions. Aestivates during dry periods but requires moisture to remain. Breeds February to June and is found in south Texas, south of the Balcones Escarpment.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Texas horned lizard (*Phrynosoma cornutum*)	--	T	Prefer open, arid to semi-arid regions containing sparse vegetation including grass, cactus, and scattered scrub-shrub. Prefer soils that are sandy to rock in texture. Known to burrow into soils, rodent burrows, or beneath rocks when inactive.	*May affect, not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Alternative Onshore and Inshore Pipelines; however, sandy soils near beaches could be utilized by the species
Texas scarlet snake (*Cemophora coccinea lineri*)	--	T	Prefers mixed hardwood scrub located atop sandy soils. Feed on reptilian eggs and is active April to September.	*May affect, is not likely to adversely affect.* Minimal potentially suitable habitat will be crossed by the Alternative Onshore and Inshore Pipelines. Additionally, sandy soils preferred by this species are prevalent within the Project area.
Texas tortoise (*Gopherus berlandieri*)	--	T	Prefers open brush containing a grassy understory. Bare ground and open grasslands are avoided. Occupy shallow depressions at the base of shrubs or cactus, occasionally underground in burrows or beneath objects. Active March through November and breed April to November.	*No effect*. Terrestrial habitat within the Alternative Project area consists primarily of cleared industrial, residential, and agricultural habitat.

Table 8-20: State-Listed Threatened and Endangered Species in San Patricio and Nueces Counties				
Species	**Federal Status**	**State Status**	**Habitat Description**	**Effect Determination**
Timber rattlesnake (*Crotalus horridus*)	--	T	Found in swamps, floodplains, upland pine and deciduous woodlands, riparian areas, and abandoned farmlands. Prefers sandy soil or black clay and dense vegetation such as palmetto.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Birds				
American peregrine falcon (*Falco peregrinus anatum*)	--	T	Species is a year-round resident in west Texas and is known to nest in tall cliff eyries. Occupies a wide range of habitats during migration including urban areas along coastal and barrier islands. This low-altitude migrant prefers stopovers along leading landscape edges including lake shores, coastlines, and barrier islands	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Bald eagle (*Haliaeetus leucocephalus*)	--	T	Found primarily near rivers and large lakes. This species generally nests within tall trees or along cliffs near water.	*Not likely to cause a take.* Minimal potentially suitable habitat would be crossed by the Onshore Pipelines.
Eskimo curlew (*Numenius borealis*)	--	E	Historic species that prefers grasslands, pastures, plowed fields, and infrequently marshes or mudflats.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Botteri's sparrow	--	T	This species prefers grassland and coastal prairies intermingled with shrubs and trees. Generally, prefers tall grasses for nesting	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore and Inshore Pipelines.
Peregrine falcon (*Falco peregrinus*)	--	T	Both subspecies are known migrants across Texas and winter along the coast and farther south.	*May affect, not likely to adversely affect*. Minimal potentially suitable habitat will be crossed by the Alternative Onshore and Inshore Pipelines.
Reddish egret (*Egretta rufescens*)	--	T	Resident of the Texas Gulf Coast; known to occur in brackish marshes and shallow salt ponds or tidal flats. Nests on the ground, in trees, or bushes along dry coastal islands containing brushy thickets of yucca and prickly pear.	*May affect, not likely to adversely affect.* A TXNDD search reported no known E.O.s in the Project area; however, the Alternative Project would cross potential habitat for this species.

Table 8-20: State-Listed Threatened and Endangered Species in San Patricio and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Sooty tern (*Onychoprion fuscatus*)	--	T	Primarily found in flight. Does not dive; however, it snatches small fish and squid as it flies or hovers over water. Breeds from April to July.	*May affect, not likely to adversely affect*. Minimal potentially suitable habitat will be crossed by the Alternative Onshore and Inshore Pipelines; however, portions of San Jose island contain potential breeding habitat for this species.
Swallow-tailed kit (*Elanoides forfivatus*)	--	T	This species prefers lowland forested regions, especially swampy areas. This species may also occur along open woodlands; marshes; and along rivers, lakes and ponds. Known to nest in tall trees along clearings of forest edges consisting of pine, cypress, or deciduous tree species.	*No effect*. Minimal potentially suitable habitat would be crossed by the Alternative Onshore Pipelines.
Texas Botteri's sparrow (*Peucaea botterii texana*)	--	T	This ground nesting species prefers grasslands and short-grass plains containing intermittent bushes or shrubs such as sagebrush, mesquite, and yucca.	*No effect*. Minimal potentially suitable habitat would be crossed by the Onshore Pipelines.
Tropical parula	--	T	Prefers semi-tropical evergreen woodlands along rivers and resacas. This species is generally found in dense to open woodlands, undergrowth, brush, and trees along the edges of rivers and resacas. Breeds from April to July	*No effect*. Minimal potentially suitable habitat would be crossed by the Alternative Onshore Pipelines.
White-faced ibis (*Plegadis chihi*)	--	T	Prefers freshwater marshes, sloughs, and irrigated rice fields; however, is known to occur in both brackish and saltwater habitats. Nests within marshes, in low trees, on the ground in bulrushes or reeds, or on floating mats	*May affect, not likely to adversely affect.* This species is a permanent resident along the Texas Gulf Coast within coastal wetland habitats such as those crossed by the Alternative Project
White-tailed hawk (*Buteo albicaudatus*)	--	T	Occurs near the coast along prairies, cordgrass flats, and scrub-live oak. Further inland, this species is known to occur on prairies, mesquite and oak savannas, and mixed savanna-chaparral habitat. Breeds March to May	*No effect*. Terrestrial habitat within the Alternative Project area consists primarily of cleared industrial, residential, and agricultural habitat.
Wood stork (*Mycteria americana*)	--	T	Forages in prairie ponds, flooded pastures and fields, ditches, and other shallow bodies of standing water (including salt water). Communal rooster that is found in tall snags, sometimes associated with other wading birds. Breeds in Mexico and moves to the Gulf States in search of mud flats and other wetlands. Formerly nested in Texas; however, no breeding records have occurred since 1960.	*May affect, not likely to adversely affect*. The Alternative Project area does not contain preferred habitat for this species; however, it could utilize saltwater or brackish habitats during overflights.

Table 8-20: State-Listed Threatened and Endangered Species in San Patricio and Nueces Counties

Species	Federal Status	State Status	Habitat Description	Effect Determination
Fishes				
Opossum pipefish (*Microphis brachyurus*)	--	T	Brooding adults found in fresh to low-salinity waters. Young move or are carried into more saline waters after birth in southern coastal areas.	*May affect, not likely to adversely affect. P*otential habitat occurs in the vicinity of the Alternative Project.
Smalltooth sawfish (*Pristis pectinata*)	--	E	Young are found close to shore in muddy and sandy substrates, seldom descending to depths greater than 32 ft (10 m); young are also found in protected bays, on shallow banks, and in estuaries or river mouths. Adults are found in various habitats with varying salinity and temperature regimes and at various depths. Generally, this species feeds on a variety of fish species and crustaceans.	*No effect*. A TXNDD search reported no known E.O.s in the vicinity of the Alternative Project area. Additionally, this species has been extirpated from this region and only occurs near Florida.
Mammals[a]				
White-nosed coati (*Nasua narica*)	--	T	Found in woodlands, riparian corridors, and canyons. Most occurrences in Texas are believed to be transient from Mexico. Diurnal and crepuscular species that is gregarious and forages on the ground or in trees.	*No effect*. No woodlands or significant riparian corridors, or canyons are present in the Alternative Project area.
Southern yellow bat (*Dasypterus ega*)	--	T	This species is generally associated with tall species such as palms (*Sabal mexicana)* in Brownsville, which provide daytime roosting habitat. Breeds in late winter and is insectivorous.	*No effect.* No tall forested areas containing species such as palms occur within the Alternative Project area.

a TPWD also identifies the red wolf as potentially occurring in the Alternative Project area; however, it is extirpated and therefore not assessed (TPWD 2019c).

8.3.2 Alternative Project Construction Impacts

8.3.2.1 Onshore

Construction of the Alternative Onshore Pipelines would impact wildlife habitat, including wetlands, native upland, and disturbed or non-native communities. Habitat crossed by the Alternative Onshore Pipelines would include primarily agricultural, herbaceous, and scrub-shrub habitat which would be expected to return to pre-construction conditions within one to three growing seasons. Impacts to wildlife associated with the Alternative Onshore Pipelines from noise, light, and human/vehicular presence would be similar to those described for the Proposed Project. Additionally, the Alternative Onshore Pipelines would cross ephemeral, intermittent, and perennial waterbodies similar to the Proposed Project and as described in Section 5: Wetlands and Waters of the U.S. Construction of the pipelines through waterbodies may occur through one of three methods, including open-cut, conventional bore, and horizontal directional drill (HDD). No sensitive habitats have been identified within the footprint of the Alternative Onshore Pipelines.

8.3.2.2 Inshore

Existing terrestrial habitats associated with the 8.4-mi- (13.5-km-) long Alternative Inshore Pipelines would be similar to those described for the Proposed Project and would include herbaceous land, industrial land, and wetlands. Wetland habitats in the Alternative Project area include emergent estuarine wetlands as well as emergent palustrine (freshwater) wetlands which would provide nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species. Similar to the Proposed Project, the Alternative Project would include the 19-ac (7.7-ha) Alternative Booster Station, which includes upland and wetland vegetation.

Where the Alternative Inshore Pipelines would be installed via HDD as they approached Mustang Island, impacts would be similar to those described for the Proposed Project. However, the Alternative Inshore Pipelines would cross approximately 5.8 mi (9.3 km) of open water as well as the shoreline of the DMPU island and upland staging area associated with Mustang Island. In open water, the pipelines would be installed using a submersible pipeline jetting sled operated from an anchored pipe laying barge across Corpus Christi Bay. Active trenching would increase TSS concentrations in the vicinity of the Alternative Project. As described in Section 4: Water Quality, because of the shallow depths in Corpus Christi Bay (averaging 11 ft), the initial suspension of sediments during trenching would cause a significant but temporary water quality impact in the vicinity of the pipeline. Further, trenching would require additional vessels to transit and be present in Corpus Christi Bay, increasing the potential for vessel strike of the Nueces Bay/Corpus Christi Bay Estuary stock of bottlenose dolphins; however, given the existing vessel traffic in Corpus Christi Bay, these impacts are anticipated to be negligible.

Trenching and jetting would result in increased turbidity and sedimentation in and immediately adjacent to the construction footprint. Turbidity refers to the insoluble, suspended particulates that impede the passage of light through water by scattering and absorbing light energy. The reduction of penetrating light reduces the depth of the photic zone which reduces the depth at which primary productivity occurs. Turbidity, although temporary, reduces the light available to the seagrasses, which is a highly productive habitat and important for estuarine species growth. The resultant sedimentation, however, can result in mounds of deposited sediment that are then prone to re-suspension (Handley, Altsman, and DeMay 2007). Seagrasses would take approximately 3 to 5 years to recover, if buried by no more than 3-inches of sediment; however, shoal grass (which is known to occur in the bay system) could quickly invade and outcompete other native species prior to their recovery (USACE and Interagency Coordination Team 2002).

No seagrasses are anticipated to be present in the middle of Corpus Christi Bay; however, it is present along the perimeter of Shamrock Island and within shallow water areas along Mustang Island (TPWD 2019h). To minimize seagrass impacts, BWTT would need to use BMPs, such as weighted turbidity curtains, on the edges of the construction ROW to minimize the turbidity and sedimentation adjacent to construction workspaces. Sediment

side cast from trenching would also likely need to be stored on barges rather than on the bay floor adjacent to the trench to prevent re-suspension of the sediment in the water column and further mitigate increased turbidity during construction. Required mitigation and final BMPs would be determined prior to construction based on the conditions of the USACE permit. Overall installation of the Alternative Inshore Pipelines would have the potential to impact seagrass habitats utilized by wildlife and protected species and would cause increased sediment and turbidity; however, these impacts are anticipated to be minor and temporary with implementation of BMPs.

As with the Proposed Project, piping plover critical habitat is designated along the beach of Mustang Island (which is also potential sea turtle nesting habitat) and would be affected by HDD construction noise. Impacts from HDD construction on noise levels could result in more than a perceived doubling of sound (10 dB). Impacts due to noise from HDD construction would be temporary, and the use of HDD construction would avoid disturbance of critical habitat due to trenching (see Section 13: Meteorology, Air Quality, and Noise). Therefore, impacts would be temporary and minor.

8.3.2.3 Offshore

Impacts from the offshore pipeline installation of the Alternative Project would be similar with those impacts described for the Proposed Project, with few exceptions. The Alternative Offshore Pipelines would be installed by HDD for the first approximate 4,950 ft (1,508.3 m) from shore; the remaining 16.2 mi (26.1 km) of the pipelines would be installed by jetting, as discussed for the Proposed Project. However, where the Alternative Offshore Pipelines would cross a shipping fairway, a greater depth of cover (10 ft [3 m]) and placement of rip rap over the pipeline trench is required, which would remain during operations; therefore, the volume of sediment disturbed for trenching along that 3.1 mi (5.0 km) of pipe would be greater, and localized construction would require more time, than elsewhere along the Alternative Offshore Pipelines. In addition, jetting for the Alternative Offshore Pipelines would result in temporary impacts on Lonestar Reef given its proximity (see Section 6: Aquatic Environment); sediment levels would be expected to be similar to those experienced along the trench but, given the relatively short duration of impacts they would be minor.

8.3.2.4 Deepwater Port Pile-driving and Installation

Impacts from pile-driving and offshore installation of the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.2.5 Hydrostatic Testing of the Pipelines

Impacts from hydrostatic testing of the Alternative Project would be consistent with those impacts described for the Proposed Project. However, given the decreased length required to be hydrostatically testing, the total volume of seawater required is estimated to be 3.2 million gallons (12,113 m^3), which would entrain or impinge approximately 178,915 eggs and 276,774 larval fish.

8.3.2.6 Construction Vessel Operations

Impacts from construction vessel operations of the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3 Alternative Project Operation Impacts

As with the Proposed Project, impacts on the wildlife and protected species during operation of the Alternative Project would generally be limited to presence of the SPM buoy systems, port calls by the VLCCs, the sporadic transit of support vessels to and from the offshore port, and the presence of the restricted zones (see Section 14: Navigation, Safety, and Security). Additionally, although not anticipated to occur, a release of petroleum products from the SPM buoy systems or pipelines would also impact wildlife and protected species.

8.3.3.1 Onshore

Impacts from the presence of the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3.2 Inshore

No impacts on inshore fisheries would occur through operation of the Alternative Inshore Project Components as the Inshore Pipelines would be buried under the bed of the bays and channels. Operational maintenance of the Inshore Pipelines along Mustang Island and the DMPU Island would be similar to that discussed for the Proposed Onshore Pipelines. As Mustang Island is managed for wildlife, it is likely that periodic disturbance from vegetation maintenance at that location would result in impacts on wildlife species; however, all impacts are expected to be temporary and negligible due to the limited nature of the activities.

8.3.3.3 Offshore

Impacts from the presence of the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3.4 Deepwater Port Presence and New Hard-bottom Habitat

Impacts from the presence of the Alternative Project would be consistent with those impacts described for the Proposed Project. In addition, where rip rap would be installed along 3.1 mi (5.0 km) of the Alternative Offshore Pipelines in the shipping fairway, it would act as an artificial hard structure, allowing sessile invertebrates with a substrate on which to attach. Because of the hard structure provided for marine species in an area of otherwise ubiquitous soft-bottom habitat, the presence of the rip rap would be considered a permanent, beneficial impact.

8.3.3.5 VLCC Transit

Impacts from VLCC transit to the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3.6 VLCC Water Use

Impacts from VLCC water use at the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3.7 Support Vessel Mooring and Anchoring

Impacts from support vessel operations at the Alternative Project would be consistent with those impacts described for the Proposed Project.

8.3.3.8 Inadvertent Product Release

Wildlife and their associated habitats that could be affected in the event of a spill would be consistent with those impacts described in Section 1.3.2.

8.3.4 Alternative Project Decommissioning Impacts

The decommissioning procedures and impacts associated with the Alternative Onshore and Inshore Pipelines would be consistent with those impacts described for the Proposed Project.

8.3.4.1 Offshore

The decommissioning procedures and impacts associated with the Alternative Offshore Pipelines would be consistent with those impacts described for the Proposed Project, with offshore removal of the pipelines beginning about 4,806 ft (1,465 m) from the shore.

8.3.5 Summary of Alternative Project Impacts

8.3.5.1 Alternative Project Construction Impacts

8.3.5.1.1 FEDERALLY LISTED SPECIES

BWTT assessed potential impacts to 27 federally listed species in San Patricio and Aransas Counties, Texas. Of these, 13 species are not anticipated to occur in the habitats crossed by the Proposed Project; therefore, the Proposed Project would have no effect on these species. The Proposed Project may affect but is not likely to adversely affect the remaining 14 protected species. Marine sea turtles are known to occur and/or nest within the vicinity of the Alternative Project area and seagrass areas (preferred sea turtle habitat) would likely be impacted by trenching during inshore construction of the Alternative Project. Additionally, sea turtle species could be impacted from inadvertent vessel strikes, inadvertent releases, impacts to *Sargassum*, and noise during construction and operation of the Alternative Project. Threatened and endangered marine mammals and fish are known to occur within deeper coastal waters; however, they are occasionally identified within shallower coastal waters such as those of the Alternative Project area. Although unlikely to occur in the Alternative Project area, these species could be impacted by vessel strikes and noise impacts during all phases of the Alternative Project. Impacts from pile-driving noise are anticipated to have the highest potential impacts marine fauna, but BWTT would implement appropriate mitigation for this potential impact through coordination with NMFS. Further, federally listed bird species are known to occur and have preferred habitat within the Alternative Project area. Known critical habitat for the piping plover (and suitable beach habitat for sea turtles) occurs in the Alternative Project area; however, impacts to this habitat would be avoided through the implementation of HDD construction methods.

8.3.5.1.2 STATE-LISTED SPECIES

BWTT assessed potential impacts to 25 state-listed threatened and endangered species within San Patricio and Aransas Counties, Texas. Of these, the Alternative Project would have no effect on 17 species due to the Alternative Project area not containing preferred habitat and a TXNDD report indicated no elemental occurrences in the vicinity of the Project area. The Alternative Project may affect, but is not likely to adversely affect the remaining 8 state-listed threatened and endangered species, which may occur in the Alternative Project area, but for which impacts would be minimized or avoided through HDD construction methods.

8.3.5.1.3 ONSHORE

Construction of the Alternative Onshore Pipelines would result in vegetation clearing and stream crossings within the 125-ft-wide (38.1-m-wide) construction ROW, along its 23.1 mi (37.2 km) length. Habitat crossed by the Alternative Onshore Pipelines would include primarily agricultural, herbaceous, and scrub-shrub habitat which would be expected to return to pre-construction conditions within one to three growing seasons. No sensitive habitats have been identified within the footprint of the Alternative Onshore Pipelines. Streams crossed by open-cut would be temporarily affected by turbidity and sedimentation; streams crossed by trenchless methods (HDD or bore) would generally be avoided and the potential for an inadvertent return would be minimized through implementation of BWTT's Project-specific HDD Inadvertent Returns Contingency Plan. During construction, wildlife would likely avoid areas of active construction due to the increase in noise, light, and human and vehicular presence. However, wildlife are expected to return to adjacent, undisturbed areas once construction has been completed such that impacts would be temporary to short-term and negligible.

8.3.5.1.4 INSHORE

The 8.4-mi- (13.5-km-) long Alternative Inshore Pipelines would be constructed using a combination of HDD and open-cut methods. Existing terrestrial habitats associated with the Alternative Inshore Pipelines include herbaceous land, industrial land, and wetlands. Wetland habitats in the Alternative Project area include emergent estuarine wetlands as well as emergent palustrine (freshwater) wetlands which would provide nutrients, cover, shelter, and water for a variety of terrestrial and aquatic wildlife species. The Alternative Booster Station would

permanently remove 19 ac (7.7 ha) of upland and wetland vegetation. Piping plover critical habitat is designated along the beach of Mustang Island (which is also potential sea turtle nesting habitat) and would be subject to temporary impacts from HDD construction noise; while noise could result in more than a perceived doubling of sound (10 dB), impacts due to noise from HDD construction would be temporary, and the use of HDD construction would avoid disturbance of critical habitat due to trenching such that no direct effects on these beaches would occur. Any wildlife present on the DMPU or Mustang Islands would experience temporary to short-term, negligible impacts, as discussed above for the Alternative Onshore Pipelines.

The Alternative Inshore Pipelines would cross approximately 5.8 mi (9.3 km) of open water as well as the shoreline of a DMPU island and upland staging area associated with Mustang Island. Active trenching would significantly increase TSS concentrations along the trenched portions of the Alternative Inshore Pipelines as the distance at which these concentrations return to ambient would likely be greater than the 2.1 mi (3.5 km) estimated for the Alternative Project Offshore Pipelines; this distance was also based on a 3 ft (1 m) depth of cover as opposed to the 5 ft (1.5 m) depth of cover required in Corpus Christi Bay. Increased turbidity and sedimentation, although temporary, can affect seagrasses (important habitat for estuarine species) around the edges of Corpus Christi Bay, which would take approximately 3 to 5 years to recover, if buried by no more than 3-inches of sediment. However, these impacts are anticipated to be minor and temporary with implementation of BMPs.

8.3.5.1.5 OFFSHORE

OFFSHORE PIPELINE INSTALLATION

The Alternative Offshore Pipelines would be installed by HDD to a point about 4,950.0 ft (1,580.3 m) offshore of the shoreline at which point they would be installed by jetting for 16.2 mi (26.1 km), until reaching the SPM buoy systems. The Alternative Offshore Pipelines would be buried a minimum of 3 ft (0.9 m) below the sediment surface, but would be buried to a depth of 10 ft (3 m) where beneath existing safety fairways (about 3.1 mi [5.0 km]). In addition, rip rap would be installed over the pipelines, and would remain during operations. Impacts from turbidity and sedimentation associated with pipeline jetting would be temporary and minor, with suspended sediment levels along the trench generally returning to pre-construction levels within 1 to 2 days. TSS concentrations would be highest in the immediate area of the trench and would dissipate with distance from the trench, returning to ambient levels within a maximum distance of about 2.1 mi (3.5 km); the Lonestar Reef, an artificial reef, is 0.2 mi (0.3 km) away and would experience temporary sedimentation levels similar to those along the trench. Given the short duration, impacts would be minor. Therefore, impacts associated with these suspended sediments would be temporary, localized, and minor. As the benthic community is generally less motile, it would likely be reduced in species richness, species abundance, and biomass through direct mortality; however, recovery of the affected habitat is anticipated within 3 years, and as such, is considered minor and short-term.

DEEPWATER PORT PILE-DRIVING AND INSTALLATION

To minimize impacts associated with offshore construction, the Alternative SPM buoy systems and associated components (including 34 piles) would be fabricated at controlled onshore facilities and delivered to the site by barge. Installation activities for these components would be of limited duration and are not anticipated to cause long-term adverse effects to the biological community, although 700 square ft (0.02 ac) of soft-bottom habitat (and affected biota) would be permanently lost. Increased turbidity and sedimentation from placement of the Offshore Components is considered a temporary and negligible impact given the extent of locally available soft-bottom and water column habitat. Some installation activities would continue 24 hours a day and require continuous lighting. Lights in the form of navigational beacons would also be required. Although lighting may attract fishes, and their predators, to the construction area, resulting impacts are expected to be temporary and negligible.

Temporary underwater noise during construction would result from installation of the pipelines (including vessel activity and jetting to bury the Alternative Offshore Pipelines after they are laid on the seafloor) and construction

of the Alternative SPM buoy systems (including vessel activity and pile-driving). Underwater noise may be generated by continuous sources, such as vessels in transit, and short, intense (impulse) sources, such as pile-driving. In addition, airborne noise generated by the Alternative Project could impact terrestrial wildlife and marine and coastal birds in the Alternative Project area. The most impactive construction noise would be in-water pile-driving, which would exceed injury and behavioral thresholds for marine mammals, sea turtles, and fish. However, BWTT would ensure proper coordination with NMFS to identify what additional measures should be implemented during pile-driving to minimize impacts on these species, such that impacts are minimized to the extent practicable. Increases in noise associated with installation of the Alternative Project facilities, including airborne noise from pile-driving, could result in temporary impacts on birds in the vicinity of construction; however, birds are highly mobile and would likely avoid areas of active construction, such that impacts would be negligible.

HYDROSTATIC TESTING

Hydrostatic testing of two 30-inch-diameter pipelines would require approximately 3.2 million gallons (12,113 m^3) of seawater, which would entrain or impinge approximately 178,915 eggs and 276,774 larval fish; however, this loss is not believed to result in a reduction in fish or prey species at the population-level; therefore, the food web and fisheries populations would incur a negligible adverse impact through water intakes during construction.

CONSTRUCTION VESSEL OPERATIONS

The presence of construction vessels traveling to and from the Offshore Components could affect the faunal community through vessel strikes, inadvertent spills of contaminants, and an increase in lost marine debris. Increased vessel traffic increases the likelihood of collision between ships and marine mammals, resulting in possible injury or death to some animals. For all Alternative Project construction or support vessels, BWTT would require implementation of BOEM NTL No. 2016-G01, Vessel Strike Avoidance and Injured/Dead Protected Species Reporting, which includes measures for reduced speeds and maintained distances between vessels and observed marine mammals. Therefore, the increase in vessel traffic associated with port construction is not expected to directly impact non-threatened and non-endangered marine mammals. Similarly, BWTT would adhere to applicable regulations and NTL No. 2015-BSEE-G03, Marine Trash and Debris Awareness and Elimination to minimize the potential for lost marine debris, which would result in negligible impacts on marine life from lost debris.

Any discharges from construction vessels would be in accordance with applicable regulations, would be localized, and would dissipate quickly given the dilution capacity of the GOM. Similarly, potential spills of construction-related fuels and chemicals may affect fauna in the immediate vicinity of a spill; however, BWTT vessels would adhere to MARPOL requirements to minimize the potential for spills and would implement a Project-specific spill response plan to further prevent, contain, and clean up any inadvertent spills. Therefore, significant impacts related to spills and releases are not anticipated.

8.3.5.2 Alternative Project Operation Impacts

8.3.5.2.1 ONSHORE

Operation and maintenance of the Alternative ROW during normal operation would be restricted to vegetative management over the 75-ft-wide permanent ROW on an as-needed basis. Vegetation maintenance during operations would impact wildlife habitat through an increase in noise and human and vehicular presence. However, wildlife are expected to return to the ROW and adjacent areas immediately upon cessation of these activities, such that impacts are anticipated to be temporary to short-term and negligible. No operational impacts or vegetation maintenance is anticipated within the streams crossed by the Alternative Onshore Pipelines.

8.3.5.2.2 INSHORE

No impacts on inshore fisheries would occur through operation of the Alternative Project Inshore Components as the Alternative Inshore Pipelines would be buried under the bed of the bays and channels. Operational maintenance of the Alternative Inshore Pipelines along terrestrial habitats would be similar to that discussed for the Alternative Onshore Pipelines, and are expected to be short-term and negligible due to the periodic and limited nature of the activities. The Alternative Booster Station would permanently convert 19.0 ac (7.7 ha) of vegetated habitat to an industrial facility, and would indirectly impact adjacent areas from increased lighting and noise. However, given the negligible impact on sound levels at NSA less than 1 mi from the site (including designated critical habitat), the increased noise would result in permanent, but negligible impacts on wildlife.

8.3.5.2.3 OFFSHORE

DEEPWATER PORT PRESENCE AND NEW HARD-BOTTOM HABITAT

Once constructed, the SPM buoy systems' seafloor components and rip rap installed in the shipping fairway would act as an artificial hard structure, providing a permanent, beneficial impact by allowing sessile invertebrates with a substrate on which to attach in an otherwise ubiquitous soft-bottom habitat. Lighting may cause behavioral changes in nearby fauna, including attraction of predator and prey species, as well as trans-GOM migratory birds; however, measures would be taken to minimize the amount of total lighting used on the Alternative DWP to that required for safety, such that impacts would be permanent, but minor. Anchor chain scour would also occur within each SPM buoy system's swing circle (radius of 125 ft [38.1 m]), but this continual disturbance to the benthic community is considered negligible.

NOISE EFFECTS

Airborne noise generated by the Alternative Project could impact terrestrial wildlife and marine and coastal birds in the Alternative Project area; however, impacts on ambient noise from airborne sources are expected to be permanent and negligible in the Alternative Project area. Underwater sounds generated from the operation of the Offshore Components are estimated to range between about 20 and 40 dB above background levels, which would result in a permanent, localized increase in noise levels. Operation of the buried pipelines is not expected to impact ambient underwater sound levels. No significant increase in vessel traffic is anticipated in the Alternative Project area, and therefore underwater noise impacts from vessel traffic during operations would be negligible.

VLCC TRANSIT

The primary threat to marine mammals resulting from vessel transits in shipping lanes in the GOM would be an increased risk of vessel strikes while VLCCs and support vessels are underway. The VLCCs and support vessels traveling to the SPM buoy systems would use established and well-traveled shipping lanes. In addition, BWTT would provide the operators of VLCCs with NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* (NMFS 2008) and request that these measures be used when transiting to and from the SPM buoy systems. As such, ship strikes are not anticipated.

VLCC WATER USE

During facility operations, VLCCs would require the uptake and discharge of seawater for cooling of engines, pumps and other equipment, and in support of hoteling operations. The water column would be disturbed via the intake and discharge of water, as could any pelagic or planktonic species present in the immediate area of these activities. Benthic communities in the Alternative Project vicinity are not expected to be affected by operation of the Alternative Project due to the depth of the water in which it would be located.

The estimated amount of water withdrawn due to vessel use is estimated to be about 1.04 billion gallons per year, which is estimated to entrain or impinge 90.0 million larval fish and 57.9 million fish eggs at the DWP each year, all of which are expected to be lost. Although the number of eggs and larvae that would be annually entrained appears high, many fish species are broadcast spawners that release a high number of eggs that are subject to

high mortality rates; therefore, the overall effect of the water intake and discharge is expected to be but minor, but will extend for the life of the Proposed Project. Discharges from the VLCCs, some of which would have altered properties (e.g., temperature, DO, pH), would comply with applicable USCG and MARPOL requirements for marine vessel discharges, such that they would limit impacts from discharge to be minor and localized impacts.

INADVERTENT PRODUCT RELEASES

In the event of an inadvertent spill, the probability of which is extremely low, marine species could be directly and indirectly affected, with impacts ranging from area avoidance to mortality, depending on the duration and type of exposure. The worst-case scenario spill associated with the Alternative Project would release a total of 120,770 bbl. over 10 days. While direct mortality of individuals could occur in the immediate area of a spill where concentrations of contaminants and the potential for fouling would be highest, impacts would occur over a short period and the population-level injury, such as those estimated by the DWH NRDA Trustees following that incident, would not occur.

SUPPORT VESSEL MOORING AND ANCILLARY OPERATIONS

Support vessels would regularly transit from shore to the Alternative Project area and could affect wildlife and protected species as discussed for construction, but are not anticipated to significantly affect faunal communities.

RESTRICTED OPERATIONS ZONE

The safety zones established for the SPM buoy systems and VLCCs would restrict non-Alternative Project-related activities within approximately 939 ac (380 ha) of the marine environment which would otherwise be available for fishing opportunities. In addition, the hard structures associated with the SPM buoy systems would provide new structure for epifaunal colonization and fisheries recruitment over time; therefore, as the safety zone would prohibit fishing activities, this new habitat and faunal community would be protected from fishing pressures, representing a permanent and beneficial, but minor impact.

8.3.5.3 Alternative Project Decommissioning Impacts

8.3.5.3.1 ONSHORE/INSHORE

At the end of its useful life (50 years), the Alternative Project would be decommissioned. Decommissioning of the Alternative Onshore and Inshore Pipelines would consist of purging the pipe of crude oil liquids and filling them with water, which could result in negligible impacts on ichthyoplankton if seawater were used. No decommissioning activities are anticipated to occur in onshore or inshore waterbodies. Removal of the Alternative Booster Station would be similar in scope to that discussed for construction and would have minimal impacts on area wildlife. Once the Alternative Booster Station has been decommissioned, the terrestrial habitat would be restored and would be available for wildlife use.

8.3.5.3.2 OFFSHORE

The Alternative Project Components associated with the offshore SPM buoy systems and pipelines would be disassembled and brought to shore, which would have similar impacts to that discussed for construction. However, loss of the hard-bottom components in the offshore environment would result in loss of the epifaunal community that had likely colonized the structures, resulting in a permanent and adverse, but minor impact.

8.4 Summary of Impacts

Based on the analysis presented in the sections above, potential impacts on wildlife and protected species are summarized in the Table 8-21 below.

The Proposed and Alternative Projects may affect, but are unlikely to adversely affect 14 federally listed species through increased vessel traffic, inadvertent releases, and noise (particularly pile-driving noise). However, there is a higher potential for impacts on federally listed sea turtles from the Alternative Project due to the open-cut

trenching within Corpus Christi Bay, which may affect preferred sea turtle habitat (seagrasses). In addition, 8 state-listed species could also be affected by the Proposed and Alternative Projects, which will include impacts similar to those discussed other wildlife species (e.g., habitat clearing, noise, lighting, vessel and human presence).

Construction of the Proposed and Alternative Onshore Pipelines would result in temporary to short-term, minor impacts on wildlife and wildlife habitat. Wildlife will likely avoid areas of active construction due to the increase in noise, light, and human and vehicular presence, but are expected to return to adjacent, undisturbed areas once construction has been completed. All vegetated habitat crossed by the Proposed and Alternative Onshore Pipelines are herbaceous or scrub-shrub and are expected to return to pre-construction conditions within about one to three growing seasons; impacts on open-cut streams will return to pre-construction conditions shortly after construction is completed. Although the Alternative Onshore Pipelines are about 0.9 mi (1.4 km) longer than the Proposed Onshore Pipelines, this minor difference is length does not result in significantly different impacts on wildlife and protected species.

The Proposed and Alternative Projects have significantly different impacts on inshore habitats, with respect to the location of the Booster Stations, the barrier islands crossed, and the method of construction through inshore waters. Although both the Harbor Island Booster Station and Alternative Booster Station will require the same amount of land, the placement of the Harbor Island Booster Station is considered to be in a lower quality habitat area for wildlife given the infrastructure, fragmentation, and limited land area present on Harbor Island. Mustang Island, while also showing infrastructure and some development, contains larger areas of upland and wetland vegetation that are suitable for wildlife use. San Jose Island, which is crossed by the Proposed Inshore Pipelines, is privately managed for wildlife and will be affected by construction; however, only 4.5 ac (1.8 ha) will be disturbed during construction, as opposed to the 18.2 ac (7.4 ha) that would be disturbed on Mustang Island by the Alternative Inshore Pipelines. Noise impacts at designated critical habitat nearest HDD construction of the Alternative Inshore Pipelines would be greater than the Proposed Inshore Pipelines and could cause more than a perceived doubling of sound (10 dB); however, impacts due to noise from HDD construction would be temporary, and the use of HDD construction would avoid disturbance of critical habitat due to trenching for both the Proposed and Alternative Projects.

Further, while both Projects cross terrestrial habitats and wetlands, the Proposed Project will cross all major inshore waterbodies (e.g., Redfish Bay, navigable channels) using HDD construction methods, which generally avoids impacts on the features crossed. Therefore, although seagrasses and oysters are present along the Proposed Inshore Pipelines, impacts on these sensitive features will be avoided. However, about 82 percent (5.8 mi [9.3 km]) of the Alternative Inshore Pipelines will cross the open waters of Corpus Christi Bay by trenching. Given the shallow depths of Corpus Christi Bay, the 5 ft (1.5 m) of covered needed for pipeline burial, and the presence of seagrasses, extended durations of turbidity and the subsequent sedimentation is considered a potentially significant impact on wildlife and wildlife habitats, although these impacts are anticipated to be minor and short-term with implementation of BMPs.

The majority of impacts associated with the Proposed and Alternative Offshore Projects will be identical, including the increased vessel traffic, noise, SPM buoy systems installations, and potential for inadvertent releases or spills. However, the Alternative Offshore Pipelines would require about 10.2 mi (16.4 km) fewer miles of offshore trenching than will the Proposed Offshore Pipelines. Fewer miles of pipeline installation corresponds to decreased impacts on the benthic community through direct loss and increased turbidity and sedimentation, as well as decreased impacts on the plankton community through decreased hydrostatic test water requirements. However, although impacts on these resources from the Alternative Offshore Pipelines would be proportionally less than those impacts associated with the Proposed Offshore Pipeline, both projects would have temporary to short-term, negligible to minor impacts on these resources in the offshore environment. Further, where the Alternative Offshore Pipelines would cross navigational fairways (about 3.1 mi [5.0 km]), the depth of cover would increase

from 3 ft (1 m) to 10 ft (3 m), which would result in higher turbidity and sedimentation levels during crossing of the fairways when compared to other locations along the Proposed or Alternative Offshore Pipelines. In addition, rip rap would be installed over the Alternative Offshore Pipelines in the fairway, and would remain during operations. Where the Alternative Offshore Pipelines are within 0.2 mi (0.3 km) of the Lonestar Reef, impacts from sedimentation would be temporary and minor; the nearest artificial reef is 5.7 mi (9.2 km) from the Proposed Project.

In summary, The Alternative Project has an overall greater potential for impacts on wildlife and protected resources from loss or disturbance of wildlife habitat and from the open water trenching that would be needed through Corpus Christi Bay. Although the Proposed Project will result in slightly greater impacts on the benthic community in the offshore environment from the additional 10.2 mi (16.4 km) of Offshore Pipeline installation, offshore benthic habitat is relatively benign and ubiquitous when compared to the seagrass habitat that would likely be affected by open water trenching through Corpus Christi Bay. Further, the Alternative Offshore Pipelines would affect turbidity levels at an artificial reef (Lonestar Reef). For these reasons, the Proposed Project is the Least Environmentally Damaging Practicable Alternative (LEDPA) and is considered to be environmentally preferable to the Alternative Project.

Table 8-21: Summary of Impacts

		Construction	Operation	Decommissioning
Proposed Project	**Onshore**	Impacts from vegetation clearing along 22.2 mi (35.7 km) onshore will be temporary or short-term and negligible. Impacts on streams, including downstream turbidity and sedimentation, will be temporary (if open-cut) or avoided (in crossed by trenchless methods). Displacement of wildlife from increased noise, light, and human presence will be temporary to short-term and negligible.	Impacts on terrestrial habitat will be temporary to short-term and negligible through vegetative maintenance, and increased noise and human presence. No impacts on aquatic habitats are planned.	Permanent, but negligible impacts on ichthyoplankton from flooding of the abandoned pipelines with seawater, if applicable.
	Inshore	Impacts will be temporary to short-term and negligible from clearing along terrestrial habitats crossed by the Inshore Pipelines. 19 ac (7.7 ha) of terrestrial habitat will be cleared for the Harbor Island Booster Station and 38.8 ac (15.7 ha) of wildlife habitat will be cleared within privately managed wildlife habitat on San Jose Island. Sensitive features (seagrasses, oysters, beach habitat for piping plovers and sea turtles) will be avoided by HDD. Temporary, negligible impacts on critical habitat due to HDD construction noise.	Impacts on terrestrial habitat will be temporary to short-term and negligible through vegetative maintenance, and increased noise and human presence. Impacts from lighting and noise and the Harbor Island Booster Station will be permanent, but negligible. No impacts on aquatic habitats are planned.	Temporary and minor impacts on wildlife habitat from removal of the Harbor Island Booster Station, followed by the permanent benefit of restored habitat. Permanent, but negligible impacts on ichthyoplankton from flooding of the abandoned pipelines with seawater, if applicable.
	Offshore	Impacts from installation of the Offshore Pipelines will be temporary and minor, with suspended sediments returning to ambient levels within 1 to 2 days at the trench, and decreasing with distance to return to ambient 2.1 mi (3.5 km) from the trench. Impacts on benthic fauna lost under the footprint of the Offshore Components will be temporary to short-term and negligible to minor. Impacts from pile-driving noise on aquatic marine fauna will be appropriately mitigated through coordination with NMFS; impacts on birds will be temporary and negligible. Hydrostatic testing will result in a negligible impact on fisheries populations and the food web from use of 5.0 million gallons of seawater, which will result in the loss of 278,225 eggs and 432,460 larval fish. Impacts from inadvertent vessel strikes, spills, and lost debris are not anticipated given adherence to various regulations and mitigating protocols.	Permanent, minor, beneficial impact on marine fauna from the presence of hard structure for colonization and the safety zone (restricted fishing). Permanent, negligible impacts on benthos from anchor chain sweep, and from marine fauna from operational noise. No ship strikes of large marine fauna are anticipated with implementation of proposed mitigation measures. Permanent, minor impacts from entrainment of fish eggs and larvae into VLCC system water. Inadvertent product spills would not result in population-level impacts of fauna, in the unlikely event that one were to occur.	As discussed for construction. In addition, there will be a permanent and adverse, but minor impact from removal of colonized hard structure at the SPM buoy systems.

Table 8-21: Summary of Impacts

		Construction	Operation	Decommissioning
Alternative Project	**Onshore**	Impacts from vegetation clearing along 23.1 mi (7.2 km) onshore will be temporary or short-term and negligible. Impacts on streams, including downstream turbidity and sedimentation, will be temporary (if open-cut) or avoided (in crossed by trenchless methods). Displacement of wildlife from increased noise, light, and human presence will be temporary to short-term and negligible.	Impacts on terrestrial habitat will be temporary to short-term and negligible through vegetative maintenance, and increased noise and human presence. No impacts on aquatic habitats are planned.	Permanent, but negligible impacts on ichthyoplankton from flooding of the abandoned pipelines with seawater, if applicable.
	Inshore	Impacts will be temporary to short-term and negligible from clearing along terrestrial habitats crossed by the Inshore Pipelines. 19 ac (7.7 ha) of terrestrial habitat will be cleared for the Alternative Booster Station and 4.5 ac (1.8 ha) of wildlife habitat will be cleared on Mustang Island. *Significant increases in TSS would occur from trenching through 5.8 mi (9.3 km) of seafloor in Corpus Christi Bay. This increase in TSS could impact nearby seagrasses (sea turtle and wildlife habitat) and oyster beds, if present, although overall impacts are anticipated to be minor and short-term with the implementation of any BMPs required by the applicable agencies. *Temporary, minor impacts on critical habitat due to HDD construction noise.	Impacts on terrestrial habitat will be temporary to short-term and negligible through vegetative maintenance, and increased noise and human presence. Impacts from lighting and noise and the Alternative Booster Station will be permanent, but negligible. No impacts on aquatic habitats are planned.	Temporary and minor impacts on wildlife habitat from removal of the Harbor Island Booster Station, followed by the permanent benefit of restored habitat. Permanent, but negligible impacts on ichthyoplankton from flooding of the abandoned pipelines with seawater, if applicable.
	Offshore	Impacts along the Alternative Offshore Pipeline route would be generally consistent with those identified for the Proposed Project, although over a shorter distance of pipeline (17.1 mi [27.5 km]). *Locally greater turbidity impacts where deeper trenching is required across the navigational fairway and where the Alternative Project crosses 0.2 mi (0.3 km) from Lonestar Reef. *Temporary, minor sedimentation impacts would occur due to trenching 0.2 mi (0.3 km) from the Lonestar Reef.	Permanent, minor, beneficial impact on marine fauna from the presence of hard structure for colonization and the safety zone (restricted fishing). Permanent, negligible impacts on benthos from anchor chain sweep, and from marine fauna from operational noise. No ship strikes of large marine fauna are anticipated with implementation of proposed mitigation measures. Permanent, minor impacts from entrainment of fish eggs and larvae into VLCC system water. Inadvertent product spills would not result in population-level impacts of fauna, in the unlikely event that one were to occur.	Impacts along the Alternative Offshore Pipeline route would be generally consistent with those identified for the Proposed Project, although over a shorter distance of pipeline (17.1 mi [27.5 km]). *Locally greater turbidity impacts where deeper trenching is required across the navigational fairway and in the vicinity of the Lonestar Reef.

*Indicates an environmental consequence that is significantly more impactful as compared to the other Project alternative

8.5 Mitigation of Proposed Project Impacts

The Proposed Project is the LEDPA choice in regard to impacts on wildlife and protected species. Therefore, mitigation measures for the anticipated impacts from only the Proposed Project are discussed in this section.

BWTT will employ BMPs during construction of the Proposed Project, including re-establishing pre-construction contours after backfilling the pipeline trenches in onshore and inshore environments, and restoring permanent vegetation. After clearing is completed but before grading begins, erosion/sediment control measures will be installed where necessary to minimize runoff and sedimentation into adjacent lands, wetlands, waterbodies, roads, or other areas. A proposed BMP Plan for the Project is included as Appendix V.

Impacts to wildlife habitats have been avoided and minimized, to the extent practicable, by using HDD crossing methods, and strategically siting pipeline and facilities in and near existing disturbance. Impacts to wetlands and waters of the U.S., which could be habitat for wildlife and protected species, and the proposed mitigation measures are discussed in Section 5: Wetlands and Waters of the US.

The Proposed Project has been developed in a manner that minimizes impacts on all habitat and species to the extent possible. In addition to siting the SPM buoy systems and Offshore Pipelines in soft-bottom habitats, which are the most prevalent and least sensitive habitat in the GOM, the following BMPs have also been incorporated into the Proposed Project:

- using HDD construction methods for the coastal landfall approach of the Offshore Pipelines to San Jose Island and across all inshore waters between San Jose Island and the mainland, which will result in impacts on estuarine resources, including SAV, oyster beds, and the species that use them;
- designing the Project to have the smallest footprint practicable to minimize impacts on marine resources;
- construction and support vessels under the purview of BWTT will be required to implement NTL No. 2015-BSEE-G03, Marine Trash and Debris Awareness and Elimination, which will minimize the potential for marine species to ingest, or become entangled in, lost debris;
- land-based fabrication of the offshore SPM buoy systems, to minimize the timing and disturbance associated with offshore installation;
- to minimize the potential for vessel strikes of marine mammals, BOEM NTL No. 2016-G01, Vessel Strike Avoidance and Injured/Dead Protected Species Reporting, will be followed by all Project construction and support vessels;
- a Project-specific spill response plan will be developed prior to construction, which will identify measures to prevent, contain, and clean up any inadvertent spills from construction and support vessels;
- the Project will meet all lighting stipulations as noted in 33 CFR, Part 149, which requires limiting Terminal lighting to that required for safety and navigational concerns, in order to reduce the disruptive effects of lighting, and will down-shield lighting, to the greatest extent possible, to reduce light dispersion;
- BWTT will provide the operators of VLCCs with NMFS' *Vessel Strike Avoidance Measures and Reporting for Mariners* and request that these measures be used when transiting to and from the SPM buoy systems to minimize the potential for impacts from vessel strikes; and
- as described in Section 8.3.1.3, pile-driving associated with installation of the SPM buoy systems could result in injury or harassment of fish, turtles, and marine mammals. BWTT will use biological monitors during pile-driving activities and will cease pile-driving if a marine mammal is identified within the injury zone for mid-frequency marine mammal injury; pile-driving will not restart until the mammal had left the area of its own accord, thereby avoiding injury. As the ZOIs for sea turtles, marine mammal behavioral effects, and low-frequency cetacean injury are too large to be effectively monitored, BWTT will ensure proper coordination with NMFS to identify what additional measures will need to be implemented during

pile-driving to minimize impacts. Any such mitigation will also minimize the potential impacts of underwater noise on marine fishes. While identification of mitigation is not final, measures may include:

- use of the lowest energy hammer feasible for installation of the piles;
- the use of "soft starts," using a lower hammer energy level to begin pile-driving, which allows sensitive species to avoid the vicinity prior to peak pile-driving noise; and
- the use of a bubble curtain or other sound damping system to minimize propagation of pile-driving noise.

The following BMPs may be employed to further reduce the potential impacts to protected species and their habitats:

- timing construction windows to avoid sea turtle nesting season;
- environmental monitors may be employed during construction of Onshore, Inshore, and Offshore Project Components when deemed appropriate or as required by issued permits;
- flagging around potentially hazardous or protected habitats; and
- in the event of an inadvertent return during HDD activities, the Project's will employ the Inadvertent Returns Contingency Plan, which will be approved prior to initiating HDD installation.

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