Appendix B – Environmental Resources

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects
Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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List of Acronyms

AAHU Average Annualized Habitat Unit

AQCR Air Quality Control Region

CAMS Continuous Ambient Monitoring Station

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CFR Code of Federal Regulations

EFH Essential Fish Habitat

EPA Environmental Protection Agency

ESA Endangered Species Act

FPPA Farmland Protection Policy Act

FR Federal Register

GIWW Gulf Intracoastal Waterway

GLO General Land Office

GMFMC Gulf of Mexico Fisheries Management Council

HSI Habitat Suitability Index

LCRA-SAWS Lower Colorado River Authority – San Antonio Water System

MLT Mean Low Tide

MSC Matagorda Ship Channel

NAAQS National Ambient Air Quality Standards

NCDC National Climatic Data Center

NFWL National Fish and Wildlife Laboratory

NMFS National Marine Fisheries Service

NOAA National Oceanic and Atmospheric Administration

NRCS Natural Resources Conservation Service

NRDA Natural Resource Damage Assessment

NWI National Wetland Inventory

NWR National Wildlife Refuge

PL Public Law

SAV Submerged Aquatic Vegetation

STSSN Sea Turtle Stranding and Salvage Network

TAC Texas Administrative Code

TCEQ Texas Commission on Environmental Quality

TCOON Texas Coastal Ocean Observation Network

TCWC Texas Colonial Waterbird Census

TDSHS Texas Department of State Health Services

TPWD Texas Parks and Wildlife Department

USACE United States Army Corps of Engineers

USC United States Code

USDA United States Department of Agriculture

USFWS United States Fish and Wildlife Service

USGS United States Geologic Survey

WMA Wildlife Management Area

1. INTRODUCTION

The Matagorda Ship Channel (MSC) extends from the Port of Port Lavaca-Point Comfort Turning Basin in Lavaca Bay through the Matagorda Bay and extends into the Gulf of Mexico via the Matagorda Peninsula. The current length of the ship channel is approximately 26 miles (Figure 1.1). The in-bay channel is authorized to a current depth of -38 feet Mean Low Low Water (MLLW) with a bottom width of 200 feet. The Entrance Channel is maintained at -40 feet MLLW.

The MSC Project would widen the in-bay channel to 350 feet and deepen the channel to -47 feet MLLW. The Entrance Channel would be widened to 600 feet and deepened to -47 feet MLLW.

An Environmental Impact Statement (EIS) is being prepared for the MSC Project due to the significand and adverse impacts to wetlands and oyster reefs. The sections below detail the existing conditions and effects of the alternatives, including No-Action, on the environment in the MSC Project study area.

2. EXISTING CONDITIONS/AFFECTED ENVIRONMENT

2.1 CLIMATE

The Matagorda Bay region climate is classified as humid subtropical and is primarily affected by the intensity and direction of the winds (NCDC, 2016a). Southeasterly winds dominate from March to November with a typical range of 8 to 12 mph. Throughout the rest of the year the region is dominated by northerly winds ranging from 10 to 11 mph. The average annual wind speed is approximately 10 miles per hour (NCDC, 2016b).

The monthly mean temperatures in Point Comfort range from a low of 54.4° F in January to a high of 84.6° F in August. Sea breezes from the Gulf of Mexico help to ease the effect of the high temperatures as a result of the dominant maritime tropical air mass (NCDC, 2016b). Winters have considerable day-to-day variation between modified continental polar and maritime polar air masses and the tropical air mass providing for more moderate conditions (URS, 2006).

The Matagorda Bay region can expect precipitation throughout the year with no consistent seasonal pattern in rainfall totals apparent. No consistent trend is shown with regards to mean monthly precipitation values. Mean monthly precipitation ranges from a low of 2.3 inches in April to a high 4.8 inches in November. Annual rainfall averages 42.4 inches per year (NCDC, 2016b).

As a humid subtropical climate regime the humidity is typically above 50 percent, with an average annual humidity fluctuating between 66 percent in the afternoon and 90 percent in the morning (NCDC, 2016b). The highest percentages of sunlight occur in the summer months, with an overall average of sunlight present for 59 percent of all possible daylight hours. (NCDC, 2016a).

Figure 1.1. Map of the Matagorda Ship Channel Project Study Area and Placement Areas.

2.2 PHYSICAL RESOURCES

2.2.1 Regional Geological and Geomorphic Setting

The project area is situated near the seaward margin of the West Gulf Coastal Plain Physiographic Province. Several geologic processes have created a series of marine embayments and barrier islands, which are characteristic of the regional geology. These processes include longshore drift, beach swash, wind deflation and deposition, tidal currents and waves, delta outbuilding, and river point bar and flood deposits (Lankford and Rehkemper, 1969).

The coastal plain along the Gulf is located within a major center of sediment deposition originating from the middle to late Jurassic period known as the Gulf Coast geosyncline. Jurassic to Pleistocene-aged sedimentary deposits thicken to more than 30,000 ft. closer to the Gulf. Due to the isolation of the regional seas and the restrictions of water flow during part of the Mesozoic Era (late Triassic to Jurassic) evaporate sediments, dominated by salt, were deposited (Wermund et al., 1989). The region was then overlain primarily by prograding sands and muds. Salt domes, interspersed throughout the lays have migrated upwards to within a few thousand feet of the land surface.

The Pleistocene-aged Beaumont Formation, estimated to be less than 1,000 ft. thick, underlies the geology of the region. This formation is composed primarily of clay, silt, sand and gravel. Overlying this formation is a layer characterized by Quarternary-aged (Recent and Holocene) Alluvium. These formations consist mainly of stream channel, point bar, natural levee, marsh, and backswamp deposits associated with former and current river channels and bayous. The Alluvium outcrops, which parallel the Texas coastline, are approximately 70 to 90 miles wide (Barnes, 1975).

Dredging and material disposal within the intracoastal waterways, canals, and access channels has resulted in extensive channelization in the area (McGowen et al., 1976). An offshore dredged material disposal area is located immediately south of the Entrance Channel segment. Dredging and disposal typically results in material that is less coherent and more permeable. Subaqueous dredged material usually consists of mixed mud, sand, silt, shell, and reworked dredged material. Reworked dredged material is commonly sandy and moderately sorted with high to very high permeability and low water-holding capacity.

Bays and estuaries in the region have been partially filled with sediment originating from wave erosion of valley walls, transportation by rivers and small, and movement through tidal inlets into the bay-estuary system. Barrier island development was the result longshore transport of riverborne sediment from the Colorado-Brazos delta area to the northwest. The Matagorda Peninsula, which separated the Matagorda Bay from the Gulf, resulted from spit accretion (McGowen et al., 1976). The sediments within the fluviate-deltaic system consist primarily of sand, silt, and mud. An area of prodelta muds exist beyond the Colorado-Brazos delta front. Muddy sand distribution is related to hurricane washovers, dredging activities, and reworking of relict sediments, and is not controlled by depth (McGowen and Morton, 1979).

Offshore of Matagorda Bay, the width of the shoreface, the seaward extension of the barrier-strandplain system, averages about 1.0 to 1.1 miles. The sediment of the shoreface transitions from primarily sand (the beach), to mud and muddy sand at the 30 ft. depth, and to predominantly mud where it merges with the continental shelf beyond the 30 ft. depth (McGowen et al., 1976). The sand-mud interface is approximately 1.8 to 2.6 miles offshore from the Matagorda Peninsula. The inner continental shelf experiences extensive bioturbation by burrowing organisms. This area also undergoes periods of considerable erosion and resedimentation during the hurricane season. (McGowen et al., 1976).

Coastal zone faults were formed primarily through natural geologic processes, including deposition and differentiation, compaction of sediment, upward movement of salt deposits to diapirs, Gulfward creep of coastal landmass, and warping of landmass due to regional tectonics. Both growth and salt dome faults that occur in the region. Growth faults are formed by subsurface slumping, creep, and consolidation of sediments during deposition. These faults typically parallel the Gulf Coast and are confined to Cenozoic-aged sediments. The growth faults along the Gulf Coast can exceed 6 miles in length. Salt dome faults form around the top of salt domes and occur in radial and crestal graben type patterns. They reveal linear surface traces that can be curved with numerous intersections. These faults can be numerous, but are typically shorter (<3 miles long) than growth faults.

Subsidence manifests as the sudden sinking (e.g. sink holes) or gradual downward settling of land. This can be caused by surface faults and intensified and/or accelerated by subsurface mining or the pumping of oil and/or groundwater. The localized subsidence has been shown to be lessened once groundwater, oil and gas pumping has decreased or ended altogether. Extensive groundwater withdrawal is not a major problem in the Port Lavaca area (McGowen et al., 1976). However, land subsidence on the order of 0.8 to 0.9 ft. in the Jackson County vicinity has been attributed to the extraction of oil and gas in the Port Lavaca (Holzer and Gabrysch, 1982; Verbeck and Clanton, 1981).

2.2.2 Physical Oceanography

Matagorda Bay is a broad, shallow estuary, separated from the Gulf by the Matagorda Peninsula and a barrier island complex. The bay is interspersed with multiple dredged navigation channels, the largest of which are the MSC and GIWW. Freshwater sources for the estuary include the Lavaca-Navidad River system and several smaller rivers and creeks. Matagorda Bay is connected to the Gulf primarily through Pass Cavallo, the MSC landcut, and the Colorado River Mouth Complex.

U.S. Geological Survey (USGS) mapping shows the surface topography of the study area to be flat to gently rolling and sloping to the southwest (USGS, 1951, 1989a, 1989b, 1995). A bayhead delta is formed by the draining of the Lavaca-Navidad River to the north of the study area into Lavaca Bay. The bayside of the barrier islands and peninsulas, and parts of the mainland shoreline contain fringing marshes (McGowen et al., 1976). Along the bay shorelines are bluff banks, ranging from 5 to 10 ft. in elevation that form by wave erosion from prevailing southeasterly winds. The study area has been experiencing shoreline erosion, primarily from wind waves, as described by McGowen and Brewton (1975). The authors suggested approximately 8,450 acres of land of bay and Gulf shorelines were lost to natural erosion between 1856 and 1957 compared to approximately 615 acres by natural accretion.

The Lavaca delta is characterized by a variety of marsh types, salt, intermediate and freshwater (McGowen et al., 1976). Marsh areas expand in conjunction with delta growth. Woody vegetation is sparse at most places, but oak clusters and other vegetation can be found in the more sandy areas and in the riparian uplands. Broad areas of coastal prairies, pastureland, and farmland occur inland from the Gulf.

<u>2.2.2.1 Tides</u>

Tide date along the Texas coastline is provided by NOAA's Center for Operational Oceanographic Products and Services (Table 2.1). The datum for this product is MLLW. There are two gages in the interior of the bay and one in the Entrance Channel. The gage at the Entrance Channel is in deeper water due to the scouring by laterally compressed inflow at the channel's opening. The two interior gages experience decreased tidal range due to timing lags as the tide travels up through the bay. The mean diurnal tide can be significantly altered by area winds. Strong north winds from winter cold fronts can lower water surfaces by up to 2 ft. below MLT. Tropical storms can increase water levels up to 15 ft.

Table 2.1: Diurnal tide ranges within the study area.

Area	Tidal Range
Matagorda Bay Entrance Channel	1.25
Port O'Connor, Texas	0.80
Port Lavaca, Texas	0.92

2.2.2.2 Currents and Circulation

The study area contains one major estuarine system (Matagorda Bay) and three rivers (Lavaca River, Colorado River, and Tres Palacios River). The GIWW flows through the study area creating a complex movement of water. The study area also encompasses a portion of the northern Gulf of Mexico.

The MSC extends about four miles into the Gulf and is confined to the inner continental shelf area. The shelf slopes at a rate of approximately 36 ft. /mile from 0 to 18 ft., about 17 ft. /mile from 18 to 30 ft., and about 5 ft. /mile from 30 to 48 ft. (McGowen et al., 1976). The entrance channel is a high-energy environment flanked by two man-made rock jetties. The barrier islands and peninsula help make the Matagorda Bay system a relatively low-energy environment.

The study area has been modified by human activity by channel dredging and dredged material placement areas. The USACE currently maintains water depths in the bay and offshore segments of the MSC to depths of -38 and -40 ft. MLLW, respectively. The MSC is approximately 300 ft. in width for the entrance channel (offshore) and 200 ft. in width within the bay. Increased flow through the jetties at the MSC entrance channel has scoured the water bottoms to over 100 ft. inside the bottleneck at the bay and on both sides of the bottleneck as it opens to the wider part of the jetties, and at the Gulfward end of the north and south jetties (USACE, 2000). The tidal channels, passes, and dredged channels within the bay are deeper than average depth of the bay as a whole. The mean water depth of Matagorda Bay is approximately 12 ft., while that of the adjacent bays is 6 to 7 ft. on average (USACE, 1989).

2.2.2.2.1 GIWW

The GIWW runs through the entire study area and provides a protected navigational shipping route along most of the Texas Gulf Coast. Salinity varies and depends on the source of the predominant inflow. Those areas open to the Gulf of Mexico typically have higher salinities, while areas closed to the Gulf of Mexico tend to have lower salinity due to a higher influx of freshwater. Dredged material has been placed along the banks of the GIWW.

2.2.2.2.2 Colorado River

The Colorado River originates near Dawson County, New Mexico and travels approximately 600 miles to its mouth on Matagorda Bay. The Colorado River basin covers approximately 39,900 square miles.

2.2.2.2.3 Lavaca River

The Lavaca River begins in Gonzalez County, Texas and flows southeast approximately 115 miles before ending in Lavaca Bay. The river basin covers approximately 2,280 square miles.

The Lavaca River is a fine-grained meanderbelt system characterized by frequent cutoff and abandoned channel courses, relatively high mud load, and narrow to broad floodplains. Natural ponds, lakes holding ponds, and artificial reservoirs are present on the floodplains.

2.2.2.3 Salinity

The salinity regimes within the Matagorda Bay system from 1952 to 1980 were studied by Ward and Armstrong (1980). Their study showed the mean salinity in the bay area ranged between 8-31 parts per thousand (ppt). Areas of lower salinity were located near the mouths of the rivers (freshwater inflows) and higher salinities were found in areas more tidally influenced (saltwater inflows). Lavaca Bay, influenced by the Lavaca River, was consistently the freshest bay area, while the open water areas of Matagorda Bay and the western half of eastern Matagorda Bay were the most saline.

Vertical stratification was generally absent due to the average shallow depth and mixing strongly induced by winds, except for the MSC (Ward and Armstrong, 1980). Stratification in the MSC was normally associated with differences in freshwater inflow, with stronger stratification resulting from higher freshwater inflow. Vertical stratification, though infrequent outside of the MSC, did occur in the areas where saltwater inflow was high, such as the MSC landcut. A seasonal pattern of salinity variation was related to seasonal inflows of freshwater. High freshwater inflows in the spring resulted in lower salinities. The gradual decrease in inflows from late fall and winter resulted in increases in salinity until a maximum in March is observed. The areas of the bay system more directly impacted by inflows showed more pronounced seasonal variation in salinity. Ward and Armstrong (1980) noted a significant increase in salinities after October 1963, which corresponds to the MSC landcut through Matagorda Peninsula, with an increase that ranged from 2 to 5 ppt in adjacent areas.

The Texas Water Development Board has been using datasondes to collect water quality data, including salinity, in Matagorda and Lavaca bays since fall 1986. The data for three years (1988, 2010, and 2011) with complete monthly data available were downloaded for comparison. In 1988 both the station at the mouth of the entrance channel and at Point Comfort were similar in salinity ranges. The station at the mouth of the entrance channel ranged from 24.8-33.6, while the station at Point Comfort ranged from 23.4-33.1. 2010 appears to be an anomalous year with very low salinities at the Point Comfort station, ranging from 4.1-22.9, while the station at the mouth of the entrance channel ranged from 23.6-31.9. In 2011 the salinities at the different stations were again closer to each other. The station at the mouth of the entrance channel ranged from 26.7-36.9, while the station at Point Comfort ranged from 21.0-37.6.

2.2.3 Water and Sediment Quality

The TCEQ has designated water quality segments for the Matagorda Bay system. The designated uses for the waters of the system are contact recreation (activities involving a significant risk of ingesting water) and support of aquatic life (TCEQ, 2000). All Matagorda Bay segments are assigned an Exceptional (E) Aquatic Life Use Subcategory and Oyster Waters (O) (waters producing edible oysters). The Aquatic Life Use Subcategory establishes a numerical criteria that is dependent on desired use, sensitivities of aquatic communities, and chemical and physical characteristics. The categories include limited, intermediate, high, and exceptional aquatic life and oyster waters. Under TCEQ procedures, the E/O designation translates to a DO criteria for saltwater of an average of 5 milligram per liter (mg/L) and a minimum of 4 mg/L. The O designation criterion for bay and gulf waters is a fecal coliform (FC) median concentration not to exceed 14 cfu/dL (colony forming units per deciliter, or 100 mL, with no more than 10 percent of all samples exceeding 43 cfu/dL).

In addition to the averages of the periodic longer-term monitoring, the TCEQ conducts water quality assessments with a special set of procedures every 2 years to determine whether the uses are being attained (TCEQ, 2004). Lavaca Bay/Chocolate Bayou and Keller Bay are both listed by TCEQ as impaired for oyster use.

2.2.4 Hydrology

The Matagorda Bay system consists of the Lavaca-Guadalupe and Coastal Colorado-Lavaca Basins. Freshwater inflows primarily come from the Colorado River, Tres Palacios Creek, and the Lavaca River. Tidal exchange with the Gulf through the MSC, Pass Cavallo, and the mouth of the Colorado River through to the GIWW and to Matagorda Bay, to a limited degree.

The average tidal range at Port O'Connor is 0.8 ft. (TCOON, 2017). Based on an average bay depth of approximately 5 ft., roughly 16 percent of the bay volume is exchanged on each tidal cycle. The general movement of water is from the freshwater inflows in the north to the Gulf, considering average wind, freshwater inflow, and tidal influence conditions (Mueller and Matthews, 1987). Circulation patterns are complex and vary greatly from month to month. One of the main drivers of circulation in the bay is the MSC. Frontal passages can also effect circulation through changes in water levels, exchanges between the bays and the Gulf, and forcing water from one bay to another.

2.2.5 Soils (Prime and Other Important Unique Farmland)

The Farmland Protection Policy Act of 1981 (FPPA, 7 CFR 658) requires that Federal agencies consider alternatives to projects that would result in conversion of agricultural land. The 1985 Farm Bill revised the FPPA (P.L. 97-98, Sec. 1539-1549; 7 USC 4201, et seq.) to provide for limited enforcement of the requirements of the FPPA. According to 658.2a (FPPA Rule, 7 CFR 658), if a site is not designated as prime, unique, statewide, or local farmland, then the FPPA does not apply. Prime farmland is defined by the FPPA as land that is best suited for producing food, feed, forage, fiber, and oilseed crops and is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are appropriate for producing a sustained high yield of crops in an economic manner.

The U.S. Department of Agriculture (USDA) NRCS maintains a national database of prime and other important farmlands that is organized by county. The three counties in the study area are Calhoun, Jackson, and Matagorda. The Calhoun County Soil Survey (NRCS, 2017) lists seven mapping units as prime farmland, one prime farmland, if drained, and no other types of important farmland (Table 2.2). The Matagorda County Soil Survey (NRCS, 2017) lists 17 mapping units as prime farmland, one prime farmland, if drained, and no other types of important farmland (Table 2.3).

2.2.6 Energy and Mineral Resources

The project area has numerous natural resources, including oil and gas, sulfur, salt, shell, clay, sand, magnesium, and bromine. The most significant of these is oil and gas. Oil, natural gas, and natural gas liquids are important drivers of the local economy of the area and used in refineries and as a raw material in many petrochemical processes.

Sulfur generally occurs in the cap rock of salt domes, but it can also be extracted from sour gas. Sulfur is primarily used in the manufacture of a variety of other industrial products, such as sulfuric acid. The abundance of salt domes in the area provides for an abundant supply of high-grade sodium chloride. Salt is another important resource in Texas, with the bulk of Texas salt production occurring in the Texas coastal zone. The nearest brine production site at the Bryan Mound facility, 3.8 miles east of Port Lavaca.

Table 2.2: Prime and Other Important Farmland, Calhoun County, Texas

Map Unit Name	Classification*
Dacosta-Contee complex, 0 to 1 percent slopes	PF
Dacosta-Contee complex, 1 to 3 percent slopes	PF
Edna very fine sandy loam	PF
Laewest clay, 0 to 1 percent slopes	PF
Dacosta clay loam, 0 to 1 percent slopes	PF
Dacosta clay loam, low	PF
Contee-Dacosta complex	PF
Edna very fine sandy loam, low	PF, if drained

*NRCS (2017); PF=Prime Farmland

Table 2.3: Prime and Other Important Farmland, Matagorda County, Texas

Map Unit Name	Classification*
Asa silt loam, rarely flooded	PF
Asa silty clay, rarely flooded	PF
Brazoria clay, rarely flooded	PF
Clemville silty clay loam, rarely flooded	PF
Dacosta sandy clay loam, 0 to 1 percent slopes	PF
Faddin loam, 0 to 1 percent slopes	PF
Fulshear fine sandy loam, 2 to 5 percent slopes	PF
Katy fine sandy loam, 0 to 2 percent slopes	PF
Laewest clay, 0 to 1 percent slopes	PF
Laewest clay, 1 to 3 percent slopes	PF
Laewest silty clay, 0 to 1 percent slopes, overwashed	PF
Norwood silty clay loam, rarely flooded	PF
Pledger clay, rarely flooded	PF
Pledger clay, occasionally flooded	PF
Texana fine sandy loam, 0 to 1 percent slopes	PF
Texana fine sandy loam, 1 to 3 percent slopes	PF
Bacliff clay, 0 to 1 percent slopes	PF, if drained

*NRCS (2017); PF=Prime Farmland

Sand deposits in the area have the potential for industry or specialty uses, such as foundry sands, glass sands, and chemical silica. Common clays are used in the manufacture of brick and tile. While gypsum does occur in the cap rock deposits of certain salt domes in the area it is not easily mined and, therefore, significant production is unlikely.

2.2.7 Hazard, Toxic, and Radioactive Waste Concerns

The region is home to multiple port facilities and a large ALCOA refining/smelting facility. The ALCOA facility in Point Comfort was established in 1948 and has been used as an aluminum smelting facility and a refinery for chlorine-alkali processor. Mercury is one of the byproducts of work undertaken at the ALCOA facility. The mercury was discharged into Lavaca Bay and subsequent high levels of mercury in the Bay led to fishing restrictions in 1988. The site was listed on the National Priorities List for the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) in 1994. A Natural Resources Damage Assessment (NRDA) was performed at the site and restoration and remediation work was undertaken to compensate for environmental damages (GLO et al., 2001).

A Formosa facility at Point Comfort was listed among the Resource Conservation and Recovery Act (RCRA) list of sites. A RCRA Facility Investigation (RFI) was deemed to be necessary in 1990 and the work plan was approved in 1992. The subsequent groundwater monitoring determined the migration of contaminated groundwater is under control.

TCEQ GIS database shows 23 petroleum storage tanks in the area (1 in Point Comfort and 22 in Port Lavaca).

2.2.8 Air Quality

The Clean Air Act Amendments of 1970 and 1990 (42 USC 7409) mandated the U.S. Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Two types of national air quality standards were established:

- Primary standards set limits to protect public health, including the health of "sensitive" populations such as asthmatics, children, and the elderly.
- Secondary standards set limits to protect public welfare, including protection against decreased visibility, and damage to animals, crops, vegetation, and buildings.

NAAQS for six criteria pollutants have been established by the EPA office of Air Quality Planning and Standards: carbon monoxide (CO); lead (Pb); nitrogen dioxide (NO_2); ozone (O_3); particulate matter with particle diameters of 10 micrometers or less (PM_{10}) and 2.5 micrometers or less ($PM_{2.5}$); and sulfur dioxide (SO_2) (40 CFR Part 50). The General Air Quality Rules (30 Texas Administrative Code [TAC] Chapter 101) of the Texas Commission on Environmental Quality (TCEQ) enforces federal NAAQS. The TCEQ has also set standards for net ground-level concentrations of sulfur compounds. Air quality is generally considered acceptable if pollutant levels are less than or equal to established standards on a continuous basis, as represented in Table 2.4.

The Clean Air Act also required the EPA to assign an attainment designation to each area of the US regarding compliance with the NAAQS. EPA categorizes the level of compliance or noncompliance as follows:

- Attainment – an area that currently meets all the NAAQS;
- Maintenance – an area that currently meets the NAAQS, but have previously been out of compliance for at least one criteria pollutant;

- Nonattainment – an area that currently does not meet the NAAQS for at least one criteria pollutant; and
- Unclassifiable – an area that cannot be classified on the basis of available information as meeting or not meeting the NAAQS for a criteria pollutant.

The Matagorda region is in the Corpus Christi – Victoria Air Quality Control Region (AQCR) consisting of Aransas, Bee, Brooks, Calhoun, De Witt, Duval, Goliad, Gonzales, Jackson, Jim Wells, Kenedy, Kleberg, Lavaca, Live Oak, McMullen, Nueces, Refugio, San Patricio, and Victoria Counties. This AQCR meets all of the EPA NAAQS and is in compliance with the Clean Air Act.

The TCEQ is tasked with monitoring air quality within the state and making that information available to the public. The University of Texas Center for Energy and Environmental Resources TEXASQII Air Quality Study Project has monitoring stations throughout the state that provide real time monitoring data. The monitoring station in Port O'Connor (CAMS C657) has been providing data on the concentrations of O_3 and $PM_{2.5}$ in the air, as well as air temperature and wind velocity since October 2005 (TCEQ, 2017). The O_3 and particulate matter (PM) monitors collect and report data on a continuous basis.

Nitrogen oxide (NO_x) emissions are mostly attributed to fuel combustion equipment at industrial facilities. The majority of SO_2 emissions in the project area can be attributed to marine vessels, with the amount of emissions in direct proportion to the sulfur concentration in the diesel fuel and the size of the engines. The major non-point sources that affects air quality in the surrounding area are dust from agricultural activities, vehicle emissions, commercial, industrial, and manufacturing activities.

Matagorda Bay activities that contribute air contaminants include air emissions derived from waterborne traffic, including ships, barges, tugs, dredged, and other recreational and noncommercial vessels. Port activities, including the loading and unloading of bulk cargo vessels and tankers, also contribute to air emissions effecting air quality.

2.2.9 Noise

Noise is defined as unwanted sound that disrupts or interferes with normal activities or that diminishes the quality of the environment. Noise is typically linked to human activity and an additional layer along with the natural acoustic setting of an area. Exposure to high levels of noise over an extended period can lead to hearing loss, but most environmental noise only rises to the level of an annoyance. Each individual will respond to noise events differently based on the level of existing background sounds, the character of the noise, the time of day, the setting, and their own sensitivity.

The human ear senses sounds when a source emits oscillations (sound waves) through an elastic medium, such as air or water. Sound is characterized by the frequency and amplitude of the sound waves. The frequency is measured in hertz (Hz) and is commonly referred to as pitch. The loudness of a sound is related to the amplitude of the sound waves. The pressure levels exerted by the sound's amplitude is measured on the decibel (dB) scale. The decibel scale is logarithmic, beginning at 0 (the approximate threshold level where sound can be heard by humans). Normal speech is comes in at approximately 60 dBs. At approximately 120 dBs sound begins to create discomfort of pain inside the ear (EPA, 1976).

The human ear is more attuned to mid-range frequencies than low or extremely high frequencies. As such, sound waves of the same amplitude (pressure), but different frequencies, are not perceived by the human ear as being at the same level of loudness. In order to compensate for this, sound measurements are adjusted through the use of an "A-weighting."

This adjustment puts the measurement on a scale similar to human perception. All regulatory agencies require that measurement be taken using the A-weighted sound level (dBA).

Table 2.4: EPA National Ambient Air Quality Standards[1] and TCEQ Ground Level Concentration Standards[2].

Air Pollutant	Time Averaging Period	NAAQS Primary[*]	NAAQS Secondary	TCEQ Standards
Carbon Monoxide (CO)	1-hour[3]	35 ppm (40mg/m^3)	None	__
Lead (Pb)	8-hour[3]	9 ppm (10 mg/m^3)	None	__
Nitrogen Dioxide (NO_2)	Quarterly Average	1.5 µg/m^3	1.5 µg/m^3	__
Ozone (O_3)	8-hour[4]	0.053 ppm (100 µg/m^3)	0.053 ppm (100 µg/m^3)	__
Particulate Matter – Respirable (PM_{10})	24-hour[5]	150 µg/m^3	150 µg/m^3	__
Particulate Matter – Respirable ($PM_{2.5}$)	24-hour[6]	35 µg/m^3	35 µg/m^3	__
	Annual[7] Arithmetic Mean	15 µg/m^3	15 µg/m^3	__
Sulfur Oxides (measured as SO_2)	30-minute	__	__	0.4 ppm (1,021 µg/m^3
	3-hour[3]	__	0.5 ppm (1300 µg/m^3)	__
	24-hour[3]	0.14 ppm	__	__
	Annual Arithmetic Mean	0.03 ppm	__	__

[*]parts per million = ppm; milligrams per cubic millimeter = mg/m^3; micrograms per cubic meter = µg/m^3
[1]NAAQS as codified in 40 CFR Part 50.
[2]TCEQ Standards as codified in 30 TAC §111.155 and § 112.3.
[3]Not to be exceeded more than once per year.
[4]To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08ppm.
[5]Not to be exceeded more than once per year on average over 3 years.
[6]To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3.
[7]To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15 µg/m^3.

Sound measured using dBA provides the level of sound at a given moment, but the level of noise within a community is constantly in flux. This fluctuation is due to the presence of numerous sources within a community at a given time that emit sounds of a varying time scale. As a result of this a descriptor called the equivalent sound level (L_{eq}) is necessary. L_{eq} provides a way to describe the average sound level, in dB, for any given time period.

Noise-sensitive receptors are facilities or areas where excessive noise may disrupt normal activity, cause annoyance, or loss of business. These can include residential areas, religious, educational, recreational, and medical facilities, which are more sensitive to increased noise levels than areas of commercial and industrial land use. Noise-sensitive receptors are located in the City of Port Lavaca and the communities of Port O'Connor, Magnolia Beach, Indianola, Alamo Beach, and Point Comfort. The existing noise environment of these communities is primarily affected by waterborne transportation activities (ship traffic, barges, commercial and recreation vessels, and maintenance dredging of the channel). Measured ambient noise levels at noise-sensitive receptors in communities with a similar degree of activity range between 60.9 and 65.1 L_{dn} (HFP Acoustical Consultants, Inc., 2002).

2.3 ECOLOGICAL AND BIOLOGICAL RESOURCES

2.3.1 Ecoregion

The study area lies within the Western Gulf Coastal Plain ecoregion, which extends along the Texas Gulf Coast form the Sabine River south to the Rio Grande (Griffith 2004). The prominent features of this coastal ecosystem include fresh, intermediate, brackish, and saline marshes; bays and lagoons with seagrass beds, tidal flats, and oyster reef complexes; barrier islands; riparian forests; and dense brush habitats. Wetlands provide multiple environmental functions, including flood storage, water quality maintenance, and fish and wildlife habitat. In addition the study area is part of the Central Flyway migration route, which is an important wintering and migration stopover habitat for migratory birds, as well as waterfowl, shorebirds, and wading birds. National wildlife refuges (NWRs) and wildlife management areas (WMAs) along the coast also provide critical staging areas for waterfowl migrating to and from Mexico (TPWD 2017; USFWS 2017a).

The ecoregion is shaped by natural forces, including the dominant south to southeast winds, tropical weather systems, and a substantial amount of rainfall. Flooding and freshwater inflows are key systemic processes, which buffer salinity and provide nutrients and sediments to extensive estuaries in the Matagorda region. Coastal wetlands have been formed along the coast in Calhoun, Jackson, Matagorda, and Victoria Counties by deltaic processes and barrier islands. This region is a very productive fish and wildlife habitat, in spite of extensive human activity.

2.3.2 Wetlands

Terrestrial lands bordering aquatic areas along the coast are known as coastal wetlands (saline to freshwater) when the water table is at or near the surface of the land. These areas may be covered by shallow water and emergent vegetation may or may not be present. The wetlands provide essential habitat for fish, shellfish and other wildlife. Coastal wetlands help to filter runoff and provide a buffer to coastal areas limiting storm and wave damage. Factors influencing the condition and distribution of wetlands include water depth, frequency of inundation, salinity, and erosive/accretive forces.

The estuarine system extends from the open waters of the estuary, inland to freshwater areas (salinity <0.5 during average annual low flow) (Cowardin et al., 1979). The estuarine system includes a number of distinct wetland communities. Estuarine tidal flats are comprised of coastal wetlands periodically flooded by tidal waters and have less than 30 percent vegetation cover, by area. Tidal flats can include sandbars, mud flats, and salt flats. Salt flats may be sparsely vegetated by glasswort (*Salicornia* spp.), saltwort (*Batis maritima*), and shoregrass (*Monanthochloe littoralis*). The salt flats serve provide feeding grounds for coastal shorebirds, including the threatened piping plover, fish and invertebrates.

The extent of barrier island tidal flats in the study region have decreased in areal coverage since the 1950s (White et al., 2002). Some of the loss may be due to "an accelerated rate of relative sea-level rise from the 1960s through the late 1970s." These tidal flats have converted to estuarine marsh, seagrass, or remained as unvegetated open water.

The estuarine wetlands comprise the majority of the wetlands in the Matagorda Bay system. The estuarine marshes in the study area can be broken down into three geographic settings:

- Interior marshes. These are most prevalent in lower energy environments, such as inlets and interior bays (e.g., Powderhorn Lake, Keller Bay). The surrounding pasture, range, and croplands, primarily rice fields, drain into these interior marshes. The seasonalities of agricultural practices, inundation and draining, have a large effect on the hydrology of the marshes within these watersheds.
- Pass Cavallo/Port O'Connor area. This is a flood-tidal-delta complex that contains the majority of the estuarine marsh and SAV in the project area (White et al., 2002).
- Matagorda Peninsula (barrier island) bayside marshes. These are shoreline (saline/brackish) marshes on the leeward side of the barrier islands.

Low marshes are those areas that are regularly flooded, and high marshes are those areas found at slightly higher elevations and experience less frequent flooding. In the Matagorda Bay area, low salt marsh is typically dominated by smooth cordgrass (*Spartina alterniflora*) and common species such as saltgrass, saltwort, glasswort, and saltmarsh aster (*Symphyotrichum tenufolium*) (LCRA-SAWS, 2006; White et al., 2002). High salt marshes do not include smooth cordgrass, but may include other species plus more halophytic species, such as shoregrass, annual seepweed (*Sueda linearis*), sea ox-eye daisy (*Borrichia frutescens*), and sea-purslane (*Sesuvium portulacastrum*).

Low brackish marshes are found at similar elevations at the low salt marshes, but are located in less saline waters. These marshes are generally dominated by salt-marsh bulrush (*Bolboschoenus robustus*). Other species include marshhay cordgrass, black needlerush (*Juncus rosemarianus*), and glasswort. As the low brackish marshes grade into high brackish marshes, salt-marsh bulrush and black needlerush drop out and marshhay cordgrass becomes dominant. High brackish marsh species also include saltgrass, marsh fimbray (*Fimbrystylis castanea*), asters (*Symphotrichum* spp.), Gulf cordgrass (*Spartina spartinae*), and Carolina wolfberry (*Lycium carolinianum*).

In the Matagorda Bay area, the tidal inundation of sea water and inflow of fresh water leads to a mixture of the saline and brackish marshes. Smooth cordgrass is typically found along the open-water areas in what may be a fringe only a few feet wide. A rapid transition from low saline marsh to low brackish marsh can occur within a band a few feet wide (LCRA-SAWS, 2006).

The areal coverage of estuarine marsh on, and near, the barrier islands has increased since the 1950s in West Matagorda Peninsula due to washover fans deposited by Hurricane Carla in 1961 and from accretion into Pass Cavallo due to longshore drift. Relative sea level change has also played an important role in the decline of interior marshes and increased shoreline erosion within the bay (White et al., 2002).

The Matagorda Bay area also includes low and high scrub-shrub estuarine wetlands (LCRA-SAWS, 2006, White et al., 2002). The low wetlands on Matagorda Island are dominated by black mangrove (*Avicennia germinans*) and they also occur scattered throughout estuarine marshes in the Pass Cavallo-Port O'Connor area. Common woody species in the high (irregularly flooded) scrub-shrub wetland include sumpweed (*Iva frutescens*) and eastern false-willow (*Baccharis halimifolia*). Marshhay cordgrass, southern reed (*Phragmites australis*), and Gulf cordgrass are common herbaceous species in this community.

Fresh/intermediate marsh can be found on the mainland, on the barrier islands, and along shorelines in upstream drainages areas and in depressional areas or swales (LCRA-SAWS, 2006; NWI, 1980-1995; White et al., 2002). Common species in low fresh-intermediate marshes include coastal cattail (*Typha domingensis*), California bulrush (*Schoenoplectus californicus*), southern reed, swamp smartweed (*Polygonum hydropiperoides*), Gulfcoast spikesedge (*Eleocharis cellulosa*), large spike spikerush (*Eleocharis palustris*), green flat-sedge (*Cyperus virens*), sand spikerush (*Eleocharis montevidensis*), longlobe arrowhead (*Sagittaria longiloba*), giant cut-grass (*Zizaniopsis milacea*), seashore paspalum (*Paspalum vaginatum*), three-square bulrush (*Schoenoplectus pungens*), and coastal water-hyssop (*Bacopa monnieri*). High marsh, also known as "wet meadow," supports many of the same species, but will not include species such as cattails, California bulrush, or southern reed. Awl-leaf aster (*Symphyrotichum sublatum*), deep-rooted sedge (*Cyperus enterianus*), green flat-sedge, and caric-sedge (*Carex* spp.) are also common in the wet meadows.

The fresh/intermediate scrub-shrub wetlands are found in the same general areas as the fresh/intermediate marshes. Common scrub-shrub species include buttonbush (*Cephalanthus occidentalis*), Chinese tallow tree, and coastal cattail (White et al., 2002; LCRA-SAWS, 2006, NWI, 1980-1995).

2.3.3 Aquatic Resources

The Matagorda Bay System is the third largest estuary on the Texas coast (Armstrong et al., 1987; EPA, 1999). The substrate is composed of unvegetated bottom regions, oyster reefs, and patches of SAVs. The open-water habitats support communities of benthic organisms, plankton, nekton, and numerous fish species.

Phytoplankton are the primary producers in the open-bay and are fed upon by zooplankton, fishes, and benthic organisms. The phytoplankton of Lavaca Bay is dominated by diatom species and achieve their highest level of abundance in the winter, and the lowest abundance numbers in the summer. Zooplankton are animals that cannot swim against the current. Their abundances are determined largely by phytoplankton abundance and tend to increase after increases in phytoplankton. In Lavaca Bay they are most abundant during the spring, and at their lowest levels in the fall. The zooplankton community is dominated by the copepod *Acartia tonsa* and barnacle nauplii. Zooplankton form the basis of the food chain for larval and juvenile fish. Zooplankton are found in limited numbers in regions of high turbidity, as these are areas of reduced sunlight penetration, and thus lower levels of phytoplankton densities. The zooplankton species are also susceptible to the currents, which can carry them out to sea and away from concentrated food masses (Armstrong et al., 1987). It is expected that plankton assemblages in Matagorda Bay would be similar to those of Lavaca Bay.

Nekton assemblages (organisms that swim freely in the water column) consist mainly of secondary consumers feeding on zooplankton or juvenile and smaller nekton species. The Matagorda Bay system supports a diverse nekton population including fish, shrimp, and crabs.

The community composition of nekton changes throughout the year as some spend their entire life in the bay (residents) and other species may only spend a portion of their life cycle in the estuary (migrants) (Armstrong et al., 1987).

The dominant nekton species inhabiting the Matagorda Bay estuary are bay anchovy (*Anchoa mitchilli*), Atlantic croaker (*Micropogonias undulatus*), white shrimp (*Litopenaeus setiferus*), brown shrimp (*Farfantepenaeus aztecus*),and spot (*Leiostomus xanthurus*) (Brown et al., 2013). These species are found throughout the Texas coast. Seasonal differences occur in abundance and biomass depending on the timing of Gulfward migrations. Anchovy are at their most abundant in the early part of the year (January – April), while croaker are more abundant in the spring and summer, followed by spot in the summer and fall. Brown shrimp reach their peak in abundance typically in May, with white shrimp abundance at their maximum in late summer and fall (Brown et al., 2013).

Matagorda Bay has one of the lowest percentages of the total finfish harvest of all the Texas bay systems, contributing less than 5 percent of the coastwide landings from 1997 to 2001. Commercially caught species include black drum (*Pogonias cromis*), flounder (*Paralichthys lethostigma*), striped mullet (*Mugil cephalus*), and sheepshead (*Archosargus probatocephalus*) (Culbertson et al., 2004).

The main commercially harvested shellfish species in Matagorda Bay are brown, white shrimp and blue crabs. A commercial fishery for eastern oysters (*Crassostrea virginica*) does exist in Matagorda Bay, however the harvest makes up only about five percent of all oysters landed in Texas (Culbertson et al., 2004).

After mating female blue crabs will migrate to areas of the estuary with higher salinities to lay their eggs. The eggs are attached to the underside of their abdomen and are brood there for about two weeks. Females will move Gulfward and hatch the eggs offshore. Blue crab larvae will pass through several planktonic larval stages before they are able to move back into the estuary with the surface plankton (Britton and Morton, 1989).

Brown and white shrimp have similar life cycles. Adults spawn in the Gulf. Eggs hatch within 24 hours of being released by the females and remain in the Gulf where they cycle through various larval stages for several weeks. Postlarval shrimp are planktonic and are carried into estuarine and fresh water shallows to mature. The shrimp grow and mature in the shallow nursery areas and then migrate to deeper estuarine waters, finally completing the life cycle by migrating offshore in the Gulf to spawn. Peak spawning season for brown shrimp occurs from September to May, and for white shrimp, March to September (Britton and Morton, 1989).

Black drum spawn in the open-bay and nearshore Gulf waters from January to mid-April. The species exhibits broadcast fertilization. The larvae and juveniles move into areas of fresher water until they reach about four inches in size and migrate back into the open-bay. They remain in the bay until reaching sexual maturity (Patillo et al., 1997).

Adult southern flounder spawn in the offshore waters of the Gulf during the late fall and early winter through broadcast fertilization. Adults return to the estuaries after spawning. The larvae will remain in the offshore plankton for four to eight weeks before they are carried into the estuaries. As juveniles the southern flounders will migrate to fresher water areas and remain there until reaching sexual maturity after about two years. Once reaching sexual maturity they migrate back to the Gulf to spawn (Daniels, 2000; Patillo et al., 1997).

Atlantic croaker spawn in the nearshore Gulf areas from September through May utilizing broadcast fertilization. The early planktonic larval stages remain offshore in plankton until they are carried by the currents inshore to estuarine areas. Juvenile Atlantic croaker migrate to fresher water regions to mature before migrating back offshore to spawn (Patillo et al., 1997).

Sheepshead spawn offshore in the spring (March and April) through broadcast fertilization. The planktonic larvae are carried into the estuary and spend the next 30 to 40 days growing into the juvenile form. The juveniles settle into in the seagrass beds to further mature before moving to nearshore reefs. Sheepshead reach sexual maturity by age two (Patillo et al., 1997).

Striped mullet spawn offshore from October to March through broadcast fertilization. The eggs and planktonic larvae remain offshore and develop into prejuveniles before entering the bays and estuaries to mature. Sexual maturity occurs at three years of age. Adults can be found in the near inshore waters throughout their life (Patillo et al., 1997).

Sand seatrout spawn in the Gulf in late fall or winter through broadcast fertilization. The planktonic larvae are carried into the estuary by the currents and migrate to the fresher water areas of the estuary, settling in shallower waters to mature. Adult sand seatrout reach sexual maturity at twelve months before returning to the Gulf to spawn (Patillo et al., 1997).

The open-bay bottom is an important component of the aquatic environment as it is comprised of flat areas of mud and sand that contribute large quantities of nutrients and food. The distribution of the benthic macroinvertebrates within the bay is influenced by both bathymetry and sediment type (Calnan et al., 1989). Benthic macroinvertebrates found in the sediments of the Matagorda Bay are primarily polychaetes, bivalves, gastropods, and crustaceans (Calnan et al., 1989). The dominant bivalves include the dwarf surf clam (*Mulinia lateralis*), the concentric nut clam (*Nuculana concentrica*), and the scorched mussel (*Brachidontes exustus*); the dominant gastropods are the Eastern white slipper shell (*Crepidula plana*), the channeled barrel-bubble (*Acteocina canaliculata*), and the beautiful little caecum (*Caecum pulchellum*); the dominant polychaetes are *Mediomastus californiensis* and *Spiophanes bombyx*; and the dominant crustaceans are *Pseudohaustorius* spp. and *Ampelisca abdita* (Calnan et al., 1989).

The Matagorda Bay system is home to numerous Eastern oyster reefs. The reefs form in areas of hard substrate and beneficial currents. Most of these reefs are in subtidal or intertidal areas near passes, cuts, or the edge of marshes. Oysters are filter feeders and can filter water up to 1,500 times their body volume in an hour. This mass filtration of water helps to improve water clarity and, in turn, phytoplankton abundance (Lester and Gonzalez, 2001; Powell et al., 1992). Another important role oysters play is as an indicator species of pollutants and contamination. Because they are sessile they tend to bioaccumulate whatever pollutant is present in the water column of the bay (Lester and Gonzalez, 2001).

Eastern oysters are stimulated to spawn by rising water temperatures and other chemical cues in the spring. Oysters are broadcast spawners and release their eggs and sperm into the open water. Larval oysters spend the next two to three weeks as plankton in the water column before they settle as spat onto a hard substrate and mature into the adult form (Britton and Morton, 1989).

Oysters can survive in salinities ranging from 5 to 40+, but are most productive within a salinity range of 10 to 25, in part due to the limitations this range puts on and predators. At salinities below 5 oysters can survive by remaining tightly closed, and will remain in that state until salinities increase or they use up all their metabolic reserves, at which point they would die. On the other end of the salinity range predators, such as oyster drills, welks, and crabs thrive and can wipe out large percentages of oyster abundance (Cake, 1983). However, it is not predators that are the primary factor in decreasing habitat suitability. The presence of Dermo (*Perkinsus marinus*) can kill more than 50 percent of a reef's population in the Gulf. Dermo is the most common and deadly oyster pathogen in the bays bordering the Gulf. The prevalence of Dermo within Matagorda Bay oysters was studied by Ray and Soniat (2008). Samples from Indian Point indicate oyster mortalities there can likely be attributed to Dermo. Infection of Dermo has also been found at Gallinipper Point (adults and juveniles), Indian Point (juveniles), and Sammy's Reef (adults).

Oyster reefs provide good habitat for a wide range of aquatic organisms, including mollusks, barnacles, crabs, gastropods, amphipods, polychaetes, and isopods (Sheridan et al., 1989). With such a rich biodiversity the reefs also attract a large number of predator species, including black drum, blue crab, and oyster drill (*Thais haemastoma*) (Lester and Gonzalez, 2001; Sheridan et al., 1989). Shore birds will also utilize oyster reefs that are expose at low tides as resting places (Armstrong et al., 1987).

While oyster reefs are prominent in parts of Lavaca Bay and Matagorda Bay, the full extent of oyster reef distribution has not been mapped. Oysters are commercially harvested from the Matagorda Bay system. The Texas Department of State Health Services (TDSHS) has classified shellfish-harvesting areas in Lavaca, Matagorda, Carancahua, and Tres Palacios bays. Shellfish-harvesting areas are classified as approved (an area where harvesting is allowed), conditionally approved (status changes based upon meteorological or hydrological conditions), or restricted (no harvesting allowed). Much of the Matagorda Bay estuary is approved or conditionally approved; however there are some restricted areas within the bay system. Most of the restricted areas are located in the upper portion of Lavaca, Keller, Carancahua, and Tres Palacios bays (TDSHS, 2017).

Estuarine SAV includes the true seagrasses such as shoalgrasses (*Halodule wrightii*), turtlegrass (*Thalassia testudinum*), manateegrass (*Syringodium filiforme*), and clovergrass (*Halophila engelmannia*), but also includes widgeongrass (*Ruppia maritima*), not considered a true seagrass because it also grows in freshwater environments. Widgeongrass also differs from the other species in that it is an annual rather than perennial. Widgeongrass populations can be very transient, changing from year to year (i.e., a large distribution may disappear or appear from year to year).

The presence of estuarine SAV beds are highly dependent on water clarity and thus tend to occur in shallow areas (generally <6 ft. water depth). Seagrass communities are highly productive ecosystems and provide refuge for shrimp, fish, crabs, and their prey species. Seagrass beds can maintain faunal abundances 2-25 times greater than adjacent unvegetated areas (TPWD, 1999). Shoalgrass, widgeongrass, and turtlegrass have been documented in the Matagorda Bay system (Adair et al., 1994; LCRA-SAWS, 2006; TPWD, 1999; White et al., 2002). Shoalgrass and widgeongrass have been mapped in Keller Bay and Carancahua Bay (Salt Lake and Redfish Lake) (Adair et al., 1994; GLO, 2003). Shoalgrass was mapped along the southern shoreline of Keller Bay, in Boggy Bayou north of Port O'Connor, near the bayside marshes of the barrier island (Matagorda Peninsula) north of the MSC cut (GLO, 2003), and associated with the marshes west of Pass Cavallo where turtlegrass was also noted (GLO, 2003; White et al., 2002). The Seagrass Conservation Plan of Texas (TPWD, 1999) lists shoalgrass, widgeongrass, and clovergrass in the Matagorda Bay system.

Fresh-intermediate SAV may be present in the upstream parts of drainages, in depressional areas or swales within uplands, and in ditches and abandoned channels. There may also be small patches that occur in areas of palustrine marsh. Species may include widgeongrass, Sago pondweed (*Potamogeton pectinatus*), cabomba (*Cabomba caroliniana*), mermaid weed (*Proserpinica palustris*), water hyacinth (*Eichornia crassipes*), water lettuce (*Pistia stratiotes*), frogbit (*Linobium spongia*), or alligator-weed (*Alternanthera philoxeroides*) (LCRA-SAWS, 2006; NWI, 1980-1995; White et al., 2002).

2.3.4 Wildlife Resources

The project area is located within the Texas Biotic Province, as described by Blair (1950). This province represents a transitional area between the forested Austroriparian Biotic Province to the east and grassland provinces to the west. Such integration of forests and grasslands results in a mixture of vertebrate species typical of two general habitats. At least 49 species of mammals are known to have occurred in the Texan province in recent times, in addition to 39 snake species, 16 lizards, 2 land turtles, 18 anurans (frogs and toads), and 5 urodeles (salamanders and newts) (Blair, 1950). There are no endemic vertebrate species in this region.

The Texan Biotic Province is a barrier to the distribution of endemic urodele fauna that occurs in the Balconian Biotic Province to the west and the fauna of the Austroriparian Biotic Province (Blair, 1950). The five urodele species found in the Texas Biotic Province also occur in the Austroriparian Biotic Province. Urodele fauna that could occur in the project area include the small-mouthed salamander (*Ambystoma texanum*), eastern tiger salamander (*Ambystoma tigrinum tigrinum*), central newt (*Notophthalmus viridescens louisianensis*), and western lesser siren (*Siren intermedia netting*), all of which are restricted to moist bottomland or hydric habitats (Bartlett and Bartlett, 1999; Dixon, 2000).

Anuran species expected to occur in the project area include Blanchard's cricket frog (*Acris crepitans blanchardii*), Gulf coast toad (*Bufo nebulifer*), eastern narrow-mouthed toad (*Gastrophryne carolinensis*), Great Plains narrow-mouthed toad (*Gastrophryne olivacea*), Strecker's chorus frog (*Pseudacris streckeri*), upland chorus frog (*Pseudacris feriarum feriarum*), American bullfrog (*Rana catesbeiana*), southern leopard frog (*Rana sphenocephala*), Hurter's spadefoot (*Scaphiopus hurterii*), and several tree frogs, including the green tree frog (*Hyla cinera*), Cope's gray tree frog (*Hyla chrysoscelis*), and gray tree frog (*Hyla versicolor*) (Bartlett and Bartlett, 1999; Dixon, 2000).

Common reptiles expected to occur in the project area include turtles such as the red-eared slider (*Trachemys scripta elegans*) and three-toed box turtle (*Terrapene carolina triunguis*); and lizards such as the green anole (*Anolis carolinensis*), six-lined racerunner (*Aspidoscelis sexlineatus*), common five-lined skink (*Eumeces fasciatus*), broadhead skink (*Eumeces laticeps*), southern prairie skink (*Eumeces septentrionalis obtusirostris*), little brown skink (*Scinella lateralis*), prairie lizard (*Sceloporus consobrinus*), and western slender glass lizard (*Ophisaurus attenuates attenuates*) (Bartlett and Bartlett, 1999; Dixon, 2000).

Snakes of the project area include the eastern yellow-bellied racer (*Coluber constrictor flaviventris*), Texas ratsnake (*Elaphe obsoleta*), eastern hog-nosed snake (*Heterodon platirhinos*), prairie kingsnake (*Lampropeltis calligaster calligaster*), western coachwhip (*Masticophis flagellum testaceus*), diamond-backed watersnake (*Nerodia rhombifer*), rough greensnake (*Opheodrys aestivus*), and several venomous species such as the southern copperhead (*Agkistridon contortix contortix*), western cottonmouth (*Agkistridon piscivorious leucostuma*), Texas coral snake (*Micrurus tener*), and western diamond-back rattlesnake (*Crotalus atrox*) (Dixon, 2000; Werler and Dixon, 2000).

Numerous avian species are found within the project area. Common year-round residents include the great blue heron (*Ardea herodias*), turkey vulture (*Cathartes aura*), red-tailed hawk

(*Buteo jamaicensis*), killdeer (*Charadrius vociferus*), mourning dove (*Zenaida marcoura*), belted kingfisher (*Ceryle alcyon*), blue jay (*Cyanocitta critata*), American crow (*Corvus brachyrhynchos*), tufted titmouse (*Baeolophus bicolor*), Carolina wren (*Thryosthorus ludovicianus*), northern mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), lark sparrow (*Chondestes grammacus*), red-winged blackbird (*Agelaius phoeniceus*), eastern meadowlark (*Sturnella magna*), great-tailed grackle (*Quiscalus mexicanus*), brown-headed cowbird (*Molothrus ater*), northern bobwhite (*Colinus virginianus*), and house sparrow (*Passer domesticus*) (Lockwood and Freeman, 2004; Sibley, 2000; Texas Ornithological Society, 1995).

Matagorda Bay is located along the Central Flyway for waterfowl and is one of the most significant waterbird wintering regions in North America. The Matagorda Island National Wildlife Refuge and State Natural Area is home to numerous species of resident and migrant birds. Some common species that occur within the project area include little blue heron (*Egretta caerulea*), sanderlings (*Calidris alba*), least sandpiper (*Calidris minutilla*), great blue heron, white ibis (*Eudocimus albus*), roseate spoonbill (*Platalea ajaja*), royal tern (*Sterna maxima*), sandwich tern (*Sterna sandvicensis*), laughing gull (*Larus altrcilla*), and ring-billed gull (*Larus delawarensis*). Other bird species that are associated with the prairies and marshes region include a variety of raptors, songbirds, and migratory waterfowl.

The Texas Colonial Waterbird Census (TCWC) database has documented nesting habitat in the project area for multiple species of colonial waterbirds (USFWS, 2017b). The annual census, conducted in May and June, began in 1973 and includes location data for colonies along the Texas coast, along with an estimated number of breeding pairs per colony. The census data are collected by volunteers from State and Federal agencies, as well as nonprofit organizations. The database is maintained by the USFWS Clear Lake Ecological Services Field Office.

The project area is within the TPWD's Coastal Survey Zone, which includes the Gulf Prairies and Marshes region. The TPWD Midwinter Waterfowl Survey (2016) documented 5,992,094 birds in 2016, representing at least 26 species. The Coastal Zone accounted for 23 percent (1,380,528 birds, at least 18 species) of this total. Waterfowl species expected to migrate through the project area include the blue-winged teal (*Anas discors*), mallard (*Anas platyrhynchos*), gadwall (*Anas strepera*), green-winged teal (*Anas crecca*), Canada goose (*Branta canadensis*), and wood duck (*Aix sponsa*).

Many other species of birds migrate through the project area in the spring and fall or use the area for overwintering. Migrant or winter residents expected to occur in the project area include the double-crested cormorant (*Phalacrocorax auritus*), cackling goose (*Branta hutchinsii*), snow goose (*Chen caerulescens*), northern pintail (*Anas acuta*), gadwall, ring-necked duck (*Aythya collaris*), lesser scaup (*Aythya affinis*), common merganser (*Mergus merganser*), northern flicker (*Colaptes auratus*), ruby-crowned kinglet (*Regulus calendula*), cedar waxwing (*Bombycilla cedrorum*), yellow-rumped warbler (*Dendroica coronata*), chipping sparrow (*Spizella passerina*), field sparrow (*Spizella pusilla*), vesper sparrow (*Pooecetes gramineus*), savannah sparrow (*Passerculus sandwichensis*), white-throated sparrow (*Zonotrichia albicollis*), dark-eyed junco (*Junco hyemalis*), and American goldfinch (*Carduelis tristis*) (Lockwood and Freeman, 2004; Sibley, 2000; Texas Ornithological Society, 1995).

Summer residents expected to occur in the project area include the yellow-bellied cuckoo (*Coccyzus americanus*), chuck-will's widow (*Caprimulgus carolinensis*), common nighthawk (*Chordeiles minor*), chimney swift (*Chaetura pelagica*), eastern kingbird (*Tyrannus tyrannus*), scissor-tailed flycatcher (*Tyrannus forficatus*), purple martin (*Progne subis*), barn swallow

(*Hirundo rustica*), summer tanager (*Piranga rubra*), indigo bunting (*Passerina cyanea*), painted bunting (*Passerina ciris*), and dickcissel (*Spiza americana*).

Mammals using the coastal fields and forests of the project area include the Virginia opossum (*Didelphis virginiana*), least shrew (*Cryptotis parva*), eastern mole (*Scalopus aquaticus*), eastern red bat (*Lasiurus borealis*), evening bat (*Nycticeius humeralis*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cottontail (*Sylvilagus floridanus*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), Attwater's pocket gopher (*Geomys attwateri*), hispid pocket mouse (*Chaetodipus hispidus*), American beaver (*Castor canadensis*), fulvous harvest mouse (*Reithrodontomys fulvescens*), white-footed mouse (*Permyscus leucopus*), hispid cotton rat (*Sigmodon hispidus*), march rice rat (*Oryzomys palustris*), eastern woodrat (*Neotoma floridana*), nutria (*Myocastor coypus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), common gray fox (*Urocyon cinereoargenteus*), ringtail (*Bassariscus astutus*), northern raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), bobcat (*Lynx rufus*), and white-tailed deer (*Odocoilieus virginianus*) (Davis and Schmidly, 1994; Schmidly, 2004).

2.3.5 Protected Resources

2.3.5.1 Threatened and Endangered Species

The Endangered Species Act (16 USC 1531 et seq) of 1973 (ESA), as amended, was enacted to provide a program for the preservation of threatened and endangered species and to provide protection for the ecosystems upon which the species depend for their survival. All Federal agencies are required to implement protection programs for these designated species and to use their authorities to further the purpose of the Act. The USFWS and the NMFS are the primary agencies responsible for implementing the ESA. The USFWS is responsible for the flora and fauna, including freshwater species, while the NMFS is responsible for nonbird marine species.

USFWS and NMFS have identified twelve federally listed threatened and endangered species and four candidate species as potentially occurring in the project area (Calhoun and Matagorda counties, TX). The ESA defines a threatened species as "a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" and an endangered species as "a species that is in danger of extinction throughout all or a significant portion of its range" (50 CFR 424.02). A candidate species is one for which sufficient information exists regarding the biology and threats to propose it as a threatened or endangered species. Candidate species are not protected under the ESA, but will be provided the full protection of the ESA if listed after the Section 7 consultation is completed.

When a species is listed as threatened or endangered, the ESA requires the designation of critical habitat unless designation would not be prudent or the critical habitat is not determinable. Critical habitat is defined as: "(1) the specific areas within a geographical area currently occupied by a species, at the time it is listed in accordance with the Act, on which are found those physical or biological features (i) essential to the conservation of the species and (ii) that may require special management consideration or protection, and (2) specific areas outside the geographical area occupied by a species at the time is listed upon a determination by the Secretary [Secretary of the Interior of Secretary of Commerce] that such areas are essential for conservation of the species" (50 CFR 424.02). Federal agencies are required to consult with USFWS or NMFS about the effect of actions they authorize, fund, or carry out, on designated critical habitat. Critical habitat has been designated in the vicinity of the project area for the Piping plover (*Charadrius melodus*) and the Whooping crane (*Grus americana*).

There are no federally listed threatened or endangered plant species in the project area.

Threatened and endangered species considered in this analysis were identified from county species list provided by USFWS. Information regarding the potential occurrence of a species in this area was obtained from the literature. It should be noted that inclusion on the list does not imply that a species is known to occur in the project area, but only acknowledges the potential for occurrence.

Piping plovers breed in the northern Great Plains of the U.S. and Canada, along beaches of the Great Lakes, and along the Atlantic coast. Following the breeding season, this species migrates to the southern U.S. Atlantic coastline, the Gulf coastline, and to scattered Caribbean islands. Thus, piping plovers are potential winter residents (November – March), and spring and fall migrants in the project area. This species can be found along Texas beaches, tidal flats, mud/sand flats, dunes, and offshore islands. This species has been observed in the project area. Critical habitats have been designated along the Texas coast, including portions of the Matagorda/Lavaca bay system.

The entire breeding population of the whooping crane migrates from Canada's Northwest Territories to a narrow section of the Texas coast on the Aransas National Wildlife Refuge located south of the project area. Thus, individuals are likely to fly through/over the project area en route to their primary wintering destination. In Texas, the principal winter habitats include brackish bays, marshes, and sand flats. Whooping cranes are also known to forage in nearby upland areas.

Critical habitats have been designated for the Whooping crane in Calhoun County, but are restricted to the Aransas National Wildlife Refuge and adjacent areas. The whooping crane has not been recorded in the project area, but cranes overwintering in the Aransas National Wildlife Refuge could move through or utilize habitats in Matagorda and Lavaca bays.

The Least tern (*Sterna antellarum*) was listed as an endangered species under the ESA in 1985. Their range has been defined as the Mississippi River and its tributaries north of Baton Rouge, LA and all drainages in Texas more than 50 miles inland from the coast (50 FR 21784-21792). They are colonial nesters, with colony size ranging from a few birds to more than 1200 (Jones, 2012). Least terns migrate in the fall along the major river basins to the Mississippi River and on to the Gulf of Mexico. Their winter habitat is not well described, other than where they have been seen to congregate on marine coasts, bays, estuaries, and river mouths (Thompson et al., 1997). Least terns only need to be considered under the ESA if the project is wind related along their migration route.

The Red knot (*Calidris canutus rufa*) was listed as a threatened species under ESA in 2014 (79 FR 73705-73748). The species is known to migrate long distances from their nesting habitat in the mid to high-arctic latitudes to their nonbreeding winter habitats in the coastal United States and South America. The *rufa* subspecies stops in the Gulf of Mexico on its migration northward (Gonzalez et al., 2006).

The Northern Aplomado falcon (*Falco femoralis septentrionalis*) was determined to be an endangered species in 1983 (51 FR 6686-6690). The species was once found from the Yucatan, along the Gulf Coast of Mexico and into the Trans-Pecos region of Texas, southern New Mexico, and southeastern Arizona (USFWS, 1990). Their decline has largely been caused by the encroachment of agriculture into their grassland habitat (Hector, 1987). There is little known about the migration of this species, though they are believed to overwinter in the US (Hector, 1981 and 1987).

The Gulf coast jaguarundi (*Herpailurus yaguarondi cacomitli*) is a secretive, small, slender-bodied cat that inhabits dense thornscrub and brushland (Schmidly, 2004). The jaguarondi has a neotropical distribution and historically occurred in southeast Arizona, southern Texas, and

Central and South America (Davis and Schmidly, 1994). Today, the jaguarondi has a similar distribution, but with significantly reduced numbers. In Texas, its distribution includes Cameron, Hidalgo, Starr, and Willacy counties where it is extremely rare. The jaguarondi has not been reported in Texas since a roadkill specimen was found outside Brownsville in April 1986 (USFWS, 2013b).

The West Indian manatee (*Trichechus manatus*) is a federally listed endangered aquatic mammal that inhabits brackish water bays, large rivers, and saltwater (Davis and Schmidly, 1994). They feed upon submergent, emergent, and floating vegetation with the diet varying according to plant availability (O'Shea and Ludlow, 1992). The manatee is more common in the warmer waters off of coastal Mexico, the West Indies, and Caribbean to northern South America (NatureServe, 2000). In the U.S., populations are primarily found in Florida, but occasional vagrants migrate along the coast into Texas. Although extremely rare in Texas, recent records include specimens from Cameron, Galveston, Matagorda, and Willacy counties (USFWS, 1995).

The Kemp's ridley sea turtle (*Lepidochelys kempii*) inhabits shallow coastal and estuarine water, usually over sand or mud bottoms. Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979). Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. Sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years.

The Hawksbill sea turtle (*Eretmochelys imbricata*) is a circumtropical species, occurring in the tropical and subtropical seas of the Atlantic, Pacific, and Indian Oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The Hawksbill sea turtle is widely distributed in the Caribbean Sea and Western Atlantic Ocean, with representatives of at least some life-history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2017a). The hawksbill generally inhabits coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where it occurs at depths of less than 70 ft. Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine algae (i.e. sargassum rafts) in the open ocean (NFWL, 1980). In the continental U.S., the hawksbill largely occurs in Florida where it is sporadic at best. In 1998 the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. Texas is the only state outside of Florida where hawksbills are encountered with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2017a). This species may potentially occur in the study area.

The Leatherback sea turtle (*Dermochelys coriacea*) is probably the most wide-ranging of all sea turtle species. The species occurs in the Atlantic, Pacific, and Indian Oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, Cape of Good Hope, and Argentina; and in other water bodies such as the Mediterranean Sea (NFWL, 1980). The leatherback is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992) or when following concentrations of jellyfish, when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths. Leatherbacks nest primarily in tropical regions and only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2017b). Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs (NMFS and USFWS, 1992). No leatherback sea turtles have been taken by dredging activities in Texas (USACE, 2017); however, a leatherback was caught by a trawler in a shipping channel approximately 1.5 miles north of Aransas Pass (NMFS, 2003). This species is unlikely to occur in the study area.

The Green sea turtle (*Chelonia mydas*) is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, the species occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and Suriname. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (Hirth, 1997; NMFS and USFWS, 1991). The green sea turtle in Texas inhabits shallow bays and estuaries where its principal foods, various SAVs, grow (Bartlett and Bartlett, 1999). While green sea turtle prefer to inhabit bays with seagrass meadows, they may also be found in unvegetated bays. The green sea turtles in these Texas bays are largely juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines of by offshore shrimpers or are washed ashore in a moribund condition (Shaver, 2000; STSSN, 2017).

Green sea turtles nests are rare in Texas. Since long migrations of green sea turtles from the nesting beaches to distant feeding grounds are well documented (Green, 1984; Meylan, 1982), the adults occurring in Texas may be either at their feeding grounds of in the process of migration to or from their nesting beaches. The juveniles frequenting the seagrass beds of the bay areas may remain there until they move to other feeding grounds, or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

The Loggerhead sea turtle (*Caretta caretta*) is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, the Gulf, Indian, and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Iverson, 1986; Rebel, 1974; Ross, 1982). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast, including Texas. Like the worldwide population, the population of loggerheads in Texas has declined. The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It is often seen around offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when one of their food items, the Portuguese man-o-war, is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year (STSSN, 2017). A large proportion of these deaths is the result of accidental capture by shrimp trawlers, where caught turtles drown and their bodies are dumped overboard. Critical habitat for the species was designated in 2014 (63 FR 46693). The designated critical habitat in the study area encompasses a large area in the Gulf for feeding habitat.

2.3.5.2 Essential Fish Habitat

Congress enacted amendments to the Magnuson-Stevens Act (PL 94-265) in 1996 that established procedures for identifying Essential Fish Habitat (EFH) and required interagency coordination to further the conservation of federally managed fisheries. Rules published by NMFS (50 CFR Sections 600.805-600.930) specify that any Federal agency that authorized, funds, or undertakes, or proposes to authorize, fund, or undertake an activity that could adversely affect EFH is subject to the consultation provisions of the above-mentioned act and identifies consultation requirements.

EFH is defined as "those water and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." EFH is separated into estuarine and marine components. The estuarine component is defined as "all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities); sub-tidal vegetation (seagrass and algae); and adjacent inter-tidal vegetation (marshes and mangroves)." The marine component is defined as "all marine waters and substrates (mud, sand, shell, rock, and associated biological communities) from the shoreline to the seaward limit of the Exclusive Economic Zone" (GMFMC, 2004). Adverse effect to EFH is defined as, "any impact, which reduces quality and/or quantity of EFH…" and may include direct, indirect, site-specific, or habitat impacts, including individual, cumulative, or synergistic consequences of actions.

NMFS and the Gulf of Mexico Fisheries Management Council (GMFMC) have identified the project area as EFH for brown shrimp, pink shrimp, red drum (*Sciaenops ocellatus*), gray triggerfish (*Balistes capricus*), greater amberjack (*Seriola dumerili*), lesser amberjack (*Seriola fasciata*), cobia (*Rachycentron canadum*), dolphin (*Coryphaena hippurus*), king mackerel (*Scomberomorus cavalla*), Spanish mackerel (*Scomberomorus maculatus*), bluefish (*Pomatomus saltatrix*), little tunny (*Euthynnus alletteratus*), Atlantic bluefin tuna (*Thunnus thynnus*), lane snapper (*Lutjanus synagris*), red snapper (*L. campechanus*), bonnethead shark (*Sphyrna tiburo*), blacktip shark (*Carcharhinus leucas*), and Atlantic sharpnose shark (*Rhizoprionodon terranovae*). The categories of EFH that occur within the project area include estuarine water column, estuarine sand and mud bottoms (unvegetated estuarine benthic habitats), estuarine shell substrate (oyster reefs and shell substrate), estuarine emergent wetlands, and seagrasses. Additionally, portions of the project located in marine waters include the marine water column, unconsolidated marine water bottoms, and natural structural features.

3. EXPECTED FUTURE WITHOUT PROJECT CONDITIONS

3.1 Air Quality

The future without project conditions (also known as the No-Action Alternative) does not include an increase in construction or dredging operations, and thus there is no expected increase in air contaminant emission sources. Air contaminants are likely to increase due to an increase in shipping traffic resulting from growth in existing businesses and new businesses.

Ongoing existing maintenance dredging activities will continue to contribute to air emission contaminants through the fuel combustion/exhaust of marine vessels, as will construction equipment on-shore, and local commuter vehicles. Maintenance dredging schedules are not expected to change from current timelines and no increase in emissions is expected from this activity.

3.2 Noise

The No-Action Alternative does not include widening or deepening of the existing ship channel. However, the existing maintenance dredging and operations of the channel will continue. A hopper dredge is typically used for a portion of the maintenance dredging operations. This type of dredge houses its equipment below deck and is likely to operate at noise levels similar to that of a large tug boat. Table 3.1 lists noise levels typical of equipment utilized in maintenance dredging operations.

Permanent noise impacts are not expected under the No-Action Alternative. Dredging operations occur in the channel, which is a significant distance from the shoreline and noise-sensitive receivers. The nearest receiver, at Magnolia Beach, is approximately 3,000 feet from the channel. This distance will reduce the amount of noise output from the channel that is received at the shoreline. The existing noise levels in the project area range from 52.4 to 65.1 dBA (L_{dn}). The No-Action Alternative is not likely to result in short-term or permanent noise impacts.

Table 3.1: Typical noise levels associated with equipment regularly used in maintenance dredging operations.

Equipment	Noise Level (dBA)
Cutterhead Dredge (at 160 ft.)	79[1]
Hopper Dredge (at 50 ft.)	87[2]
Large Tug Boat (at 50 ft.)	87[3]
Small Tug Boat	72[3]
Bulldozer (at 50 ft.)	82[4]
Bucket Crane (at 50 ft.)	82[4]

[1] Geier and Geier Consulting, 1997 [2]Assumed to be the same as a large tug boat.
[3] Epsilon Associates, 2006 [4]Federal Highway Administration, 2006

3.3 Physiography, Topography, and Bathymetry

No impact to the physiography, topography, or bathymetry would occur to the project area as a result of the No-Action Alternative. Maintenance dredging and placement in PAs would continue under the No-Action plan.

The current level of wave energy and shoreline erosion would continue under the No-Action Alternative. The majority of waves in the region are wind waves, with only a small portion of the waves being caused by ship traffic. There is no expected increase in wave energy or shoreline erosion resulting from ship traffic under the No-Action Alternative.

3.4 Geology

The No-Action Alternative would not cause any changes in the geology of the project area.

3.5 Energy and Mineral Resources

The No-Action Alternative would not cause any changes to the energy or mineral resources of the project area. As maintenance dredging continues under normal scheduled operations more sand and sediment will become available that could be used beneficially to counter natural shoreline erosion.

3.6 Soils

Placement of dredged material in the upland Placement Areas is the main driver of impacts to soils in the project area. The placement of maintenance material will continue under the No-Action Alternative, but is not expected to occur at an elevated rate or increase the impacts to soils. Commercial and residential development is another driver of impacts to local soils and is not expected to increase under the No-Action Alternative.

3.7 Groundwater Hydrology

The No-Action Alternative would not impact groundwater hydrology within the project area and trends related to the hydrology would continue along historical trends.

3.8 Hazardous Material

The No-Action Alternative is not expected to have any impacts on hazardous materials in the project area. Maintenance dredging and placement will continue under the No-Action Alternative. Increased ship traffic resulting from growth in existing and/or new businesses may slightly increase the possibility of spills resulting from accidents, but is not expected to differ from historical rates.

3.9 Water and Sediment Quality

3.9.1 Water Exchange and Inflows

No changes to the ship channel depth or width would occur under the No-Action Alternative and water movements will continue to follow historical trends.

3.9.2 Salinity

No changes to the ship channel depth or width would occur under the No-Action Alternative and changes in salinity will continue to follow historical trends.

3.9.3 Water Quality

The effects on dissolved oxygen (DO) concentrations from the No-Action Alternative are not entirely clear. There are conflicting study results on whether or not the placement of maintenance material impacts DO (Brown and Clark, 1968; Hopkins, 1972; May, 1973; Pearce, 1972; Wakeman, 1974; Windom, 1972). Temporary decreases in DO were found by May (1973) at the interface of the water and sediment at areas of mud flow, possibly due to the anaerobic nature of maintenance material.

The amount of turbidity resulting from dredging activities will be unchanged under the No-Action Alternative.

3.9.4 Sediment Quality

No changes to the quality of sediments are expected under the No-Action Alternative. Natural recovery through sedimentation will continue to areas with high levels of mercury concentrations in the area of the ALCOA (Point Comfort)/Lavaca Bay Superfund Site, as stated in the ROD for the ALCOA Superfund Site.

3.10 Wetlands and Submerged Aquatic Vegetation

The submerged aquatic vegetation (SAV) community in the project area will be unaffected under the No-Action Alternative, except for the beds in Keller bay, which may be impacted if the southern shoreline is breached by erosion or tropical storm/hurricane washover. If the shoreline is breached approximately 250 acres of SAV could be permanently lost.

Estuarine tidal flats may decline due to relative sea level rise under the No-Action Alternative. However, new tidal flats may be created by washover from tropical storms/hurricanes.

Estuarine (saline and brackish) marshes may decline due to relative sea level rise under the No-Action Alternative. However, new marshes may be created by washover from tropical storms/hurricanes. New marshes may also be created in Pass Cavallo due to longshore drift.

Estuarine scrub-shrub wetland would not be impacted under the No-Action Alternative. Black mangrove populations in Pass Cavallo and Port O'Connor would likely adjust to new elevations caused by longshore drift.

Fresh-intermediate wetlands and SAVs would not be impacted under the No-Action Alternative.

3.11 Wildlife

No direct impacts to wildlife would occur as a result of the No-Action Alternative. Continued commercial and residential development may result in loss of habitat for wildlife. Ongoing maintenance dredging and placement operations may result in increased turbidity in the bay and a resulting impact to aquatic species used as prey by coastal birds and other terrestrial wildlife species.

3.12 Aquatic Resources

3.12.1 Recreational and Commercial Fisheries

The No-Action Alternative will not impact recreational or commercial fisheries. However, the ongoing maintenance dredging and open-water placement may indirectly impact fishery species due to increased turbidity. No decrease in abundance is expected and any impacts would be temporary.

3.12.2 Open-Bay Bottom

The No-Action Alternative will not impact open-bay bottom habitats. Ongoing maintenance dredging and open-water placement may indirectly impact benthic and demersal species due to increased turbidity and burying of the benthos. No decrease in abundance is expected and any impacts would be temporary.

3.12.3 Oyster Reef

The No-Action Alternative will not impact oyster reefs. However, the ongoing maintenance dredging and open-water placement may indirectly impact oyster reef beds due to increased turbidity.

3.12.4 Essential Fish Habitat

The No-Action Alternative will not impact essential fish habitat (EFH). However, the ongoing maintenance dredging and open-water placement may indirectly EFH due to increased turbidity. Any indirect effects are expected to be temporary.

3.13 Threatened and Endangered Species

The No-Action Alternative would not impact any threatened or endangered species or their critical habitat in or near the project area.

4. FUTURE WITH PROJECT CONDITIONS

Two alternatives were analyzed, with varying depths included as scales of each alternative. The impacts of each alternative would be similar, except with respect to duration of construction. The placement areas outlined in the DMMP (Appendix F) would not be changed as they are large enough to accommodate larger quantities than anticipated from the TSP. The alternative and scales that were not selected would not change the expected impacts from the implementation of the TSP. The impacts discussed below are in reference to the TSP, but would be indicative of impacts associated with the alternative and scales that were eliminated from consideration for the Matagorda Ship Channel Project.

4.1 Air Quality

4.1.1 Construction Dredging Equipment

Diesel fired-engines will be used during dredging operations, to transport materials to their designated locations, and for support of associated dredging equipment. This equipment will include primarily dredges, booster pumps, barges, tug boats, transport and supply boats, survey boats, and crew boats. Emission sources related to the dredging operations can be found in Table 4.1.

4.1.2 Construction Volumes and Timeline

The total volume of new work dredged material for the TSP has been estimated to be 30.2 mcy. The emission rates used for this report assume a conservative maximum length of operations for a project life of approximately two years, with construction beginning in fall 2020 and ending in fall 2022.

4.1.3 Construction Dredging Emissions

Emission rates for dredging and support equipment is directly related to the horsepower rating of the engines, load factors, duration of use, and amount of material to be dredged. Emission rates for employee commuter vehicles is directly related to the total miles traveled per vehicle. Diesel fuel combustion in the internal combustion engines of the vehicles during dredging operations will result in emissions of CO, NO_x, PM, SO_2, and VOC.

4.1.4 Project Construction Emissions Inventory

Temporary increases in air pollution would result from the equipment associated with construction of the TSP. These air contaminant emissions would result from the use of marine vessels and land-based mobile sources during the construction activities, including:

- Dredge and Support Equipment—dredging vessels and supporting equipment and vessels such as tugboats;
- Non-Road Construction Equipment—land-based equipment such as bulldozers and graders;
- On-Road and Employee Vehicles—land-based equipment such as cars and trucks; and
- Maintenance Dredging—dredging vessels for maintenance such as tugboats.

Air contaminant emissions associated with these construction activities would be primarily combustion products from fuel burned in equipment used for Project dredging, support vessels, and dredged material placement equipment. Equipment such as excavators, backhoes, and front-end loaders also would be required. The marine vessel emission sources would be primarily diesel-powered engines. The off-road and on-road equipment may be assumed to be a mix of gasoline and diesel-powered vehicles. These construction activities would be considered one-time activities, i.e., the construction activities would not continue past the date of completion. For purposes of estimating emissions, the construction activities will be projected to occur from the year 2020 to the year 2022. It will be assumed 136 that the proposed construction dredging may continue up to 20 hours per day, seven days per week (with some scheduled down time). The dredges would operate in continuous 10-hour shifts, during which supporting equipment would be used to transport the crew to and from the dredges for each shift. It is expected that the same boat that brings one work crew to the dredge would return to shore with the exiting crew. Light plants would be used in the late afternoon and evening time frames to provide additional lighting for the crew and to serve as safety beacons to surrounding waterborne traffic.

Table 4.1: Proposed project construction emission sources.

Construction Emission Sources	Quantity	Horsepower Rating
Dredging Equipment*		
30-inch Hydraulic Dredge	2	13,200
Hopper Dredge	1	18,000
Clamshell Dredge	1	2,340
Dredging Support Equipment*		
Booster Pump Barge	2	5,400
Dredge Tender Barge	4	150
Tug for Supply Barge	2	1,000
Tug Boat	2	850
Tug Boat for Dump Scow	1	3,500
Work Boat	2	350
Survey Boat	2	350
Crew Boat	2	350
Generator	2	7
Welding Machine	2	10
Air Compressor	2	55
Placement Area Construction Equipment*		
Cat D6 LPG Dozers	3	225
Hydraulic Excavator	3	250
200-ton Crane – Dragline	2	550
Spill Barge/Crane	2	416
Cat 325 Marsh Buggy	2	250
Generator	2	7
Mules	2	50
Air Compressor	2	55
Dump Truck – 20 yard	4	430
Light Plant	4	300
Commuter Vehicles		
Van	5	n/a
Cars	8	n/a
Trucks	17	n/a

*All equipment information is based on experience from past projects.

Onshore construction equipment related to the dredged material placement areas would include cranes, trucks, dozers, front-end loaders, backhoes, compactors, graders, and dump trucks. Sulfur dioxide emissions from onshore construction equipment will be estimated based on an assumed 0.0015 percent by weight fuel sulfur content, in accordance with EPA reduced fuel sulfur standards.

Commuter vehicles will be used to transport the crew and staff from the shore to land-side locations and back to the shore. Crew and staff sizes will be determined based on estimates from previous dredging projects. Employee commuter vehicles would include a mix of light-duty gas vehicles and light-duty gas trucks. It is assumed that vans will transport the dredge crew inland twice per month; passenger cars will be assumed to transport management staff and support crew 30 days per month; and trucks will be assumed to transport management staff 15 days per month. An average commute of 25 miles each way per day of work will be assumed for each vehicle.

Fugitive dust that may be generated by the physical disturbance of soils caused by earth-moving and equipment/vehicle traffic at the land-based Project construction sites would be minimal as the dredged material (sand, silt, and clay) is assumed to be moist; and therefore, quantitative estimates are not necessary. However, dust-reduction measures, such as the use of a water truck at the site, may be employed, if required.

In general, air contaminant emission rates for the non-road/off-road emission sources will be estimated using the following equation:

Emission Rate = (engine horsepower) x (load factor) x (hours per year of operation) x (emission factor, grams per horsepower-hour)

Air contaminant emission rates for the on-road emission sources will be estimated using the following equation:

Emission Rate = (number of vehicles) x (vehicle miles traveled per vehicle per year) x (emission factor, grams per vehicle mile traveled)

The calculated emissions will be converted to tons per year using the appropriate conversion factors.

At present there is no indication that the project will lead to loss of EPA NAAQS attainment status. The estimation of no status change is based on emissions output from previous channel widening and deepening projects in Texas. Modeling will be performed to verify that the project will not cause the region to lose its emissions attainment status and will remain in compliance with the Clean Air Act.

4.1.4.1 Dredge and Support Equipment

Dredge and support equipment emissions will be estimated for each equipment type for each year using the following equation:

Annual Emissions, tons/year = HP x LF x Hr x EF / (453.59 g/lb) / (2000 lb/ton)

Where:

HP = Horsepower (hp)

LF = Load Factor (unitless)

Hr = Annual Operating Hours (hr)

EF = Emission Factor (g/hphr)

Dredge and support equipment list, monthly operating hours per equipment type and activity, hp, and engine tier will be provided by the USACE for the Preferred Alternative. Load factors will be taken from Table 3-3 in *Current Methodologies for Preparing Mobile Source Port-Related Emission* Inventories (EPA 2009). Emission factors for the dredging and support vessels will be developed from Table 3-8 in *Current Methodologies for Preparing Mobile Source Port-Related Emission Inventories* (EPA 2009). The emission factors in the table will be presented in units of g/kW-hr. These will be converted to units of g/hp-hr using a conversion factor of 1.341022 kWh/g/hp-hr. Greenhouse gas (GHG) emissions will be estimated for CO2, methane (CH4), and nitrous oxide (N2O) and converted to carbon dioxide equivalents (CO2e) using Global Warming Potentials (GWP). Hazardous air pollutants (HAPs) emission factors for engines less than 600 hp will be based on AP-42, *Compilation of Emission Factors* (herein AP-42), Tables 3.3-1 and 3.3-2 (EPA 1996). HAP emission factors for engines greater than 600 hp will be taken from AP-42, *Compilation of Emission Factors*, Tables 3.4-3 and 3.4-4. HAP emissions represent a sum of the following pollutants: Benzene, Toluene, Xylenes, Formaldehyde, Acetaldehyde, Acrolein, Napthalene, Diesel Particulate Matter, and Polycyclic Aromatic Hydrocarbons. HAP emissions for dredging and support vessels with engines greater than 600 hp do not include 1,3-Butadiene because emission factors will be not available from AP-42 for this pollutant.

4.1.4.2 Non-road Construction Equipment

Non-road construction equipment emissions will be estimated for each equipment type for each year using the following equation:

Annual Emissions, tons/year = HP x LF x Hr x EF / (453.59 g/lb) / (2000 lb/ton)

Where:

HP = Horsepower (hp)

LF = Load Factor (unitless)

Hr = Annual Operating Hours (hr)

EF = Emission Factor (g/hphr)

A non-road construction equipment list, monthly operating hours per equipment type and activity, and hp will be provided by the USACE for the Preferred Alternative. Load factors will be taken from EPA's Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling (EPA 2004). Emission factors will be developed using the EPA Motor Vehicle Emissions Simulator (MOVES) model, version 2014a, using the NONROAD modeling functioning through MOVES. The MOVES model will be used to produce emission factors in units of g/hp-hr for peak winter (January, 7:00 a.m. to 8:00 a.m.) and peak summer (July, 5:00 p.m. to 6:00 p.m.), as emission factors change seasonally for some pollutants. These peak emission factors will be averaged and used to calculate the annual emissions. For construction years 2020 through 2022, 2020 emission factors will be used. Typically, a single year is used to calculate construction emission factors because the same construction fleet tends to be used throughout the full construction schedule.

GHG emissions will be estimated for CO2, CH4, and N2O and converted to CO2e using GWP. The NONROAD model within MOVES does not include emission factors for N2O or total HAPs. N2O emission factors will be developed by multiplying the CO2 emission factor by a ratio, 0.0000697. HAP emission factors for non-road vehicles will be taken from AP-42, Tables 3.3-1 and 3.3-2 (EPA 1996). The sum of the following pollutant emission factors will be used: Benzene, Toluene, Xylenes, 1,3-Butadiene, Formaldehyde, Acetaldehyde, Acrolein, Napthalene, Polycyclic Aromatic Hydrocarbons, and Diesel PM10.

4.1.4.3 On-road and Employee Vehicles

On-road and employee vehicle emissions will be estimated for each equipment type for each year using the following equation:

Annual Emissions, tons/year = VMT x EF / (453.59 g/lb) / (2000 lb/ton)

Where:

VMT = Annual Vehicle Miles Traveled (miles)

EF = Emission Factor (g/VMT)

Annual VMT will be calculated by multiplying the number of vehicles per day, the 227 daily travel distance per vehicle, and the number of travel days per year. The number of vehicles per day and number of travel days per year will be provided by the USACE. The daily travel distance will be assumed to be 25 miles each way per day of work, on average. Emission factors will be developed in the MOVES model, version 2014a.

The MOVES model will be used to produce emission factors in units of g/VMT for peak winter (January, 7:00 a.m. to 8:00 a.m.) and peak summer (July, 5:00 p.m. to 6:00 p.m.), as emission factors change seasonally for some pollutants. These peak emission factors will be averaged and used to calculate the annual emissions. For construction years 2020 through 2022, 2020 emission factors will be used. Typically, a single year is used to calculate construction emission factors because the same construction fleet tends to be used throughout the full construction schedule. The total number of miles traveled will be estimated from the number of miles per trip multiplied by the total number of days of travel to and from the worksite times the number of vehicles.

MOVES 2014a on-road model CO2e emission factors will be used for estimating emissions of GHGs. The HAP emission factors for on-road vehicles will be a sum of the following pollutant emission factors: Benzene, 1,3-Butadiene, Formaldehyde, Acrolein, Napthalene, and Polycyclic Organic Matter.

4.1.4.4 Maintenance Dredging

Maintenance dredging equipment emissions will be calculated the same way as the dredge and support equipment emissions will be calculated.

4.2 Noise

Dredging operations would generate noise from multiple sources of equipment, though dredges would be the primary contributor to the noise environment. Smaller vessels would not be expected to contribute appreciably to the noise associated with dredging operations. Table 4.2 provides a summary of dredging-related noise levels by equipment type.

No permanent noise sources will be installed as part of the project. However, short term noise levels could be elevated at the noise-sensitive receptors in Magnolia Beach and Alamo Beach. The proposed project's dredging noise levels at sensitive receivers would be less than the existing ambient conditions beyond 4,100 ft. from the channel. In other words, short term noise levels from the project would be similar to those from ongoing maintenance dredging operations within the channel.

Under the proposed DMMP material would be placed in Placement Area P1, a 248 acre site located south of FM 2760. The area is planned as an upland site that would be developed over the 50-year life of the project. Levees would be constructed around the perimeter of the site to provide capacity for future maintenance material. Construction equipment would be utilized on as as-needed basis. Material would be delivered via pipeline and moved by earth-moving equipment. The typical noise level of a bulldozer operating at 50 ft. is approximately 82 dBA. Noise emissions would be reduced to 76 dBA at 100 ft., 70 dBA at 200 ft., and diminish further with increasing distance from the noise source. The noise levels are not expected to increase substantially as a result of the proposed project.

Table 4.2: Typical noise levels from dredge-related equipment

Equipment	Noise Level (dBA)
Cutterhead Dredge (at 160 ft.)	79[1]
Hopper Dredge (at 50 ft.)	87[2]
Large Tug Boat (at 50 ft.)	87[3]
Small Tug Boat	72[3]
Bulldozer (at 50 ft.)	82[4]
Bucket Crane (at 50 ft.)	82[4]

[1]Geier & Geier Consulting, 1997
[2]Assumed same as large tug
[3]Epsilon Associates, 2006
[4]Federal Highway Administration, 2006

4.3 Physiography, Topography, and Bathymetry

The total estimated amount of dredged material generated from the TSP would be approximately 46.5 mcy of new work material and 257.5 mcy of maintenance material over the 50 years following completion of the project's construction. The material will be placed in open-bay placement areas, a confined upland placement area, a confined bay dredge island placement area, and offshore unconfined placement area.

One upland PA would be created (PA P1, see Figure 1.1). The dredge island ER3/D will be enlarged and used for in-bay confined placement. While local changes would occur to bathymetry and topography during construction of the project, these alterations would be expected to have negligible impacts on the regional physiography, topography, and bathymetry of the submerged and subaerial portions of the study area.

4.4 Geology

The impacts on the local geology during dredging associated with the proposed project would include redistribution of existing sediment and potential increases in local scouring and shoaling rates. Net impacts on geology would be minimal from these operations. Additionally, no impacts or modifications to geological hazards, such as faulting and subsidence, are expected.

In an October 2006 Memorandum for Record (USACE, 2006), results of a study performed concerning the cross-sectional stability of Pass Cavallo showed the width of the pass has decreased since construction of the MSC in 1966. The study concluded that Pass Cavallo would remain open at its present cross-sectional channel area or with an increase in area. The proposed widening of the MSC is not expected to notably change the stability of Pass Cavallo because the additional capture of the tidal prism by the ship channel would be small relative to past changes in tidal prism (Appendix G).

4.5 Energy and Mineral Resources

The TSP would include widening and deepening the existing MSC. This action would result in 46.5 mcy of new work material and an additional 257.5 mcy of maintenance material over the next 50 years after project completion. The locations identified for dredged material placement do not appear to impact known areas of mineral production.

The DMMP was designed to minimize impacts to oil and gas wells and pipelines. Table 4.5.1 summarizes the energy resources identified within the proposed placement areas. One permitted well location is within the proposed in-bay unconfined PA locations. No active wells are located within the proposed PA sites.

Approximately 22 active pipelines are mapped within the 2,000 ft. wide buffer along the proposed ship channel. Although well sites and pipelines are mapped within the buffer, no impacts are likely with the TSP. Well and pipeline locations reported by the Texas Railroad Commission are approximate. No mitigation is expected for well sites, plugged wells, or dry holes. As a result of the project, pipelines will need to removed and relocated to meet the USACE's policy of a minimum of 20 ft. below the channel and a distance of 50 ft. on each side of the channel. Pipeline relocation will be assessed by the owners. This relocation/removal of pipeline may cause an impact to Matagorda Bay bottoms and temporary increases in turbidity. No long-term or significant impacts are anticipated from the relocation/removal of these pipelines.

4.6 Soils

Under the TSP the proposed terrestrial upland area PA P1 located south of Alamo Beach on existing agricultural land would be impacted by placement of dredged material. This would cover soils currently used for agricultural purposes. The soil types impacted by this placement are Da (Polacios loam, 0 to 1 percent slopes, rarely flooded), Fr (Francitas clay loam, 0 to 1 percent slopes, rarely flooded), Lo (Livia silt loam, 0 to 1 percent slopes, rarely flooded) and Lv (Livia clay loam, 0 to 1 percent slopes). None of these soils are considered prime or unique farmland. Therefore, the project is in compliance with the Farmland Protection Policy Act.

Possible impacts to surface soils exist from the potential release of petroleum products during construction and hazardous material spills from hazardous cargo during shipping operations. However, the use of best management practices (BMPs) in the project area would minimize the potential for this type of impact.

4.7 Groundwater Hydrology

Construction and operation activities associated with the TSP are not expected to result in impacts to groundwater hydrology. In addition, no groundwater withdrawals are anticipated for the project. No apparent public, private, or industrial water wells registered with the TWDB (2017) would be destroyed and/or affected by the TSP based on their proximal distances and completed depths below surface grade.

The Chicot Aquifer is the surficial aquifer, with the Evangeline Aquifer below. The total thickness of the Chicot Aquifer ranges from approximately 800 to 1,200 ft. Therefore, deepening of the MSC to -47 ft. below MLLW would not penetrate the Chicot Aquifer. No impacts to the Chicot Aquifer would be anticipated.

Possible impacts to the shallow groundwater exist from the potential release of petroleum products during construction and hazardous material spills from shipping interests. However, the use of BMPs in the project area would greatly minimize the potential for this type of impact. BMPs that meet local, State, and Federal requirements would be developed as part of the Spill Response Plan for the project to address potential spills. In addition, packages for hazardous material must conform to standards set by Research and Special Programs Administration (RSPA) of the DOT and the International Maritime Organization (IMO). A carrier accepting hazardous cargo from a shipper or intermediary is obliged to exercise reasonable care to be sure that the shipment has been properly prepared. This obligation exists each time the cargo is handed off during the transportation process. Specific requirements apply to highway, rail, air, and ocean transport. Compliance with these procedures would greatly reduce the risk of impact to the underlying groundwater in the project area.

4.8 Hazardous Material

The potential for encountering impacted material during the construction of the project is limited. Impacts associated with regulated facilities are most likely to be encountered near the source of the contaminants. These sources include, but are not limited to, industry located in the Point Comfort area. According to a review of database records and research of the environmental history of the region, the industrial activity adjacent to Lavaca Bay has caused measurable impacts to the terrestrials and marine environments adjacent to this and adjacent waterways.

The industrial activity adjacent to Lavaca Bay is extensive and primarily related to two large industrial complexes located immediately adjacent to the project. Industrial activity at Alcoa Point Comfort Operation and Formosa has resulted in quantifiable impacts to groundwater, surface water, soil, and sediment. Corrective action performed at both facilities has minimized the potential to encounter media during project construction. In spite of remedial activities, the potential for the project to encounter impacted media remains. The documented areas impacted by previous industrial activity are isolated to the Lavaca Bay adjacent to Point Comfort. According to the regulatory agency database report, the northern extent of the project enters into an area defined as an NPL (Superfund) site. This area has been defined as having been impacted by contaminant releases from the Alcoa facility. Data provided by NOAA delineates elevated levels of mercury within sediment in the vicinity of Dredge Island. The concentrations of mercury within the impacted area range from below detection limits to 2.00 mg/kg.

Due to the prolonged use of portions of the area as military training, the potential of unexploded ordnance within the project area does exist. However, the potential to encounter unexploded ordnance during dredging activity is considered to be quite low. The existing channel has been maintained through maintenance dredging for the last 50 years and there has been no reported incidences of unexploded ordnance encountered in the Matagorda Bay area (USACE, 2001a, 2001b).

4.9 Water and Sediment Quality

4.9.1 Water Exchange and Inflows

The TSP would not have any effect on freshwater inflows, but would to a limited extent modify the tidal exchange of water with the Gulf. There would also be modifications to the tidal movement of water produced by the PA features. With tidal exchange, the main constriction points for water entering and leaving the bay are the inlet at the MSC entrance and at Pass Cavallo. There are no modifications to Pass Cavallo under consideration. Hydrologic modeling suggests the deepening and widening of the Matagorda Ship Channel will have little effect on the tides and waves within Matagorda Bay (See Appendix G for more detail.).

4.9.2 Salinity

One effect of deepening the MSC would be to allow the density current to transport a large volume of higher salinity Gulf water up the bay under certain conditions. The biggest effects are expected to occur following large freshwater inflow events when there is a strong salinity gradient from the upper to the lower bay. In this case, the deeper channel can be expected to reduce the time required for the density current to move higher salinity Gulf water to Lavaca Bay. This can be expected to increase the average salinity in the upper Matagorda and Lavaca Bays. During dry periods when salinity levels are relatively high throughout the bay, density differences would be small and the deeper channel would have relatively little effect.

The MIKE3-FM model was used by Moffatt & Nichol to simulate salinity changes resulting from the TSP. In low flow cases, salinities are up to 30 practical salinity units (PSU) in much of the bay and about 26 PSU in Lavaca Bay. In the median flow simulation, salinities are in the 16-24 range in Lavaca Bay and only get to 30 PSU near the Gulf. In contrast, during the high flow period, all of Lavaca Bay averages less than 10 PSU.

The model predicts salinity increases along the channel. The amount of the salinity increase is greater during times of higher inflow. The largest changes in salinity are predicted to occur fairly rarely – less than 10 percent of the time for most months. At the other end, about a quarter of the time the low flows would be low enough that there is little change in salinity. The median salinity changes should correspond to the flow that is exceeded 50 percent of the time.

4.9.3 Water Quality

Under the TSP, factors that could affect DO include the increase in both water circulation and salinity. The increased tidal activity is primarily associated with the bottleneck removal, which is not part of this project. In general, increased water velocity would contribute to improved mixing and oxygen transport. The increase in salinity along the axis of the MSC will slightly reduce the DO saturation concentration and thus the absolute value by a similar amount. For example, a change in salinity from 20 to 21 PSU would reduce the DO saturation concentration at 25 degrees Celsius (°C) from 7.39 to 7.35 mg/L (Kraus et al., 2006). The magnitude of change is not likely to have a significant effect on the system.

Although there will be more maintenance material placed in Matagorda Bay under the TSP, the source of the material will not change, and the method of placement will not change. Open-bay placement of maintenance material would not occur in Lavaca Bay, and turbidity should decrease somewhat in that bay since the turbidity caused by placement of dredged material would not be added to the natural, wind-and-wave-generated turbidity. Also, the fine material that would have resulted from open-bay placement would not be available for resuspension in the water column. There is the possibility of contamination of the maintenance material by a spill or other event, as there is now, but deepening and widening the channel should increase safety and decrease the probability of a spill. Additionally, the USACE routinely tests the elutriates prepared from maintenance material according to the Inland Testing Manual (ITM, EPA/USACE, 1998) and the RIA (EPA/USACE, 2003) protocols before dredging to ensure that there are no causes for concern. The ITM and RIA provide guidance for testing sediments for in-bay and offshore placement, respectively. Tier I (use of readily available information), Tier II (sediment and water chemistry information, including comparison of elutriates to TWQSs and WQC), and Tier III (bioassays and bioaccumulation testing) testing of elutriates with chemical analyses and water column bioassays indicated no cause for concern. Additionally, significant detrimental environmental effects have not been noted in past maintenance dredging operations are not expected with the TSP.

Open-bay placement of maintenance material will continue in Matagorda Bay, so turbidity impacts there should be roughly equivalent to the No-Action Alternative. Offshore placement of construction material will cause a one-time increase in turbidity at the construction material ODMDS, and offshore placement of future maintenance material will periodically create turbidity, as it does now.

Indicator bacteria are a water quality issue in the bay system. The project will not produce any significant alterations in runoff hydrology, so there should not be any change in runoff-related bacteria levels. However, because indicator bacteria are found in sediments (Fries et al., 2006) and the project will disturb sediments as part of the dredging process, some localized and short-term increases in indicator bacteria concentrations during dredging can be expected.

A similar situation exists for mercury in sediment. While the project will not involve dredging in the areas that have highest mercury concentrations, there will be some amount of resuspension of sediment associated with the construction dredging process, and there is some concentration of mercury in sediments. However, no significant change in ambient or sediment mercury concentrations are expected.

The water quality certificate will be sought from TCEQ following publication of the draft EIS.

4.9.4 Sediment Quality

The TSP could result in the disturbance of bay sediments and subsequently impact the sediment quality in the project area. The primary concern with regard to sediment quality in the project area is mercury. Activities performed as part of the TSP that may potentially disturb bay sediments include dredging, placement of dredged material to build dikes or levees, placement of dredged material within placement areas, and building access channels for moving equipment. There is potential for a change in bay-bottom velocities due to a wider and deeper channel and the actions taken as part of the DMMP.

Alcoa collected soil boring samples approximately every 2 ft. from the mudline, through the consolidated sediment, to the consolidated material. Utilizing data from Alcoa and the procedures outlined in the ITM, mercury concentrations were averaged over a 6 ft. dredge cut. The mercury concentration in the material underlying unconsolidated sediment was assumed to be negligible or, for calculation purposes, 0 mg/kg.

Based on the analysis, all average mercury concentrations were below the remedial action objective of 0.25 mg/kg established for critical habitats (fringe marsh-type) during the remedial investigation of the Alcoa (Point Comfort)/Lavaca Bay Superfund Site. Thus there should be no restrictions on the use of the dredged material.

The area north of Dredge Island (PA ER3/D) was identified as an area of concern following the remedial investigation of the Superfund Site. Alcoa sampling data from 2005 confirmed elevated mercury concentrations in the area. The area is currently undergoing natural recovery by sedimentation. However, the sedimentation rates in the area is lower than rates in the rest of the bay (Alcoa, 1997). Under the TSP, the natural recovery would be enhanced by placement of dredged material over the impacted sediments. No change in surficial sediment quality is expected under the TSP.

4.9.4.1 Placement of Dredged Material

Bay sediments can be disturbed by placement of dredged material and from building dikes/levees to contain the dredged material within the placement areas. There is the possibility that placement of dredged material to build the dikes/levees would displace sediments from underneath the dikes, referred to as a mud wave. Mud waves occur when dredged material is rapidly placed on top of soft, weak sediments exceeding the sediment's bearing capacity. This is a concern in areas where soft sediment is present and where mercury concentrations are elevated because the potential for the exposure of buried mercury. The areas where mud waves might be of concern include PA ER3/D, where dikes/levees have to be placed and that are within areas of historical mercury contamination. According to sediment probing performed in 2006, PA ER3/D has soft sediments with depths ranging from 19 – 62 inches.

Historical data indicate elevated mercury concentrations at depth in PA ER3/D within Lavaca Bay (Alcoa, 1999). Current analytical data show mercury concentrations above 0.5 mg/kg along the shoreline of Dredge Island. Residual elevated mercury concentrations have been found at the surface and at depth. In areas where very soft sediment exists, it may be difficult to avoid creating mud waves during construction of the levees. The issue of exposing sediments with elevated mercury concentrations in these areas has been recognized. Because there is a potential risk of increasing the surface sediment mercury concentration through the disturbance of mercury-impaired sediment, postconstruction sampling for mercury levels will be performed at PA ER3/D. If mercury levels exceed the remedial action objective of 0.5 mg/kg for open-water habitats, then the sediment will be managed in a manner consistent with the Lavaca Bay Superfund Site requirements.

The quality of the maintenance material is not expected to change from the No-Action Alternative. While more maintenance material is estimated with the TSP, the source of the maintenance material will not change and the method of placement will not change in Matagorda Bay. However, the material from the Channel in Lavaca Bay will all be confined. Project actions should increase safety and decrease the probability of a spill. The USACE routinely tests the maintenance material according to the ITM and RIA protocols before dredging to ensure that there are no causes for concern. Past testing of maintenance material with chemical analysis, whole mud bioassays, and bioaccumulation studies has indicated no cause for concern.

4.10 Wetlands and Submerged Aquatic Vegetation

Wetland delineations were performed at Dredge Island (BESI, 2006) within the footprints of PAs ER3/D and P1 (NRCS, 2017). USACE verified the delineations in February 2009. The condition and distribution of wetland types can be affected by changes in depth and frequency of inundations as well as salinity. The physiological tolerances of species with respect to many factors, such as salinity, water depth, and frequency of inundations, determines the species composition of plant communities. However, wetland communities are often classified by salinity characteristics, although the actual salinity ranges vary by location. In general, many species can grow and have higher productivity values under fresher conditions; however, there is competition from more species in the fresh water.

There are no known occurrences of submerged aquatic vegetation (SAV) in the footprint of the proposed dredging or placement of dredged material, so SAV would not be directly impacted by excavation of burial. There may be short-term rises in turbidity and associated reduced water clarity during the channel dredging and placement, but these would not be expected to have any lasting, measurable effect on SAV beds.

The hydrodynamic modeling predicts an increase of <1 PSU in average annual salinity throughout the project area over most of the growing season under low flow conditions. This would not be expected to have a measurable impact on any wetland communities, including SAVs. Although high flow conditions show greater differences in salinities for the TSP, the absolute values would be relatively low, and so would not stress the estuaries SAV beds.

Nonvascular vegetation, such as freshwater algae and free-floating marine seaweed (*Sargassum* spp.) that occur more commonly near outlets to the Gulf should not be impacted. The freshwater algaes are remote from the proposed activities, and sargassum that drifts into the bay from the Gulf would be carried by currents and/or drift away from turbulent areas.

There would no loss of tidal flats expected within the TSP greater than would be expected under the No-Action Alternative. The TSP is predicted to have little effect on both tides and waves. It is unlikely tidal flats would be impacted.

There are no estuarine marshes within the footprint of the widened channel under the TSP, so no direct impacts associated with construction are anticipated. However, placement of dredged material would result in the loss of 21 acres of marsh at PA1 (1.5 acres) and PA ER3/D (19.5 acres). The Habitat Suitability Index (HIS) model for clapper rail (Lewis and Garrison, 1983) was used to estimate impacts and mitigation requirements. The model indicates the loss of 10.8 Average Annualized Habitat Units (AAHUs) from the material placement. The clapper rail model indicated 26 acres of marsh mitigation would be required to achieve a replacement value of 10.9 AAHUs. The estuarine marshes to be impacted have been documented by a wetland delineation on Dredge Island. Impacts are associated with the construction of PA ER3/D.

Changes in salinity predicted by the hydrosalinity model may cause some adjustments in the saline to brackish marshes (i.e., some areas may become more saline or species typical of saline marshes may increase in brackish marshes). However, the salinity ranges provided by the model show less than 1 PSU difference in average annual salinities between the TSP and the No-Action Alternative, and so are not expected to have greater impact on these marshes. They are well within the salinity tolerance for wetland communities. The predicted differences are minor under the low flow conditions, thus no loss or reduction in marsh function is anticipated.

The predicted increases in tidal amplitude with the TSP are minor. It is unlikely there would be any measurable impacts to the vegetation. However, it is possible that vegetation might exhibit minor shifts in distribution in response to elevated water levels, and if there is any response, it would likely be that small parts of high salt/brackish marshes would become low marsh. Since low marshes are generally considered better habitat for fish and wildlife, this would not necessarily be considered a negative impact.

No negative impacts to existing shrub-scrub wetlands are anticipated.

No impacts to fresh-intermediate wetlands are anticipated (including aquatic vegetation) are anticipated either by dredging or placement of material, except 1.5 acres of farmed wetlands at PA 1. The USACE Galveston District determined these acres were jurisdictional based on their adjacency to Lavaca Bay. The impacts to wetlands constitute a significant adverse affect.

4.11 Wildlife

4.11.1 Dredging and Construction

The dredged material would be deposited in one confined upland PA, one confined in-bay PA, one ODMDS, and multiple unconfined in-bay PAs. Construction of these PAs would be unlikely to have a direct impact on wildlife species but may have an indirect impact by affecting the food supply of many terrestrial species. The primary direct adverse impact of the TSP on wildlife would result from the placement of dredged material over the 50-year life of the project. Construction of PA P1 would directly affect approximately 246.5 acres of agricultural land (i.e., rice fields) and 1.5 acres of jurisdictional wetlands. This tract and adjacent areas provide important habitat for a wide variety of migratory bird species, including shorebirds, waders, waterfowl, raptors and songbirds. The mid-coast of Texas, which is located within the Central Flyway for waterfowl, is one of the most significant waterbird wintering regions in North America. Peak populations of duck and geese on this and nearby sites normally exceeds 100,000 birds during the late wintering periods. During migratory periods, the prairies, marshes, and agricultural fields along the Texas Gulf coast provide important stopover habitat for numerous migrating shorebirds, raptors, and songbirds. The consumptive and non-consumptive activities related to these birds provide an important economic resource for the local communities.

Placement of dredged material within this site would result in the direct loss of habitat currently used by many species of shorebirds, waders, waterfowls, raptors and songbirds.

Construction activities in the project area might result in the direct destruction of those organisms not mobile enough to avoid construction equipment. These would potentially include individuals of several species of reptiles, mammals, and if construction occurs during the breeding season, the young of some species, including nesting and fledgling birds. Most wildlife species, particularly adult birds and larger wildlife species, would avoid the initial construction activity and move into available habitat outside the project area. Each species, however, is dependent upon available resources such as food, shelter, water, territory, and nesting sites in any given area of habitat (Dempster, 1975). The availability of these resources determines the carrying capacity for a given area. It is assumed, for the purpose of impact analysis, that habitats are at their carrying capacity for the species in the particular area. Therefore, displaced wildlife populations would be forced into competition with resident populations in adjoining habitats. Temporary, local impacts to terrestrial communities and habitats may occur due to these activities.

Construction of the PAs and associated levees would likely have additional indirect effects on wildlife by affecting aquatic organisms (Section 4.12) that serve as a food source for terrestrial species. Temporary impacts to aquatic communities and habitat from increased sedimentation and turbidity would be expected. This in turn may temporarily impact birds in the area by potentially reducing the availability of their local food supply. Noise and increased human activity during construction may temporarily impact wildlife in areas adjacent to the machinery. These impacts are expected to be minor and short term.

Under the TSP dredged material would be placed in one upland confined PA (PA P1). This area is currently dominated by agricultural land (mostly rice fields). While this area might provide limited wildlife habitat, the conversion of a rice field to a PA is not expected to have a significant impact on local wildlife resources.

While dredging activities are unlikely to have a direct impact on wildlife species, they may have an indirect impact. Such activities may cause temporary impacts to aquatic communities and habitats, which in turn may indirectly impact seabirds in the area by potentially reducing the availability of the food supply. These impacts are local and temporary, and considering the large size of the bay and the mobility of birds, these effects are not likely to be significant. The increased potential for accidental spills of petroleum products, chemicals, or other hazardous materials during dredging activities, however slight, also poses a potential, although very small, threat to the aquatic community, and thus the food source of many coastal birds in the area.

The noise of equipment and increased human activity during dredging activities near shorelines may disturb some local wildlife, particularly, coastal birds, especially during the breeding season. Such impacts, however, would be temporary and without significant long-term implications.

Once the initial dredging activities associated with the project have been completed, only minor additional impacts are anticipated. Maintenance dredging activities would have similar temporary impacts as the initial dredging, but on a lesser scale and for a shorter term. Accidental chemical or petroleum product spills that may occur during dredging operations would pose a potential, albeit minor, threat to the aquatic community, and thus the food source of many coastal birds in the area. Impacts from noise and human activity are unlikely to be a substantial factor, although these impacts may force some mobile species to avoid the immediate vicinity of the project and move into similar adjacent habitats. However, these effects would be short term and no different from impacts associated with current maintenance activities.

4.11.2 Operational Activities

Once the initial dredging activities associated with the project have been completed, little additional impact is expected. Proposed improvements to the MSC are not expected to result in substantial increases in ship traffic. Thus, impacts from noise and human activity are unlikely to be a factor.

Species that can be expected to benefit from increased upland habitat, including wooded areas, for the purposes of cover, foraging, and nesting include, but are not limited to the northern mockingbird (*Mimus polyglottos*), northern cardinal (*Cardinalis cardinalis*), yellow-rumped warbler (*Dendroica coronata*), nine-banded armadillo (*Dasypus novemcinctus*), least shrew (*Cryptotis parva*), northern raccoon (*Procyon lotor*), eastern grey squirrel (*Sciurus carolensis*), eastern fox squirrel (*Scriuris niger*), little brown skink (*Scincella lateralis*), and Texas ratsnake (*Elaphe obsoleta*). Species that would directly benefit from upland herbaceous cover and woodland-edge habitats include eastern meadowlark (*Sturnella magna*), field sparrow (*Spizella pusilla*), white-tailed deer (*Odocoileus virginianus*), northern pygmy mouse (*Baiomys taylori*), eastern narrow-mouthed toad (*Gastrophyne carolinensis*), ornate box turtle (*Terrapene ornata ornata*), Texas spotted whiptail (*Aspidoscelis gularis gularis*), and western coachwhip (*Masticophis flagellum testaceus*). Species that would directly benefit from increased upland territorial range would include the coyote (*Canis latrans*), bobcat (*Lynx rufus*), and common gray fox (*Urocyon cinereoargenteus*).

Species that can be expected to benefit from the increased marsh habitat for cover and foraging include, but are not limited to, the great blue heron (*Ardea herodias*), belted kingfisher (*Ceryle alcyon*), northern pintail (*Anas acuta*), lesser scaup (*Aythya affinus*), American beaver (*Castor canadensis*), swamp rabbit (*Sylvilagus aquaticus*), American alligator (*Alligator mississippiensis*), gray tree frog (*Hyla versicolor*), and southern leopard frog (*Rana sphenocephala utricularia*).

Temporary impacts to aquatic communities and habitat from increased sedimentation and turbidity during maintenance dredging would be expected. This in turn may impact birds in the area by potentially reducing the availability of their food supply. This impact may be more noticeable at sites located near known bird rookeries. However, this impact would differ from the No-Action Alternative only in the duration of activities.

Upland PA P1 would convert 248 ac of agricultural land (primarily rice fields) to an upland dredged material PA. Impacts would be minimized to species utilizing these wetland environments. Although agricultural land may serve some ecological value to selected species, impacts to wildlife would be minimal. The PA would connect to adjacent uplands, which would allow edge and early-successional species to colonize the resulting vegetative community.

PA ER3/D would create approximately 575 ac of in-bay upland habitat. PA ER3/D would provide additional upland habitat by expanding the size of Dredge Island. This would also increase the linear feet of shoreline habitat and bird loafing, nesting, and foraging areas of this island. Terrestrial mammals, reptiles, birds, amphibians, and invertebrates would benefit from this increase, as well as waders, divers, and various shorebirds.

4.12 Aquatic Resources

4.12.1 Recreational and Commercial Fisheries

Temporary and minor adverse effect to recreational and commercial fisheries may result from altering of removing productive fishing grounds and interfering with fishing activity during construction and maintenance dredging. However, no significant impacts to food sources for nekton are likely; therefore, reductions of nekton standing crop would not be expected. Major species of nekton, including sciaenid fishes and penaeid shrimp, should not suffer any significant losses in standing crop. Thus, recreational and commercial fishing would not be expected to suffer from reductions in the numbers of important species.

Repeated dredging and placement operations for channel maintenance may temporarily reduce the quality of recreational and commercial fisheries in the vicinity of construction and dredging operations. This may result from decreased water quality and increased turbidity during dredging as well as from a loss of attractiveness to game fish resulting from loss of benthic prey. This condition is not permanent, and the quality of fishing in the vicinity of the channel and PAs should steadily improve after dredging is completed and would likely be similar to existing maintenance dredging, as described for the No-Action Alternative. Maintenance dredging operations would only cause temporary effects to the immediate area during the proposed dredging process.

During construction dredging, game fish would leave prime recreational fishing areas for more favorable, less turbid locations; however, once construction is completed, conditions would improve and game fish would return to the area. Placement of new work and maintenance material in an existing ODMDS (PA 1) and a new ODMDS (PA O5) may result in a localized effect on recreational and commercial fishing in the area. However, construction activity should not significantly affect overall fishing in the project area. The TSP should enhance habitat for recreational and commercial fishing throughout the Matagorda Bay system and offshore through the creation of marsh habitat and oyster reefs.

A slight increase in salinity is likely to be observed as a result of the proposed channel improvements. However, adverse effects are not expected to occur to community structure or productivity as a result of salinity changes with the TSP. Therefore, impacts to recreational and commercial fish populations are not expected to be significant.

4.12.2 Open-Bay Bottom

The TSP directly affects open-bay bottom by loss of benthic habitat. A total of 4,492 acres (excluding the proposed ship channel) of open-bay bottom will be lost; however, the acreage involved is a small fraction of the total available habitat within the entire system (Table 4.3).

Table 4.3: Acres of aquatic acres impacted

Placement Area	Acres of Bottom Impacted	Creation Type
Proposed Ship Channel	594	None
ER3/D	272	In-bay uplands and upland cap
O5	1600	Offshore placement; topographic relief
In-bay unconfined PAs	2670	Bay bottom

The TSP would alter the benthic habitat through dredging and placement activities. Dredging represents two problems for benthic communities: excavation and placement; however, disposal is more harmful than excavation. Excavation buries and remove organisms, but organisms can recover rapidly and recolonize, whereas placement smothers or buries existing benthic communities. Placement of dredged material may cause ecological damage to benthic organisms in three ways: (1) physical disturbance to benthic ecosystems; (2) mobilization of contaminated sediments, making them more bio-available; and (3) increasing the amount of suspended in the water column (Montagna et al., 1998). Organisms that are buried must vertically migrate or die (Maurer et al., 1986). Maurer et al. (1986) demonstrated that many benthic organisms were able to migrate vertically through 35 inches of dredged material under certain conditions; however, the species present in early successional stages of recovery are not the same as those buried by the dredged material. Although vertical migration is possible, most organisms at the center of the disturbance do not survive, and survivability was shown to increase as distance from the disturbance increased (Maurer et al., 1986). Additionally, if placement is completed before the major recruitment period (late winter or early spring in Texas) for that year, then the recovery will be faster (Armstrong et al., 1987; Ray and Clarke, 1999).

Repeated dredging during biennial maintenance dredging operations may prevent benthic organisms from fully developing (Dankers and Zuidema, 1995). Excavation destroys the community that previously existed but creates new habitat for colonization (Montagna et al., 1998) and can actually maintain high rates of macroinfauna productivity (Rhoades et al., 1978). By repeatedly creating new habitat via disturbance, new recruits continually settle and grow. However, these new recruits are always small, surface-dwelling organisms with high growth rates. Large, deep-dwelling organisms that grow slower and live longer are lost to the areas of repeated excavation. In this way, excavation associated with maintenance dredging many not cause a decrease in production, but rather a shift in community structure (Montagna et al., 1998). Sheridan (1999) found that benthic communities can take anywhere from 18 months to over three years to recover for certain parameters.

Benthic organisms are, in general, able to tolerate a wide range of salinities with community structure and abundance varying over the salinity gradient within an estuary (Armstrong et al., 1987; Longley, 1994). The most abundant benthic assemblages in Matagorda Bay and Lavaca Bay are similar; however, the salinity ranges tend to differ, with Matagorda Bay from 18 to 32 and Lavaca Bay from 5 to 20 (Longley, 1994). Kalke and Montagna (1989) presented a conceptual model of benthic organism dynamics in Texas estuaries. This model shows the relationships between abundance, diversity, and freshwater inflow in Texas estuaries. In general, with a decrease in salinity, abundance of benthic organisms increases and diversity decreases. Likewise, with an increase in salinity, diversity increases and abundance decreases. The increase in salinity from the TSP may shift species composition and abundance; however, this is not necessarily a negative impact and could be positive, depending on the change that occurs.

4.12.3 Oyster Reef

During the construction phase of the TSP, approximately 129.2 acres of oyster reef habitat will dredged during the construction of the channel and 3.4 acres of oyster reefs and habitat would be covered at PA ER3/D. The dredged material is to be placed on top of oyster reefs located in an area of mercury-impacted sediments at PA ER3/D. Use of the American Oyster HSI model (Swannack et al, 2014) found a net loss of 81.3 AAHUs. The model calculated that 133 acres of new oyster reef would 81.6 AAHUs. The 133 acres of oyster reef would be constructed at locations within the Matagorda Bay. Although it is unknown how long the process may take, an oyster reaches the legal size of three inches in about two years, which a good estimate of the amount of time required for a reef to become productive (Hofstetter, 1998). The impacts to the oyster reefs constitute a significant adverse effect.

Indirect effects to oyster reef habitat may result from a higher salinity regime due to the effects of channel improvements. This has the potential to cause an increase in predators such as oyster drills and pathogens such as Dermo (Britton and Morton, 1989). The intensity of Dermo infection increases during the warmer months (August and September) when salinity are greater. With the improved channel, an overall rise of salinity of about 1 to 2 could be expected based on the hydrodynamic salinity model. Numerous studies have been conducted on the effects of temperature and salinity on Dermo. Crosby and Roberts (1990) found that both temperature and salinity increased infection intensity; however, it was demonstrated that temperature was more important. In a laboratory experiment Fisher et al. (1992) also found that temperature was a more important factor than salinity in relation to Dermo infection. Conversely, Craig et al. (1989) surveyed Gulf oysters and found the variation in disease intensity between sites studied had no relationship to temperature. Long-term monitoring in the Gulf by Powell et al. (1992b) showed that long-term climate changes through the years as influenced by El Nino Southern Oscillation may have a significant effect on the presence and intensity of Dermo in this region. Through numerous studies, it is apparent that both temperature and salinity affect Dermo infection on oysters (Maryland Sea Grant College, 1996). Although rising salinities and temperatures have significant control over the intensity of Dermo, there is also a combination of other factors related to oyster health, including availability of food, siltation, current flow, and harvest intensity.

Water column turbidity would increase during project construction and maintenance dredging that could affect survival or growth of oysters. Heavy concentrations of suspended sediment can clog gills and interfere with filter feeding and respiration. Adult oysters are more capable of withstanding such conditions than seed or spat, and during periods of high turbidity can close up tightly for a week or more until normal conditions return (Cake, 1983). Turbidity from the TSP should be temporary and local. The location of oyster populations can gradually shift in response to natural and man-made modifications in the bay system (Britton and Morton, 1989). Therefore, it is likely oyster reefs affected by implementation of the TSP could adjust to new conditions over time. As stated previously, approximately 133 acres of oyster reef would be created by the construction of new reefs within the Matagorda Bay system.

4.12.4 Essential Fish Habitat

All of the federally managed fisheries in and near the Matagorda Bay system utilize estuarine and gulf habitat during some portion of their life cycle for spawning, food, development or protection (GMFMC, 2004). The TSP will have negative impacts, both directly and indirectly, to EFH in the project area. However, it also has the potential to enhance habitat for EFH throughout the Matagorda Bay system and offshore by the creation of marsh habitat and oyster reef. The TSP would temporarily affect EFH by distributing bottom sediments and increasing turbidity in both the marine and estuarine water column in the vicinity of the dredging activity, which can have adverse effects on finfish and shellfish species. Dredging would also directly affect estuarine and Gulf bottom habitats. Although considering the nature of the sediments that would be dredged and the temporary nature of the dredging, these impacts should not be significant.

Unavoidable impacts to EFH would be compensated for through the protection and creation of marshes, increasing the amount of nursery areas, protective habitat, and food sources within the Matagorda Bay estuary. While bay bottom habitat would be lost, the creation of marshes would help offset the effects of this bottom bay habitat loss since marshes provide essential habitat for federally managed species. The loss of oyster reef will indirectly benefit certain federally managed species and their prey given that the mercury-impacted area will no longer be available as habitat. The creation of potential oyster reef habitat could benefit federally managed species and their prey since the new habitat will be located in an unimpacted area.

4.13 Threatened and Endangered Species

Multiple threatened and endangered species were identified from county species lists provided by the USFWS. Inclusion in the list does not imply that a species is known to occur in the project area, but only acknowledges the potential for occurrence. Effect determinations for federally listed species are listed in Table 4.4.

The West Indian manatee is extremely rare in Texas and to date has not been seen in the project area. Potential impacts to the manatee of the proposed work would be indirect and minor. Should a manatee wander into the project area, the greatest threats would be from boat traffic or dredging operations. However, due to its rare occurrence, the project is not expected to have any significant impact on this species.

Piping plovers and red knots are potential winter residents (November – March), and spring and fall migrants in the project area. Piping plovers are known to occur in the project area. Critical habitats occur in the vicinity of the project area. Minor changes in salinity ant tidal amplitude as a result of the TSP are expected to have no impact on the piping plover or red knot. The primary constituent elements (PCEs) of the piping plover critical wintering habitat are those components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing PCEs within the designated boundaries are considered critical habitat. The PCEs found in the coastal areas that support intertidal beaches and flats (between annual low and high tide) and associated dune systems and flats above annual high tide (FR, 2001). No placement of dredged material will occur within areas of designated critical habitat or in areas that include PCEs for piping plover. The designated critical habitat for the piping plover would not be directly affected by construction of dredging activities.

Other federal-listed species, such as the Northern aplomado falcon, least tern, and whooping crane could occur in the project vicinity. These species are not likely to be adversely affected by project activities. The Gulf jaguarondi is listed as potentially occurring in the project vicinity, though there are no known records of the species in the project vicinity and therefore the TSP will not likely adversely affect this species.

It has been well documented that hopper dredging activities occasionally result in the sea turtle entrainment and death, even with seasonal dredging windows, V-shaped turtle-deflector dragheads, and concurrent relocation trawling (NMFS, 2003). Between January 2008 and December 2017, dredging activities within the USACE, Galveston District resulted in 40 lethal takes of sea turtles: 22 green sea turtles, 13 loggerhead sea turtles, and five Kemp's ridley sea turtles (USACE, 2018). Kemp's ridley sea turtles tend to move offshore in December when cooler waters occur, returning with warmer waters in March (NMFS, 2003). Green sea turtles may be found year-round in inshore waters, although in lesser numbers during the winter months, and are known to move into warm waters during the winter months (Shaver, 2000). Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Apart from direct mortality, dredging activities could have an impact on sea turtles through an increase in sedimentation, turbidity, and resuspension of toxic sediments.

Table 4.4: Effect Determinations Summary for the Proposed Matagorda Ship Channel Project.

Common Name	Scientific Name	Dredging	Placement
REPTILES			
Green sea turtle	*Chelonia mydas*	Likely to adversely affect*	May affect, not likely to adversely affect
Hawksbill sea turtle	*Eretmochelys imbricata*	Likely to adversely affect*	May affect, not likely to adversely affect
Kemp's ridley sea turtle	*Lepidochelys kempii*	Likely to adversely affect*	May affect, not likely to adversely affect
Leatherback sea turtle	*Dermochelys coriacea*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Loggerhead sea turtle	*Caretta caretta*	Likely to adversely affect*	May affect, not likely to adversely affect
BIRDS			
Whooping crane	*Grus americana*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Piping plover	*Charadrius melodus*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Red knot	*Calidris canutus rufa*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Least tern	*Sterna antellarum*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Northern aplomado falcon	*Falco femoralis septentrionalis*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
MAMMALS			
West Indian manatee	*Trichechus manatus*	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Gulf coast jaguarundi	*Herpailurus yaguarondi cacomitli*	May affect, not likely to adversely affect	May affect, not likely to adversely affect

*The likelihood of adverse effects (incidental take) of sea turtles due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

The sedimentation may affect food sources for the turtles, and the turbidity could affect primary productivity. However, this would be short term. The increased possibility of chemical or oil spills could pose a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, posthatchlings, and juveniles in the area could be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Other potential impacts as a result of the project include disorientation because of lighting on vessels and increased accumulation of plastic detritus.

Although the loggerhead and green sea turtle have not been recorded nesting the in the study area, these two species have been recorded in the study area (USACE, 2017). The hawksbill and leatherback sea turtles are extremely unlikely to nest in the study area. While nesting in the study area is uncommon, hopper dredging outside of the nesting/emergence season (April 1 to September 30), turning off/lowering/shielding unessential lighting, and use of shielded, low-sodium vapor lights for those that cannot be safely eliminated would reduce the potential disorientation impact. The TSP may affect, but is not likely to adversely affect nesting of the Kemp's ridley sea turtle, loggerhead sea turtle, green sea turtle, and hawksbill sea turtle. The TSP will have no effect on the nesting of the leatherback sea turtle.

Hopper dredging may result in the mortality of Kemp's ridley sea turtles, but no Kemp's ridleys have been reported taken during dredging maintenance operations of the MSC since before October 2008 (USACE, 2018). During the onset of colder waters in December, Kemp's ridley will move away from inshore waters into deeper waters, returning in March with warmer waters, ready to nest on the Texas coast and to forage in tidal passes and bays (NMFS, 2003). Restriction of hopper dredging activities to between December 1 and March 31, whenever possible, would reduce the likelihood of direct mortality. Hopper dredging impacts on sea turtles will be minimized by following the reasonable and prudent measures included in the NMFS BO for construction and the Gulf Regional Biological Opinion (GRBO) for maintenance dredging in the Gulf. No significant impact to Kemp's ridley as a result of this project is anticipated.

The hawksbill sea turtle has not been recorded from the study area, and no hawksbill have been taken during hopper dredging activities in Texas (USACE, 2018). Nevertheless, the proposed hopper dredging activity can be considered as likely to affect the hawksbill sea turtle.

Of the five species of sea turtles occurring in Texas waters, the leatherback sea turtle is the species to likely to be affected by the proposed project because of its rare occurrence and pelagic nature. It is unlikely to occur in the action area and has not been caught in hopper dredges. The proposed hopper dredging activity may affect, but is not likely to affect the leatherback sea turtle.

Sea turtle avoidance measures would include an avoidance plan for hopper dredge impacts to sea turtles. This avoidance plan includes reasonable and prudent measures that have largely been incorporated in USACE regulatory and civil works projects throughout the Gulf for more than a decade. These measures include use of temporary dredging windows, when possible; intake and overflow screening; use of sea turtle deflector dragheads; observer reporting requirements; and sea turtle relocation/abundance trawling.

In summary, for nesting sea turtles (Kemp's ridley, loggerhead, green and hawksbill) the conclusion is "may affect, but is not likely to adversely affect." For nesting leatherback sea turtles the conclusion is "no effect." For hopper dredging activities, the conclusion for the Kemp's ridley, loggerhead, green, and hawksbill sea turtles is "likely to adversely affect", while the conclusion for the leatherback sea turtle is "may affect, but it not likely to adversely affect."

5. CUMULATIVE IMPACTS

The CEQ defines cumulative impacts as those impacts "on the environment which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or persons undertake such actions." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Impacts include both direct effects (caused by the action and occurring at the same time and place as the action), and indirect effects (caused by the action but removed in distance and later in time, and reasonably foreseeable).

Cumulative effects can result from a wide range of activities including the addition of materials to the affected environment, repeated removal of materials or organisms from the affected environment, and repeated environmental changes over large areas and long periods. Complex cumulative effects can occur when different types combine to produce a single effect or suite of effects. Cumulative impacts may also occur when individual disturbances are clustered, creating conditions where effects of one episode have not dissipated before the next occurs (timing) or are so close that their effects overlap (distance).

In assessing cumulative impact, consideration is given to the following:

- the degree to which the proposed action affects public health or safety;
- unique characteristics (physical, biological, and socioeconomic factors) of the geographic area;
- the degree to which the effects on the quality of the human environment are likely to be highly controversial;
- the degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks; and,
- whether the action is related to other actions with individually insignificant, but cumulatively significant, impacts on the environment.

The methodology is consistent with similar Federal projects.

5.1 ASSESSMENT METHOD

The MSCIP EIS follows a traditional cumulative impact assessment method, addressing impacts for a finite set of criteria, comparing projects within the study area to the TSP. Thirteen cumulative impact criteria were identified to evaluate projects relevant to the future condition of the study area (project area and surrounding Calhoun and Victoria Counties). Ten projects were considered.

5.1.1 Evaluation Criteria

Criteria include ecological, physical, chemical, socioeconomic, and cultural attributes, listed in Table 5.1. These parameters were identified as key resources discussed in NEPA documents and project reports, and they form a basis for comparison of other projects in the area with the TSP.

5.1.2 Individual Project Evaluation

Ten past, present, and reasonably foreseeable projects/activities within the study area were determined relevant for this cumulative impacts analysis (in no particular order). These projects are listed in Table 5.2 and are compared to the TSP presented in this EIS.

Table 5.1. Cumulative impacts criteria

Ecological Environment	Physical/Chemical Environment	Socioeconomic Environment
Wetlands	Air Quality	Recreational Fisheries
Benthos	Noise Impacts	Commercial Fisheries
Essential Fish Habitat	Sediment Quality	
Threatened/Endangered Species	Water Quality	

Table 5.2 Past, present, and reasonably foreseeable actions within the Study Area

Past or Present Projects/Activities	Reasonably Foreseeable Projects/Activities
Gulf Intracoastal Waterway	Jetty Stabilization Project
Mouth of the Colorado River	Gulf Intracoastal Waterway Reroute
Formosa Plastics Corporation	Port of Calhoun Expansion
E.S. Joslin Power Station	
Alcoa	
Palmetto Bend Project	
LCRA-SAWS Water Project	

5.2 Reasonably Foreseeable Future Actions

5.2.1 Jetty Stabilization Project

The entrance to the MSC passes through a man-made cut in the western end of Matagorda Peninsula. North and south jetties were constructed in the 1960s on the Gulfward side of the entrance. The purpose of the jetties is to provide reliable and safe navigation through Matagorda Peninsula to local ports. The jetties also protect the man-made cut through the peninsula from scour and erosion. The existing jetty channel is 38 ft deep, 300 ft wide, and about 4 miles long from the Gulf through the jetties to the inner channel.

The USACE, Galveston and New Orleans Districts have completed a jetty stabilization project initial appraisal report for a proposal to stabilize the MSC jetty at the entrance channel (USACE, 2018). In the report, the objectives of the jetty stabilization project are (1) to improve the efficiency and safety of the deep-draft navigation system, and (2) to maintain or enhance the quality of the area’s coastal and estuarine resources. The current proposal is to remove the north and south bottlenecks and flange the bay entrance (USACE, 2018).

The removal of the bottleneck as currently proposed may increase tidal amplitude in the Matagorda Bay system.

5.2.2 Gulf Intracoastal Waterway Reroute

The USACE, Galveston District proposes to reroute the GIWW across Matagorda Bay to provide safety improvements for shipping and reduce maintenance dredging frequency. The proposed alignment crosses the bay about a mile north of the existing channel. Based on barge simulation analysis and modeling, the channel will have a bottom width of 125 ft from Station 0+00 until it approaches the bend at Station 550+00. From that point to Station 585+00, the channel width widens to 847 ft and then narrows to 300 ft to Station 670+00. This will allow for both two-way traffic and safe navigational passage of vessels across strong currents at the MSC. The alignment uses the existing GIWW route on the eastward end for approximately 3.9 miles, then turns westward for 13 miles. Approximately 2.5 mcy of new work material would be dredged during construction, and maintenance dredging quantities are estimated to be 77,500 cy per year (3,875,000 cy for the 50-year life of the project) (USACE, 2002).

A DMMP was designed for each reach of the new channel based on sediment type and quantity. Based on the DMMP, dredged material for Reach 1 will be used to create a test marsh along the shoreline near Palacios Point or will be placed in the surf zone of Matagorda Peninsula. Material from Reach 2 will be placed in the surf zone of Matagorda Peninsula to supply sediment for littoral transport. Material dredged from Reach 3A will be used to create marsh in the bay to the northwest of Port O'Connor and/or pumped in the surf zone along Matagorda Peninsula, depending on the success of a test marsh. The large amount of sand present in new work material and expected from maintenance material in Reach 3B provides the opportunity for beach nourishment. Thus, material from this reach that is not used in marsh creation associated with Reach 3A will be used to nourish Port O'Connor Beach and Sundown Island. Material not suitable for these uses will be placed in the surf zone along Matagorda Peninsula for beach nourishment and littoral transport (USACE, 2002).

The GIWW reroute will impact approximately 350 ac of open-bay bottom from construction of the new channel. Up to 326 ac of bay bottom would be converted to marsh or bird habitat from placement of dredged material. Up to 70 ac of seagrass beds, 295 ac of marsh, and 31 ac of bird habitat could potentially be created in Matagorda Bay as a result of the project (USACE, 2002).

Remote-sensing surveys, including a close-order survey, and coordination with the Texas State Marine Archeologist determined that no cultural resources are present along the proposed channel alignment. Placement areas will be designed to avoid documented shipwrecks and anomalies with signatures similar to that of historic shipwrecks. Thus, no impacts to cultural resources are expected (USACE, 2002).

According to the Finding of No Significant Impact (FONSI) prepared by USACE for the project (USACE, 2002), the following summarizes potential impacts associated with the project:

- Temporary impacts to aquatic habitat, fish, and invertebrates during dredging and placement activities
- Impacts to seagrass, marsh, and terrestrial habitats from pipeline crossings on Matagorda Peninsula
- No significant negative impacts to threatened and endangered species or historic resources
- Temporary impacts to air quality and noise during dredging operations

- No impact to water or sediment quality in Matagorda Bay
- No disproportionate impact to minority, low-income, or Native American tribal populations

Potential benefits resulting from the proposed GIWW reroute include:

- Reduced risk of spills
- Increased productivity in the bay from marsh creation
- Benefits to endangered brown pelican from placement at Sundown Island
- Benefits to threatened piping plover from beach nourishment
- Decreased frequency of maintenance dredging reduces overall effects
- Shoreline erosion protection from marsh creation and beach nourishment
- Potential increase in seagrass beds
- Increased recreational use from beach nourishment at Port O'Connor
- Contributing to littoral drift within the surf zone of Matagorda Peninsula and Island

5.2.3 Port of Calhoun Expansion

Three current facilities are planning, or undergoing, expansion in anticipation of the increase of commodities traffic. Arrowhead Offshore is currently constructing a terminal with 250,000 barrels (bbl) of crude oil storage. This terminal is expected to be completed in June 2018. NorthStar Midstream is currently expanding their storage tank facility to allow for an additional 500,000 to 700,000 bbl. Formosa Plastics is expanding the operations of their chemical plant and is expected to be completed in late 2018.

These impacts and benefits of these expansions are accounted for in the future-with-project conditions taking into account the increase in ship traffic expected with the MSCIP.

5.3 PAST OR PRESENT ACTIONS

5.3.1 Gulf Intracoastal Waterway

On July 23, 1942, Congress authorized enlargement of the Gulf Section of the Intracoastal Waterway from Apalachee Bay, Florida, to Corpus Christi, Texas, for a 12-ft-deep and 125-ft-wide channel. Since that time, many improvements have been made. Impacts to the study area are primarily associated with maintenance dredging activities and include periodic impacts to bay bottom at the dredge and placement sites, temporary increases in turbidity, and potential for sea turtle takes.

5.3.2 Mouth of the Colorado River

The River Diversion Project, constructed in 1989–1992, diverted the flow of the Colorado River to the eastern arm of Matagorda Bay and closed Parker's Cut (Wilber and Bass, 1998). The diversion cut was made to restore inflow from the river into the bay, and thus partially restore the fishery conditions that existed before deltaic growth and related dredging produced the direct discharge of river flow into the Gulf. The primary goal was to benefit bay and Gulf commercial fisheries by improving habitat. This included reducing bay salinities, increasing input of nutrients, and creating new intertidal marsh. The diversion cut has lowered bay salinities by 1.6 ppt (eastern arm of Matagorda Bay) and created intertidal marsh that serve as high-quality nursery area (Bass, 2003). Although dredging of the channel removed 104 ac of intertidal marsh, 305 ac of marsh had been created by 2004 as the new delta developed (LCRA, 2006b). The original EIS (USACE, 1981) predicted the eventual creation of 4,000 ac of new delta before 2100.

An additional 37 ac of viable oyster reef were created. Catch per unit effort (CPUE) and mean length for oysters remained stable. However, the project led to further burial of the remnants of Dog Island Reef, which had already been impacted by river deposits and dredging. The major oyster-producing reefs, Mad Island and Shell Island, are distant enough to avoid or minimize impacts from bacterial contaminations associated with increased inflow and should benefit from decreased occurrences of Dermo, a parasite that thrives in warm, high-salinity, warm-temperature waters.

There has been no change in finfish landings (i.e., Gulf menhaden, striped mullet, spotted seatrout, red drum) (PBS&J, 2005b); however, mean lengths for all species (except red drum) have decreased. Brown shrimp CPUE has increased, and white shrimp CPUE has decreased. There has been an increase in mean abundance of blue crab.

The diversion cut led to increased currents and navigation dangers at the intersection of the river and the GIWW. This has led to proposals to create another cut from the diversion channel to the old channel.

5.3.3 Formosa Plastics Corporation

Formosa currently operates eight plants and a variety of support facilities at an 1,800-ac complex in Point Comfort. Construction of the plant began in 1980, and it was in continuous production by 1983. In 1994 a $1.5 billion expansion was completed at the plant. The facility, which manufactures plastic resins and petrochemicals for a multitude of products and processes, is a major employer in the study area, employing 3,600 people in 2004. The facility was cited for environmental violations in 1990 by the Texas Water Commission and EPA. Violations included improper storage of oil and other waste, cracked wastewater retention ponds, and releases of acidic wastewater into surface water. Groundwater contamination also exists beneath the facility. Corrective action was taken under an EPA enforcement order in 1991 and entered into an EPA Region 6 – Texas Natural Resource Conservation Commission (now TCEQ) Corrective Action Strategy (CAS) pilot project. This was an aggressive program to assist in streamlining the RCRA Corrective Action Process and is a useful approach for facilities willing to commit resources up front to manage risk at their sites. As a result, approximately one-quarter of the cost for the $1.5 billion expansion in 1994 was for environmental protection features.

In addition, a Formosa Plastics Receiving Water Monitoring Program was established in 1993 to monitor the discharge of treated wastewater into Lavaca Bay from the Point Comfort Facility. The objectives of the Receiving Water Monitoring Program are as follows: (1) to establish baseline background conditions in Lavaca Bay in the area that receives the Outfall 001 discharge; (2) to monitor the health and structure of the biological community in the vicinity of the Outfall 001 discharge; (3) to monitor the sediment and water quality in the vicinity of the outfall discharge; (4) to evaluate compliance with the TWQS (TAC Chapter 307); (5) to monitor fish and shellfish tissue constituent concentrations for animals in the vicinity of the outfall discharge to assess any potential human health risks; and (6) to comply with the requirements of the National Pollutant Discharge Elimination System (NPDES) Sampling and Analysis Program. Data collection began in 1993 and is conducted quarterly as required by the TCEQ and the EPA. Over 43 sampling events have occurred, and more than 10 Annual Reports for the

Receiving Water Monitoring Program have been submitted. The results of the monitoring program, to date, indicate that there are no adverse impacts to the health or structure of the biological community in Lavaca Bay. No adverse impacts have been noted in the water and sediment quality of Lavaca Bay in the vicinity of the discharge outfall since discharges first began.

5.3.4 E.S. Joslin Power Station

The E.S. Joslin Power Station generating facility is a 261-MW natural gas–fired facility that began power production in 1971. The facility was shut down in 2004.

The power station was built and activated before it was necessary to obtain an air emissions permit. Instead, several units had been operating under Permit by Rules designed for smaller air emission sources. However, in November 2002 the station did obtain a TCEQ Electric Generating Facility permit that covered the existing parameters for the site at that time, limiting sulfur content in the fuel oil and establishing a NO_x emissions allocation.

Studies were conducted by Central Power and Light Company (Moseley and Copeland, 1971) to assess potential impacts on bay resources from the release of heated effluent from the power station. Baseline field sampling was conducted in Cox Bay for 21 months prior to operation of the facility and postoperation sampling was conducted for 12 months. Sampling was conducted for nekton (i.e., fishes and large, free-swimming invertebrates such as shrimp) and phytoplankton. Environmental temperature ranges for 11 abundant vertebrate and invertebrate species were established, and results indicated no significant decrease in phytoplankton abundance or distribution as a result of power plant operations.

5.3.5 Alcoa

The Alcoa PCO plant currently operates one plant and a variety of support facilities at a 3,500-ac complex in Point Comfort, Texas. The PCO has been producing alumina since at least 1948 and continues today. Other facilities and operations have taken place at the PCO, including chloro-alkali processing from 1966 and into the 1970s, natural gas from 1958 to 1988, and coal tar from 1968 to 1985.

During the chloro-alkali processing operation from 1966 into the 1970s, mercury-laden wastewater was discharged into Lavaca Bay (mercury is involved in the processing). Additional contaminated water may have entered Lavaca Bay through groundwater seepage. In 1988, the TDSHS issued a closure order banning consumption of finfish and crabs due to elevated mercury level in tissues. In 1994, the EPA added PCO contaminated sites to the NPL list and signed an Administrative Order on Consent to conduct a RI/FS under CERCLA.

The RI/FS revealed mercury contamination within the Lavaca Bay System, PCO soils, and groundwater. Within the bay system, the Witco Channel was found to contain 200,000 cy of mercury-impacted sediment. Proposed remediation measures included dredging and disposal of all mercury-impacted sediments within an on-site confined disposal facility on Dredge island. The Witco marsh was also identified as a problematic site due to the high potential for bioaccumulation of mercury in local flora and fauna. Remedial measures of the marsh may include dredging or filling of the site. Bay bottoms in areas north of Dredge Island were also found to have high contamination. Two areas within the PCO were identified to have high mercury levels in soils and are found below the former Witco area and the former chloro-alkali processing areas. These areas will be capped with clays and then crushed rock. Lastly, groundwater below the PCO revealed unsafe mercury levels, and this water will be extracted, treated, and then discharged into Lavaca Bay.

5.3.6 Palmetto Bend Project

The Palmetto Bend Project, which included construction of a dam across the Navidad River, concrete spillway, multi-level river outlet works for water releases, and the impoundment of water in an 11,000-ac reservoir, was completed in 1981. The project uses Lake Texana to regulate flows of the Lavaca and Navidad rivers for supplying municipal and industrial water for Jackson and Calhoun counties, and for recreation and fish and wildlife habitat (U.S. Bureau of Reclamation, 2008).

An EIS was conducted by the U.S. Bureau of Reclamation (1974) to assess potential impacts to area habitats. As a result of the project, the most apparent losses include 16,300 ac of land, 11,000 ac of wildlife habitat, and 47 miles of stream and associated riverine habitat. Conversely, there were gains of 11,000 surface ac of water-oriented wildlife habitat, 11,000 surface ac of freshwater recreational opportunities, and a gain of 40,000 waterfowl using the reservoir (U.S. Bureau of Reclamation, 1974).

5.3.7 LCRA-SAWS Water Project

The LCRA and SAWS have joined together in the LCRA-SAWS Water Project. The goal of the project was to conserve and develop water for the lower Colorado River basin and the San Antonio area in the twenty-first century by conserving irrigation water and capturing excess river flows. Additionally, limited amounts of groundwater would be pumped for use by farmers in the lower Colorado River basin when surface water is lacking. The project can divert up to 1.5 million acre-feet per year (LCRA-SAWS, 2018).

The three main components of the LCRA-SAWS Water Project were:

- Conservation of irrigation water used by rice farmers by improving irrigation canals, leveling farmland with laser technology, and planting higher-yielding and more-water-efficient varieties of rice.
- Construction of off-channel reservoirs in the lower Colorado River basin to store excess surface water during flooding.
- Use of groundwater for agriculture in the Lower Colorado River basin when surface water is lacking.

The project included a 6-year study that began in 2004 to assess benefits and detriments to the community, Colorado River, and Matagorda Bay. The implementation of the proposed LCRA-SAWS Water Project could reduce freshwater inflows into Matagorda Bay. Studies unrelated to the proposed MSCIP are currently under way to assess potential impacts resulting from reduced freshwater inflows in the Matagorda Bay System. It is unknown at this time whether or not changes in salinities would affect marshes, seagrasses, oysters, or other aquatic species and/or habitats in the bay.

5.4 RESULTS

The following sections provide discussion regarding potential cumulative impacts resulting from the

TSP combined with past, present, and reasonably foreseeable actions affecting the study area.

5.4.1 Air Quality

The study area is currently considered an attainment area. Existing industrial facilities in the area are operating within regulated parameters. Temporary impacts from dredging activities have occurred and will continue to occur for maintenance dredging of channels in the bay. Air emissions associated with construction of the TSP and the GIWW reroute may temporarily impact the air quality of the study area. However, with both projects there is potential that maintenance dredging would need to occur less frequently, thus reducing the frequency of maintenance dredging. Therefore, no cumulative long-term impacts to air quality are anticipated.

5.4.2 Noise

Noise receptors are located primarily along the west shoreline in Matagorda Bay. These receptors are far enough away from the MSC and GIWW reroute that ship traffic and dredging operations are not likely to increase noise levels from ambient conditions. Likewise, industrial activities in Lavaca Bay are not likely to impact noise levels at receptors nearest them. Thus, no cumulative impacts to noise are anticipated.

5.4.3 Hazardous Material

Past actions in Matagorda Bay have negatively impacted the bay system. Industrial activity by Alcoa and Formosa has resulted in quantifiable impacts to groundwater, surface water, soil, and sediment. Corrective actions were performed to minimize the potential for encountering impacted media. In addition, there are elevated levels of mercury at Dredge Island due to past releases by Alcoa. Due to prolonged use of portions of the Matagorda Bay area for military training, the potential of unexploded ordnance within the area does exist. However, the potential to encounter unexploded ordnance is considered to be quite low. The beneficial use of construction material to cap contaminated sediments should reduce the probability of future exposure potential. Precaution will be taken to minimize displacement of impacted sediments.

5.4.4 Water Quality

The high mercury levels in sediments, resulting from the Alcoa discharges that led to the Superfund site investigations, caused water quality concerns. However, the water quality in the area is good, and should not be negatively impacted by the proposed dredging and dredged material placement. While the Colorado River Diversion lowered the salinity in the eastern arm of the bay system, there will be some increase in the salinity in the bay system with the present project. The beneficial use of construction material to cap high-mercury-content sediments should reduce the probability that these sediments will impact water quality by being suspended in the water column.

5.4.5 Sediment Quality

As noted in subsection 3.9.4, as a result of discharges by Alcoa, there are wide areas of Lavaca Bay where the mercury concentrations in sediments are high, but none of these sediments will be dredged for the proposed project. However, 698 ac of these sediments will be capped by the beneficial use of construction material, reducing the chance of contact with these sediments by epibenthic organisms and the chance of resuspension from disturbances such as wave action or boating.

5.4.6 Wetlands and Submerged Aquatic Vegetation

Past actions in Matagorda Bay have negatively impacted wetland habitat within the system. However, recent and future actions are subject to regulatory authority and impacts would be mitigated. Additionally, although the Colorado River diversion project impacted about 104 ac of wetland, it is expected to create 4,000 ac of wetland habitat by 2092 as the new river delta builds. Planned projects in the bay are expected to impact approximately 60 ac of wetland and create about 905 ac, resulting in a net increase in wetland acreage in the bay. Potential changes in salinity and tidal amplitude due to the TSP and the USACE jetty stability project, combined, could result in a transition of marshes from freshwater to saline/brackish marshes.

Over 5,000 ac of bay bottom would be impacted in the bay. These impacts could result in the loss of SAV. However, approximately 325 ac of sand platform is expected to be created as a result of the GIWW reroute. This sand platform is likely to recruit seagrass. Thus, no significant cumulative impacts to SAV in Matagorda or Lavaca bays are expected.

5.4.7 Recreational and Commercial Fisheries

Past projects in the study area have resulted in impacts to fisheries in the Matagorda Bay system. There have been consumption bans on certain finfish and shellfish because of the mercury spill in Lavaca Bay, and decreases in CPUE have been noted. Additionally, although the GIWW resulted in a benefit for navigation access to the area, the Colorado River diversion resulted in increased currents and navigational hazards where the diversion channel meets the GIWW. None of the proposed future projects are expected to impact commercial or recreational fisheries in the study area. However, it should be noted that the net increase in marsh habitat expected in the bay could result in increased productivity, providing a benefit to fisheries in the bay.

5.4.8 Benthos and Oyster Reef

Information available at the time of this analysis for each of the past, present, and reasonably foreseeable projects in the study area indicated that greater than 9,358 ac of bay bottom was or will be directly impacted by 2092. This includes the loss of bay bottom associated with the diversion of the Colorado River, which is expected to continue to build marsh habitat as the delta builds. Approximately 5,900 ac would be or have been directly impacted by dredging operations. Organisms living in the benthos recover fairly quickly following a disturbance. However, the benthos in areas periodically disturbed for maintenance dredging, such as the GIWW and MSC, never fully returns to the pre-disturbed benthic fauna. Impacts to oyster reef associated with the proposed project are mitigated for by creating 133 acres of new oyster reef. The proposed GIWW reroute project was expected to result in the conversion of 305 ac of bay bottom to marsh and create 70 ac of seagrass habitat by 2004, and a total of 4,000 ac of marsh are expected to be created by 2092. Thus, although several acres of open-bay bottom are impacted, habitat created or protected in the bay is expected to increase productivity and potentially benefit the health of the bay system.

5.4.9 Essential Fish Habitat

Although past, present, and reasonably foreseeable projects have or will impact EFH in the bay, as noted above, the creation, enhancement, or protection of more-productive habitats, such as marsh and seagrass beds, would benefit these species by providing productive feeding and potential nursery grounds. Thus, cumulative impacts to EFH are not expected to be significant.

5.4.10 Threatened and Endangered Species

In the past, actions that occurred in the study area have resulted in negative impacts to protected species. Hopper dredging activities have resulted in the take of three loggerheads, two Kemp's ridleys, and one green sea turtle in the entrance channel to the MSC since October 1996 (USACE, 2017). However, over time, mitigation measures applied to dredging activities and habitat creation, enhancement, and restoration activities resulting from enforcement of the ESA and other regulatory programs and conservation efforts have assisted in an increase in sea turtle populations in the area, particularly for Kemp's ridley (NPS, 2018). Due to past mitigation measures and the associated increase in sea turtle populations, it is reasonable to expect that hopper dredging activities associated with the

TSP for both construction and maintenance could result in the take of protected sea turtles. However, many of the mitigation measures proposed for the TSP and other reasonably foreseeable future actions discussed here would result in the creation of marsh and seagrass habitat that would increase the productivity within the bay beyond existing conditions. The increased productivity may be beneficial to sea turtles in the area. Because hopper dredges would not be used during the GIWW Reroute or the Jetty Stability project, no take of sea turtles is expected from these activities.

Shoreline erosion and increases in tidal amplitude over time have negatively affected habitat in the Matagorda Bay system, including habitat that may have previously supported piping plovers and other shoreline birds. Critical habitat for the piping plover is present in the study area, including on Matagorda Peninsula where the MSC enters Matagorda Bay. The Jetty Stabilization Project could result in impacts to that habitat. On the other hand, placement of beach-quality material from the GIWW Reroute on Matagorda Peninsula and Sundown Island could result in additional potential habitat for the piping plover. The Kemp's ridley sea turtle has nested on Matagorda Peninsula and Matagorda Island (NPS, 2018). Thus, placement of beach-quality material on Sundown Island, providing such placement follows USFWS guidelines, may be beneficial to nesting sea turtles.

5.5 CONCLUSIONS

Cumulative impacts due to past, existing, and reasonably foreseeable future projects, along with the TSP, are not expected to have significant adverse effects to resources in the study area. The majority of impacts associated with these projects would be temporary, and some result in positive impacts for the area. Existing governmental regulations, in conjunction with the goals and coordination of community planning efforts, address the issues that influence local and ecosystem-level conditions. Resources in the area are provided some protection through the coordination of the numerous stakeholder groups, local organizations, and State and Federal regulatory agencies, and through regulations such as the Texas Coastal Management Program (TCMP), the Clean Water Act, and the Clean Air Act. This coordination and regulation of resources should prevent or minimize negative impacts that could threaten the general health and sustainability of the region.

Several of the projects included in the analysis involve dredging operations, which result in temporary impacts such as increased turbidity and air emissions and long-term impacts such as impacts to bay bottom. As described above, there would be a net increase in the productivity in the bay system as a result of mitigation associated with many of the proposed or ongoing projects. Overall, this would benefit the bay. Perhaps the most substantial impact would be potential for increased salinity and tidal amplitude in the bay, which could affect shoreline habitat. However, as previously discussed, the expected salinity changes are not outside the normal ranges for the species present in the system and changes in tidal amplitude are fairly minor.

6. CONSISTENCY WITH OTHER STATE AND FEDERAL LAWS

The following sections summarize actions being taken in this study to comply with various statutes applicable to Federal study or project.

6.1 Clean Air Act

The Clean Air Act (CAA) contains provisions under the General Conformity (GC) Rule to ensure that actions taken by Federal agencies in air quality nonattainment and maintenance areas do not interfere with a state's plans to meet national standards for air quality. Under the General Conformity Rule (the Rule), Federal agencies must work with state, Tribal and local governments in a nonattainment or maintenance area to ensure Federal actions conform to the air quality plans established in the applicable state or tribal implementation plan. The regulations codifying the Rule under 40 CFR Part 93, Subpart B, specify that no Federal agency shall engage in, or provide financial assistance for any activity which does not conform to an applicable implementation plan.

Appendix B, Section 4.1 of this DIFR-EIS discusses the conformity demonstration requirements that will be necessary in the next planning phase, once the TSP has been refined. An estimate of construction emissions will be conducted in the next planning phase to determine if the de minimis thresholds applicable to the Corpus Christi-Victoria AQCR for the ozone precursors NO_x and VOCs under this rule would be exceeded. The Corpus Christi-Victoria AQCR is currently in attainment status for all NAAQS.

It is not anticipated emissions would be above de minimis requiring a Formal Determination of Conformity. A Draft GCD would be prepared to help determine if emissions that would result from construction of the proposed action are in conformity with the Texas State Implementation Plan (SIP) for the Corpus Christi-Victoria AQCR and consultation and coordination with the TCEQ and the EPA would be initiated. The Draft GCD will be publicly coordinated in accordance with 40 CFR Part 93, and a Final GCD, with the results and details of the air conformity threshold analysis issued after the coordination and required public noticing and comment period. A public notice of availability for the Final GCD will also be published as required by 40 CFR Part 93.

6.2 Clean Water Act

Section 404 of the CWA regulates dredge and/or fill activities in U.S waters. The proposed action would require dredging in U.S. waters. Since 1989, the USACE and EPA have implemented policy under the Section 404 program to achieve a Presidential goal of “no net loss” of wetlands. This program is responsible for ensuring the Administration’s policy regarding “no net loss” of wetlands by requiring permit applicants to make every effort to avoid and minimize aquatic resource impacts, and provide compensatory mitigation to offset any permitted impacts. Therefore, impacts to wetlands and achieving no net loss of wetlands are important factors in complying with the CWA. No wetlands would be impacted by the TSP channel modifications. Placement of dredged material will impact 21 acres of fresh and brackish marsh (See Appendix B, Enclosure 1 – Mitigation Appendix).

The regulations implementing the CWA Section 404 also include the mandatory guidelines developed to implement Section 404(b)(1) which prescribes procedures for specifying dredged material disposal sites and determining the suitability of dredged material for disposal. An extensive review of existing past maintenance and new work sediment testing data covering the MSC was performed to determine the next steps in applying the procedures pursuant to USACE Regulatory Guidance Letter (RGL) 06-02, the Section 404(b)(1) guidelines, and the related joint testing manuals developed for them, including the Upland, and Inland Testing Manuals, as needed and appropriate, for the placement methods and sites selected during the development of the DMMP for the TSP. A draft 404(b)(1) Evaluation Form for the TSP channel modifications and DMMP has been prepared and will be released concurrent with the release of the Draft EIS.

6.3 Section 103 of the Marine Protection, Research, and Sanctuaries Act

Section 103 of the Marine Protection, Research, and Sanctuaries Act (MPRSA) prescribes regulations, procedures, and evaluations applicable to Federal projects for the disposal of dredged materials in offshore waters. The currently permitted Offshore Dredged Material Disposal Site (ODMDS) has been identified as one of the existing placement areas in the Matagorda Bay system that will be considered for maintaining TSP features. New work Material from the existing channel is approved to be placed in the ODMDS. It is expected that maintenance material from the TSP improvements directly adjacent to the existing MSC in this reach is similarly of suitable quality and would be approved for placement there. This necessary testing to establish suitability according to the Ocean Testing Manual will be identified and performed in later planning phases and coordination with EPA Region 6 will be conducted to verify the suitability.

6.4 Section 7 of the Endangered Species Act

The Endangered Species Act (ESA) provides a program to conserve threatened and endangered plants and animals, and the habitats in which they are found. The lead agencies for implementing and administering it are the USFWS and the NMFS. The Act requires Federal agencies to consult with the USFWS and NMFS, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of designated critical habitat of listed species. The Act also prohibits any action that causes an avoidable "taking" of any listed species of endangered fish or wildlife.

Compliance with the Endangered Species Act (7 U.S.C. 136; 16 U.S.C. 460 et seq.) is being coordinated with the USFWS and the National Oceanic and Atmospheric Administration (NOAA) for those species under their respective jurisdictions. A final BA will be included with the public release of the DIFR-EIS. The USACE has provided a copy of the BA to the USFWS and NOAA. Formal consultation with USFWS is being initiated. Discussions with NOAA have confirmed that the BO issued for the MSCIP study in 2009 is still valid and reinitiation is not necessary unless the impacts change significantly.

The BA covers the proposed action of the TSP channel modifications and the DMMP. The determination of may affect, but not likely to adversely affect, was made for sea turtles with respect to placement of material. The determination of may affect, but not likely to adversely affect, was made for leatherback sea turtle, but a determination of likely to adversely affect was made for sea turtles with respect to dredging. The existing ODMDS offshore placement site approved under MPRSA is located in the Sargassum critical habitat designated in 2014 for the Loggerhead turtle, which is essentially offshore Gulf waters from the 10 meter contour. The conditions placed on dredging within the MSC are identical to those for avoiding loggerheads in their critical habitat. Discussions with NOAA have indicated that this will not be cause for reinitiation of consultation.

The determination of may affect, but not likely to adversely affect, was made for whooping crane, piping plover, red knot, least tern, northern aplomado falcon, West Indian manatee, and Gulf Coast jaguarundi with respect to both dredging and placement of material.

Though it is not likely that West Indian manatee, and the other listed marine and shorebird species would be encountered within the TSP project area, their presence in the area is possible. An advisory for construction contractors to be aware of their possible presence, and contact numbers to immediately call in case of contact with any of these species for the USFWS's Corpus Christi Coastal Ecological Services Field Office in the case of listed shorebirds, or the Marine Mammal Stranding Network in the case of a turtle or manatee, will be added to the USACE contract specifications for this project.

Best management practices would be utilized, to the maximum extent practicable, to avoid project construction impacts to any T&E species or their critical habitat within the project area. The USACE will continue to closely coordinate and consult with the USFWS and the NMFS regarding T&E species under their jurisdiction that may be potentially impacted by implementing the proposed action. Consultation will not be considered complete until the Record of Decision is signed.

6.5 Magnuson-Stevens Fishery Conservation and Management Act

The MSFCMA (PL 94-265), as amended, establishes procedures for identifying EFH and required interagency coordination to further the conservation of federally managed fisheries. Regulations codifying the Act in 50 CFR Sections 600.805–600.930 specify that any Federal agency that authorizes, funds, or undertakes, or proposes to do, an activity that could adversely affect EFH, is subject to the consultation provisions of the Act and identifies consultation requirements. EFH consists of habitat necessary for spawning, breeding, feeding, or growth to maturity of species managed by Regional Fishery Management Councils (RFMC) in a series of FMP. The GMFMC is the RFMC applicable to the project location. EFH is designated for the project area in which the TSP is located. Consultation with NMFS had been initiated

6.6 Section 106 of the National Historic Preservation Act

Compliance with the National Historic Preservation Act of 1966, as amended, requires identification of all National Register of Historic Places (NRHP)-listed or NRHP-eligible properties in the project's APE and development of mitigation measures for those resources adversely affected in coordination with the Texas SHPO and the Advisory Council on Historic Preservation (ACHP).

6.7 Coastal Zone Management Act

The CZMA of 1972, as amended, provides for the effective management, beneficial use, protection, and development of the resources of the nation's coastal zone. The CZMA directs Federal agencies proposing activities within or outside of the coastal zone that could affect any land or water use or natural resource of the coastal zone, to assure that those activities or projects are consistent, to the maximum extent practicable, with the approved State programs. The Texas Coastal Management Program is the State entity that participates in the Federal Coastal Zone Management Program created by the CZMA. The TCMP designates the coastal zone and coastal natural resource areas (CNRA) requiring special management in that zone, including coastal waters, waters under tidal influence, coastal wetlands, submerged lands and aquatic vegetation, dunes, coastal historic areas, and other resources. The following CNRAs are found in the vicinity of the TSP and PAs:

- Water under tidal influence – Matagorda Bay waters
- Waters of the Open Gulf of Mexico – ODMDS
- Submerged land – Matagorda Bay bottom in the project area.
- Hard substrate reefs and oyster reefs – Hard-bottom habitat and oyster reef discussed in Section 4.12.3
- Special hazard areas – Floodplain areas mapped by the Federal Emergency Management Agency (FEMA) as special hazard areas Zone AE and floodway, and Zone VE are located in the MSC as discussed in Section 6.12.
- Coastal shore areas – Areas 100-ft landward of the highwater mark on submerged lands, which includes land surrounding the entrance channel and along the shorelines of Matagorda Peninsula, Matagorda Bay and Lavaca Bay.
- Coastal historic areas – Onshore historical markers and archaeological sites adjacent to the channel. Architectural surveys within the TSP's Area of Potential Effect (APE) will be conducted as needed to determine presence of submerged cultural resources.
- Coastal wetlands – Estuarine wetlands (salt water marsh etc.) discussed in Section 4.10.
- Submerged aquatic vegetation – Channel area is not characterized as having large expanses of SAVs.
- Coastal barriers – The TSP is not directly located in any designated coastal barrier.
- Gulf beaches – The Matagorda Peninsula contains Gulf beaches, though no dredging or placement will take place there.
- Critical erosion areas – The shoreline from Chocolate Bay to Powderhorn Lake is listed as eroding per latest Texas Bureau of Economic Geology data.
- Tidal sand or mud flats – Tidal sand flats located between and around the fringes of existing PAs 14 and 15 or unarmored shoreline.
- Coastal preserves – Welder Flats Coastal Preserve is located in the study area, though not within the TSP.

Of these CNRAs, the first five are found in the TSP and DMMP footprint. All other CNRAs would be avoided. Changes in 2012 to the TCMP resulted in the Coastal Coordination Advisory Committee (CCAC) replacing the previous Coastal Coordination Council (CCC). The CCAC is composed of several State agencies and local officials, to advise the TxGLO Commissioned on administering the TCMP. The TCMP reviews all Federal actions that may affect natural resources in the coastal zone for consistency with the Federal goals and objectives. The Federal Agency proposing the action prepares a Consistency Determination for review by the TxGLO for consistency with the TCMP. An in-progress Statement of Compliance with the TCMP has been prepared and will be delivered to the TxGLO.

6.8 Fish and Wildlife Coordination Act

The USACE's proposed action under the TSP is being coordinated with the USFWS, NMFS, TPWD and other State and Federal resource agencies through resource agency meetings being held for this study, and additional coordination and consultation. Additionally, the USFWS, NMFS and TPWD will be sent copies of the DIFR-EIS for review and comment during the agency and public review period. Pursuant to Fish and Wildlife Coordination Act (FWCA), the USFWS provided a draft Planning Aid Letter (PAL) to assist with the planning of the proposed project by providing comments and recommendations related to impacts on fish and wildlife resources. A copy of the PAL is provided in Enclosure 5 of this appendix. The Coordination Act Report will be completed following the TSP.

6.9 Marine Mammal Protection Act of 1972

The Marine Mammal Protection Act (MMPA) was passed in 1972 and amended through 2007. It establishes a moratorium on the taking and importation of marine mammals and marine mammal products by persons subject to the jurisdiction of the U.S, with certain exceptions. The definition of “persons” also includes any officer, employee, agent, department, or instrumentality of the Federal Government. The Act is intended to conserve and protect marine mammals and it established the Marine Mammal Commission, the International Dolphin Conservation Program, and a Marine Mammal Health and Stranding Response Program. Review and consultation for the MMPA is also triggered via the ESA when actions involve marine mammals.

The only marine mammals covered under the MMPA expected to regularly be present in Matagorda Bay are bottlenose dolphins (*Tursiops truncatus*). These are highly mobile species that would be able to readily avoid dredging activities and vessels. As avoidance of the area would be only during construction, and there is an abundance of similar habitat within the area, the proposed action would have minimal and temporary impacts, by way of disturbance, to the individuals present.

6.10 Federal Water Project Recreation Act

This Act directs ". . . that . . . in investigating and planning any Federal navigation, flood control, reclamation, hydroelectric, or multipurpose water resource project, full consideration shall be given to the opportunities, if any, which the project affords for outdoor recreation." Any such features are subject to cost sharing with the beneficiaries of the recreational feature.

6.11 Farmland Protection Policy Act of 1981 and the CEQ Memorandum Prime and Unique

The purpose of the Farmland Protection Policy Act is to minimize the extent to which Federal programs contribute to the unnecessary and irreversible conversion of farmland to nonagricultural uses. The act requires among other things, agencies to identify and take into account the adverse effects of Federal programs on the preservation of prime and unique farmlands, and consider alternative actions, as appropriate that could lessen such adverse effects. The CEQ issued a memorandum “Analysis of Prime and Unique Agricultural Lands in Implementing the National Environmental Policy Act” that supplemented NEPA procedures to include analysis of these impacts in NEPA documents. The regulation codifying the Act in 7 CFR Part 658 specified procedures and criteria for the analysis of these impacts. The definitions in this regulation specify that farmland does not include land already used as water storage, which would include open water. The TSP channel modifications are entirely in open water.

No terrestrial resources other than very small amounts of urbanized, disturbed land at the channel margins are impacted by the TSP channel modifications, and therefore, no prime or unique farmlands would be affected. Placement area PA/P1 is in an agricultural area, but no prime or unique farmland, as determined by soil survey maps, is present within the placement area.

6.12 Executive Order 11988, Floodplain Management

This EO directs Federal agencies to avoid possible impacts associated with the modification of floodplains and to avoid support of floodplain development wherever there is a practicable alternative. In carrying out the activities described above, each agency has a responsibility to evaluate the potential effects of any actions it may take in a floodplain associated with the one percent annual chance event.

The TSP is in sections of the Calhoun County Coastal Project Area and Matagorda Bay mapped by the Federal Emergency Management Agency as either subject to inundation by the one percent annual chance event (Zone AE) or floodways designated for Zone AE, or coastal flood zone with velocity hazard (Zone VE). As discussed in Appendix G, the TSP is not expected to have substantial hydrodynamic impacts including tidal variations or surge conditions, based on recent modeling studies for other channel modification projects, which will be confirmed by hydrodynamic modeling in the next planning phase.

6.13 Executive Order 11990, Protection of Wetlands

This EO directs Federal agencies to avoid undertaking or assisting in new construction located in wetlands, unless no practical alternative is available, and the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use. The EO directs agencies to take such actions in carrying out its responsibilities in (1) acquiring, managing, and disposing of Federal lands and facilities; and (2) providing federally undertaken, financed, or assisted construction and improvement; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities. As discussed in Section 6.9.2, the CWA Section 404 program is responsible for ensuring the Presidential policy to achieve “no net loss” of wetlands. This EO further strengthens the commitment for Federally-implemented and permitted projects to achieve no net loss of wetlands, primarily through avoidance of impacts. Therefore, impacts to wetlands and achieving no net loss of wetlands are important factors in complying with this EO. The TSP channel modifications would not impact any wetlands. The placement of dredged material will impact 21 acres of marsh lands. Twenty-six acres of marsh mitigation will be done in accordance with ER 1165-2-27 (Establishment of Wetland Areas in Connection with Dredging).

6.14 Executive Order 12898, Environmental Justice

This EO directs Federal agencies to determine whether their programs, policies, and activities would have a disproportionately high or adverse effect on minority or low-income population groups within the Project Area. Most of the project area is in the open waters of Matagorda Bay and the industrial part of the MSC, with large, relatively sparsely populated census tracts (due to the land use and water). As documented in Section 2.8.1, examination of the census where populated land was closest to the TSP indicated an average of 51 percent minority and an average median household income of $22,939 in Matagorda County, slightly below the state average. These blocks would be closest to the TSP footprint where direct effects experienced would be their greatest. Given the income and percent minority of those blocks, an EJ issue would not be expected. Therefore, the proposed action is not expected to have any disproportionately high or adverse effect on low-income or minority population groups.

6.15 Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds and the Migratory Bird Treaty Act

This EO directs Federal agencies to increase their efforts under the Migratory Bird Treaty Act, Bald and Golden Eagle Protection Acts, Fish and Wildlife Coordination Act, the ESA of 1973, NEPA of 1969, and other pertinent statutes to avoid or minimize impacts on migratory bird resources. The 2006 Memorandum of Understanding (MOU) between the DOD and the USFWS developed pursuant to this EO lists activities covered under the purpose and scope of the MOU, including natural resource management activities. The EO directs DOD to encourage incorporation of comprehensive migratory bird management objectives in the preparation of DOD planning documents, including NEPA analyses. The EO also directs DOD to, prior to starting any activity likely to affect migratory birds populations, 1) identify the species likely to occur in the area of the proposed action and determine if any species of concern could be affected by the activity, 2) assess and document the effect of the proposed action on species of concern through the NEPA process when applicable, and 3) engage in early planning and scoping with the USFWS to proactively address conservation, and initiate appropriate actions to avoid or minimize the take of migratory birds.

The proposed action is not expected to permanently impact migratory bird populations. Options to avoid migratory and nesting bird impacts may include adjusting the construction timeline to accommodate the nesting season or re-sequencing construction activities to work in areas where no active nests are present. Maintenance dredged material placement cycles in these and other PAs have been conducted successfully with minimal disturbance to migratory species.

6.16 Executive Order 13045, Protection of Children from Environmental and Safety Risks

This EO mandates that federal agencies identify and assess disproportionate environmental health and safety risks to children, and ensure that its policies, programs, activities, and standards address them. “Environmental health risks and safety risks” are defined as risks to health or safety that are attributable to products or substances that the child is likely to come in contact with or ingest, such as air, food, drinking or recreational use of water, soil children may live on, and products they use or are exposed to. The proposed action of building the TSP was evaluated for disproportionate effects towards children. Construction dredging of the TSP and the associated temporary ambient air and noise emissions will not have an impact that particularly targets or disproportionately affects children given the distance and general nature of the temporary impacts. Therefore, there would be no disproportionate effects on children due to environmental health or safety risks.

7. ANY IRREVERSIBLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES INVOLVED IN THE IMPLEMENTATION OF THE TSP

The labor, capital, and material resources expended in the planning and construction of the TSP would be irreversible and irretrievable commitments of human, economic, and natural resources. Material resources would chiefly be the fuel spent in dredging, and the minor portion would be steel and concrete for the few structural components of the TSP, such as sheet piling and mooring dolphins. These commitments would be a relatively minor portion of the available material resources. The commitment of economic resources would be for a plan analyzed to reasonably maximize NED benefits to the Nation, producing more in net annual benefits than cost, as demonstrated in the economic analysis for this study. The oyster reef, an impacted fisheries resource, would be mitigated, and would therefore be replaceable.

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Enclosure 1 – Ecosystem Mitigation

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects

Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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Contents

List of Figures

List of Acronyms

DMMP Dredged Material Maintenance Plan

HSI Habitat Suitability Index

MLLW Mean Low Low Water

MSC Matagorda Ship Channel

1. INTRODUCTION

The Matagorda Ship Channel (MSC) extends from the Port of Port Lavaca-Point Comfort Turning Basin in Lavaca Bay through the Matagorda Bay and extends into the Gulf of Mexico via the Matagorda Peninsula. The current length of the ship channel is approximately 26 miles (Figure 1). The in-bay channel is authorized to a current depth of -38 feet Mean Low Low Water (MLLW) with a bottom width of 200 feet. The Entrance Channel is maintained at -40 feet MLLW.

The MSC Project would widen the in-bay channel to 350 feet and deepen the channel to -47 feet MLLW. The Entrance Channel would be widened to 600 feet and deepened to -47 feet MLLW.

The purpose of this appendix is to discuss conceptual mitigation procedures for the unavoidable impacts to habitat from the proposed project. This appendix describes the impacts to each habitat type and describes the compensation calculated for these losses.

2. PROJECT IMPACTS

Dredging operations required for the proposed Matagorda Ship Channel Project would convert open bay bottom and offshore bottom to deep water habitats in the channel and remove oysters present on the side slope of, and areas adjacent to, the existing channel. Placement of materials dredged from the channel, during both initial construction and in subsequent maintenance dredging, would displace additional bay bottom and cover some areas of existing intertidal marsh, farmed wetland, and oyster reef (Figure 1). There are no anticipated impacts to submerged aquatic vegetation from the MSC Project. The design of placement areas and placement of new work and maintenance material are discussed in the Dredged Material Management Plan (DMMP) (Appendix F).

2.1 Impacts to Low Marsh

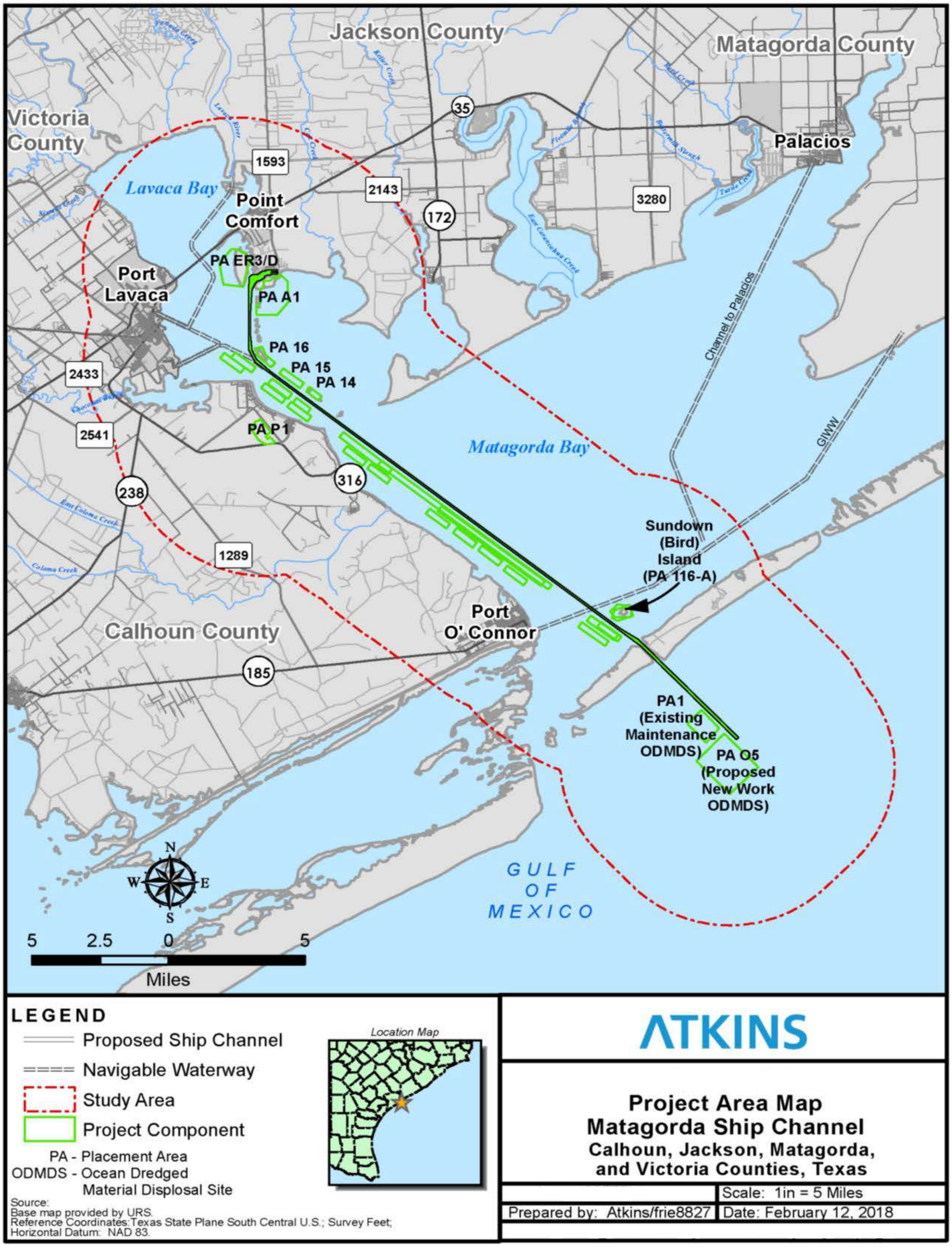
Low intertidal marsh communities are those marsh areas regularly inundated by daily tides and support nearly monotypic stands of smooth cordgrass (*Spartina alterniforma*). Low marshes transition to high marsh as elevation increases and tidal inundation decreases.

For the proposed project, 1.1 acres of low marsh would be impacted at placement area ER3/D (Figure 2). Low marsh area in ER3/D was delineated in the field (BESI 2006). Any marsh impacted on existing placement areas would not require mitigation for the placement of materials, as the areas are currently designated for that use.

2.2 Impacts to High Marsh

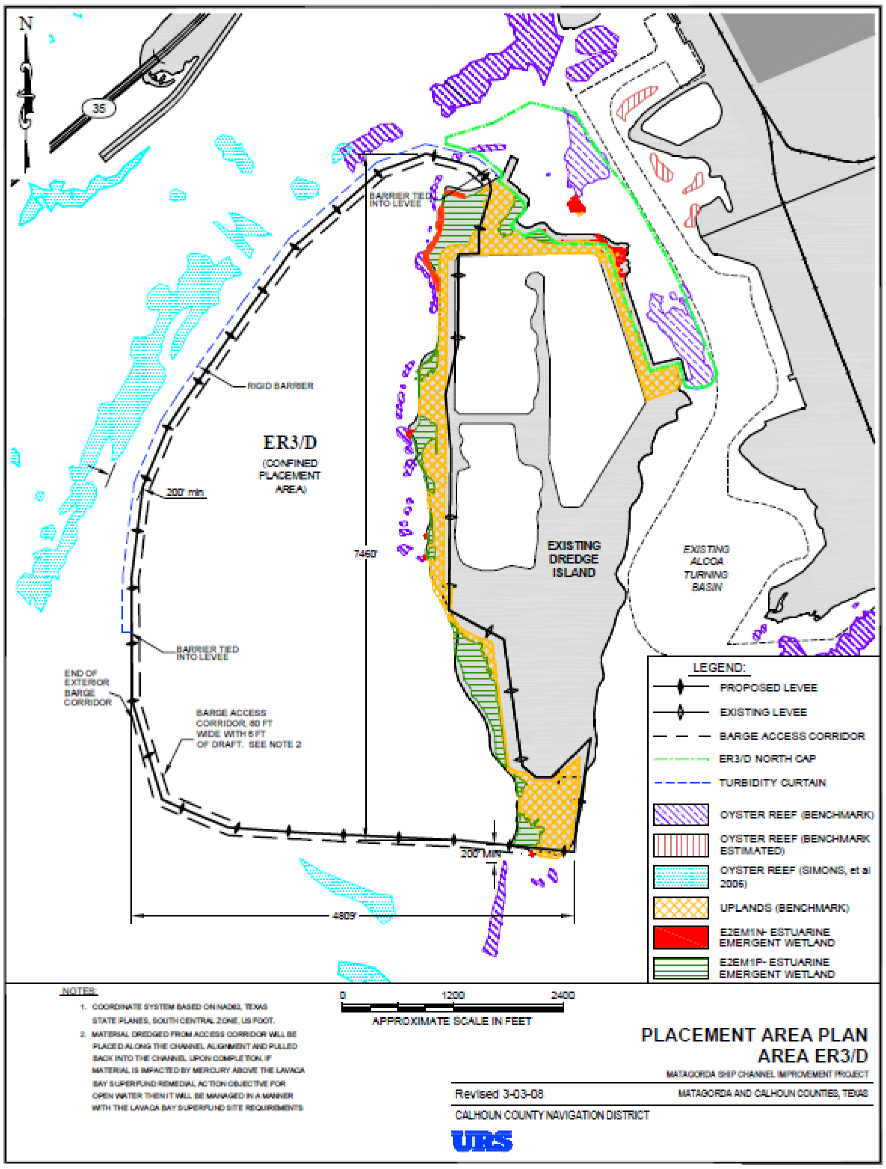
High marsh communities are subject to infrequent tidal flooding and/or receive runoff and groundwater flow from site levees and riprap areas. Vegetation that would be impacted in the high marshes is of moderate to sparse density. The high marsh vegetative community is typically dominated by saltgrass (*Distichlis spicata*), sea-ox-eye daisy (*Borrichia fructescens*), sea purslane (*Sesuvium maritimum*), annual glasswort (*Iva fructescens*), and saltmeadow cordgrass (*Spartina patens*).

Figure 1. Map of the Matagorda Ship Channel Project Study Area and Placement Areas.



A total of 17.9 acres of high marsh would be impacted by the proposed project at placement area ER3/D. These high marshes have become established on Dredge Island in Lavaca Bay (Figure 2). High marsh in area ER3/D was delineated in the field (BESI 2006).

Figure 2. Placement area ER3/D with delineated habitats.

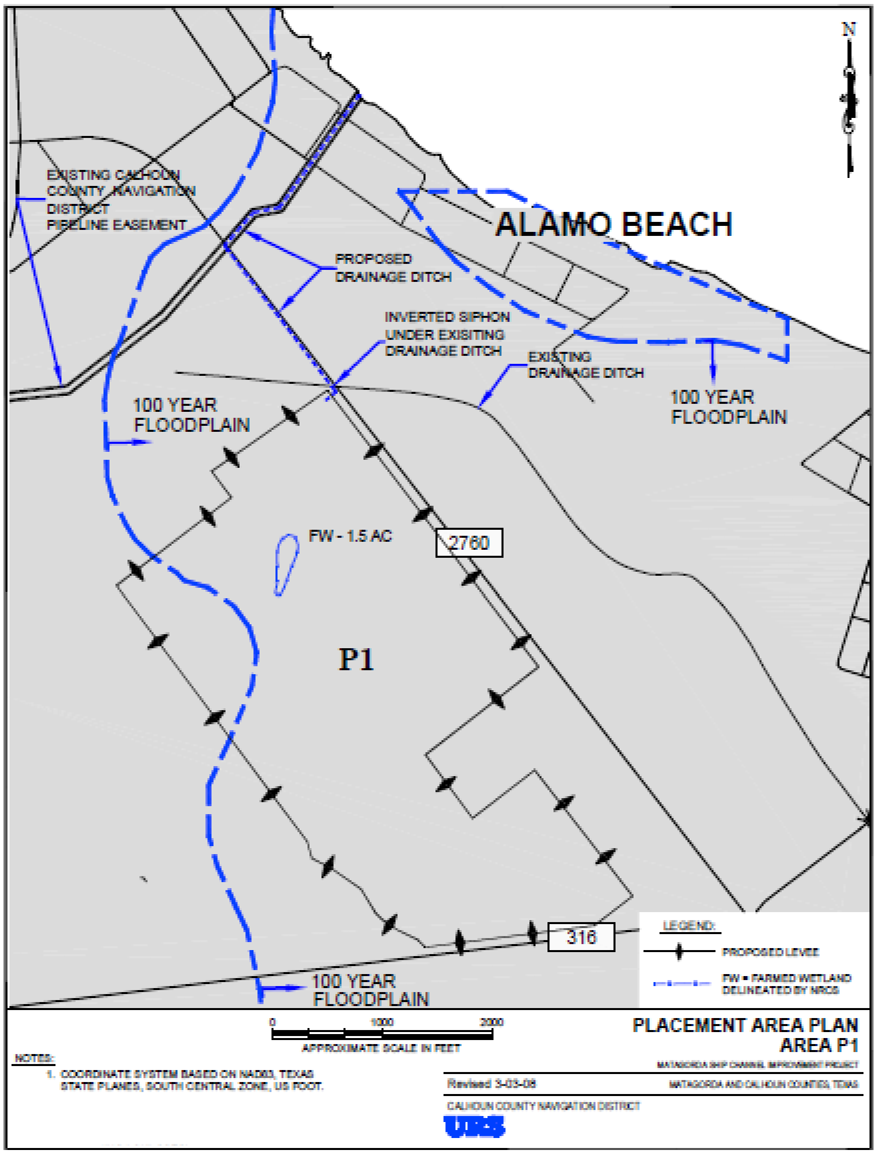


2.3 Impacts to Wetlands above Intertidal Influence

Proposed onshore placement area P1 is located on agricultural land. A wetland delineation done by PBS&J indicates that the site contains 1.5 acres of farmed wetlands that would be filled by construction of the placement area (Figure 3). The wetland is located inside an actively cultivated rice field, and surrounded by a low berm.

The bird habitats found to the west of placement area P1 presently under management or proposed for management through habitat improvements (impoundment, food plantings, etc.) would be avoided. The placement area would be leveed and used for dredged material placement with decanted water returned to the bay.

Figure3. Placement Area P1 with designated wetland within farmed lands.



2.4 Impacts to Oyster Reefs

A total of 132.6 acres of oyster reef would by directly impacted by the proposed project. The majority of direct impacts in the project area are from the widening of the existing ship channel. There are 129.2 acres of oyster reef on the side slope and on the bay bottom adjacent to the existing channel. Oysters will likely recolonize the side slopes of the widened channel, however these areas are considered permanent losses and require compensation at the same ratio as other direct losses. Area ER3/D would cover 3.4 acres of oyster reef. Oyster reefs delineated in the field are shown in Figure 4. The American Oyster HSI model (Swannack et al, 2014) was

Indirect effects to oyster reef habitat may result from a higher salinity regime due to the effects of channel improvements. This has the potential to cause an increase in predators such as oyster drills and pathogens such as Dermo (Britton and Morton, 1989). The intensity of Dermo infection increases during the warmer months (August and September) when salinity are greater. With the improved channel, an overall rise of salinity of about 1 to 2 could be expected based on the hydrodynamic salinity model. Numerous studies have been conducted on the effects of temperature and salinity on Dermo. Crosby and Roberts (1990) found that both temperature and salinity increased infection intensity; however, it was demonstrated that temperature was more important. In a laboratory experiment Fisher et al. (1992) also found that temperature was a more important factor than salinity in relation to Dermo infection. Conversely, Craig et al. (1989) surveyed Gulf oysters and found the variation in disease intensity between sites studied had no relationship to temperature. Long-term monitoring in the Gulf by Powell et al. (1992) showed that long-term climate changes through the years as influenced by El Nino Southern Oscillation may have a significant effect on the presence and intensity of Dermo in this region. Through numerous studies, it is apparent that both temperature and salinity affect Dermo infection on oysters (Maryland Sea Grant College, 1996). Although rising salinities and temperatures have significant control over the intensity of Dermo, there is also a combination of other factors related to oyster health, including availability of food, siltation, current flow, and harvest intensity.

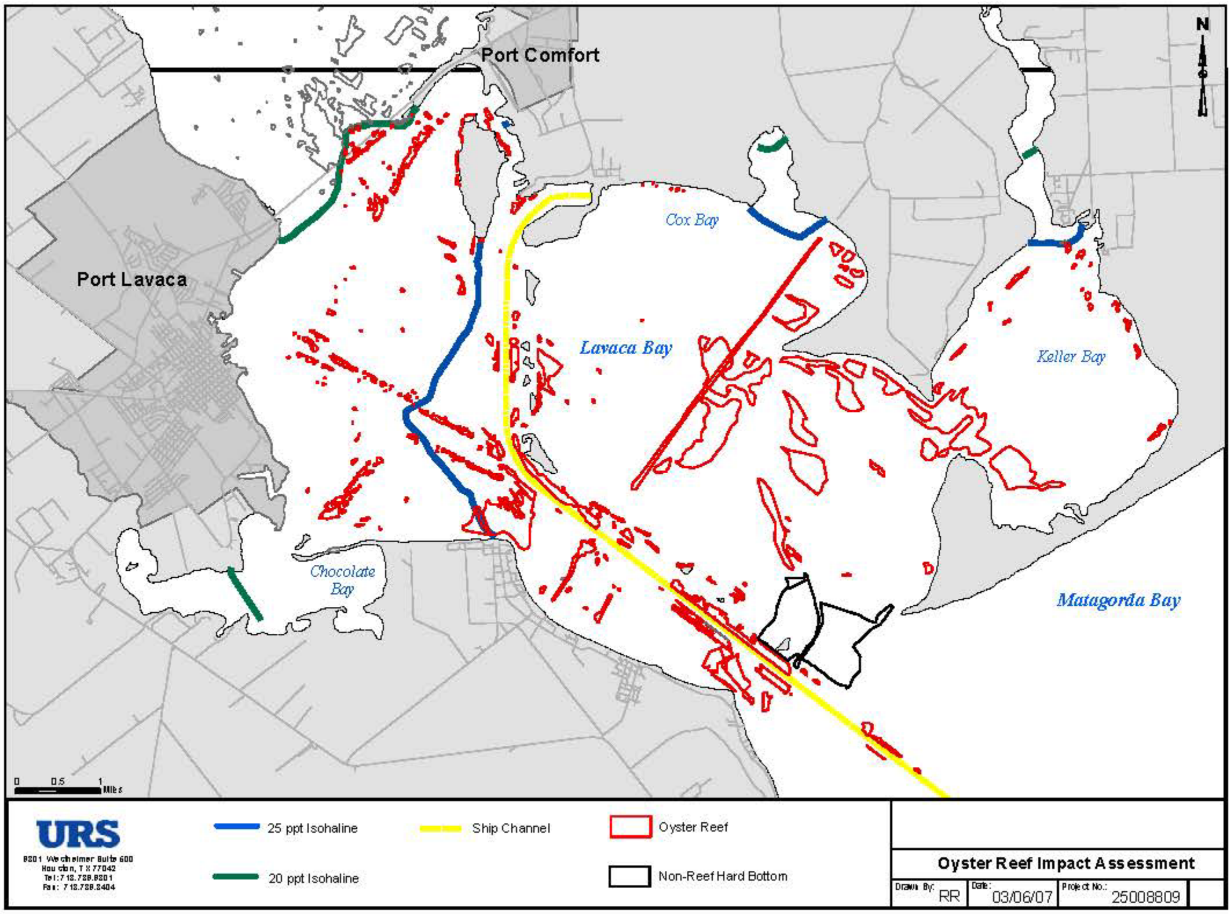
Water column turbidity would increase during project construction and maintenance dredging that could affect survival or growth of oysters. Heavy concentrations of suspended sediment can clog gills and interfere with filter feeding and respiration. Adult oysters are more capable of withstanding such conditions than seed or spat, and during periods of high turbidity can close up tightly for a week or more until normal conditions return (Cake, 1983). Turbidity from the TSP should be temporary and local. The location of oyster populations can gradually shift in response to natural and man-made modifications in the bay system (Britton and Morton, 1989). Therefore, it is likely oyster reefs affected by implementation of the TSP could adjust to new conditions over time. As stated previously, approximately 133 acres of oyster reef would be created by the construction of new reefs within the Matagorda Bay system.

2.5 Impacts to Bay and Offshore Bottom

The conversion of bay bottom habitat as a result of the MSC Project is expected to have both positive and negative effects on the overall habitat functional value of the bay system, with an expected net increase in functional value. Some of the dredged material from the proposed MSC Project would be used to convert open bay bottom to mitigation marsh, oyster reef, or sand platform conducive to seagrass colonization. Material would also be used to cap mercury-impacted sediments and provide a bay bottom suitable for benthic production. A total of 1540 acres of bay bottom and mercury-impacted bottom would be enhanced by habitat creation.

Unconfined placement areas would also receive dredged material. A total of 3927 acres would be impacted by unconfined placement. Areas impacted by open bay placement are allowed to recover between dredging cycles with productivity restored within one year. In the proposed project 1874 acres of Matagorda Bay bottom associated with placement areas adjacent to the widened ship channel would be impacted by new work placement. Of the 2053 acres of Offshore Bottom impacted, approximately 1600 acres would be used for new work material, with the remaining 453 acres receiving maintenance material.

Figure 4. Oyster reefs within Lavaca Bay.



3.0 MITIGATION MEASURES

Placement of dredged material would result in the loss of 21 acres of marsh at PA1 (1.5 acres) and PA ER3/D (19.5 acres). The Habitat Suitability Index (HSI) model for clapper rail (Lewis and Garrison, 1983) was used to estimate impacts and mitigation requirements. The model indicates the loss of 10.8 Average Annualized Habitat Units (AAHUs) from the material placement. The clapper rail model indicated 26 acres of marsh mitigation would be required to achieve a replacement value of 10.9 AAHUs.

During the construction phase of the TSP, approximately 129.2 acres of oyster reef habitat will dredged during the construction of the channel and 3.4 acres of oyster reefs and habitat would be covered at PA ER3/D. The dredged material is to be placed on top of oyster reefs located in an area of mercury-impacted sediments at PA ER3/D. Use of the American Oyster HSI model (Swannack et al, 2014) found a net loss of 81.3 AAHUs. The model calculated that 133 acres of new oyster reef would 81.6 AAHUs.

The HSI was used to quantify the loss of functional value of oyster reef habitats impacted by the proposed project. The HSI addresses losses due to channel enlargement, and placement of new work and maintenance material over a 50-year planning period. The analysis is also used to ensure that proposed mitigation would restore all lost functional value over the 50-year analysis period. The HSI for oyster reef was calculated using the model of American Oyster (Swannack et al., 2014) using a spreadsheet certified for one-time use by the USACE EcoPCX.

A second HSI was used to quantify the loss of functional value of marsh and farmed wetlands. The HSI addresses losses due to placement of new work and maintenance material over a 50-year planning period. The analysis is also used to ensure that proposed mitigation would restore all lost functional value over the 50-year analysis period. The HSI for marsh and farmed wetland was calculated using the model for clapper rail (Lewis and Garrison, 1983) using a spreadsheet certified for one-time use by the USACE EcoPCX.

Selection of potential mitigation sites and modeling of benefits will be conducted in coordination with resource agencies. The location of the marsh mitigation sites will be, to the extent practicable, within the areas surrounding Matagorda Bay. In addition, the location of oyster reef mitigation will be within the Matagorda Bay system. Periodic meetings with the resource agencies have been ongoing to try to narrow down locations for the mitigation. During final feasibility planning, fully-realized mitigation plans will be developed in further consultation with the resource agencies and presented in the FIFR-EIS. At this time a monitoring and adaptive management plan will be developed. Estimated costs of the mitigation measures based on recent work was given to the economists for inclusion in the benefit:cost ratio calculation. Impacts of the TSP will be fully compensated in accordance with specific impacts and benefits quantified by the HSI modeling. Marsh creation/mitigation will be conducted in compliance with ER 1165-2-27 (Establishment of Wetland Areas in Connection with Dredging).

4.0 REFERENCES

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Enclosure 2 – Ocean Dredged Material Disposal Site Analyses

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects

Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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Contents

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List of Tables

List of Acronyms

CFR Code of Federal Regulations

COD Chemical Oxygen Demand

DMF Dredged Material Fate

DMMP Dredged Material Maintenance Plan

EPA Environmental Protection Agency

ERDC Engineering, Research, and Development Center

ERL Effects Range Low

FEIS Final Environmental Impact Statement

FWPCA Federal Water Pollution Control Act

LPC Limiting Permissible Concentration

MDFATE Multiple-disposal Fate

MLLW Mean Low Low Water

MLT Mean Low Tide

MPRSA Marine Protection, Research, and Sanctuaries Act

MSC Matagorda Ship Channel

MSCIP Matagorda Ship Channel Improvement Project

NAD North American Datum

NOAA National Oceanic and Atmospheric Administration

ODMDS Offshore Dredged Material Disposal Site

RIA Regional Implementation Agreement

SP Solid Phase

SPP Suspended Particulate Phase

TWQS Texas Surface Water Quality Standards

USACE United States Army Corps of Engineers

WES Waterways Experiment Station

WQC Water Quality Criteria

ZSF Zone of Feasibility

1. INTRODUCTION

The MSC is approximately 26 miles long extending from Port of Port Lavaca – Point Comfort (Port) turning basin in Lavaca Bay through the southwest section of Matagorda Bay and offshore into the Gulf of Mexico (Gulf) through Matagorda Peninsula (Figure 1), and was first authorized by Congress under the Rivers and Harbors Act of 1958 (House Document 388, 84th Congress, Second Session). The In-Bay Channel is authorized to be maintained at a project width of 200 feet (ft) and a depth of –36 ft mean low tide (MLT), plus 2 ft of advanced maintenance depth and an additional 2 ft of paid over depth to compensate for physical conditions and inaccuracies in the dredging process. Side slopes for the In-Bay Channel are maintained at a 3 vertical to 1 horizontal slope ratio. The Entrance Channel is authorized to be maintained at a width of 300 ft and a depth of –38 ft MLT plus 3 ft of advanced maintenance depth and 2 ft of paid allowable over depth, with a 10 to 1 side slope ratio. The frequency of routine maintenance dredging within the authorized Entrance Channel limits is approximately once every 1.55 years, producing an average of 682,067 cubic yards of dredged material per cycle, with the material placed at an existing designated maintenance Ocean Dredged Material Disposal Site (ODMDS). This existing 474-acre ODMDS is located approximately 2 miles offshore and 1,000 ft south of the Entrance Channel centerline in ambient water depths ranging from approximately –30 ft to –38 ft MLT.

1.1 Proposed Channel Project

The Matagorda Ship Channel (MSC) extends from the Port of Port Lavaca-Point Comfort Turning Basin in Lavaca Bay through the Matagorda Bay and extends into the Gulf of Mexico via the Matagorda Peninsula. The current length of the ship channel is approximately 26 miles (Figure 1). The in-bay channel is authorized to a current depth of -38 feet Mean Low Low Water (MLLW) with a bottom width of 200 feet. The Entrance Channel is maintained at -40 feet MLLW.

The MSC Project would widen the in-bay channel to 350 feet and deepen the channel to -47 feet MLLW. The Entrance Channel would be widened to 600 feet and deepened to -47 feet MLLW.

The purpose of this appendix is to discuss conceptual mitigation procedures for the unavoidable impacts to habitat from the proposed project. This appendix describes the impacts to each habitat type and describes the compensation calculated for these losses.

1.1.1 Project Purpose and Need

The existing MSC project provides deep-draft liquid tanker and dry bulk carrier access from the Gulf to the Port. The CCND has determined a need to reduce transportation costs, increase operational efficiencies of commodities moving through the Port, and improve navigation safety. This need was derived from an analysis of current and projected vessel transits, cargo tonnage, and capacity at the existing and proposed terminal facilities. The Port currently handles a variety of products, the principal being petroleum, aluminum ore, chemicals, and allied products. Approximately 90% of vessels that call at the Port are required to light load due to draft limitations of the present channel configuration. By expanding channel dimensions, cargo vessels could reduce or eliminate light-loading requirements, and larger cargo vessels currently unable to transit due to the existing channel configuration could begin port calls. An expanded channel may also allow two-way traffic for certain vessel classes to safely transit and/or reduce tug usage.

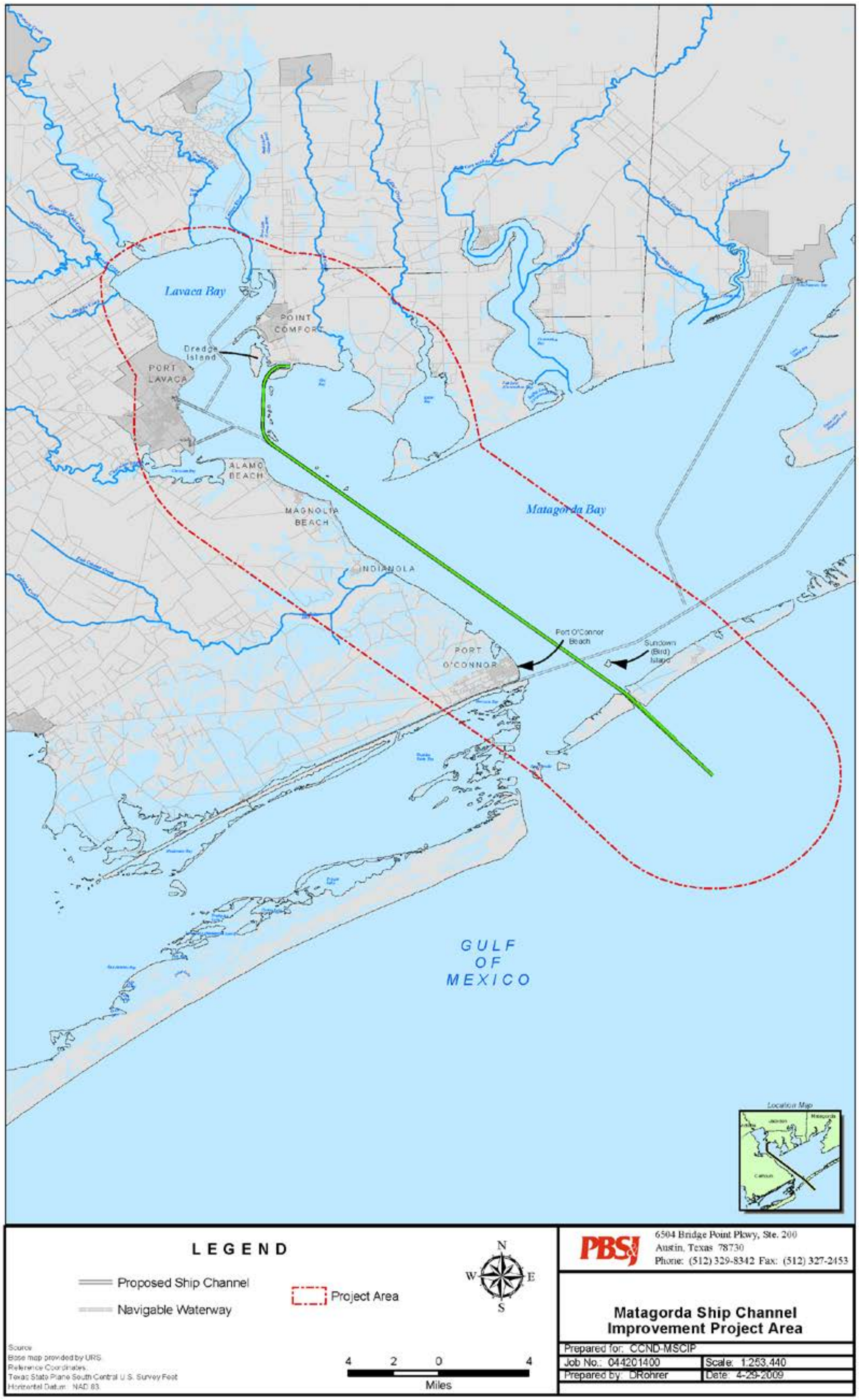

Figure 1. Matagorda Ship Channel Project Study Area.

1.2 ODMDS Designation

Ocean disposal of dredged material was not specifically regulated in the United States until passage of the Marine Protection, Research and Sanctuaries Act of 1972 (MPRSA). Limited regulation was provided by the Supervisors' Act of 1888 and the Refuse Act of 1899. Under these acts, transportation and navigation factors, rather than environmental considerations, guided selection of placement locations by the USACE and the issuance of permits for ocean disposal.

Although the Fish and Wildlife Coordination Act of 1958 initially referred to inland tidal waters, it included consideration of the effects of dredged material on commercially important marine species. This act, together with subsequent judicial decisions, empowered the USACE to refuse permits if the dredging or filling of a bay or estuary would result in significant, unavoidable damage to the marine ecosystem.

MPRSA and the Federal Water Pollution Control Act (FWPCA), later amended by the Clean Water Act of 1977, both passed in 1972 and specifically addressed waste disposal in the aquatic and the marine environment. The FWPCA and the Water Quality Improvement Act of 1970 set up specific water-quality criteria to be used as guidelines in controlling discharges into marine and aquatic environments. These water-quality criteria applied to placement of dredged material only in cases where fixed pipelines were used to transport and discharge dredged material into the environment at discrete points. MPRSA, however, specifically regulates the transport and ultimate disposal of waste materials in the ocean. Under Title I of MPRSA, the primary regulatory vehicle of the Act, a permit program for the disposal of dredged and nondredged materials was established that mandates determination of impacts and provides for enforcement of permit conditions.

The August 1975 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (Convention) is the principal international agreement governing ocean dumping. The Convention specifies that contracting nations will regulate disposal in the marine environment within their jurisdiction, disallowing all disposal without permits. The nature and quantities of all waste material and the circumstances of disposal must be periodically reported to the International Maritime Organization (formerly the Inter-Governmental Maritime Consultative Organization), which administers the Convention.

In October 1973, the Environmental Protection Agency (EPA) issued the final Ocean Dumping Regulations and Criteria (the Regulations, or Ocean Dumping Regulations), revised in January 1977 (40 CFR Parts 220 to 229). These regulations established procedures and criteria for review of ocean disposal permit applications (Part 227); assessment of impacts of ocean disposal and alternative disposal methods; enforcement of permits; and designation and management of ocean disposal sites (Part 228). They also established procedures by which the EPA is authorized to designate ODMDSs and times for ocean disposal of acceptable materials under Section 102(c) of the MPRSA and the criteria for site designation, including general and specific criteria for site selection.

The EPA is mandated with the authority granted by Congress to regulate ocean dumping and with the responsibility for site designation, monitoring, and management, as stated specifically in 40 CFR 228.4(e)(1). The EPA has been requested to designate an ocean disposal site for the one-time placement of new work dredged material generated by the MSC Project. Although EPA is responsible for designating ocean dumping sites according to Section 102 of the MPRSA, and such sites may be necessary to construct and maintain the proposed MSCIP, USACE may, with the concurrence of EPA, select an alternative ocean disposal site in accordance with MPRSA 103(b), when use of an EPA-designated site is not feasible. Site designation by EPA does not authorize any dredging project nor does it permit placement of any dredged material. Sites are designated in areas where a need for ocean disposal has been indicated, based on past dredging demands and/or projected demands associated with new or expanded projects. However, site designation does not in and of itself preclude the consideration of other placement options, including beneficial use options or the no action alternative. Once designated as an approved ocean disposal site, the appropriateness of ocean disposal is determined on a case-by-case basis in accordance with the ocean dumping criteria.

The existing designated maintenance material ODMDS is bounded by:

28° 23' 48" N, 96° 18' 00" W; 28° 23' 21" N, 96° 18' 31" W
28° 22' 43' N, 96° 17' 52" W; 28° 23' 11" N, 96° 17' 22" W

Water depths range from 30 to 38 ft and the site is located approximately 2 miles offshore from the Matagorda Peninsula shoreline (Figure 2), and 1,000 ft southeast of the MSC Entrance Channel centerline. The area of the site equals approximately 456 acres.

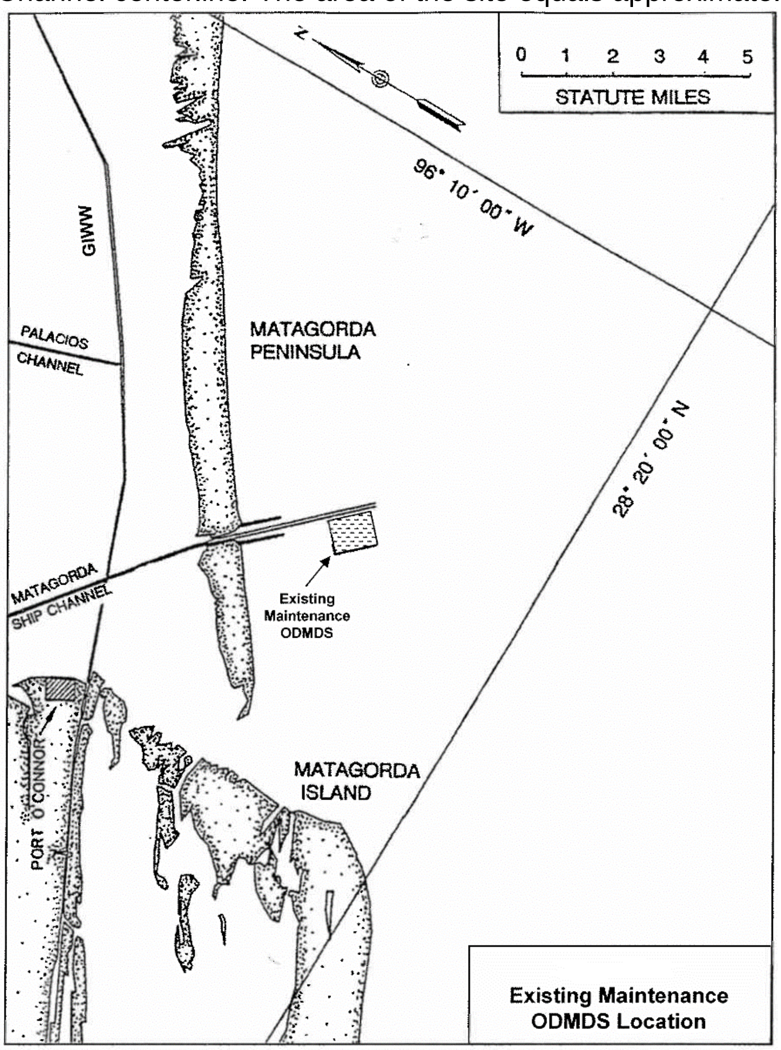

Figure 2. Location of Existing Maintenance ODMDS

1.2.1 ODMDS Designation Purpose and Need

The federal action for which this document was prepared is the possible designation by EPA or the USACE of a site or sites for the ocean placement of new work material to be dredged for the MSC Project. A Final Environmental Impact Statement (FEIS) for the maintenance dredging of the MSC was prepared by USACE (1974). One offshore site is currently in use for the existing channel. This site was designated by EPA for the continued placement of maintenance dredged material removed from the MSC Entrance Channel (EPA, 1990). The purpose of EPA's action is to either designate, based on 40 CFR 228, an ocean disposal site for the one-time placement of new work dredged material generated by the MSCIP that will provide environmentally acceptable and economically and physically feasible areas or to concur with USACE's selection of an alternative offshore disposal site for the onetime placement of the new work dredged material generated by the MSCIP.

1.2.2 ODMDS Designation Alternatives

EPA (1990) examined a suite of alternatives to locate the maintenance material ODMDS. These alternatives included the no action, non-ocean, and offshore disposal alternatives. The offshore alternatives included mid-shelf; continental slope; and nearshore, including the interim designated, historically used site. Through the Zone of Feasibility (ZSF) analysis performed by EPA (1989), it was concluded only the nearshore alternative was feasible, and the most appropriate sites were selected by eliminating areas considered to be not feasible. The existing maintenance material ODMDS resulted from this selection process and was designated.

1.2.2.1 No-Action Alternative

The No-Action alternative entails that the EPA refrain from designating a new ODMDS for the placement of 11.9 mcy of new work dredged material generated by the proposed MSCIP. Without site designation or allowance to place material within the nearshore, a much more expensive, and possibly much less safe alternative of land-based or open-bay placement methods would be required. Use of upland placement areas would greatly increase dredging costs because of double handling and the long distances involved in transporting dredged material from the offshore Entrance Channel or would require converting in-bay open-bottom habitat areas to an upland disposal site for receipt of In-Bay and Entrance Channel dredged sediments. The economic benefits of the navigation improvements would not be sufficient to justify the higher costs, nor would the environmental impacts of converting in-bay open-bottom habitats to upland placement areas warrant justification. Therefore, in the absence of Federal action to designate a new ODMDS, expand the existing ODMDS, or permit the one-time nearshore placement of new work dredged material in support of the proposed MSCIP, the existing project would continue to be maintained at its current dimensions and dredged material would be placed in compliance with the applicable DMMP. Material from the Entrance Channel would continue to be placed in the existing ODMDS, and none of the material would be used beneficially. Foregoing navigation improvements to the MSC would have the following impacts: (1) long-term increases in transportation costs to navigation relative to those that would result from project implementation; (2) loss of potential for increased channel usage, since a widened and deepened channel would permit two-way traffic and allow for larger vessel classes to transit; and (3) failure to improve vessel traffic safety that would result from a widened MSC. Therefore, the No-Action alternative is not considered viable.

1.2.2.2 Non-ocean Sites

Dredged material placement alternatives evaluated in this document consist of upland placement, beneficial use, and ocean placement. Alternate dredging methods include the use of dipper dredges, ladder dredges, and clamshell dredges. However, through the years, only hopper dredges and cutterhead-suction pipeline dredges have proved to be both safe and efficient for nearshore and offshore use, and hopper dredges are preferred for dredging areas offshore. A review of the capabilities of the dredging industry's equipment confirms that the hopper dredge is the most economical and feasible means for dredging at sea. The Port of Calhoun has determined the most economical construction methodology to modify the MSC Entrance Channel seaward of the Matagorda Peninsula is to excavate the channel with a hopper dredge and dispose the material at an ocean placement site. Additionally, the Port of Calhoun determined the least environmentally intrusive and most economical method to dredge the soft clay reaches within the In-Bay Channel is with a clamshell dredge and placing the material with a dump scow at an ocean disposal site. Transporting dredged material on a hopper dredge from the Entrance Channel to in-bay and upland placement areas rather than to an ocean disposal site would not be economically viable, given the hopper dredge would need to travel toward shore an additional 4 to 28 miles. Furthermore, the draft of a fully loaded hopper dredge or dump scow would restrict their movements within bay waters. As a result, the hopper dredge or dump scow would only be able to discharge its dredged material through a pump-out system, which involves mooring and connecting to a discharge pipe for each load of dredged material, thus slowing down dredge operations and increasing the cost to construct. The technology for other dredge types has not progressed sufficiently to be suitable alternatives to hopper dredging within the MSC Entrance Channel.

The nearest available land placement area is located 24 miles away from the seaward end of the project and 3.5 miles from MSC-Port Lavaca channel split. This land placement area does not have sufficient capacity to receive offshore channel construction, In-Bay Channel construction, and future maintenance material. Therefore, use of this site for offshore or a portion of the in-bay construction material would require the acquisition and construction of new placement areas to receive routine maintenance material from the in-bay reaches of the MSC. Since the surrounding land areas are wetlands or shallow bay habitats, it is not likely that suitably sized replacement areas could be obtained without significant loss of quality wetlands or bay bottoms. Additionally, utilizing land placement areas for the entrance or the soft clay reaches of the In-Bay Channel's new work dredged material would extend the period of construction, resulting in an increase in total emissions of particulates into the air during the period of project construction. Therefore, a land-based disposal alternative would not offer sufficient net environmental benefits to replace the disposal of the entrance and In-Bay Channel's dredged material at an offshore placement site.

After a review of the options, it is concluded that for this project, land-based and in-bay alternatives offer no environmental or economic advantages over placement of the MSC Entrance Channel's new work and maintenance dredged material or the MSC In-Bay Channel's soft clay reaches new work dredged material in the ocean. Furthermore, the methodology of hopper dredging in the Entrance Channel and clamshell dredging in the soft clay reaches of the In-Bay Channel, coupled with ocean placement of the dredged material, are considered to be both environmentally and economically viable. All other alternatives, including the No-Action alternative, have negative consequences associated with them.

1.2.2.3 ODMDS Offshore Sites

The mid-shelf and continental slope areas are located approximately 30 and 70 miles, respectively, from the entrance of the MSC. Hauling dredged material to these deeper offshore sites will extend the project schedule and require additional fuel, manpower, and closer surveillance to guard against short dumps. A straightforward analysis of transporting material with a hopper dredge a distance from 1 to 10 miles increases the cost of dredging on a per-cubic-yard (cy) basis by a factor of 2.5. EPA (1983) notes an increase of $0.15/cy/mile of transport distance for disposal at a mid-shelf site off Tampa Bay, Florida. Since fuel costs have skyrocketed since 1983, this value is very low. The value of $0.15/cy/mile, noted above, would be $0.29/cy/mile, if adjusted for inflation (ftp://ftp.bls.gov/pub/special.requests/cpi/cpiai.txt). Using a unit value of $0.29/cy/mile, with an expected quantity of new work material of 12.0 mcy and an incremental round-trip transport distance of 64 miles to a mid-shelf site.

Additionally, deep-water sites are more difficult to monitor baseline conditions and postdisposal impacts. Whereas grab samplers and SCUBA divers can be used to monitor shallow-water sites, more-sophisticated sampling devices and larger support vessels are necessary to monitor deep-water sites. Working farther offshore also carries greater safety risks during both the disposal and monitoring operations. For these reasons, the mid-shelf and continental-slope sites were eliminated from further consideration.

1.2.2.4 ODMDS Nearshore Sites

Nearshore sites that are suitable for establishment of ODMDSs for the MSC were identified following the ZSF analysis performed by EPA (1989). This analysis involved identifying a large area within which the ODMDS could be located, based primarily on physical and geographical constraints. Subareas within the ZSF were then excluded from ODMDS siting, based on the locations of biologically sensitive areas, beaches and recreational areas, cultural and historical areas, and living and nonliving resources. These areas were excluded from the ZSF based on the interpretation of 5 general and 11 specific criteria described in 40 CFR 228.5 and 228.6(a) of the Ocean Dumping Regulations. The boundaries of the Matagorda ZSF were defined by a 10-mile radius from the intersection of the Entrance Channel and the beach line. Monitoring and surveillance are feasible within all regions of the Matagorda ZSF, and the ZSF does not intersect any political boundaries. The enclosed area is approximately 157 square miles, and all areas outside the ZSF were eliminated from further consideration.

1.2.2.5 ODMDS Size and Location for New Work Dredged Material

The multiple-disposal fate (MDFATE) model developed by the USACE Engineering, Research and Development Center (ERDC), formerly known as the Waterways Experiment Station (WES), was employed to assist in determining the dimensions and location of a proposed ODMDS for the MSCIP's new work dredged material. The results of the MDFATE simulations are described in Section 5.0 of this report. Based upon these results, it is recommended to either designate an additional Matagorda ODMDS for the one-time use to place 12.0 mcy of the MSCIP's new work dredged material under Section 102 of the MPRSA or permit the one-time placement of the new work material consistent with Section 103 (b) of the MPRSA. The proposed new work ODMDS would be located adjacent and seaward of the existing maintenance material ODMDS, within the non-exclusionary boundaries as originally established by the ZSF analysis (Figure 3) originally performed by EPA for the MSC ODMDS Designation (EPA, 1989, 1990).

This proposed ODMDS is bounded by:

28° 21' 52' N, 96° 16' 01" W; 28° 23' 01" N, 96° 17' 12" W
28° 22' 08" N, 96° 18' 14" W; 28° 21' 01" N, 96° 17' 04" W

Water depths range from 43 to 50 ft, and the site is located 3.5 miles offshore from the Matagorda Peninsula shoreline (Figure 4), and 1,000 ft southeast of the MSC Entrance Channel centerline. The area of the site equals approximately 1,647 acres. The depth of closure typically for the Gulf Coast ranges from –20 ft to –30 ft (USACE, 1989). Since the water depths of the proposed ODMDS are beyond the depth of closure for the shoreward transport of sediments, the dredged material proposed for placement in the new work ODMDS is not expected to migrate onshore nor impact the Pass Cavallo inlet located downdrift of the ODMDS.

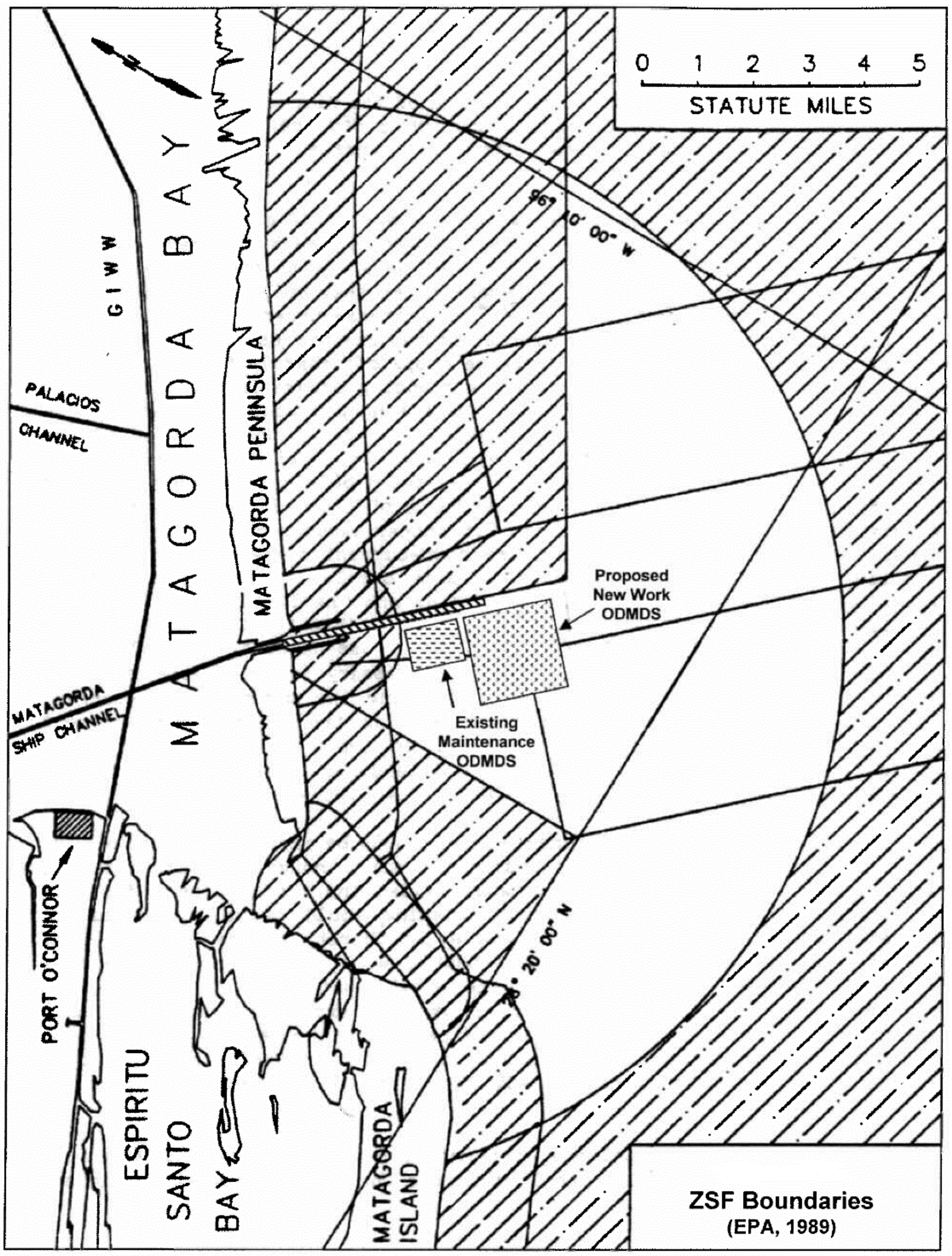

Figure 3. Boundaries of the EPA ZSF study for the New Work ODMDS.

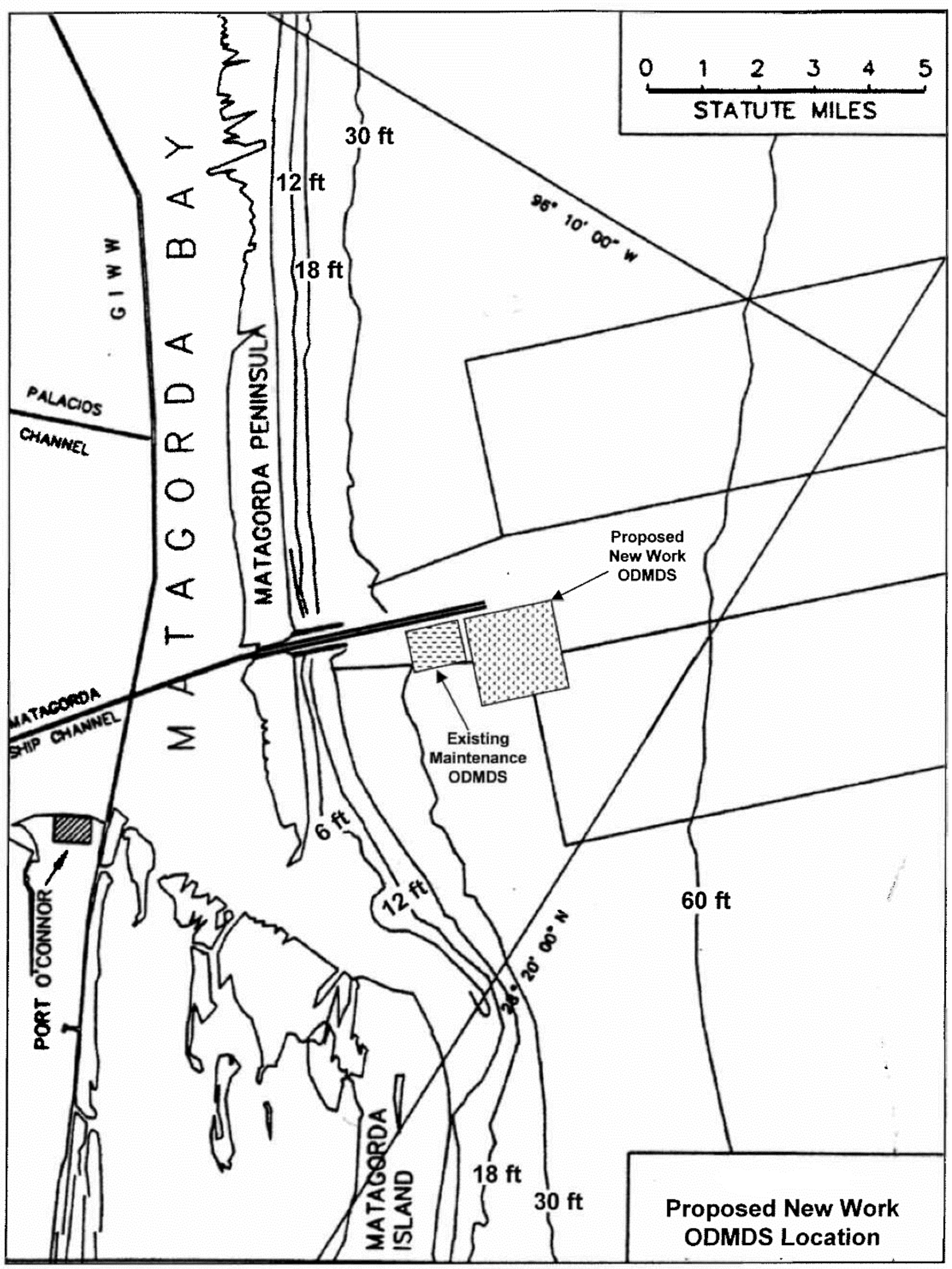

Figure 4. Location of the New Work ODMDS.

2. PROPOSED USE OF THE SITES

2.1 New Work Material ODMDS

The MSCIP proposes to improve the existing MSC by widening and deepening the In-Bay Channel to a width of 400 ft and a depth of –47 ft MLLW and the Entrance Channel to a width of 600 ft and a depth of -47 ft MLLW. A total of 46.5 mcy of new work material will need to be dredged to modify the MSC, of which approximately 12.0 mcy of the new construction dredged material will require transport to and the one-time placement within an ODMDS. The remaining quantity new work material will be placed in an array of dredged material placement areas located within the Matagorda Bay region.

2.2 Maintenance Material ODMDS

The existing ODMDS will continue to receive maintenance material from the routine maintenance dredging of the MSC Entrance Channel. Over the course of the 50-year study approximately 13.6 mcy of the maintenance dredged material will require transport to and placement within an ODMDS. The remaining quantity of maintenance material will be placed in an array of dredged material placement areas located within the Matagorda Bay region.

3. CHARACTERIZATION OF THE DISPOSAL SITES

Table 1 provides dredging dates and volumes dredged from the MSC Entrance Channel from 1966 to 2006. The average time between the beginnings of each dredging operation is approximately 1.55 years (18 months), and the average amount of material dredged per routine maintenance cycle is 682,067 cy. This does not mean that the Entrance Channel is dredged every 1.55 years, on average, but it does indicate the average frequency of use of the maintenance material ODMDS. Based upon the sedimentation study performed for the MSCIP, it is estimated that due to the widening and the deepening of the Entrance Channel, the annual sedimentation rate will be 272,000 cy/year. The increase in sedimentation rate is due primarily to increased channel length to reach project depth. However, due to the increased channel width, the accumulation rate within the Entrance Channel is expected to decrease to approximately 0.35 ft/year. As reported in Section 2.2, the result of this decreased sediment accumulation rate will be a change in the required routine maintenance dredging frequency from an average of once every 1.55 years to once every 4 years. As such, the expected volume of maintenance material to be placed at the existing ODMDS will increase from an average of 682,067 cy to 1,088,000 cy per dredging cycle.

3.1 Maintenance Material ODMDS Characteristics

Sediment and water quality in and near the existing designated ODMDS are within EPA standards (EPA, 1990). Grain-size analysis of the interim ODMDS prior to the designation of the permanent site shows the dredged material closely matches that of the existing ODMDS. Entrance Channel maintenance sediments average over 90% sand in the western portion of the channel. However, the sediments near and offshore of the former interim site are comprised of sand plus silt and sand plus clay fractions, respectively. Therefore EPA (1990) concluded that sediments dredged from the Entrance Channel have, over time, altered the natural sediment composition at the existing ODMDS.

3.2 New Work Material Proposed ODMDS Characteristics

The proposed ODMDS for the new work material is proposed to be located immediately offshore of the existing ODMDS, and generally consists of sand plus clay fractions as its natural bottom sediment characteristic (EPA, 1990). Figure 5 displays the bottom sediment characteristics within the offshore area of the MSC.

Table 1. Historical use of the Maintenance Material ODMDS

Start	Completed	Quantity Dredged (cubic yards)
March 15, 1966	April 17, 1966	536,212

July 2, 1966	December 35, 1966	728,300
March 13, 1967	April 9, 1967	381,500
July 17, 1967	October 31, 1967	985,464
January 29, 1968	March 25, 1968	661,100
July 29, 1968	October 6, 1968	683,664
February 10, 1969	April 13, 1969	711,000
October 3, 1969	November 30, 1969	1,003,000
April 20, 1970	May 17, 1970	492,087
October 11, 1970	November 29, 1970	906,785
July 25, 1971	August 8, 1971	229,040
March 20, 1972	April 16, 1972	484,560
March 26, 1973	April 29, 1973	547,000
December 28, 1974	May 6, 1975	1,463,473
January 21, 1976	February 17, 1976	943,112
December 22, 1977	January 29, 1978	290,000
August 2, 1979	August 31, 1979	624,727
August 28, 1980	December 22, 1980	1,716,288
January 26, 1984	March 7, 1984	908,933
January 30, 1989	February 20, 1989	489,040
August 11, 1993	September 7, 1993	964,186
October 3, 1996	October 21, 1996	488,383
July 16, 1999	August 3, 1999	499,341
October 21, 2001	October 29, 2001	285,594
January 18, 2004	February 6, 2004	365,226
July 31, 2006	August 10, 2006	336,720
Total		17,733,735
Average per cycle		682,067

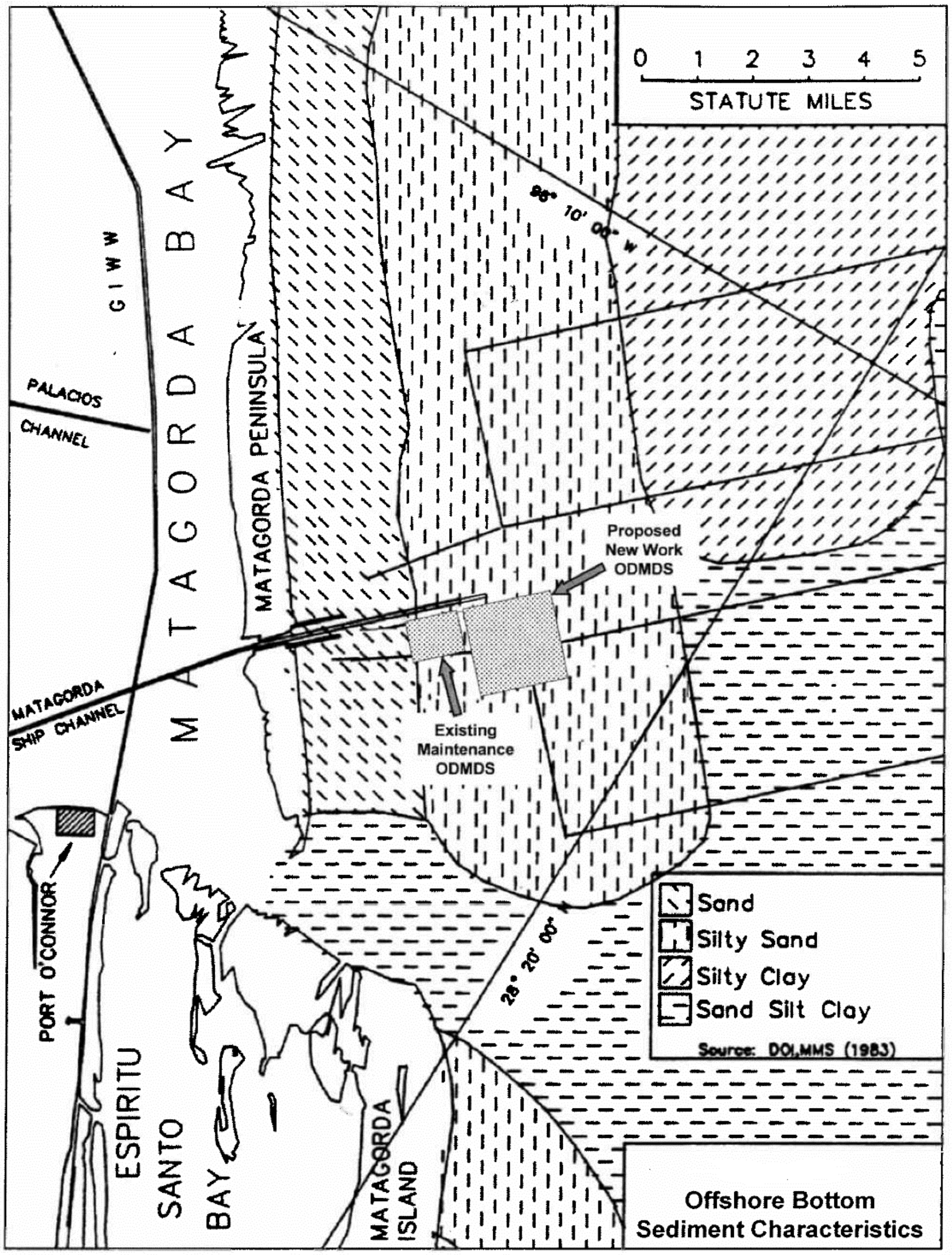

Figure 5. Characteristics of the bottom sediment in the offshore area.

4. CHARACTERIZATION OF THE MATERIAL EXPECTED TO BE DREDGED

4.1 New Work Material

Data collected by the USACE dating back to 1987 were used as the basis to determine the sediment quality of the new work dredged material targeted to be placed in the proposed ODMDS (USACE, 2009). There are two In-Bay Channel reaches (Lavaca Bay Reach and

Matagorda Bay Reach) and there is one Offshore Reach. A portion of the Matagorda Bay Reach and Offshore Reach will generate new work dredged material to be placed in the proposed ODMDS.

The geotechnical characteristics of the new work material within the footprint of the MSCIP was derived by reviewing boring logs for the original MSC project (USACE, 1962). The new work sediments contained within the MSC In-Bay Channel reaches that have been identified for placement within the proposed ODMDS generally consist of soft clay material. The portion of the Matagorda Bay Reach and the Offshore Reach where material will be generated for the ODMDS generally consists of a mixture of sand, silt, and clay for the new work material.

Sediment, water, and elutriate data are available for each reach extending back to 1987, with the water and elutriate data being compared against the Texas Surface Water Quality Standards (TWQS) and EPA's water quality criteria (WQC), and with the sediment data being compared against the Effects Range Low (ERL) values from the National Oceanic and Atmospheric Administration (NOAA) 1999 Screening Quick Reference Tables (Buchman, 1999). However, EPA does not consider data more than 5 years old to be relevant for determining whether there is cause for concern.

4.1.1 In-Bay Channel – Stations 76+000 to 71+000 Characterization

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962) and the M-PC-03 sediment samples collected in April 2003 and MPC-06 sediment samples collected in February 2006 reveal the material within Reach 7 predominantly consists of clay. For Reach 7, samples collected since 2001 did not exceed WQC, TWQS, and ERL values. A total of 1.7 mcy of new work dredged material consisting of clay from this reach is planned to be placed in the proposed ODMDS.

4.1.2 In-Bay Channel – Stations 67+000 to 54+000 Characterizaton

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962), the M-PC-03 sediment samples collected in April 2003, and the M-PC-06 sediment samples collected in February 2006 reveal the material within this reach predominantly consists of clay. Samples collected since 2001 did not exceed WQC, TWQS, and ERL values. A total of 2.8 mcy of new work dredged material consisting of clay from this reach is planned to be placed in the proposed ODMDS.

4.1.3 In-Bay Channel – Stations 54+000 to 46+000 Characterization

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962) and the M-PC-03 sediment samples collected in April 2003 reveal the material within this reach predominantly consists of clay and silt. For this reach, samples collected since 2001 did not exceed WQC, TWQS, and ERL values. A total of 0.9 mcy of new work dredged material consisting of clay from this reach is planned to be placed in the proposed ODMDS.

4.1.4 In-Bay Channel – Stations 46+000 to 40+000 Characterization

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962) and the M-PC-03 samples collected within this reach in April 2003 reveal the material within this reach predominantly consists of a mixture of sand, silts, and clay. For Reach 11, samples collected since 2001 did not exceed WQC, TWQS, and ERL values. A total of approximately 0.2 mcy of new work dredged material consisting of clay from this reach is planned to be placed in the proposed ODMDS.

4.1.5 In-Bay Channel – Stations 40+000 to 6+000 Characterization

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962) and the M-PC-03 sediment samples collected within this reach in April 2003 reveal the material within this reach consists of sand, silt and clay mixture. For this reach, samples collected since 2001 did not exceed WQC, TWQS, and ERL values. A total of 3.2 mcy of new work dredged material consisting of clay from this reach is planned to be placed in the proposed ODMDS.

4.1.6 Entrance Channel – Stations –5+000 to –23+000 Characterization

The grain-size analysis of the MSC 1962 boring logs (USACE, 1962), the MEC-01 sediment samples collected in May 2001, and the MEC-06 sediment samples collected in November 2005 revealed the material within this reach is made up predominantly of medium-sized sand, and the maintenance material has typically been a mixture of silt, clay, and sand. Elutriate test results for mercury exceeded the WQC and the TWQS threshold for elutriate samples MEC-06-01, MEC-06-02, and MEC-06-03. Additionally, even though the mercury in the water samples was below the WQC and the TWQS, it was relatively high compared to concentrations found in the nearshore Gulf water (USACE historic database). However, mercury was not detected in the sediment samples that were used in the elutriate preparation prior to 2005. The samples collected in 2005 were the only time mercury has been detected in either water or elutriate samples. Bioassays were conducted and survival in three of nine Suspended Particulate Phase (SPP) bioassays with these samples was significantly less than survival in the Dilution-Water Control (USACE, 2009). However, survival in no test was less than 82%, and the LC_{50} could not be calculated but would have to be greater than 100%. Therefore, the Limiting Permissible Concentration (LPC) for water column toxicity/SPP was met, and the material is acceptable under the Ocean Dumping Regulations pertaining to water column impacts.

For sediments, the only ERL value exceeded occurring within this reach over the past 5 years was for arsenic from sediment sample MEC-01-02 collected in May 2001. However, the concentration for arsenic only slightly exceeded (8.42 milligrams per kilogram [mg/kg]) the ERL value of 8.20 mg/kg. Solid Phase (SP, or whole mud) bioassays were conducted on the sediments collected in May 2001 with the burrowing amphipod, *Ampelisca abdita*, and the epifaunal shrimp, *Americamysis bahia*. There were no tests in which survival in the Reference Control was greater than survival in the treatments, and the difference exceeded 10% (20% for amphipods), requiring statistical analysis (USACE, 2009). Therefore, the survival data from the SP bioassay indicated no potential for environmentally unacceptable toxic impacts to benthic organisms from the unconfined open-water placement of sediments from the MSC Entrance Channel. Bioaccumulation studies were conducted on the sediments using bentnose clam, *Macoma nasuta*, and the sand worm, *Nereis virens*. No organic chemicals were found above detection limits in test organism tissues. The concentrations of none of the metals in tissues of *N. virens* or *M. nasuta* exposed to test sediments were significantly higher than the respective concentrations in Reference Control organisms. Therefore, there is no indication of bioaccumulation from exposure to these sediments, all LPCs pertaining to sediments are met, and the material is acceptable under the Ocean Dumping Regulations.

A total of 3.2 mcy of new work dredged material consisting of sand, silt, and clay from this reach is planned to be placed in the proposed ODMDS.

5. MODELING OF DREDGED MATERIAL DISTRIBUTION

The disposition of dredged material was simulated using an updated version (EPA/USACE, 1991) of the Dredged Material Fate (DMF) model, developed for the USACE through the Dredged Material Research Program by Tetra Tech., Inc. (Brandsma and Divoky, 1976). The modifications to this model (known as MDFATE) were made under the supervision of Dr. Billy H. Johnson of the WES of the USACE. The purpose of the modeling was to determine the necessary size of any new ODMDSs and to determine whether the existing ODMDS is of sufficient size to contain the future maintenance dredged material from the MSC Entrance Channel following improvement.

The MDFATE model simulates the initial behavior and final disposition of dredge material deposited “instantaneously” at the site of interest through the doors of a hopper dredge or through the split-hull opening of a dump scow. The MDFATE model assumes that this procedure may be broken into three phases: (1) convective descent, during which the discharge cloud falls under the influence of gravity; (2) dynamic collapse, occurring when the descending cloud impacts the bottom or arrives at a level of neutral buoyancy at which point the descent is retarded and horizontal spreading dominates; and (3) long-term passive dispersion, commencing when the material transport and spreading are determined more by ambient currents and turbulence than by the dynamics of the disposal operation (Johnson and Holliday, 1978). The model also includes the settling of suspended solids.

The output from the MDFATE model simulates a subaqueous mound configuration on the ocean floor following the cumulative disposal of the entire volume of dredged material at predetermined grid points. Inputs required to perform the simulation include the dredged sediment characteristics, physical and environmental characteristics of the disposal site, dredge and disposal equipment characteristics, and disposal operations characteristics.

5.1 New Work Dredged Material

The percentage of the various soil particle types anticipated in the new work sediments to be dredged was estimated by using the grain-size analysis results from sediment samples collected in April 2003 from reaches Matagorda Bay Reach and in May 2001 and November 2005 the Offshore Reach.

For the In-Bay Channel reaches, the following assumptions were made with respect to simulating the placement of new work dredged material within the proposed ODMDS: (1) the new work In-Bay Channel dredged material predominantly consists of cohesive clay; (2) the material would be excavated with a clamshell dredge; (3) the dredged material would be transported and placed by a 4,000 cy split-hull dump scow; and (4) the speed during release of the dredge material would be 3.3 feet per second (ft/s).

For the Entrance Channel reach, the following assumptions were made with respect to simulating the placement of the new work dredged material within the proposed ODMDS: (1) the new work Entrance Channel dredged material contains sediments consisting of predominantly medium-sized sand; (2) would be dredged, transported, and placed with a 3,600-cy hopper dredge; and (3) the speed during release of the dredged material would be 6.7 ft/s.

The evolution of the disposal mound was simulated by sequencing in three segments the placement of the new work dredged material at the proposed ODMDS. The first segment entailed the placement of 3.2 mcy of Entrance Channel sediments at the proposed ODMDS. The second and third segments entailed placing 4.3 and 4.5 mcy, respectively, of In-Bay Channel dredged sediments at the proposed ODMDS. The simulations resulted in a cumulative mound configuration for the new work material that was slightly skewed in the current and vessel-heading directions and that formed rounded diamond shapes, slightly elongated in the downcurrent and vessel-travel directions, although this is difficult to see at the scale on the figures in Attachment A. At its thickest, the mound elevation of the new work material in the proposed ODMDS would be 2 ft, and the relief along the inner edges of the placement area does not change following the simulations. Therefore, an examination of Attachment A reveals the dimensions (8,350 ft on each side at depths ranging from 38 to 44 ft) of the proposed

ODMDS is sufficient to contain the new work material from the MSCIP, without excessive mounding.

5.2 Maintenance Material

It is planned to modify the maintenance dredging cycle for the Entrance Channel to once every 4 years following construction of the MSCIP. As a result, approximately 1.088 mcy of future maintenance dredged material would be placed at the existing maintenance ODMDS per dredging cycle. EPA (1989, 1990) concluded the existing maintenance ODMDS could receive 795,000 cy of maintenance dredged material per year. In order to determine whether or not the existing maintenance dredging site would have the capacity to receive a total of 1.088 mcy of future maintenance material per dredging cycle, the MDFATE model was used to simulate the mound configuration for the larger maintenance material volume. For the simulation, the dredged material was assumed: (1) to predominantly consist of sand, equivalent to 63.3% sand, 20.4% silt, and 16.3% clay; (2) would be dredged, transported, and placed with a 3,000-cy hopper dredge; and (3) the speed during release of the maintenance dredged material would be 3.3 ft/s.

6. REGULATORY CHARACTERIZATION OF ENVIRONMENTAL CONSEQUENCES

As required by the Ocean Dumping Regulations (40 CFR 220-229) promulgated to interpret the MPRSA, the proposed new work material ODMDS for one-time use will be examined relative to the 5 general criteria and the 11 specific factors (40 CFR 228.5 and 40 CFR 228.6(a), respectively). Since the maintenance material to be dredged from the proposed widening and deepening of the Entrance Channel should be the same as the existing maintenance material, except for volume, the existing routine maintenance material ODMDS will be examined only to determine whether it is of sufficient size to receive a greater quantity of material per dredging cycle, and is not included in the analysis presented in sections 6.1 and 6.2, unless specifically stated. This information is included in the examination relative to the 5 general criteria and the 11 specific factors, where pertinent. In the following section, the criteria and factors are presented in italics, followed by the statement indicating compliance.

6.1 Five General Criteria

6.1.1 40 CFR 228.5(a)

The dumping of materials into the ocean will be permitted only at sites or in areas selected to minimize the interference of disposal activities with other activities in the marine environment, particularly avoiding areas of existing fisheries or shellfisheries, and regions of heavy commercial or recreational navigation.

The preferred ODMDS, like the other nonexcluded areas, was selected, including appropriate buffer zones, to avoid sport and commercial fishing activities, as well as other areas of biological sensitivity. The excluded areas include the jetties, Pass Cavallo, and several lighted oil platforms. The buffer zones were sized by EPA (1989) on the basis of the physical movement of the maintenance material. Since maintenance material, because of the higher percentage of fines, is transported farther than new work material, those buffer zones should be conservative for the new work ODMDS. The preferred ODMDS is outside the Channel, avoids all known navigation obstructions, and is located a greater distance away than the existing ODMDS from the buffer zones established by EPA (1989).

6.1.2 40 CFR 228.5(b)

Locations and boundaries of disposal sites will be so chosen that temporary perturbations in water quality or other environmental conditions during initial mixing caused by disposal operations anywhere within the site can be expected to be reduced to normal ambient seawater levels or to undetectable contaminant concentrations or effects before reaching any beach, shoreline, marine sanctuary, or known geographically limited fishery or shellfishery.

Testing has been conducted on existing maintenance material for years and those data were examined. There is no evidence that either the new work or maintenance material would not meet the criteria of 40 CFR 227. The appropriate sizes for the buffer zones and for the preferred ODMDS are based on sediment transport modeling and the physical oceanographic characterization of the MSC area. These, combined with the information on the expected quality of the material to be dredged, ensure that perturbations caused by placement would be reduced to ambient conditions at the boundaries of the site.

6.1.3 40 CFR 228.5(c)

If, at any time during or after disposal site evaluation studies, it is determined that existing disposal sites presently approved on an interim basis for ocean dumping do not meet the criteria for site selection set forth in 228.5–228.6, the use of such sites will be terminated as soon as suitable alternative disposal sites can be designated.

This criterion does not apply to the preferred sites because they are not existing sites approved on an interim basis. However, extensive monitoring programs, including bathymetric scans; water, sediment and elutriate chemistry; and benthic infaunal analyses, during construction should provide warning of potential problems. Extensive monitoring programs, including water, sediment, and elutriate chemistry; bioassays; and bioaccumulation studies are routinely conducted under the Regional Implementation Agreement (RIA) among the EPA, Region 6, and the USACE, Galveston and New Orleans districts (EPA/USACE, 2003) on all maintenance material. The results of that monitoring, plus studies conducted prior to designation of the existing ODMDSs (EPA, 1990), indicated no problems at the existing ODMDSs in the past. There is no reason to expect problems with future maintenance material from the MSC Project. However, the alternatives analysis performed by EPA (1990) indicates that, should the preferred ODMDS be found in the future to be not suitable and de-designation of the preferred ODMDS proves desirable, other areas are available and suitable for use as an ODMDS. Monitoring will also be conducted on the new work ODMDS in accordance with Section 7 of this report.

6.1.4 40 CFR 228.5(d)

The sizes of ocean disposal sites will be limited in order to localize for identification and control any immediate adverse impacts and to permit the implementation of effective monitoring and surveillance programs to prevent adverse long-range impacts. The size, configuration, and location of any disposal site will be determined as a part of the disposal site evaluation or designation study.

The sizes of the sites are as small as possible to reasonably meet the criteria stated in 40 CFR 228.5 and 228.6(a). The determined size of proposed new work ODMDS for one-time use is 1,600 acres, as established by the MDFATE Modeling, described in sections 5.0, 5.1, and 5.2. The monitoring program should provide adequate surveillance to prevent adverse long-range impacts.

6.1.5 40 CFR 228.5(e)

EPA will, wherever feasible, designate ocean dumping sites beyond the edge of the continental shelf and other such sites that have been historically used.

The lack of resilience of the deep-ocean benthic community (EPA, 1990) indicates that an off-shelf placement site would cause severe impacts to the off-shelf benthic community. No environmental advantage to an off-shelf site was noted whereas impacts to the human environment were less with a nearshore site for safety reasons. The existing maintenance material ODMDS has been used since it was formally designated in 1990.

6.2 Eleven Specific Factors

40 CFR 228.6(a) states that the factors included below as sections 6.2.1 through 6.2.11 will be considered in the selection process for site designation.

6.2.1 40 CFR 228.6(a)(1)

Geographical position, depth of water, bottom topography, and distance from coast.

The preferred ODMDS is bounded by the following coordinates (NAD 83, see Figure 5):

28° 21’ 52” N, 96° 16’ 01” W; 28° 23’ 01” N, 96° 17’ 12” W

28° 22’ 08” N, 96° 18’ 14” W; 28° 21’ 01” N, 96° 17’ 04” W

The water depth at the preferred site ranges from 43 to 50 ft, the bottom topography is flat, and the site is approximately 3.5 miles from the coast at its closest point.

6.2.2 40 CFR 228.6(a)(2)

Location in relation to breeding, spawning, nursery, feeding or passage areas of living resources in adult or juvenile phases.

The pass between the jetties and Pass Cavallo, including a buffer zone of 1 mile, are excluded areas of biological sensitivity. Also excluded are lighted platforms and nonsubmerged shipwrecks, which improve fishing.

6.2.3 40 CFR 228.6(a)(3)

Location in relation to beaches or other amenity areas.

The preferred site is located approximately 3.5 miles from beaches and other amenity areas such as the Matagorda Island National Seashore. Since the ODMDSs are located in water depths greater than the depth of closure (approximately 16-ft depth), it is not expected that the deposited material will migrate to the shoreline.

6.2.4 40 CFR 228.6(a)(4)

Types and quantities of wastes proposed to be disposed of and proposed methods of release, including methods of packaging the waste, if any.

Only new work dredged material from the MSC will be disposed. It is estimated a total of 12.0 mcy of new work material will be deposited within the preferred site over a period of approximately 2 years. It is expected that 3.2 mcy of the new work material dredged from the MSC Entrance Channel will be transported by hopper dredges. The remaining 8.8 mcy of new work material dredged from the MSC In-Bay Channel will be transported by dump scows. The material from the In-Bay Channel will consist of soft clay, and the material from the Entrance Channel will contain mostly medium-sized sand. Based on chemical analyses and biological toxicity studies of past maintenance material, which should be more degraded than the underlying new work material, it was concluded for the new work material no special location or precautions would be necessary for the placement of the materials to be dredged.

6.2.5 40 CFR 228.6(a)(5)

Feasibility of surveillance and monitoring.

The preferred site is amenable to surveillance and monitoring. The proposed monitoring and surveillance program consists of: (1) a method for recording the location of each discharge; (2) bathymetric surveys; and (3) grain-size analysis, sediment chemistry characterization, and benthic infaunal analysis at selected stations.

6.2.6 40 CFR 228.6(a)(6)

Dispersal, horizontal transport, and vertical mixing characteristics of the area, including prevailing current velocity, if any.

These physical oceanographic parameters were used to develop the necessary buffer zones for the exclusion analysis (EPA, 1989, 1990) and to determine whether the size of the preferred sites was adequate (Section 5.0). Predominant longshore currents, and thus predominant longshore transport, are to the southwest. Long-term mounding has not historically occurred in the existing ODMDSs. Therefore, steady longshore transport and occasional storms, including hurricanes, remove the placed material from the sites. Long-term accumulation has not been noted at construction material placement areas near Sabine Pass, the Galveston Ship Channel, or Freeport, and is not expected at Matagorda.

6.2.7 40 CFR 228.6(a)(7)

Existence and effects of current and previous discharges and dumping in the area (including cumulative effects).

The discussion of the results of chemical and bioassay testing of samples from the existing maintenance material ODMDS and its surroundings concluded that there were no indications of water or sediment quality problems within the existing ODMDS (EPA, 1990). Testing of past maintenance material indicates that it was acceptable for ocean placement under 40 CFR 227. Based on current direction and modeling of the new work material, the preferred site was situated to prevent discharged material from reentering the Channel and to ensure that any mounding poses no obstruction to navigation. No excessive mounding has been detected at the existing maintenance material ODMDS, and there is no reason to expect any excessive mounding at the proposed new work material ODMDS.

6.2.8 40 CFR 228.6(a)(8)

Interference with shipping, fishing, recreation, mineral extraction, desalination, fish and shellfish culture, areas of special scientific importance and other legitimate uses of the ocean.

The items from the above list that are pertinent to the present situation are: shipping, mineral extraction, commercial and recreational fishing, recreational areas, and historic sites. The preferred site will not interfere with these or other legitimate uses of the ocean because the exclusion process in EPA (1989, 1990) was designed to prevent the selection of sites that would interfere. The proposed new work ODMDS is located in the nonexcluded area of the ZSF as established by EPA (1989, 1990). Placement operations in the past have not interfered with other uses.

6.2.9 40 CFR 228.6(a)(9)

Existing water quality and ecology of the site as determined by available data or by trend assessment or baseline surveys.

Monitoring studies (EPA, 1989) have shown only short-term water-column perturbations of turbidity, and perhaps chemical oxygen demand (COD), which resulted from disposal operations. No short-term sediment quality perturbation, except grain size, could be directly related to disposal operations. In general, the water and sediment quality is good throughout the ZSF, including the existing maintenance material ODMDS. This indicates there have been no long-term impacts on water and sediment quality. However, EPA (1990) noted there appear to be long-term impacts on the grain size, and thus on the benthos at the existing maintenance ODMDS. As such, EPA recommended giving preference to the historically impacted area, against other areas evaluated in the ZSF (EPA, 1989), as the preferred site for the permanent designation of the maintenance ODMDS for the Matagorda Ship Channel. Subsequent monitoring data reveal further changes to the benthos at the maintenance ODMDS have not occurred and have therefore stabilized. Reoccurring disposal at another ocean disposal site most likely will result in impacts. However, since the proposed new work material ODMDS is planned to be designated for the one-time use to receive new work dredged material from the MSCIP, any benthos impacts within the proposed new work ODMDS should be temporary as the mound disperses over time.

6.2.10 40 CFR 228.6(a)(10)

Potentiality for the development or recruitment of nuisance species in the disposal site.

With a disturbance to any benthic community, initial recolonization will be by opportunistic species. However, these species are not nuisance species in the sense that they would interfere with other legitimate uses of the ocean, that they are human pathogens, or that they are nonindigenous, nuisance species. The placement of maintenance material in the past has not attracted or promoted, and the placement of the new work material and future maintenance material should not attract or promote, the development or recruitment of nuisance species.

6.2.11 40 CFR 228.6(a)(11)

Existence of or in close proximity to the site of significant natural or cultural features of historical importance.

The nearest site of historical importance is northeast of the channel, or upcurrent of the preferred site by approximately 1 mile. In addition, the preferred site is roughly 5 miles from a cluster of historic sites to the west. Because of the dispersive nature of the ODMDS, EPA (1989) concluded there would be no long-term accumulation outside the interim disposal site (predecessor to the designated maintenance ODMDS), and that short-term accumulation would be small. Therefore, one-time use of the preferred alternative would not impact sites of historical importance.

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Enclosure 3 – Biological Opinion

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects

Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

US Army Corps of Engineers®

Galveston District

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BIOLOGICAL ASSESSMENT FOR IMPACTS TO ENDANGERED AND THREATENED SPECIES RELATIVE TO THE MATAGORDA SHIP CHANNEL, PORT LAVACA, TEXAS PROJECT MATAGORDA AND CALHOUN COUNTIES, TEXAS

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1.0 INTRODUCTION

1.1 PURPOSE OF THE BIOLOGICAL ASSESSMENT

This Biological Assessment (BA) is being prepared to fulfill the U.S. Army Corps of Engineers' (USACE) requirements as outlined under Section 7(c) of the Endangered Species Act (ESA) of 1973, as amended. The proposed Federal action (project) requiring the assessment is the widening and deepening of the Matagorda Ship Channel (MSC) in Matagorda and Calhoun counties, Texas. Details of the proposed project are provided in Section 1.2; specific details are available in the Draft Environmental Impact Statement (EIS; USACE, 2018). This BA evaluates the potential impacts the project may have on federally listed endangered and threatened species and is being prepared to assist U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) personnel in fulfilling their obligations under the ESA. Table 1 presents a list of federally listed threatened and endangered species that are addressed in this BA, as provided by USFWS and NMFS.

Table 1. Threatened and Endangered Wildlife Species of possible occurrence in Calhoun and Matagorda Counties, Texas

Common Name	Scientific Name	Status
Mammals		
Gulf Coast jaguarondi	*Herpailurus yagouaruondi cacomitli*	Endangered
West Indian manatee	*Trichechus manatus*	Threatened
Blue whale	*Balaenoptera musculus*	Endangered
Finback whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaegnliae*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Birds		
Least tern	*Sterna antiallarum*	Endangered*
Northern aplomado falcon	*Falco femoralis septentrionalis*	Endangered
Piping plover	*Charadrius melodus*	Threatened
Red knot	*Calidris canutus rufa*	Threatened
Whooping crane	*Grus Americana*	Endangered
Reptiles		
Green sea turtle	*Chelonia mydas*	Threatened
Hawksbill sea turtle	*Eretomochelys imbricate*	Endangered
Kemp's Ridley sea turtle	*Lepidochelys kempii*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Corals		
Lobed star	*Orbicella annularis*	Threatened
Mountainous star	*Orbicella faveolata*	Threatened
Boulder star	*Orbicella franksi*	Threatened
Elkhorn coral	*Acropora palmata*	Threatened
Clams		
Golden Orb	Quadrula aurea	Candidate

*This species only needs to be considered for wind related projects within the migratory route.

For the purposes of the BA, we define the “project area” as those areas that will be directly affected by construction and maintenance of the proposed project. This includes the proposed dredging footprint, existing and proposed placement areas (PAs) identified in the Dredged Material Management Plan (DMMP), DMMP restoration and nourishment areas, and mitigation areas (Figure 1).

The “study area” includes a larger area for which environmental effects of the proposed project have been analyzed (Figure 2). The study area encompasses a larger area that contains the smaller project area, and includes a 10-mile radius into the Gulf of Mexico (Gulf) from the end of the entrance channel.

1.2 ALTERNATIVES CONSIDERED

This section discusses alternatives considered during the preparation of the Environmental Impact Statement (EIS). While alternate sites might be considered alternatives for some projects that address a national or statewide need, such is not the case for this project. The alternatives addressed were channel widening alternatives and dredged material placement alternatives at the project location. The No-Action Alternative always remains an alternative to the proposed action. The purpose of the proposed project is to improve the deep-draft transport of commerce on the MSC. The current channel is economically inefficient, with up to 90% of vessels calling at Port of Port Lavaca-Point Comfort (the Port) reported to be light loaded due to draft limitations of the present channel configuration. By expanding the MSC dimensions and associated turning basin and marine slips, cargo vessels could reduce or eliminate light-loading measures, and larger cargo vessels unable to transit the current channel configuration could call on the Port. The channel improvements would reduce transportation costs for existing commodities, which are crucial to the regional economy. Because the existing turning basin at 1,000 feet (ft) by 1,000 ft may be deepened but cannot be expanded to accommodate the larger vessels, the Calhoun Port Authority (CPA) proposes to construct a new turning basin at the intersection of the MSC and Alcoa Channel to accommodate larger vessels that would be able to call on the Port. In addition, a wider channel would potentially allow for two-way traffic of smaller vessels during periods of increased transits.

1.2.1 Channel Improvement Alternatives

Identification of reasonable alternatives for channel improvements began with identifying actions that would meet the stated need for the project and comparing them to one another by assessing the benefits and consequences of each alternative to the human and natural environment. Thus, a set of basic criteria is formulated against which potential project impacts were evaluated. An evaluation framework was developed to measure, quantify, and report impacts from each alternative using the established criteria. These criteria are generally derived from water resource planning guidance of the USACE and are described in terms of technical and environmental perspectives.

Technical criteria developed for alternative formulation and evaluation were based on maximizing the navigational attributes of the waterway for commercial vessel transportation in a manner that would achieve the stated purpose and need of the project and is determined as the least environmentally damaging practicable alternative. The general environmental criteria for navigation projects are to assure that care be taken to preserve and protect significant ecological, aesthetic, and cultural values, and to conserve natural resources. Particular emphasis was placed on the following:

- Protection and preservation of the existing fish and wildlife resources along with the protection and preservation of estuaries and wetland habitats and water quality and improvement of these resources through beneficial use of dredged material;
- Consideration in the project design of the least disruptive construction techniques and methods;
- Mitigation for project-related unavoidable impacts by minimizing, rectifying, reducing or eliminating, compensating, replacing, or substituting resources; and
- Preservation of significant historical and archeological resources through avoidance of effects. This is the preferable action to any other form of mitigation since these are finite, nonrenewable resources.

Two structural channel improvement alternatives were developed and evaluated using the technical and environmental criteria described above (Table 2). The primary difference between Alternative A and Alternative B is the presence/absence of a Passing Lane. Each alternative included multiple depths to be refined during the planning stage.

Table 2. Array of structural alternatives for the Matagorda Ship Channel Project.

Alternative	Depth Main / Entrance	Width Main / Entrance	Turning Basin	Passing Lane
No Action	38’ / 40’	200’ / 300’	~1,000’	NO
A	41’ / 43’	350’ / 600’	1,200’	NO
	43’ / 45’	350’ / 600’	1,200’	NO
	45’ / 47’	350’ / 600’	1,200’	NO
	47’ / 49’	350’ / 600’	1,200’	NO
	49’ / 51’	350’ / 600’	1,200’	NO
	51’ / 53’	350’ / 600’	1,200’	NO
B	41’ / 43’	350’ / 600’	1,200’	YES
	43’ / 45’	350’ / 600’	1,200’	YES
	45’ / 47’	350’ / 600’	1,200’	YES
	47’ / 49’	350’ / 600’	1,200’	YES
	49’ / 51’	350’ / 600’	1,200’	YES
	51’ / 53’	350’ / 600’	1,200’	YES

The PDT discussed the Final Array of Alternatives with the MSC Pilots. During the discussion, the Pilots indicated that a Passing Lane would not increase port efficiencies. Alternative B was removed from further consideration. Economic analyses indicate that Alternative A – 47’ MLLW for the main channel and 49’ MLLW for the entrance channel is the preferred alternative.

1.2.2 Dredged Material Placement Alternatives

The proposed action and other alternatives would require placement of construction and maintenance dredged material. The quantity of dredged material removed from the MSC would vary by alternative, and the mix of PAs would primarily distinguish the placement alternatives, along with the types of dredging equipment capable of constructing the improvements.

Thus, a range of dredged material placement alternatives was also considered, including confined upland placement, beneficial use, confined in-water, unconfined in-water, and ocean placement. In the interest of meeting the project purpose and need while minimizing and mitigating for environmental impacts, the project applicant met with representatives of several State and Federal resource agencies to develop a DMMP/Beneficial Use Plan. Work Group participants included representatives from the following State and Federal agencies:

- USACE
- Texas Commission on Environmental Quality (TCEQ)
- Texas Parks and Wildlife Department (TPWD)
- NMFS
- USFWS

A DMMP was identified and evaluated for potential impacts in the DEIS (USACE, 2018).

1.2.3 No-Action Alternative

The No-Action Alternative for this project is one which would result in no construction or improvements to the MSC.

1.2.4 Applicant's Preferred Alternative

Proposed improvements to the MSC would entail deepening the Main Channel from 38' MLLW to 47' MLLW, with 2' of advance maintenance and 2' of allowable overdepth. The Main Channel would be widened from its existing width of 200' to a proposed width of 350'. The Entrance Channel would deepen from 40' MLLW to 49' MLLW, with 3' of advance maintenance and 2' of allowable overdepth. The Entrance Channel width is proposed to be modified from 300 to 600 ft. In addition, a new turning basin would be constructed to allow for a ship-turning circle of 1,200' 47', with 2' of advance maintenance and 2' of allowable overdepth. Approximately 30.2 million cubic yards (mcy) of new work material would be generated upon initial construction, and 167.2 mcy of maintenance material would be generated over a period of 50 years after construction of the improvement project.

The proposed DMMP entails features that will utilize new work and maintenance dredged material to:

1. Cap in situ bottom sediments contaminated with elevated levels of mercury located on the northern edge of Dredge Island (PA ER3) with new work material and future maintenance material;
2. create a terrestrial upland placement site (PA P1) located immediately south of Alamo Beach on agriculture lands with new work material and future maintenance;
3. place future maintenance material in existing in-bay unconfined PAs located northwest of the MSC in Matagorda Bay; and

4. place future maintenance material from the MSC Entrance Channel at the existing Matagorda Ocean Dredged Material Disposal Site (ODMDS) (PA 1) located 2 miles offshore from the Matagorda Peninsula and 1,000 ft south of the MSC Entrance Channel centerline.

The PAs proposed in the DMMP are shown on Figure 1.

1.3 PROJECT AREA HABITAT DESCRIPTION

The study area (see Figure 2) is located in the Gulf Prairies and Marshes Ecological Region as described by Gould et al. (1960). This Eco-region spans the Texas coastline, extending 30 to 80 miles inland. Elevations range from sea level to approximately 250 ft (76.2 m). The Gulf Marshes are low, wet areas with salinities ranging from fresh to saline. Submerged aquatic vegetation, including seagrasses, grow in open-water areas and are also considered special aquatic sites. The Gulf Prairies are primarily uplands, dominated by tallgrass and post oak savannah. However, woody encroachment by trees and scrub species, including Chinese tallow (*Sapium sebiferum*), mesquite (*Prosopis glanduosa*), huisache (*Acacia farnesiana*), and oaks (*Quercus* spp.) (Hatch et al., 1990), plus agricultural and urban development have modified much of the coastline.

The project area is located in the Texan Biotic Province as described by Blair (1950). This province represents a transitional area between the forested Austroriparian Province to the east and grassland provinces to the west. The integration of forests and grasslands results in a mixture of vertebrate species typical of the two habitats. Blair (1950) identifies 23 amphibians known to occur in the Texan province, including 18 anurans (frogs and toads) and 5 caudates (salamanders and newts).

Matagorda Bay is the third largest estuary on the Texas coast, encompassing 420 square miles (1,087.8 square kilometers) and having an average depth of 6.5 ft (2.0 m) (Armstrong et al., 1987; U.S. Environmental Protection Agency [EPA], 1999). The system includes Lavaca, East Matagorda, Keller, Carancahua, and Tres Palacios bays (see Figure 2). Open-water areas include the unvegetated, bottom portion (excluding hard substrates such as oyster reefs) of the subtidal estuarine environment. Open-water habitats support communities of benthic organisms and corresponding fisheries populations.

2.0 STATUS OF THE LISTED SPECIES

To assess the potential impacts of the proposed project on endangered and threatened species, a literature review was performed and other scientific data was researched to determine species distributions, habitat needs, and other biological requirements. Significant literature sources consulted for this report include the USFWS series on endangered species of the seacoast of the U.S. (National Fish and Wildlife Laboratories [NFWL], 1980), Federal status reports and recovery plans, job reports of the TPWD, peer-reviewed journals, and other standard references. Habitat assessments were initially based on aerial photography and National Wetlands Inventory mapping. Input was also solicited from State and Federal Resource Agency personnel and from personnel from Federal National Wildlife refuges (NWRs) and State Wildlife Management areas in the area.

2.1 GULF COAST JAGUARONDI

2.1.1 Reason for Status

USFWS listed the Gulf Coast jaguarondi (*Herpailurus yagouaroundi cacomitli*) as endangered on 14 June 1976 (41 FR 24062). Later it received protection under the ESA of 1973. The primary reason for the decline of the jaguarondi is the loss of habitat. Their primary habitat is in dense brush within fertile regions of the Rio Grande Valley. This habitat has been cleared of brush for agricultural purposes and less than 5% of its habitat remains (Campbell, 1995).

2.1.2 Habitat

The jaguarondi is a secretive cat and it uses dense thorny shrublands of the Rio Grande Valley. They sometimes utilize riparian habitat along rivers or creeks. The optimal habitat is not known due to their secretive nature, though it is believed to be similar to the ocelot (*Leopardus pardalis*). Larger tracts of shrublands (at least five acres) are important to allow adequate range. Little is known about their breeding habitat, and most of what is known is anecdotal (Campbell, 1995).

2.1.3 Range

The jaguarondi is believed to range from southern Texas to Tamaulipas and Veracruz in Mexico (Natureserve, 2018). No sightings of jaguarondi have been made in Texas since 1990 in Brazoria County, though these may have been released individuals (Matthews and Moseley, 1990).

2.1.4 Distribution in Study Area

The historical distribution of the jaguarondi is throughout southern Texas, though no sitings have been made since 1990 (Matthews and Moseley, 1990). The species is believed to be on the verge of extirpation in Texas. While it is possible that a jaguarondi may be present in Calhoun or Matagorda counties, there is no suitable habitat for the species in the study area and it is unlikely to occur there.

2.2 WEST INDIAN MANATEE

2.2.1 Reason for Status

USFWS listed the West Indian manatee (*Trichechus manatus*) as endangered on 11 March 1967 (32 FR 4001). Later it received protection under the ESA of 1973. The largest known human-related cause of manatee mortality is collisions with hulls and/or propellers of boats and ships. The second-largest human-related cause of mortality is entrapment in floodgates and navigation locks. Other known causes of human-related manatee mortality include poaching and vandalism, entrapment in shrimp nets and other fishing gear, entrapment in water pipes, and ingestion of marine debris (USFWS, 2001). Hunting and fishing pressures were responsible for much of its original decline because of the demand for meat, hides, and bones, which resulted in near extirpation of the specie (USFWS, 1995).

A prominent cause of natural mortality in some years is cold stress, and major die-offs associated with the outbreaks of red tide have occurred, where manatees appear to have died because of ingestion of filterfeeding tunicates that had accumulated the neurotoxin-producing dynoflagellates responsible for causing the red tide (USFWS, 2001). The low reproductive rate and habitat loss make it difficult for manatee populations to recover.

2.2.2 Habitat

The West Indian manatee inhabits shallow coastal waters, estuaries, bays, rivers, and lakes. Throughout most of its range, it appears to prefer rivers and estuaries to marine habitats, although manatees inhabit marine habitats in the Greater Antilles (Lefebvre et al., 1989). It is not averse to traveling through dredged canals or using quiet marinas. Manatees are apparently not able to tolerate prolonged exposure to water colder than 68 degrees Fahrenheit (°F) (20 degrees Celsius [°C]). In the northern portions of their range, during October through April, they congregate in warmer water bodies, such as spring-fed rivers and outfalls from power plants. They prefer waters that are at least 3.3 to 6.6 ft (1 to 2 m) in depth; along coasts, they are often in water 9.8 to 16.4 ft (3 to 5 m) deep. They usually avoid areas with strong currents (NatureServe, 2018).

Manatees are primarily dependent upon submergent, emergent, and floating vegetation, with the diet varying according to plant availability. They may opportunistically eat other foods such as acorns in early winter in Florida or fish caught in gill nets in Jamaica (O'Shea and Ludlow, 1992).

2.2.3 Range

The manatee ranges from the southeastern U.S. and coastal regions of the Gulf of Mexico, through the West Indies and Caribbean, to northern South America. U.S. populations occur primarily in Florida (NatureServe, 2018), where they are effectively isolated from other populations by the cooler waters of the northern Gulf of Mexico and the deeper waters of the Straits of Florida (Domning and Hayek, 1986).

2.2.4 Distribution in Study Area

The West Indian manatee historically inhabited the Laguna Madre, Gulf of Mexico, and tidally influenced portions of rivers. It is currently, however, extremely rare in Texas waters, and the most recent sightings are likely individuals migrating or wandering from Mexican waters. Historical records from Texas waters include Cow Bayou, Sabine Lake, Copano Bay, the Bolivar Peninsula, and the mouth of the Rio Grande (Schmidly, 2004). Also, on July 25 and 26, 2005, a manatee was sighted near the Dolphin Point subdivision in Port O'Connor, and on August 13, 2005, a manatee was sighted at the southwest end of Espiritu Santo Bay, near Port O'Connor. In May 2005, a manatee appeared in the Laguna Madre near Port Mansfield. Although the West Indian manatee is chiefly a marine species, its occurrence in the study area is unlikely.

2.3 LEAST TERN

2.3.1 Reason for status

USFWS listed the least tern (*Sterna antillarum*) as endangered on 28 May 1985 (50 FR 21784). There are three subspecies of the least tern, with only the interior least tern

(*Sterna antillarum athalossus*) currently being considered endangered. The largest threats to the least tern are loss of natural nesting habitat, due to changes, such as channelization and damming, in natural river systems. Changes in flow regimes have impacted the timing of tern nesting (Campbell, 1995).

2.3.2 Habitat

The interior least tern is a migratory species. They breed along inland river systems in the US and winter in coastal areas of Central and South America. Their typical nesting habitat includes sparsely vegetated shell, sand or gravel beaches, preferring open areas. The interior least tern feeds in shallow water bodies with an abundance of small fish (Campbell, 1995).

2.3.3 Range

Breeding aged least terns can be found along the Pacific coast from central California down through Baja California and into Chiapas, Mexico. Inland populations can be found along major rivers, such as Red, Colorado, Arkansas, Missouri, Ohio, Mississippi, and Rio Grande. Populations can also be found along the Atlantic and Gulf coasts from Maine through Florida, Texas, the Yucatan Peninsula, and off the coasts of Belize, Honduras and Venezuela. Island populations also exist in the West Indies, Greater and Lesser Antilles, and Bermuda (Natureserve, 2018).

2.3.4 Distribution in Study Area

Calhoun and Matagorda counties are within the least tern migratory corridor along interior rivers to the southern Gulf of Mexico coast. The species may be present in the study area, though the subspecies are not easily distinguishable as fall migrants (Davis and Brewer, 2014).

2.4 NORTHERN APLOMADO FALCON

2.4.1 Reasons for Status

The northern aplomado falcon (*Falco femoralis septentrionalis*) was proposed for endangered status on 20 May 1985 (50 FR 20810). The listing was published as final on 25 February 1986, and the rule became effective on 27 March 1986 (51 FR 6686). Although reasons for the decline of the aplomado falcon are not known (Hector, 1987), habitat degradation due to brush encroachment is probably the main factor in the disappearance of this bird from the U.S. (Hector, 1983). Overcollecting of the falcons and their eggs may have contributed to the decline on a local basis (Hector, 1983, 1987). The NAS (comments published in 51 FR 6686, 25 February 1986) identified the decline as being through the loss of open grassland habitat through overgrazing and other excessive range practices. Currently, the most serious threat is reproductive failure caused by continued use of organochlorine pesticides such as DDT and DDE in Latin America, which affect both the aplomado falcon and its prey species (Hector, 1983).

2.4.2 Habitat

Typical habitat of this species is open country, especially savannah rangeland and open woodland, containing scattered mesquites (*Prosopis* spp.), yuccas (*Yucca* spp.), oaks

(*Quercus* spp.), and acacias (*Acacia* spp.) (AOU, 1998; Hector, 1983; 51 FR 6686, 25 February 1986). Open terrain with scattered trees (for nesting and observation perches), relatively low ground cover (less concealment for prey), an abundance of small to medium-sized birds, and nesting platforms (e.g., stick nests or large bromeliads), particularly in yuccas and mesquites, are the habitat requirements for this bird (Hector, 1981; USFWS, 1995). The preferred habitat of the aplomado falcon in southern Texas was coastal prairie with widely scattered mesquites and yuccas (Hector, 1987).

2.4.3 Range

The aplomado falcon is resident throughout much of Central and South America (AOU, 1998). Three subspecies are recognized: the northern aplomado falcon (*F. f. septentrionalis*) and two others (*F. f. femoralis* and *F. f. pichinchae*) (Hector, 1983). The subspecies *septentrionalis* historically occurred in southeastern Arizona, southern New Mexico, southern Texas, much of Mexico, the Pacific coast of Guatemala, and perhaps Nicaragua where it intergrades with *F. f. femoralis*. Highest nesting densities in the U.S. were formerly in New Mexico and Texas; today this bird is virtually absent from the U.S. (Homerstad, 1990) and nests regularly only in the coastal plains of eastern Mexico (Vera Cruz, Chiapas, Campeche and Tabasco) in the palm and oak savannah and is rarely seen outside this area (Hector, 1981, 1983).

In Texas, the northern aplomado falcon formerly ranged from Cameron County northward to San Patricio County, and west from Ector and Midland counties to El Paso County (Oberholser, 1974). Around the turn of the century, the southeast corner of Cameron County was an important nesting area for the aplomado falcon, with over 100 nests being recorded (Hector, 1983). Other breeding records in Texas have come from Hidalgo, Kenedy, Brooks, Pecos, Ector and Midland counties, with the last nesting pair recorded from Brooks County in 1941 (Oberholser, 1974). Until recently, the last confirmed nesting in the U.S. was near Deming, New Mexico in 1952 (USFWS, 1995). Since 1985, reintroduction efforts have been underway at several sites in south Texas in order to reestablish populations in the U.S. Reintroduction sites have included the Laguna Atascosa NWR and the King Ranch. These birds are hatched in California, flown to Texas at age 3 to 4 weeks, reared in hack boxes, and fed periodically following fledging. In 1995, a pair of these released birds successfully nested on a transmission line pole near Brownsville. In 1996 this same pair nested in a nearby mesquite, but the female and young were subsequently killed by a great horned owl (*Bubo virginianus*) (Anonymous, 1996).

2.4.4 Presence in the Study Area

Suitable habitat may exist further inland within the study area; no suitable habitat exists within the project area and its presence is highly unlikely. Even if this species recovers sufficiently from its present decline and spreads into its former range, lack of suitable nesting habitat in the project area would preclude its occurrence there.

2.5 PIPING PLOVER

2.5.1 Reasons for Status

USFWS listed the piping plover (*Charadrius melodus*) as threatened on 11 December 1985 (50 FR 50726). The piping plover is a federally listed endangered species in the Great Lakes watershed, while the birds breeding on the Atlantic Coast and northern Great Plains are federally listed as threatened. Piping plovers wintering in Texas and Louisiana are part of the northern Great Plains and Great Lakes populations and, therefore, are listed as threatened.

Shorebird hunting during the early 1900s caused the first known major decline of piping plovers (Bent, 1929). Since then, loss or modification of habitat resulting from commercial, residential, and recreational developments, dune stabilization, damming and channelization of rivers (eliminating sandbars, encroachment of vegetation, and altering water flows), and wetland drainage have further contributed to the decline of the species (USFWS, 1995). Additional threats include human disturbances through recreational use of habitat, and predation of eggs by feral pets (USFWS, 1995).

2.5.2 Habitat

General habitat includes shorelines or oceans, rivers, and inland lakes. Within the Great Plains, breeding habitat includes sandy beaches (between dunes and high tide line), spoil islands and sandbars in rivers, and sandy or alkaline shorelines along shallow lakes (AOU, 1998; Haig and Elliot-Smith, 2004). Gravel and sand pits, as well as industrial ponds, are also occasionally used (Haig and Elliot-Smith, 2004). Along the Great Lakes and the Atlantic Coast, piping plovers typically breed on open, sparsely vegetated, sand, gravel, and cobble beaches (Haig and Elliot-Smith, 2004). Beach width appears to be an important factor in nest site selection (Haig and Elliot-Smith, 2004; USFWS, 2003b). Within their wintering range, which includes the Texas Gulf Coast, piping plovers inhabit beaches and bay margins, particularly tidal mudflats and sandflats, algal flats, sandy beaches, and spoil islands (AOU, 1998; Haig and Elliot-Smith, 2004).

2.5.3 Range

The piping plover breeds on the northern Great Plains (Iowa, northwestern Minnesota, Montana, Nebraska, North and South Dakota, Alberta, Manitoba, and Saskatchewan), in the Great Lakes (Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, Wisconsin, and Ontario), and along the Atlantic Coast from Newfoundland to Virginia and (formerly) North Carolina. It winters on the Atlantic and Gulf coasts from North Carolina to Mexico, including coastal Texas, and, less commonly, in the Bahamas and West Indies (AOU, 1998; 50 FR 50726, 11 December 1985). Migration occurs both through the interior of North America east of the Rocky Mountains (especially in the Mississippi Valley) and along the Atlantic Coast (AOU, 1998). Few data exist on the migration routes of this species.

2.5.4 Presence in the Study Area

Critical habitat for the piping plover coastal wintering grounds was designated July 10, 2001 (66 FR 36038), and this designation was challenged on March 20, 2006, by the Texas GLO. The court ordered the USFWS to vacate 19 of the 37 designated units in

Texas and reevaluate them for possible redesignation. On May 20, 2008 (73 FR 29294), the Service revised and proposed the redesignation of critical habitat for wintering piping plovers in Texas in 18 units, 4 of which (19, 21, 22, and 23) occur within the proposed project area. Units 24, 25, and 26, which are also in the project area, remain designated critical habitat. Critical habitat includes the land from the seaward boundary of mean lower low water to where densely vegetated habitat, not used by the species, begins and where the constituent elements no longer occur.

Critical Habitat Unit TX-19 occurs on Matagorda Island Beach (976 acres [ac]) in Calhoun County. This stretch of beach occurs along the Gulf side for 36 miles from Cedar Bayou to Pass Cavallo on the northeast. These lands are infrequently inundated by seasonal winds and fall entirely within the boundaries of Matagorda Island NWR (65 FR 41781–41812, 6 July 2000). Unit TX-22 occurs on Decros Point (1,114 ac) at the Matagorda-Calhoun county line. This unit includes about 4.3 miles of beach habitat around the island at the western tip of Matagorda Peninsula between the natural opening to Matagorda Bay and the MSC. This area is a wind tidal flat that is infrequently inundated by seasonal winds (65 FR 41781–41812, 6 July 2000). Unit TX-23 is a 769-ac shoreline along West Matagorda Peninsula in Matagorda County. This unit extends 24 miles along the Gulf from the jetties at the MSC to the old Colorado River channel. This area is also known as a wind tidal flat and is infrequently flooded by seasonal winds (65 FR 41781–41812, 6 July 2000). Unit TX-24 is a 1,868-ac tract on West Matagorda Bay/Western Peninsula Flats in Matagorda County. This unit extends along the bayside of Matagorda Peninsula southwest of Greens Bayou to 1.6 miles north of Greens Bayou. This unit is also considered a wind tidal flat that is infrequently inundated by seasonal winds (65 FR 41781–41812, 6 July 2000). Unit TX-25 is located on West Matagorda Bay/Eastern Peninsula Flats (575 ac) in Matagorda County. This area follows the bayside of Matagorda Peninsula from Maverick Slough southwest for 3 miles. The unit begins at Maverick Slough to the northeast, and extends 3 miles to the southwest, enclosing a series of flats along Matagorda Bay (65 FR 41781–41812, 6 July 2000). Unit TX-26 is located in Matagorda County on the Colorado River Diversion Delta (13 ac). This unit follows the shore of the extreme east-northeast corner of West Matagorda Bay from Culver Cut to Dog Island Reef. The southeastern tidally emergent portion of Dog Island Reef is included with this unit. The upland areas include areas used for roosting for the piping plover (65 FR 41781–41812, 6 July 2000). NDD (2006b) documented records show this species occurring within the project area. These records are located bayside of Matagorda Peninsula approximately 1.7 air miles southwest of Greens Bayou Cut southwesterly to the breakwater just northeast of Matagorda Peninsula airport and extending west-southwest from Decros Point across the Calhoun-Matagorda county line. A review of Christmas Bird Count data (National Audubon Society [NAS], 2002) from 1958 to 2003 did not identify observations of piping plovers at the public beaches along the Magnolia-Indianola shoreline. However, wintering piping plovers are of potential occurrence on beaches and sand and mudflats along the bay margins within the study area.

2.6 RED KNOT

2.6.1 Reasons for Status

The red knot (*Calidris canutus rufa*) was federally listed as endangered on 12 January 2015 (79 FR 73706). The primary factor threatening the red knot is destruction and modification of its habitat, particularly the reduction in key food resources resulting from reductions in horseshoe crabs, which are harvested primarily for use as bait and secondarily to support a biomedical industry.

Counts of red knots within the principal wintering areas in Chile and Argentina declined by nearly 75 percent from 1985 to 2007 and declined by an additional 15 percent in the past year (2007 to 2008).

2.6.2 Habitat

Red knots use marine habitats during their migration through South and North America. They prefer sandy coasts near tidal inlets or at the mouths of bays or estuaries. The beach habitats are preferable due to the higher concentration of benthic bivalves which are an important food source (Harrington and Flowers, 1996). During the northbound migration red knots can be found feeding on clams along the coast of Virginia (Cohen et al, 2009, 2010) and on horseshoe crab eggs on Delaware Bay beaches (Tsipoura and Burger, 1999).

Red knots winter in on the sandy beaches of Texas and Florida, though they may also use peaty bank areas in Georgia or mangroves in Florida. They have been noted to move from the sandy beaches to intertidal mud flats to feed on benthic invertebrates (Rodrigues, 2000).

2.6.3 Range

Red knots of the *rufa* subspecies (*Calidris canutus rufa*) are medium-sized shorebirds that breed only in Arctic Canada and migrate approximately 18,500 miles annually between Arctic breeding grounds and primary wintering areas in Tierra Del Fuego, at the southern tip of South America. They also winter in three other distinct coastal areas of the Western Hemisphere: the southeastern United States (mainly Florida and Georgia, with smaller numbers in South Carolina), the Gulf of Mexico coast of Texas, and Maranhão in northern Brazil (USFWS, 2011).

In South American wintering areas, red knots are found principally in intertidal marine habitats, especially near coastal inlets, estuaries, and bays, or along intertidal earthen shelf formations. The Delaware Bay area (in Delaware and New Jersey) is the largest known spring migration stopover area, with far fewer migrants congregating elsewhere along the Atlantic coast. The concentration in the Delaware Bay area occurs from the middle of May to early June, corresponding to the spawning season of horseshoe crabs. The knots feed on horseshoe crab eggs, rebuilding energy reserves needed to complete migrations to the Arctic. Surveys at wintering areas and at Delaware Bay during spring migration indicate a substantial decline in the red knot in recent years. Research shows that since 1998, a high proportion of red knots leaving the Delaware Bay failed to achieve threshold departure masses needed to fly to breeding grounds and survive an initial few days of snow cover, and this corresponded to reduced annual survival rates (73 FR 75176).

2.6.4 Presence in the Study Area

Along the Texas coast, red knots forage on beaches, oyster reefs, and exposed bay bottoms and roost on high sand flats, reefs, and other sites protected from high tides (NatureServe, 2018). They are believed to use the beaches in Calhoun and Matagorda Countyies near but not in the project area. In wintering and migration habitats, red knots commonly forage on bivalves, gastropods, and crustaceans. It has been reported that Coquina clams (*Donax variabilis*) serve as a frequent and often important food resource for red knots along Gulf beaches. Reports of the size of flocks of along the Gulf of Mexico coast vary considerably, from highs of about 2,800 to 700 (USFWS, 2011).

2.7 WHOOPING CRANE

2.7.1 Reasons for Status

The whooping crane (*Grus americana*) was federally listed as endangered on 11 March 1967 (32 FR 4001). Critical habitat has been designated in Aransas, Calhoun, and Refugio counties in Texas, and includes the Aransas NWR. An experimentally introduced flock in Florida is listed as an experimental nonessential population (FR, 22 January 1993). The main factors for the decline of the whooping crane were loss of habitat to agriculture, human disturbance of nesting areas, uncontrolled hunting, and collisions with power lines (NatureServe, 2018). Biological factors, such as delayed sexual maturity and small clutch size, prevent rapid population recovery. Drought during the breeding season presents serious hazards to this species (Campbell, 1995). Whooping cranes are vulnerable to loss of habitat along their long migration route (NatureServe, 2018), along which they are still subject to cataclysmic weather events, accidental shooting, collision with power lines, and predators. They are susceptible to avian tuberculosis, avian cholera and lead poisoning (Campbell, 1995). Exposure to disease is a special problem when large numbers of birds are concentrated in limited areas, as often happens during times of drought. While in Texas, the main population is at risk from chemical spills along the Gulf Intracoastal Waterway (GIWW), which passes through the center of their winter range (Campbell, 1995). The presence of contaminants in the food base is another potential problem on their wintering grounds (Oberholser, 1974), and a late season hurricane or other weather event could be disastrous to this concentrated population.

2.7.2 Habitat

Nesting habitat in Canada is freshwater marshes and wet prairies (NatureServe, 2018), interspersed with numerous potholes and narrow wooded ridges. Whooping cranes use a variety of habitats during migration (Campbell, 1995). They feed on grain in croplands (Lewis, 1995), and large wetland areas are used for feeding and roosting. Riverine habitats, such as submerged sandbars, are often used for roosting. The principal winter habitat in Texas is brackish bays, marshes, and salt flats, although whooping cranes sometimes feed in upland sites characterized by oak mottes, grassland swales, and ponds on gently rolling sandy soils (Campbell, 1995).

Summer foods include large insect nymphs or larvae, frogs, rodents, small birds, minnows, and berries. During the winter in Texas, they eat a wide variety of plant and animal foods. Blue crabs, clams, and berries of Carolina wolfberry (*Lycium carolinianum*) comprise the diet. Foods taken at upland sites include acorns, snails, crayfish, and insects (Campbell, 1995).

2.7.3 Range

Whooping cranes were originally found throughout most of North America. In the nineteenth century, the main breeding area was from the Northwest Territories to the prairie provinces in Canada, and the northern prairie states to Illinois. A nonmigratory flock existed in Louisiana, but is now extirpated. Whooping cranes wintered from Florida to New Jersey along the Atlantic Coast, along the Texas Gulf Coast, and in the high plateaus of central Mexico. They now breed in isolated, marshy areas of Wood Buffalo National Park, Northwest Territories, Canada. They winter primarily in the Aransas NWR and adjacent areas of the central Texas Gulf Coast (USFWS, 1995). During migration they use various stopover areas in western Canada and the American Midwest.

Two experimental flocks have been established by incubating eggs and rearing the young in captivity before releasing them into the wild. Cranes were introduced in Grays Lake NWR in Idaho in 1975; these birds winter at Bosque del Apache NWR in central New Mexico. This population was not successful and is now extirpated. Introduction of another flock to Kissimmee Prairie in Florida began in 1993. The Florida population will be nonmigratory (NatureServe, 2018).

The natural wild population of whooping cranes spends its winters at the Aransas NWR, Matagorda Island, Isla San Jose, portions of the Lamar Peninsula, and Welder Point on the east side of San Antonio Bay (NatureServe, 2018). The main stopover points in Texas for migrating birds are in the central and eastern panhandle (USFWS, 1995).

2.7.4 Presence in the Study Area

According to USFWS (1995), Matagorda and Calhoun counties are within the species' migration corridor; therefore, the species may occur in the study area because of the close proximity to suitable wintering habitat. According to NDD records, the whooping crane has been recorded from Aransas County in St. Charles Bay (Aransas Wildlife Refuge, Matagorda Island, and nearby wetlands). Also, one documented occurrence of a single whooping crane was recorded on marsh area between Keller Bay and Matagorda Bay approximately 11 air miles east of Port Lavaca and 3 air miles south of Olivia. Critical habitat for the whooping crane has been documented adjacent to the study area to the southwest.

2.8 GREEN SEA TURTLE

2.8.1 Reasons for Status

The green sea turtle (*Chelonia mydas*) was listed on 28 July 1978 as threatened except for Florida and the Pacific Coast of Mexico (including the Gulf of California) where it was listed as endangered (43 FR 32808). The greatest cause of decline in green turtle populations is commercial harvest for eggs and food. Other turtle parts are used for leather and jewelry, and small turtles are sometimes stuffed for curios. Incidental catch during commercial shrimp trawling is a continued source of mortality that adversely affects recovery. It is estimated that before the implementation of TED requirements, the offshore commercial shrimp fleet captured about 925 green turtles a year, of which approximately 225 would die. Most turtles killed are juveniles and subadults. Various other fishing operations also negatively affect this species (NMFS, 2006). Epidemic outbreaks of fibropapilloma or "tumor" infections recently have occurred on green sea turtles, especially in Hawaii and Florida, posing a severe threat. The cause of these outbreaks is largely unknown, but it could be caused by a viral infection (Barrett, 1996). This species is also subject to various negative impacts shared by sea turtles in general.

2.8.2 Habitat

The green sea turtle primarily utilizes shallow habitats such as lagoons, bays, inlets, shoals, estuaries, and other areas with an abundance of marine algae and seagrasses. Individuals observed in the open ocean are believed to be migrants en route to feeding grounds or nesting beaches (Meylan, 1982). Hatchlings often float in masses of sea plants (e.g., rafts of sargassum) in convergence zones. Coral reefs and rocky outcrops near feeding pastures often are used as resting areas. The adults are primarily herbivorous, while the juveniles consume more invertebrates. Foods consumed include seagrasses, macroalgae, and other marine plants, mollusks, sponges, crustaceans, and jellyfish (Mortimer, 1982).

Terrestrial habitat is typically limited to nesting activities, although in some areas, such as Hawaii and the Galápagos Islands, they will bask on beaches (Balazs, 1980;). They prefer high-energy beaches with deep sand, which may be coarse to fine, with little organic content. At least in some regions, they generally nest consistently at the same beach, which is apparently their natal beach (Allard et al., 1994; Meylan et al., 1990), although an individual might switch to a different nesting beach within a single nesting season.

2.8.3 Range

The green sea turtle is a circumglobal species in tropical and subtropical waters. In U.S. Atlantic waters, it occurs around the U.S. Virgin Islands, Puerto Rico, and continental U.S. from Massachusetts to Texas. Major nesting activity occurs on Ascension Island, Aves Island (Venezuela), Costa Rica, and in Surinam. Relatively small numbers nest in Florida, with even smaller numbers in Georgia, North Carolina, and Texas (Hirth, 1997; NMFS and USFWS, 1991).

2.8.4 Distribution in Texas

The green sea turtle in Texas inhabits shallow bays and estuaries where its principal foods, the various marine grasses, grow (Bartlett and Bartlett, 1999). Its population in

Texas has suffered a decline similar to that of its world population. In the mid- to late nineteenth century, Texas waters supported a green sea turtle fishery. Most of the turtles were caught in Matagorda Bay, Aransas Bay, and the lower Laguna Madre, although a few also came from Galveston Bay. Many live turtles were shipped to places such as New Orleans or New York and from there to other areas. Others were processed into canned products such as meat or soup prior to shipment. By 1900, however, the fishery had virtually ceased to exist. Turtles continued to be hunted sporadically for a while, the last Texas turtler hanging up his nets in 1935. Incidental catches by anglers and shrimpers were sometimes marked prior to 1963, when it became illegal to do so (Hildebrand, 1982).

Green sea turtles still occur in these same bays today but in much-reduced numbers (Hildebrand, 1982). While green turtles prefer to inhabit bays with seagrass meadows, they may also be found in bays that are devoid of seagrasses. The green sea turtles in these Texas bays are mainly small juveniles. Adults, juveniles, and even hatchlings are occasionally caught on trotlines or by offshore shrimpers or are washed ashore in a moribund condition (Shaver, 2000; STSSN, 2018).

Green sea turtle nests are rare in Texas. One nest was recorded at the Padre Island National Seashore in 1987, five in 1998, none in 1999, and one in 2000 (NPS, 2007; Shaver, 2000). Between 2001 and 2005, up to five nests per year have been recorded from the Texas coast. In 2006, two green sea turtle nests were recorded at Padre Island National Seashore (NPS, 2007). Green sea turtles, however, nest more in Florida and in Mexico. Since long migrations of green sea turtles from their nesting beaches to distant feeding grounds are well documented (Green, 1984; Meylan, 1982), the adult green sea turtles occurring in Texas may be either at their feeding grounds or in the process of migrating to or from their nesting beaches. The juveniles frequenting the seagrass meadows of the bay areas may remain there until they move to other feeding grounds or, perhaps, once having attained sexual maturity, return to their natal beaches outside of Texas to nest.

2.8.5 Presence in the Study Area

Four juvenile/subadult green sea turtles were captured during netting operations conducted by TAMUG at Magnolia Beach from May to October 1996 (Williams and Renaud, 1998). These four turtles were outfitted with radio satellite transmitters and tracked between May 1996 and March 1997. Subsequent locations included western Matagorda Bay, Lavaca Bay, and Powderhorn Bayou. The two green sea turtles that were fitted with satellite transmitters remained in the central Texas coast until a cold front on 11 January 1997 caused them to move approximately 112 miles to the south. One of them began moving north again in mid-February and had returned to the Matagorda Bay area by late March (Williams and Renaud, 1998).

In addition to the netting records, a green sea turtle was taken in the entrance channel of the MSC during dredging operations in 2004 (USACE, 2007), and a green sea turtle was recorded in the MSC southeast of Matagorda Peninsula (NDD, 2006a). However, this may have been the same individual. No green sea turtle nests have been recorded from the study area (NPS; 2007). Of the four green sea turtle nests observed during the 2008 nesting season, three occurred on Padre Island National Seashore, and one occurred on South Padre Island (NPS, 2008).

2.9 HAWKSBILL SEA TURTLE

2.9.1 Reasons for Status

The hawksbill sea turtle (*Eretmochelys imbricata*) was federally listed as endangered on 2 June 1970 (35 FR 8495) with critical habitat designated in Puerto Rico on 24 May 1978 (43 FR 22224). The greatest threat to this species is harvest to supply the market for tortoiseshell and stuffed turtle curios (Meylan and Donnelly, 1999). Hawksbill shell (bekko) commands high prices. Japanese imports of raw bekko between 1970 and 1989 totaled 1,573,770 pounds (713,850 kilograms), representing more than 670,000 turtles. The hawksbill is also used in the manufacture of leather, oil, perfume, and cosmetics (NMFS, 2006).

Other threats include destruction of breeding locations by beach development, incidental take in lobster and Caribbean reef fish fisheries, pollution by petroleum products (especially oil tanker discharges), entanglement in persistent marine debris (Meylan, 1992), and predation on eggs and hatchlings. See USFWS (1998) for detailed information on certain threats, including beach erosion, beach armoring, beach nourishment, sand mining, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, predation, and poaching.

In 1998, NMFS designated critical habitat near Mona Island and Isla Monito, Puerto Rico, seaward to 3.5 miles (63 FR 46693–46701).

2.9.2 Habitat

Hawksbills generally inhabit coastal reefs, bays, rocky areas, passes, estuaries, and lagoons, where they occur at depths of less than 70 ft (21.5 m). Like some other sea turtle species, hatchlings are sometimes found floating in masses of marine plants (e.g., sargassum rafts) in the open ocean (NFWL, 1980). Hawksbills reenter coastal waters when they reach a carapace length of approximately 7.9 to 9.8 inches (20 to 25 centimeters). Coral reefs are widely recognized as the resident foraging habitat of juveniles, subadults, and adults. This habitat association is undoubtedly related to their diet of sponges, which need solid substrate for attachment. Hawksbills also occur around rocky outcrops and high-energy shoals, which are also optimum sites for sponge growth. In Texas, juvenile hawksbills are associated with stone jetties (NMFS, 2006).

While this species is omnivorous, it prefers invertebrates, especially encrusting organisms, such as sponges, tunicates, bryozoans, mollusks, corals, barnacles, and sea urchins. Pelagic species consumed include jellyfish and fish, and plant material such as algae, sea grasses and mangroves have been reported as food items for this turtle (Carr, 1952; Mortimer, 1982; Musick, 1979; Pritchard, 1977; Rebel, 1974). The young are reported to be somewhat more herbivorous than adults (Ernst and Barbour, 1972).

Terrestrial habitat is typically limited to nesting activities. The hawksbill, which is typically a solitary nester, nests on undisturbed, deep-sand beaches, from high-energy ocean beaches to tiny pocket beaches several meters wide bounded by crevices of cliff walls. Typically, the sand beaches are low energy, with woody vegetation, such as sea grape (*Coccoloba uvifera*), near the waterline (NRC, 1990).

2.9.3 Range

The hawksbill is circumtropical, occurring in tropical and subtropical seas of the Atlantic, Pacific, and Indian oceans (Witzell, 1983). This species is probably the most tropical of all marine turtles, although it does occur in many temperate regions. The hawksbill sea turtle is widely distributed in the Caribbean Sea and western Atlantic Ocean, with representatives of at least some life history stages regularly occurring in southern Florida and the northern Gulf (especially Texas), south to Brazil (NMFS, 2006). In the continental U.S., the hawksbill largely nests in Florida where it is sporadic at best (NFWL, 1980). However, a major nesting beach exists on Mona Island, Puerto Rico. Elsewhere in the western Atlantic, hawksbills nest in small numbers along the Gulf Coast of Mexico, the West Indies, and along the Caribbean coasts of Central and South America (Musick, 1979).

2.9.4 Distribution in Texas

Texas is the only state outside of Florida where hawksbills are sighted with any regularity. Most of these sightings involve posthatchlings and juveniles, and are primarily associated with stone jetties. These small turtles are believed to originate from nesting beaches in Mexico (NMFS, 2006). On 13 June 1998, the first hawksbill nest recorded on the Texas coast was found at Padre Island National Seashore. This nest remains the only documented hawksbill nest on the Texas coast (NPS, 2007).

2.9.5 Presence in the Study Area

As previously noted, the hawksbill sea turtle occurs along the Texas coast. However, this species has not been recorded from the study area and no hawksbills have been taken during hopper dredging activities in Texas (USACE, 2007). Nevertheless, this species is of potential occurrence in the study area.

2.10 KEMP’S RIDLEY SEA TURTLE

2.10.1 Reasons for Status

Kemp’s ridley sea turtle (*Lepidochelys kempii*) was listed as endangered throughout its range on 2 December 1970 (35 FR 18320). Populations of this species have declined since 1947, when an estimated 42,000 females nested in one day (Hildebrand, 1963), to a total nesting population of approximately 1,000 in the mid-1980s. The decline of this species was primarily the result of human activities including collection of eggs, fishing for juveniles and adults, killing adults for meat and other products, and direct take for indigenous use. In addition to these sources of mortality, Kemp’s ridleys have been subject to high levels of incidental take by shrimp trawlers (NMFS, 2006; USFWS and NMFS, 1992). The National Research Council’s (NRC) Committee on Sea Turtle Conservation estimated in 1990 that 86% of the human-caused deaths of juvenile and adult loggerheads and Kemp’s ridleys resulted from shrimp trawling (Campbell, 1995). It is estimated that before the implementation of turtle excluder devices (TED), the commercial shrimp fleet killed between 500 and 5,000 Kemp's ridleys each year (NMFS, 2006). Kemp's ridleys have also been taken by pound nets, gill nets, hook and line, crab traps, and longlines.

Another problem shared by adult and juvenile sea turtles is the ingestion of manmade debris and garbage. Postmortem examinations of sea turtles found stranded on the south Texas coast from 1986 through 1988 revealed 54% (60 of the 111 examined) of the sea turtles had eaten some type of marine debris. Plastic materials were most frequently ingested and included pieces of plastic bags, Styrofoam, plastic pellets, balloons, rope, and fishing line. Nonplastic debris such as glass, tar, and aluminum foil were also ingested by the sea turtles examined. Much of this debris comes from offshore oil rigs, cargo ships, commercial and recreational fishing boats, research vessels, naval ships, and other vessels operating in the Gulf. Laws enacted during the late 1980s to regulate this dumping are difficult to enforce over vast expanses of water. In addition to trash, pollution from heavy spills of oil or waste products poses additional threats (Campbell, 1995).

Further threats to this species include collisions with boats, explosives used to remove oil rigs, and entrapment in coastal power plant intake pipes (Campbell, 1995). Dredging operations affect Kemp's ridley turtles through incidental take and by degrading the habitat. Incidental take of ridleys has been documented with hopper dredges. In addition to direct take, channelization of the inshore and nearshore areas can degrade foraging and migratory habitat through dredged material placement, degraded water quality/clarity, and altered current flow (USFWS and NMFS, 1992).

Sea turtles are especially subject to human impacts during the time the females come ashore for nesting. Modifications to nesting areas can have a devastating effect on sea turtle populations. In many cases, prime sea turtle nesting sites are also prime real estate. If a nesting site has been disturbed or destroyed, female turtles may nest in inferior locations where the hatchlings are less likely to survive, or they may not lay any eggs at all. Artificial lighting from developed beachfront areas often disorients nesting females and hatchling sea turtles, causing them to head inland by mistake, often with fatal results. Adult females also may avoid brightly lit areas that would otherwise provide suitable nesting sites.

Kemp's ridley appears to be in the earliest stages of recovery. Approximately 6,000 Kemp's ridley nests were recorded on Mexican beaches during the 2000 nesting season; just over 10,000 nests were recorded there during the 2005 nesting season. Similarly, increased nesting activity has been recorded on the Texas beaches in the last decade or so from four nests in 1995 to 51nests in 2005 (NPS, 2007). Some of these nests were from head-started ridleys. Of 46 Kemp's ridley nests encountered in the continental U.S. during 2004, 42 were on Texas beaches (NPS, 2006). The increase likely can be attributed to two primary factors: full protection of nesting females and their nests in Mexico, and the requirement to use TEDs in shrimp trawls both in the U.S. and in Mexico (NMFS, 2006).

2.10.2 Habitat

Kemp's ridleys inhabit shallow coastal and estuarine waters, usually over sand or mud bottoms. Adults are primarily shallow-water benthic feeders that specialize on crabs, especially portunid crabs, while juveniles feed on sargassum and associated infauna, and other epipelagic species of the Gulf (USFWS and NMFS, 1992). In some regions, the blue crab (*Callinectes sapidus*) is the most common food item of adults and juveniles. Other food items include shrimp, snails, bivalves, sea urchins, jellyfish, sea stars, fish, and occasional marine plants (Campbell, 1995, Pritchard and Marquez, 1973; Shaver, 1991).

2.10.3 Range

Adults are primarily restricted to the Gulf, although juveniles may range throughout the Atlantic Ocean since they have been observed as far north as Nova Scotia (Musick, 1979) and in coastal waters of Europe (Brongersma, 1972). Important foraging areas include Campeche Bay, Mexico, and Louisiana coastal waters.

Almost the entire population of Kemp's ridleys nests on an 11-mile stretch of coastline near Rancho Nuevo, Tamaulipas, Mexico, approximately 190 miles south of the Rio Grande. A secondary nesting area occurs at Tuxpan, Veracruz, and sporadic nesting has been reported from Mustang Island, Texas, southward to Isla Aquada, Campeche. Several scattered isolated nesting attempts have occurred from North Carolina to Colombia.

Because of the dangerous population decline at the time, a head-starting program was carried out from 1978 to 1988. Eggs were collected from Rancho Nuevo and placed into polystyrene foam boxes containing Padre Island sand so that the eggs never touched the Rancho Nuevo sand. The eggs were flown to the U.S. and placed in a hatchery on Padre Island and incubated. The resulting hatchlings were allowed to crawl over the Padre Island beaches into the surf for imprinting purposes before being recovered from the surf and taken to Galveston for rearing. They were fed a diet of high-protein commercial floating pellets for 7 to 15 months before being released into Texas (mainly) or Florida waters (Caillouet et al., 1995). This program has shown some results. The first nesting from one of these head-started individuals occurred at Padre Island in 1996, and more nesting has occurred since.

2.10.4 Distribution in Texas

Kemp's ridley occurs in Texas in small numbers and in many cases may well be in transit between crustacean-rich feeding areas in the northern Gulf and breeding grounds in Mexico. It has nested sporadically in Texas in the last 50 years. Nests were found near Yarborough Pass in 1948 and 1950, and in 1960 a single nest was located at Port Aransas. The number of nestings, however, has increased in recent years: 1995 (4 nests); 1996 (6 nests); 1997 (9 nests); 1998 (13 nests); 1999 (16 nests); 2000 (12 nests); 2001 (8 nests); 2002 (38 nests); 2003 (19 nests); 2004 (42 nests); 2005 (51 nests); 2006 (102 nests); and 2008 (195 nests) (NPS, 2008). As noted above, some of these nests were from head-started ridleys. Such nestings, together with the proximity of the Rancho Nuevo rookery, probably account for the occurrence of hatchlings and subadults in Texas.

According to Hildebrand (1982, 1987), sporadic ridley nesting in Texas has always been the case.

2.10.5 Presence in the Study Area

Seven Kemp's ridleys were captured during netting operations conducted by Texas A&M University at Galveston (TAMUG) near Magnolia Beach in Matagorda Bay from May to October 1996 (Williams and Renaud, 1998). These seven turtles were outfitted with radio or satellite transmitters and tracked between May and November 1996. Most of the subsequent locations were within 4 miles of the western shoreline of Matagorda Bay. Other locations included Lavaca Bay, Carancahua Bay, Tres Palacios Bay, and Powderhorn Lake (Williams and Renaud, 1998). In addition to the netting records, a Kemp's ridley nested on Matagorda Peninsula in 2002, four Kemp's ridleys nested on Matagorda Island in 2006 (NPS, 2007), and two Kemp's ridleys were taken in the entrance channel of the MSC in 2006 (USACE, 2007). During the 2008 nesting season, 195 nests were observed; 13 of these occurred on Matagorda Island. No Kemp's ridley nests were observed on Matagorda Peninsula in 2008 (NPS, 2008).

2.11 LEATHERBACK SEA TURTLE

2.11.1 Reasons for Status

The leatherback sea turtle (*Dermochelys coriacea*) was listed as endangered throughout its range on 2 June 1970 (35 FR 8495), with critical habitat designated in the U.S. Virgin Islands on 26 September 1978 and 23 March 1979 (43 FR 43688–43689 and 44 FR 17710–17712, respectively). Its decline is attributable to overexploitation by man and incidental mortality associated with commercial shrimping and fishing activities. Use of turtle meat for fish bait and the consumption of litter by turtles are also causes of mortality, the latter phenomenon apparently occurring when plastic is mistaken for jellyfish (Rebel, 1974). Nesting populations of leatherback sea turtles are especially difficult to estimate because the females frequently change nesting beaches; however, Spotila et al. (1996) estimated the 1995 worldwide population of nesting female leatherbacks at 26,000 to 42,000. The major threat is egg collecting, although they are jeopardized to some extent by destruction or degradation of nesting habitat (NatureServe, 2018). This species is probably more susceptible than other turtles to drowning in shrimp trawlers equipped with TEDs because adult leatherbacks are too large to pass through the TED exit opening. Because leatherbacks nest in the tropics during hurricane season, a potential exists for storm generated waves and wind to erode nesting beaches, resulting in nest loss (NMFS and USFWS, 1992).

Critical Habitat: St. Croix, Virgin Islands; Santa Rosa NP., Costa Rica; sites in Mexico. NMFS (*Federal Register*, 12 May 1995) established a leatherback conservation zone extending from Cape Canaveral to the Virginia-North Carolina border and including all inshore and offshore waters; this zone is subject to shrimping closures when high abundance of leatherbacks is documented. Mortality associated with the swordfish gillnet fisheries in Peru and Chile represents the single largest source of mortality for East Pacific leatherbacks (Eckert and Sarti, 1997).

2.11.2 Habitat

The leatherback sea turtle is mainly pelagic, inhabiting the open ocean, and seldom approaches land except for nesting (Eckert, 1992). It is most often found in coastal waters only when nesting or when following concentrations of jellyfish (TPWD, 2006), when it can be found in inshore waters, bays, and estuaries. It dives almost continuously, often to great depths.

Despite their large size, the diet of leatherbacks consists largely of jellyfish and sea squirts. They also consume sea urchins, squid, crustaceans, fish, blue-green algae, and floating seaweed (NFWL, 1980). The leatherback typically nests on beaches with a deepwater approach (Pritchard, 1971).

2.11.3 Range

The leatherback is probably the most wide-ranging of all sea turtle species. It occurs in the Atlantic, Pacific, and Indian oceans; as far north as British Columbia, Newfoundland, Great Britain, and Norway; as far south as Australia, the Cape of Good Hope, and Argentina; and in other water bodies such as the Mediterranean Sea (NFWL, 1980). Leatherbacks nest primarily in tropical regions; major nesting beaches include Malaysia, Mexico, French Guiana, Surinam, Costa Rica, and Trinidad (Ross, 1982). Leatherbacks nest only sporadically in some of the Atlantic and Gulf states of the continental U.S., with one nesting reported as far north as North Carolina (Schwartz, 1976). In the Atlantic and Caribbean, the largest nesting assemblages occur in the U.S. Virgin Islands, Puerto Rico, and Florida (NMFS, 2006).

The leatherback migrates farther and ventures into colder water than any other marine reptile. Adults appear to engage in routine migrations between boreal, temperate, and tropical waters, presumably to optimize both foraging and nesting opportunities. The longest-known movement is that of an adult female that traveled 3,666 miles to Ghana, West Africa, after nesting in Surinam (NMFS and USFWS, 1992). During the summer, leatherbacks tend to occur along the east coast of the U.S. from the Gulf of Maine south to the middle of Florida.

2.11.4 Distribution in Texas

Apart from occasional feeding aggregations such as the large one of 100 animals reported by Leary (1957) off Port Aransas in December 1956, or possible concentrations in the Brownsville Eddy in winter (Hildebrand, 1983), leatherbacks are rare along the Texas coast, tending to keep to deeper offshore waters where their primary food source, jellyfish, occurs. In the Gulf, the leatherback is often associated with two species of jellyfish: the cabbagehead (*Stomolophus* sp.) and the moon jellyfish (*Aurelia* sp.) (NMFS and USFWS, 1992). According to USFWS (1981), leatherbacks never have been common in Texas waters. No nests of this species have been recorded in Texas for at least 70 years (NPS, 2007). The last two, one from the late 1920s and one from the mid-1930s, were both from Padre Island (Hildebrand, 1982).

2.11.5 Presence in the Study Area

A leatherback was caught by a trawler in a shipping channel approximately 1.5 miles north of Aransas Pass (NMFS, 2003). No leatherbacks have been taken by dredging activities in Texas (USACE, 2007). One leatherback nest was observed during the 2008 nesting season on the Padre Island National Seashore (NPS, 2008). This species is unlikely to occur in the study area.

2.12 LOGGERHEAD SEA TURTLE

2.12.1 Reasons for Status

USFWS listed the loggerhead turtle (*Caretta caretta*) as threatened throughout its range on 28 July 1978 (43 *Federal Register* [FR] 32808). The decline of the loggerhead, like that of most sea turtles, is the result of overexploitation by man, inadvertent mortality associated with fishing and trawling activities, and natural predation. The most significant threats to its population are coastal development, commercial fisheries, and pollution (NMFS, 2006).

2.12.2 Habitat

The loggerhead occurs in the open seas as far as 500 miles from shore, but mainly over the continental shelf, and in bays, estuaries, lagoons, creeks, and mouths of rivers. It favors warm-temperate and subtropical regions not far from shorelines. The adults occupy various habitats, from turbid bays to clear waters of reefs. Subadults occur mainly in nearshore and estuarine waters. Hatchlings move directly to sea after hatching, and often float in masses of sargassum (*Sargassum* sp.). They may remain associated with sargassum for perhaps 3 to 5 years (NMFS and USFWS, 1991a).

Commensurate with their use of varied habitats, loggerheads consume a wide variety of both benthic and pelagic food items, which they crush before swallowing. Conches, shellfish, horseshoe crabs, prawns and other crustacea, squid, sponges, jellyfish, basket starts, fish (carrion or slow-moving species), and even hatchling loggerheads have all been recorded as loggerhead prey (Hughes, 1974; Mortimer, 1982; Rebel, 1974). Adults forage primarily on the bottom, but also take jellyfish from the surface. The young feed on prey concentrated at the surface, such as gastropods, fragments of crustaceans, and sargassum.

Nesting occurs usually on open sandy beaches above the high-tide mark and seaward of well-developed dunes. They nest primarily on high-energy beaches on barrier islands adjacent to continental land masses in warm-temperate and subtropical regions. Steeply sloped beaches with gradually sloped offshore approaches are favored. In Florida, nesting on urban beaches was strongly correlated with the presence of tall objects (trees or buildings), which apparently shield the beach from city lights (Salmon et al., 1995).

2.12.3 Range

The loggerhead is widely distributed in tropical and subtropical seas, being found in the Atlantic Ocean from Nova Scotia to Argentina, the Gulf, Indian and Pacific oceans (although it is rare in the eastern and central Pacific), and the Mediterranean Sea (Iverson, 1986, Rebel, 1974; Ross, 1982). In the continental U.S., loggerheads nest along the Atlantic coast from Florida to as far north as New Jersey (Musick, 1979) and sporadically along the Gulf Coast. In recent years, a few have nested on barrier islands along the Texas coast. The loggerhead is the most abundant sea turtle species in U.S. coastal waters (NMFS, 2006).

2.12.4 Distribution in Texas

The loggerhead is the most abundant turtle in Texas marine waters, preferring shallow inner continental shelf waters and occurring only very infrequently in the bays. It often occurs near offshore oil rig platforms, reefs, and jetties. Loggerheads are probably present year-round but are most noticeable in the spring when a favored food item, the Portuguese man-of-war (*Physalia physalis*), is abundant. Loggerheads constitute a major portion of the dead or moribund turtles washed ashore (stranded) on the Texas coast each year (Sea Turtle Stranding and Salvage Network [STSSN], 2018). A large proportion of these deaths are the result of accidental capture by shrimp trawlers, where caught turtles drown and then are thrown overboard. Before 1977, no positive documentation of loggerhead nests in Texas existed (Hildebrand, 1982). Since that time, several nests have been recorded along the Texas coast. In 1999, two loggerhead nests were confirmed in Texas, while in 2000, five loggerhead nests were confirmed. Between 2001 and 2005, up to five loggerhead nests per year have been recorded from the Texas coast. Two loggerhead nests were recorded in 2006: one on Padre Island National Seashore and the other on South Padre Island (National Park Service [NPS], 2007). During the 2008 nesting season, four loggerheads were observed nesting on Texas beaches, two on Padre Island National Seashore, one on Bolivar Peninsula, and one on Mustang Island (NPS, 2008). Like the worldwide population, the population of loggerheads in Texas has declined. Prior to World War I, the species was taken in Texas for local consumption and a few were marketed (Hildebrand, 1982). Today, even with protection, insufficient loggerheads exist to support a fishery.

2.12.5 Presence in the Study Area

Critical habitat for the loggerhead turtle was designated on 10 July 2014 (79 FR 39856). Critical habitat was designated for areas of breeding, migration, and feeding (*Sargassum* habitat). Only the *Sargassum* habitat is present off the Texas coast. This habitat is described as "developmental and foraging habitat for young loggerheads where surface waters form accumulations of floating material, especially *Sargassum*." The areas identified as *Sargassum* habitat include the western Gulf of Mexico to the eastern edge of the Loop Current and the Atlantic ocean from the Gulf of Mexico along the northern/western boundary of the Gulf Stream and east to the outer edge of the U.S. Exclusive Economic Zone (EEZ) (79 FR 39881).

"Specifically, the Gulf of Mexico area has as its northern and western boundaries the 10 m depth contour starting at the mouth of South Pass of the Mississippi River and proceeding west and south to the outer boundary of the U.S. EEZ. The southern boundary of the area is the U.S. EEZ from the 10 m depth contour off of Texas to the Gulf of Mexico-Atlantic border (83° W. long.). The eastern boundary follows the 10 m depth contour from the mouth of South Pass of the Mississippi River at 28.97° N. lat., 89.15° W. long., in a straight line to the northernmost boundary of the Loop Current (28° N. lat., 89° W. long.) and along the eastern edge of the Loop Current roughly following the velocity of 0.101–0.20 m/second as depicted by Love *et al.* (2013) using the Gulf of Mexico summer mean sea surface currents from 1993–2011, to the Gulf of Mexico Atlantic border (24.58° N. lat., 83° W. long.). The delineation between the Gulf of Mexico and the Atlantic Ocean starts at 24.58° N. lat., 83° W. long. (near the Dry Tortugas), and proceeds southward along 83° W. long. to the outer boundary of the EEZ (23.82° N. lat.) (79 FR 39882-39883).

This species has been recorded from the study area. A loggerhead turtle was killed in 1996 during dredging operations in the entrance channel of the MSC, and two loggerheads were taken in the entrance channel of the MSC during dredging operations in 2006 (USACE, 2018).

2.13 WHALES

NMFS identifies five whale species of potential occurrence in the Gulf. These are the sei whale (*Balaenoptera borealis*), blue whale (*Balaenoptera musculus*), fin (or finback) whale (*Balaenoptera physalus*), humpback whale (*Megaptera novaeangliae*), and sperm whale (*Physeter macrocephalus*). These species are generally restricted to deeper offshore waters; therefore, it is unlikely that any of these five species would regularly occur in the study area (NMFS, 2003).

2.14 CORALS

NMFS identifies four invertebrate coral species of potential occurrence in the Gulf. These are the lobed star (*Orbicella annularis*), mountainous star (*Orbicella faveolata*), boulder star (*Orbicella franksi*), and elkhorn coral (*Acropora palmata*). These species are generally restricted to deeper offshore waters; therefore, it is unlikely that any of these four species would regularly occur in the study area.

2.15 GOLDEN ORB

2.15.1 Reasons for Status

USFWS announced a 90-day finding on the golden orb (*Quadrula aurea*) on 15 December 2009 (74 FR 66261). The species was added to the list of candidate species on 6 October 2011 (76 FR 62166). The primary threat to the species is the degradation and loss of habitat (Neves, 1991). Impoundments, sedimentation of rivers, dewatering of rivers, sand and gravel mining, and chemical contamination are some of the leading causes of habitat loss and degradation (Neck, 1982; Howells et al., 1996; Winemiller et al.,2010).

Candidate species are not protected under the ESA, but would be subject to all the protections of the ESA were it to be listed prior to, or during, the construction of the project.

2.15.2 Habitat

The golden orb is found almost exclusively in the flowing waters of medium sized rivers (Howells, 2002a). They prefer mud, sand, and gravel substrates and does not tolerate looser packed substrates, such as loose sand or silt (Howells, 2002b).

2.15.3 Range

The golden orb is endemic to the Guadalupe, San Antonio, and Nueces-Frio river basins in central Texas. Their distribution has shrunk significantly and has currently only been reported in Lake Corpus Christi, the Guadalupe, the lower San Marcos, and the lower San Antonio Rivers (76 FR 62166).

2.15.4 Presence in the Study Area

The golden orb has not been noted in the study area. Because the project is located in estuarine and open Gulf waters the species is not expected to be found within the project area.

3.0 EFFECTS ANALYSIS AND AVOIDANCE, MINIMIZATION, AND CONSERVATION MEASURES

In this document, the USACE presents their determinations about each species potentially occurring within the affected area of the MSC Improvement Project, using language recommended by USFWS:

- *No effect* – USACE determines that its proposed action will not affect a federally listed species or critical habitat;
- *May affect, but not likely to adversely affect* – USACE determines that the project may affect listed species and/or critical habitat; however, the effects are expected to be discountable, insignificant, or completely beneficial; or
- *Likely to adversely affect* – USACE determines adverse effects to listed species and/or critical habitat may occur as a direct result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or completely beneficial. Under this determination, an additional determination is made whether the action is likely to jeopardize the continued survival and eventual recovery of the species.

Following USACE effect determinations for the project on federally listed species, USFWS and NMFS will review the information and complete the Section 7 consultation process under the ESA. Because a Biological Opinion (BO) has already been received from NMFS, they will be notified of changes to this BA to ensure that the BO is still appropriate.

The following sections provide the USACE's findings and species-specific avoidance, minimization, and conservation measures that support the effect determinations.

3.1 Gulf Coast Jaguarundi

Because this jaguarundi is not expected at present to occur in the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.2 West Indian Manatee

This species is highly unlikely to occur in the project area; therefore, the project may affect, but is not likely to adversely affect, manatees. Several measures will be taken to ensure avoidance and pertain to dissemination of appropriate information to the project construction and operations employees. These employees will be 1) advised that manatees may be in the proposed project area; 2) provided materials, such as a poster, to assist in identification; 3) instructed not to feed or water the animal; and 4) provided the appropriate contact numbers for USFWS or NMFS in case a manatee is sighted.

3.3 Least Tern

The USFWS states that this species only needs to be considered for wind related projects within its migratory route. Therefore, no impacts and no effects are anticipated as a result of the proposed project.

3.4 Northern Aplomado Falcon

This falcon is not expected at present to occur in the project area, though noise from dredging and impacts to upland placement areas may affect, but are not likely to adversely affect the species as a result of the proposed project.

3.5 Piping Plover

Proposed designated and designated critical habitat occurs in the vicinity of the project area in Texas Units 19 through 27; the study area includes CH TX-24 and a portion of TX-21. Designation of critical habitat for the piping plover has been temporarily vacated for units TX-22 and TX-23 within the project area; however, these areas continue to be valuable habitat for wintering piping plovers. The primary constituent elements (PCEs) for the piping plover wintering habitat are those components that are essential for the primary biological needs of foraging, sheltering, and roosting, and only those areas containing these PCEs within the designated boundaries are considered critical habitat. The PCEs are found in coastal areas that support intertidal beaches and flats (between annual low and high tide) and associated dune systems and flats above annual high tide (65 FR 41781–41812, 6 July 2000).

No placement of dredged material will occur within areas of designated critical habitat or in areas that include PCEs for this species. The designated critical habitat for the piping plover would not be directly affected by construction or dredging activities. The piping plover has been recorded at several places in the vicinity of the project area, according to NDD (2006b); however, several decades (1958–2003) of Christmas Bird Count data (NAS, 2002) were reviewed, and piping plovers were not observed along shorelines planned for beach nourishment. Habitat created by the nourishment efforts could increase potential suitability as plover habitat. The proposed project may affect, but is not likely to adversely affect, this species.

3.6 Red Knot

This red knot is not expected at present to occur in the project area, though noise from dredging and impacts to upland placement areas may affect, but are not likely to adversely affect the species as a result of the proposed project.

3.7 Whooping Crane

Critical habitat for the whooping crane has been documented adjacent to the project area to the southwest, but no critical habitat will be affected by this project. The greatest concern of impacts to whooping cranes involves collisions with structures that are greater than 15 ft in height and smaller than 1 inch in diameter. Research provided in the USFWS Recovery Plan for the whooping crane illustrates that “tests of line marking devices, using sandhill cranes as a surrogate research species, have identified techniques effective in reducing collisions by up to 61%” (Brown and Drewien, 1995; Morkill, 1990; Morkill and Anderson, 1991, 1993; Canadian Wildlife Service and USFWS, 2007). To adopt these recommendations into the MSC Project best management practices (BMPs), project equipment that may be a collision hazard to the whooping crane (guy wires that support the dredging equipment, telecommunications towers on the dredges, and antenna or similar items located on the dredges) will be marked using red plastic balls or other suitable marking devices sized and spaced, as directed by USFWS, and lighted during inclement weather conditions when low light and/or fog is present. This BMP would be implemented at the beginning of October through April when whooping cranes are known to be present within the project vicinity. In the event of an unanticipated spill, a project-specific Spill Response Plan will be prepared and implemented prior to the onset of construction activities. With the implementation of the above listed BMPs, this project may affect but is unlikely to adversely affect this species.

Potential beneficial results of the project include the creation of suitable foraging grounds (i.e., low and high marsh), which would also provide indirect benefits through production of forage items (e.g., blue crabs and Carolina wolfberry) for the whooping crane (Chavez-Ramirez, 1996) via estuarine nursery effects.

3.8 Marine (Sea) Turtles

The responsibility for agency consultation on marine reptiles is divided between two federal agencies: the NMFS for sea turtles in the water, and the USFWS for nesting sea turtles.

Sea turtles may be present in the water within the project dredging sites during certain times of the year. Thus, construction and post-construction maintenance activities could result in impacts to sea turtles. Five species of sea turtle occur in Texas waters: Kemp’s ridley sea turtle, hawksbill sea turtle, leatherback sea turtle, loggerhead sea turtle, and green sea turtle. Since October 1996, three loggerheads, two Kemp’s ridleys, and one green sea turtle have been taken during maintenance dredging of the entrance channel of the MSC (USACE, 2007). During the 2008 nesting season, a total of 204 sea turtle nests were observed on Texas beaches: 195 Kemp’s ridley, 1 leatherback, 4 loggerhead, and 4 green turtles (NPS, 2008). NPS reports that 13 of the 195 Kemp’s ridleys nested on Matagorda Island, but no nests were observed on Matagorda Peninsula. No leatherback, loggerhead, or green sea turtle nests were observed on Matagorda Island or Matagorda Peninsula (NPS, 2008).

3.8.1 Channel Construction Dredging (New Work) and Maintenance

The proposed project calls for the use of pipeline, mechanical, and hopper dredges. It has been well documented that hopper dredging activities occasionally result in sea turtle entrainment and death, even with seasonal dredging windows, V-shaped turtle-deflector dragheads, and concurrent relocation trawling (NMFS, 2003, 2005). Between February 1995 and November 2006, hopper dredging activities within the USACE, Galveston District resulted in 60 lethal takes of sea turtles: 26 loggerheads, 21 green turtles, and 13 Kemp's ridleys (USACE, 2007). Sea turtles easily avoid pipeline dredges due to the slow movement of the dredge. Apart from direct mortality, dredging activities could have an impact on sea turtles through an increase in sedimentation, turbidity, and resuspension of toxic sediments.

The sedimentation resulting from dredging activities may affect food sources for the turtles, and the turbidity could affect primary productivity. This would be short term, however. The increased possibility of chemical or oil spills could pose a threat to turtles both directly and indirectly through their food source. While adult sea turtles may be mobile enough to avoid areas of high oil or chemical concentrations, hatchlings, posthatchlings, and juveniles in the area would be more susceptible. An increase in marine traffic may result in a higher incidence of collision with sea turtles. Other potential impacts as a result of the project include disorientation because of lighting on vessels, and increased accumulation of plastic detritus.

As noted above, hopper dredging may result in mortality of individual Kemp's ridleys. Since October 1996, two Kemp's ridleys have been taken during maintenance dredging of the MSC (USACE, 2007). This species is seasonal in nearshore waters of Texas. During the onset of colder waters in December, Kemp's ridley will move away from inshore waters into deeper waters, returning in March with warmer waters, ready to nest on the Texas coast and to forage in tidal passes and bays (NMFS, 2003). Restriction of hopper dredging activities to between December 1 and March 31, whenever possible, would reduce the likelihood of direct mortality. Hopper dredging impacts on sea turtles will be minimized by following the reasonable and prudent measures included in the BO prepared by the NMFS for construction and the most recent BO for maintenance dredging in the Gulf of Mexico.

Since October 1996, three loggerhead sea turtles and one green sea turtle have been taken during maintenance dredging of the MSC (USACE, 2007). As with the Kemp's ridley sea turtle, these two species could be negatively impacted by dredging activities. The green sea turtle is known to move into warmer waters during the winter (Shaver, 2000). Two green sea turtles captured at Magnolia Beach in the study area and tracked using satellite telemetry moved 112 miles south into south Texas offshore waters during the winter (Williams and Renaud, 1998). Working within similar windows as described for Kemp's ridleys, and having relocation trawlers working ahead of the dredges, would help to reduce these impacts.

The hawksbill sea turtle has not been recorded from the study area, and no hawksbills have been taken during hopper dredging activities in Texas (USACE, 2007).

Nevertheless, the proposed hopper dredging activity can be considered as causing potential adverse effects to hawksbill sea turtle.

Of the five species of sea turtles occurring in Texas waters, the leatherback is the species least likely to be affected by the proposed project because of its rare occurrence and pelagic nature. It is unlikely to occur in the action area and has not been caught in hopper dredges.

3.8.2 Placement of Dredged Materials

The sedimentation resulting from placement of dredged material may affect food sources for turtles, and turbidity could affect primary productivity. PAs would result in the direct loss of bay bottom over the course of the project. This bay bottom may be foraging or resting habitat for sea turtles. If sea turtles are present at disposal sites, they may be affected by sedimentation and turbidity. They could also be exposed to trash and debris; however, turtles should be easily able to overcome a descending plume, and available food sources should not be seriously reduced.

A Kemp's ridley nested on Gulf beaches of Matagorda Peninsula in 2002 and four Kemp's ridleys nested on Gulf beaches on Matagorda Island in 2006 (NPS, 2007). No material would be placed on Gulf beaches as part of the proposed project. Because Kemp's ridleys nest during daylight hours, no disorientation for adults from boat lighting would occur. Hatchlings, however, emerge from the nest at night and may be adversely affected by lighting on the boats. Under natural conditions, hatchlings typically take the shortest route to the water's edge. Bright lights on a nearshore hopper dredge may cause the hatchlings to move toward the lights, resulting in a more circuitous route to the water or open ocean, thereby exposing them to more danger. While nesting in the project area is uncommon, dredging outside of the nesting/emergence season (which occurs between April 1 and September 30), turning off/lowering/ shielding unessential lighting, and use of shielded, low-sodium vapor lights for those that cannot be safely eliminated would reduce this potential disorientation impact.

3.8.3 Additional Effects

Eastward expansion of oil and gas exploration and extraction in the Gulf and within the study area may be the major future change that could combine with other marine activities (commercial fishing, increased marine transport) and their effects (oil spills, accumulated plastic debris, fishing gear, contaminants, vessel collisions with turtles) to adversely impact marine turtles (NMFS, 2007). These activities, in addition to natural predation and habitat loss/activity disruption due to land development and increases in human density near turtle nesting areas, result in a cumulative adverse effect on sea turtles. The proposed channel improvement activities were considered with other impacts to determine whether or not the proposed project could reduce these species' survival and/or potential recovery. USACE has determined that these combined impacts may affect but are not likely to adversely affect these species.

3.8.4 Avoidance, Minimization, and Conservation Measures

Avoidance measures would include an avoidance plan for hopper dredge impacts to sea turtles. This avoidance plan includes reasonable and prudent measures that have largely been incorporated in USACE civil works projects throughout the Gulf for more than a decade. These measures include use of temporal dredging windows, when possible; intake and overflow screening; use of sea turtle deflector dragheads; observer reporting requirements; and sea turtle relocation/abundance trawling:

- *Hopper Dredging*: hopper dredging activities in Gulf waters from the Mexico-Texas border to Key West, Florida, up to 1 mile into rivers shall be completed, whenever possible, between 1 December and 31 March, when sea turtle abundance is lowest throughout Gulf coastal waters. National Oceanic and Atmospheric Administration (NOAA) should be contacted should dredging need to occur outside of this window.
- *Nonhopper-type Dredging*: pipeline or hydraulic dredges, which are not known to take turtles, must be used whenever possible between 1 April and 30 November in Gulf waters up to 1 mile into rivers.
- *Observers*: Arrangements shall be made for NOAA Fisheries–approved observers to be aboard the hopper dredges to monitor the hopper soil, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100% monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges in Texas waters between 1 April and 30 November, and whenever surface water temperatures are 51.8°F (11°C) or greater.
- *Screening*: When observers are required on hopper dredges, 100% inflow screening of dredged material is required and 100% overflow screening is recommended. If conditions prevent 100% inflow screening, screening may be reduced gradually, but 100% overflow screening is then required.
- *Sea Turtle Deflecting Draghead*: A state-of-the-art rigid deflector draghead must be used on all hopper dredges in all Gulf channels and sand-mining sites at all times of the year.
- *Dredge Take Reporting*: Observer reports of incidental take by hopper dredges must be reported to NOAA Fisheries by onboard endangered species observers within 24 hours of any observed sea turtle take. A preliminary report summarizing the results of the hopper dredging and any documented sea turtle takes must be submitted to NOAA Fisheries within 30 working days of completion of any dredging project. In addition, an annual report (based on fiscal year) must be submitted to NOAA Fisheries summarizing hopper dredging projects and documented incidental takes.
- *Relocation Trawling*: Relocation trawling shall be undertaken if two or more turtles are taken in a 24-hour period in the project or if other conditions outlined in the BO are met. Handling of sea turtles captured during relocation trawling in association with a hopper dredging project in Gulf navigation channels shall be conducted by NOAA Fisheries–approved endangered species observers.

3.8.5 Effect Determinations

Project activities may affect, but are not likely to adversely affect, nesting sea turtles (Kemp's ridley, loggerhead, green, and hawksbill) in the project area. The project area is approximately 16 miles from known nesting locations. No effect is anticipated for nesting leatherback sea turtles; however, the placement of dredged material may affect, but is not likely to adversely affect, leatherback sea turtles because of secondary impacts potentially associated with the placement of dredged material in the bay. Effect determinations due to hopper dredging activities are likely to adversely affect Kemp's ridley, loggerhead, green, hawksbill, and leatherback sea turtles. Dredging and placement activities are not expected to have an effect on the critical *Sargassum* habitat of loggerhead turtles. Effect determinations, based on the information presented in this document and in the EIS, are presented in Table 3.

In summary, construction and post-construction maintenance hopper dredging activities may result in incidental take of individual sea turtles, although upland and ocean placement of dredged materials are not expected to impact sea turtles. Feeding opportunities within the proposed channel and nearby nesting beaches could attract sea turtles, where they might be exposed to additional cumulative risks from boat traffic, contaminants, fishing and fishing gear, and accumulated plastic debris. The likelihood of adverse effects, including incidental take, during construction and maintenance are greatly reduced by full implementation of the avoidance, minimization, and conservation measures outlined above. Incidental take, if it occurs, may effect but is not likely to adversely affect these species.

3.9 Golden Orb

Because there is no suitable habitat for the golden orb within the project area, no impacts and no effects are anticipated as a result of the proposed project.

3.10 Whales

None of the five whale species are expected to occur in the project area; therefore, no effects to the five whale species are anticipated from the proposed action.

3.11 Corals

None of the four coral species are expected to occur in the project area; therefore, no effects to the four coral species are anticipated from the proposed action.

4.0 SUMMARY

The proposed project may affect a few federally listed endangered or threatened species. While interior least tern may be present in the project area, the species only needs to be considered under ESA for wind related projects along its migratory route. The golden orb, listed whale species, and listed coral species are unlikely to occur in the project area, and therefore, no effects are expected for these species. The project may affect, but is not likely adversely affect, the following species: Gulf coast jaguarondi, West Indian manatee, northern aplomado falcon, piping plover, red knot, and whooping crane. Placement of dredged material may affect, but not likely adversely affect sea turtle species (green, hawksbill, Kemp’s ridley, leatherback and loggerhead). Dredging activities may affect, but not likely adversely affect some sea turtle species (green, hawksbill, Kemp’s ridley, and leatherback). Dredging activities are likely to adversely affect loggerhead sea turtles, but it is unlikely to jeopardize the continued survival or eventual recovery of these species. The project is unlikely to jeopardize/destroy or adversely modify critical habitat for any listed species. Species effect determinations are summarized in Table 3.

Table 3. Effect determinations for threatened and endangered wildlife species of possible occurrence in Calhoun and Matagorda Counties, Texas

Common Name	Dredging Activities	Placement Activities
Mammals		
Gulf Coast jaguarondi	May affect, not likely to adversely affect	May affect, not likely to adversely affect
West Indian manatee	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Blue whale	No effect	No effect
Finback whale	No effect	No effect
Humpback whale	No effect	No effect
Sei whale	No effect	No effect
Sperm whale	No effect	No effect
Birds		
Least tern*	No effect	No effect
Northern aplomado falcon	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Piping plover	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Red knot	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Whooping crane	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Reptiles**		
Green sea turtle	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Hawksbill sea turtle	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Kemp's Ridley sea turtle	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Leatherback sea turtle	May affect, not likely to adversely affect	May affect, not likely to adversely affect
Loggerhead sea turtle	Likely to adversely affect	May affect, not likely to adversely affect
Corals		
Lobed star	No effect	No effect
Mountainous star	No effect	No effect
Boulder star	No effect	No effect
Elkhorn coral	No effect	No effect
Clams		
Golden Orb	No effect	No effect

*This species only needs to be considered for wind related projects within the migratory route.
** The likelihood of adverse effects (incidental take) of sea turtles due to dredging activities is greatly reduced by implementation and adherence to the conservation measures. Adverse effects are not expected to jeopardize the continued survival or recovery of the species.

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OCT 24 2007

F/SER31:MCB

Fred L. Anthamatten
Galveston District, U.S. Army Corps of Engineers
P.O. Box 1229
Galveston, TX 77553

Dear Mr. Anthamatten:

This constitutes the National Marine Fisheries Service's (NMFS') biological opinion (opinion) based on our review of the U.S. Army Corps of Engineers' (COE) proposed action to widen and deepen the Matagorda Ship Channel involving a combination of mechanical, pipeline, and hopper dredges. The opinion analyzes the project's effects on loggerhead (*Caretta caretta*), Kemp's ridley (*Lepidochelys kempii*), hawksbill (*Eretmochelys imbricata*), leatherback (*Dermochelys coriacea*), and green *(Chelonia mydas)* sea turtles, in accordance with section 7 of the Endangered Species Act (ESA) of 1973. It is NMFS' biological opinion that the action, as proposed, is likely to adversely affect but is not likely to jeopardize the continued existence of loggerhead, Kemp's ridley, hawksbill, leatherback, or green sea turtles.

This opinion is based on information provided in your May 16, 2007, letter and environmental assessment received by NMFS' Protected Resources Division on May 23, 2007, and information from previous NMFS consultations conducted on the use of hopper dredges.

We look forward to further cooperation with you on other COE projects to ensure the conservation and recovery of our threatened and endangered marine species. If you have any questions regarding this consultation, please contact Michael Barnette, fishery biologist, at the number listed above, or by e-mail at michael.barnette@noaa.gov.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

File: 1514-22.F.1.TX
Ref: F/SER/2006/03167

Endangered Species Act - Section 7 Consultation
Biological Opinion

Action Agency: U.S. Army Corps of Engineers, Galveston District (GDCOE)

Activity: Matagorda Ship Channel Improvement Project (Consultation Number F/SER/2006/03167)

Consulting Agency: National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS), Southeast Regional Office, Protected Resources Division, St. Petersburg, Florida

Approved By: Roy C Crabtree

Roy E. Crabtree, Ph.D., Regional Administrator
NMFS, Southeast Regional Office
St. Petersburg, Florida

Date Issued: 10/24/07

Table of Contents

Background

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), requires that each federal agency shall ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species; section 7(a)(2) requires federal agencies to consult with the appropriate Secretary on any such action. NMFS and the U.S. Fish and Wildlife Service (USFWS) share responsibilities for administering the ESA.

Consultation is required when a federal action agency determines that a proposed action "may affect" listed species or designated critical habitat. Consultation is concluded after NMFS determines that the action is not likely to adversely affect listed species or critical habitat or issues a biological opinion (opinion) that identifies whether a proposed action is likely to jeopardize the continued existence of a listed species, or destroy or adversely modify critical habitat. The opinion states the amount or extent of incidental take of the listed species that may occur, develops measures (i.e., reasonable and prudent measures - RPMs) to reduce the effect of take, and recommends conservation measures to further conserve the species. Notably, no incidental destruction or adverse modification of critical habitat can be authorized, and thus there are no reasonable and prudent measures, only reasonable and prudent alternatives that must avoid destruction or adverse modification.

This document represents NMFS' opinion based on our review of impacts associated with the proposed widening and deepening of the Matagorda Ship Channel. The proposed widening and deepening will involve a combination of mechanical, pipeline, and hopper dredges along approximately 28 miles of channel.

The GDCOE will perform the proposed action. This opinion analyzes project effects on loggerhead, Kemp's ridley, and green sea turtles, in accordance with section 7 of the ESA, and is based on project information provided by GDCOE and other sources of information including the published literature cited herein.

BIOLOGICAL OPINION

1 CONSULTATION HISTORY

The GDCOE provided NMFS a draft environmental impact statement, which included a biological assessment for the proposed project on May 23, 2007. This submission also requested ESA section 7 consultation for listed species. The biological assessment concluded the proposed action could potentially impact sea turtles. Additional information was requested by NMFS, which GDCOE provided on July 13, 2007.

2 DESCRIPTION OF THE PROPOSED ACTION AND ACTION AREA

2.1 Proposed Action

The proposed widening of the Matagorda Ship Channel will involve a combination of mechanical, pipeline, and hopper dredges. Specifically, the proposed work would include the deepening of the In-Bay Channel from -36 ft mean low tide (MLT) to -44 ft MLT, with 2 ft of advance maintenance and 2 ft of allowable overdepth; the widening of the In-Bay Channel from its existing width of 200 ft to a proposed width of 400 ft; the deepening of the Entrance Channel from -38 ft MLT to -46 ft MLT, with 3 ft of advance maintenance and 2 ft of allowable overdepth, and the widening of the Entrance Channel from 300 to 600 ft. Additionally, a new turning basin would be constructed to allow for a ship turning circle of 1,650 ft, at a depth of -44 ft MLT, with 2 ft of advance maintenance and 2 ft of allowable overdepth. Approximately 46.5 million cubic yards (mcy) of new work material would be generated by the proposed project.

According to the GDCOE, hydraulic dredges will be used in Lavaca and Matagorda Bays, and account for approximately 34.5 mcy (i.e., 74 percent) of the new work material. Clamshell dredges will also be utilized in Matagorda Bay, an area expected to produce approximately 8.8 mcy (i.e., 19 percent) of the new work material. Hopper dredges will be largely utilized in the offshore areas, producing 3.2 mcy (i.e., 7 percent) of new work material. However, a hopper dredge may also do the work tentatively assigned to the clamshell dredge, resulting in a total of 12 mcy (i.e., 26 percent) of new work material. Bed-leveling may be used in the proposed project.

While some of the dredged material will be transported to upland sites, the GDCOE also proposes to utilize new work dredged material to:

1. Create a combination upland and marsh site (Figure 1: PA A2) along the northern shore of Cox Bay to eliminate future erosion in this area with 6.3 mcy of new work material;
2. Create a clay core oyster reef (Figure 1: PAs OR1 and OR2) within Lavaca Bay with approximately 1.0 mcy of new work material;
3. Provide nourishment (Figure 1: PAs BN1, BN2, and BN3) on public beaches along the Magnolia-Indianola shoreline with 1.9 mcy of new work material;

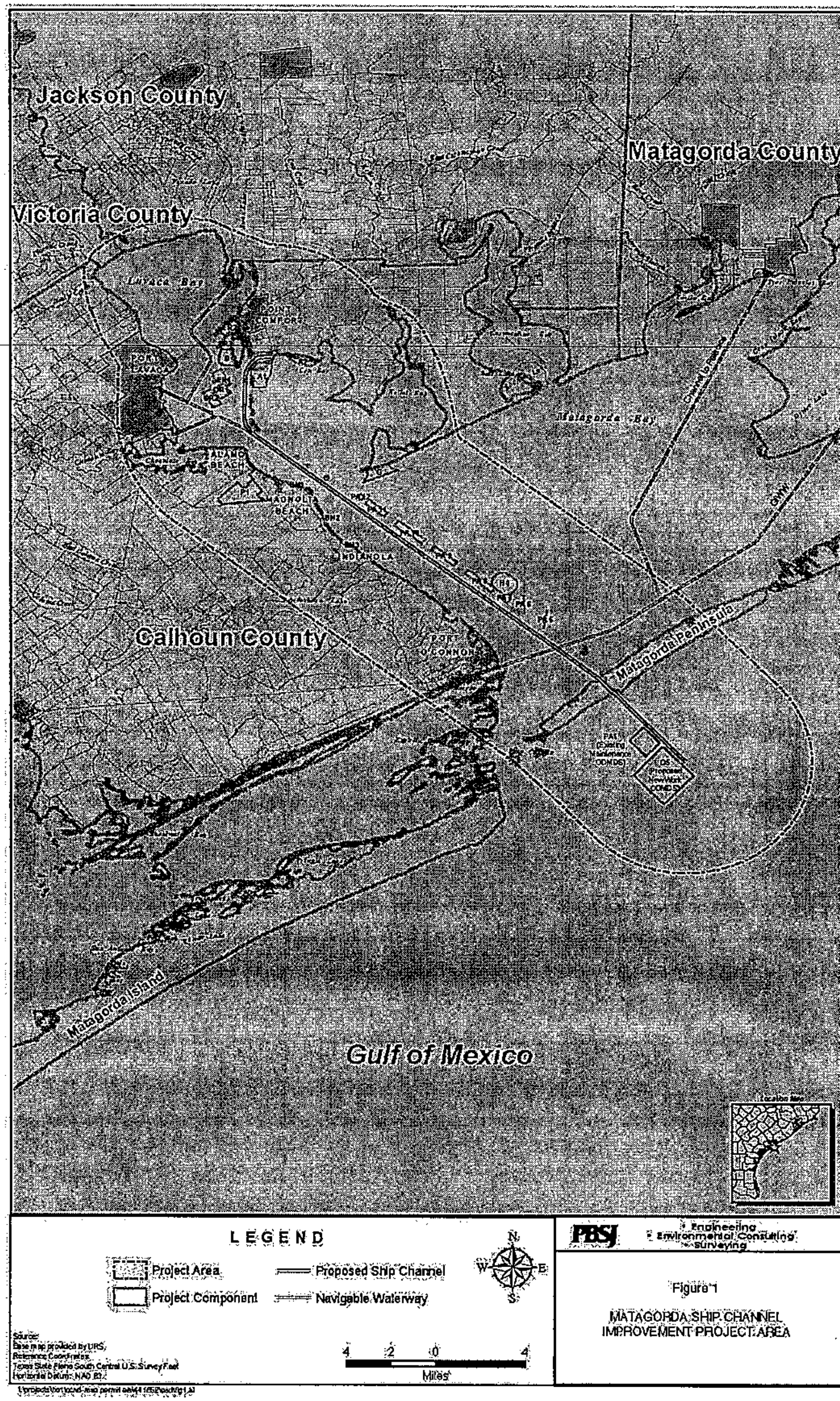

Figure 1: Matagorda Ship Channel material placement areas

4. Place submerged cap on (Figure 1: PA ER1) bottom sediments contaminated with elevated levels of mercury within Lavaca Bay southwest of Dredge Island with 0.4 mcy of new work stiff clay material, creating oyster reefs on the mounded caps;
5. Cap in situ bottom sediments contaminated with elevated levels of mercury located in shallow waters along SH 35 and then create an upland site (Figure 1: PA ER2) with 2.1 mcy of new work material;
6. Cap in situ bottom sediments contaminated with elevated levels of mercury located on the northern edge of Dredge Island and then create a transitional marsh and upland site (Figure 1: PA ER3) with 2.3 mcy of new work material;
7. Protect the eroding shoreline at Sand Point by constructing armored earthen levees and ~~in-bay marshes (Figure 1: PA G) with 4.7 mcy of new work material;~~
8. Create a multi-use habitat site (Figure 1: PA H4) located north of Port O'Conner along the Matagorda Ship Channel to include marshes, submerged aquatic platforms, and bird island with 10.0 mcy of new work material; and
9. Place 8.8 mcy of new work soft clay material from the In-Bay Channel and 3.2 mcy of new work mixed material from the Entrance Channel at a proposed Ocean Dredged Material Disposal Site (ODMDS; Figure 1: PA O5) located approximately 3 miles offshore from the Matagorda Peninsula and 1,000 ft south of the Entrance Channel centerline.

The proposed project is expected to take two years to complete. Future maintenance dredging of the Matagorda Ship Channel will be covered under the revised regional biological opinion for Gulf of Mexico navigation channels (NMFS 2007).

2.2 Action Area

50 CFR 404.02 defines action area as "all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action." The action area for this activity includes the Matagorda Ship Channel bounded by a one-mile buffer area, existing and proposed dredged material placement, restoration, and nourishment areas, and the associated ODMDS in Calhoun County, Texas.

3 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

The following endangered (E) and threatened (T) species under the jurisdiction of NMFS may occur in or near the action area:

Common Name	Scientific Name	Status
Sea Turtles		
Loggerhead sea turtle	*Caretta caretta*	T
Hawksbill sea turtle	*Eretmochelys imbricata*	E
Leatherback sea turtle	*Dermochelys coriacea*	E
Kemp's ridley sea turtle	*Lepidochelys kempii*	E

Green sea turtle	*Chelonia mydas*[1]	E/T

There is no NMFS-designated critical habitat within the action area.

3.1 Species Likely to Be Affected

Pipeline and mechanical dredges (i.e., non-hopper dredges) are not known to adversely affect sea turtles. While these dredges have the potential to impact habitat, which could adversely affect sea turtles, proposed dredging work will be confined to existing channels devoid of preferred sea turtle foraging habitat, and, therefore, pipeline and mechanical dredges are not expected to introduce any indirect effects to sea turtles. Additionally, while they may be in the area, hawksbill and leatherback sea turtles are fairly rare. No hawksbill or leatherback sea turtles have ever been taken by GDCOE hopper dredge projects. While GDCOE relocation trawlers have only captured one leatherback sea turtle (in 2003, Corpus Christi Ship Channel), both leatherback and hawksbill sea turtles have been captured in shrimp trawls off Texas. Therefore, the two species are included due to the potential impacts associated with relocation trawling in the proposed project. However, loggerhead, Kemp's ridley, and green sea turtles are all vulnerable to being taken as a result of the use of hopper dredges. NMFS believes these species may be incidentally captured in the course of the proposed action.

3.2 Status of Species

The sea turtle subsections focus primarily on the Atlantic Ocean populations of these species since these are the populations that may be directly affected by the proposed action; as sea turtles are highly migratory, potentially affected species in the action area may make migrations in other areas of the Gulf of Mexico, Atlantic Ocean, and Caribbean Sea. Therefore, the range-wide status of the species described below also best reflects each species' status within the action area. Furthermore, these species are listed as global populations (with the exception of Kemp's ridley and Florida green sea turtles, whose distribution is entirely in the Atlantic including the Gulf of Mexico), and the global status and trends of these species are included as well, in order to provide a basis for our final determination of the effects of the proposed action on the species as listed under the ESA.

3.2.1 Loggerhead Sea Turtle

The loggerhead sea turtle was listed as a threatened species throughout its global range on July 28, 1978. It was listed because of direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. Loggerhead sea turtles inhabit the continental shelves and estuarine environments along the margins of the Atlantic, Pacific, and Indian Oceans. In the Atlantic, developmental habitat for small juveniles is the pelagic waters of the North Atlantic and the Mediterranean Sea (NMFS and USFWS 1991b). Within the continental United States, loggerhead sea turtles nest from Texas to New Jersey. Major nesting areas include coastal

[1] Green turtles in U.S. waters are listed as threatened except for the Florida breeding population, which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

islands of Georgia, South Carolina, and North Carolina, and the Atlantic and Gulf of Mexico coasts of Florida, with the bulk of the nesting occurring on the Atlantic coast of Florida.

3.2.1.1 Pacific Ocean

In the Pacific Ocean, major loggerhead nesting grounds are generally located in temperate and subtropical regions with scattered nesting in the tropics. Within the Pacific Ocean, loggerhead sea turtles are represented by a northwestern nesting aggregation located in Japan and a smaller southwestern nesting aggregation, which occurs in eastern Australia (Great Barrier Reef and Queensland) and New Caledonia (NMFS 2001a). There are no reported loggerhead nesting sites in the eastern or central Pacific Ocean basin. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten et al. 1996). Recent genetic analyses on female loggerheads nesting in Japan suggest that this "subpopulation" is comprised of genetically distinct nesting colonies (Hatase et al. 2002) with precise natal homing of individual females. As a result, Hatase et al. (2002) indicate that loss of one of these colonies would decrease the genetic diversity of Japanese loggerheads; recolonization of the site would not be expected on an ecological time scale. In Australia, long-term census data has been collected at some rookeries since the late 1960s and early 1970s, and nearly all the data show marked declines in nesting populations since the mid-1980s (Limpus and Limpus 2003). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

Pacific loggerhead turtles are captured, injured, or killed in numerous Pacific fisheries including Japanese longline fisheries in the western Pacific Ocean and South China Seas; direct harvest and commercial fisheries off Baja California, Mexico; commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru; purse seine fisheries for tuna in the eastern tropical Pacific Ocean; and California/Oregon drift gillnet fisheries. In addition, the abundance of loggerhead turtles on nesting colonies throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Loggerhead turtle colonies in the western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females and reduced the reproductive success of females that manage to nest (e.g., due to egg poaching).

3.2.1.2 Atlantic Ocean

In the western Atlantic, most loggerhead sea turtles nest from North Carolina to Florida and along the Gulf coast of Florida. There are at least five western Atlantic subpopulations, divided geographically as follows: (1) A northern nesting subpopulation, occurring from North Carolina to northeast Florida at about 29°N; (2) a south Florida nesting subpopulation, occurring from 29°N on the east coast to Sarasota on the west coast; (3) a Florida Panhandle nesting subpopulation, occurring at Eglin Air Force Base and the beaches near Panama City, Florida; (4) a Yucatán nesting subpopulation, occurring on the eastern Yucatán Peninsula, Mexico (Márquez 1990; TEWG 2000); and (5) a Dry Tortugas nesting subpopulation, occurring in the islands of the Dry Tortugas, near Key West, Florida (NMFS 2001a). Additionally, there is evidence of at least several other genetically distinct stocks, including a Cay Sal Bank, Western Bahamas stock; a Quintana Roo, Mexico stock, including all loggerhead rookeries on Mexico's Yucatan Peninsula; a Brazilian stock; and a Cape Verde stock (SWOT Report, Volume II, The State of the World's Sea Turtles, 2007). The fidelity of nesting females to their nesting beach is the reason these subpopulations can be differentiated from one another. Fidelity for nesting beaches makes recolonization of nesting beaches with sea turtles from other subpopulations unlikely.

Life History and Distribution
Past literature gave an estimated age at maturity of 21-35 years (Frazer and Ehrhart 1985; Frazer et al. 1994), with the benthic immature stage lasting at least 10-25 years. However, based on data from tag returns, strandings, and nesting surveys (NMFS 2001a), NMFS estimates ages of maturity ranging from 20-38 years with the benthic immature stage lasting from 14-32 years.

Mating takes place in late March through early June, and eggs are laid throughout the summer, with a mean clutch size of 100-126 eggs in the southeastern United States. Individual females nest multiple times during a nesting season, with a mean of 4.1 nests/individual (Murphy and Hopkins 1984). Nesting migrations for an individual female loggerhead are usually on an interval of 2-3 years, but can vary from 1-7 years (Dodd 1988). Generally, loggerhead sea turtles originating from the western Atlantic nesting aggregations are believed to lead a pelagic existence in the North Atlantic Gyre for as long as 7-12 years or more. Stranding records indicate that when pelagic immature loggerheads reach 40-60 cm straight-line carapace length they begin to live in coastal inshore and nearshore waters of the continental shelf throughout the U.S. Atlantic and Gulf of Mexico, although some loggerheads may move back and forth between the pelagic and benthic environment (Witzell 2002). Benthic immature loggerheads (sea turtles that have come back to inshore and nearshore waters), the life stage following the pelagic immature stage, have been found from Cape Cod, Massachusetts, to southern Texas, and occasionally strand on beaches in Northeastern Mexico.

Tagging studies have shown loggerheads that have entered the benthic environment undertake routine migrations along the coast that are limited by seasonal water temperatures. Loggerhead sea turtles occur year round in offshore waters off North Carolina where water temperature is influenced by the Gulf Stream. As coastal water temperatures warm in the spring, loggerheads begin to immigrate to North Carolina inshore waters (e.g., Pamlico and Core Sounds) and also move up the coast (Epperly et al. 1995a; Epperly et al. 1995b; Epperly et al. 1995c), occurring in Virginia foraging areas as early as April and on the most northern foraging grounds in the Gulf of Maine in June. The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by mid-September but some may remain in mid-Atlantic and Northeast areas until late fall. By December loggerheads have emigrated from inshore North Carolina waters and coastal waters to the north to waters offshore North Carolina, particularly off Cape Hatteras, and waters further south where the influence of the Gulf Stream provides temperatures favorable to sea turtles ($\geq 11°C$) (Epperly et al. 1995a; Epperly et al. 1995b; Epperly et al. 1995c). Loggerhead sea turtles are year-round residents of central and south Florida.

Pelagic and benthic juveniles are omnivorous and forage on crabs, mollusks, jellyfish, and vegetation at or near the surface (Dodd 1988). Sub-adult and adult loggerheads are primarily coastal dwelling and typically prey on benthic invertebrates such as mollusks and decapod crustaceans in hard bottom habitats.

Population Dynamics and Status

A number of stock assessments (TEWG 1998; TEWG 2000; NMFS 2001a; Heppell et al. 2003) have examined the stock status of loggerheads in the waters of the United States, but have been unable to develop any reliable estimates of absolute population size. Based on nesting data of the five western Atlantic subpopulations, the south Florida-nesting and the northern-nesting subpopulations are the most abundant (TEWG 2000; NMFS 2001a). Between 1989 and 1998, the total number of nests laid along the U.S. Atlantic and Gulf coasts ranged from 53,014 to 92,182, annually with a mean of 73,751 (TEWG 2000). On average, 90.7 percent of these nests were of the south Florida subpopulation and 8.5 percent were from the northern subpopulation (TEWG 2000). The TEWG (2000) assessment of the status of these two better-studied populations concluded that the south Florida subpopulation was increasing at that time, while no ~~trend was evident (may be stable but possibly declining) for the northern subpopulation.~~ A more recent, yet-to-be-published analysis of nesting data from 1989-2005 by the Florida Wildlife Research Institute indicates there is a declining trend in nesting at beaches utilized by the south Florida nesting subpopulation (McRae letter to NMFS, October 25, 2006). Nesting data obtained for the 2006 nesting season is also consistent with the decline in loggerhead nests (Meylan pers. comm. 2006). It is unclear at this time whether the nesting decline reflects a decline in population, or is indicative of a failure to nest by the reproductively mature females as a result of other factors (resource depletion, nesting beach problems, oceanographic conditions, etc.). NMFS has convened a new Turtle Expert Working Group for loggerhead sea turtles that will gather available data and examine the potential causes of the nesting decline and what the decline means in terms of population status. A final report by the loggerhead TEWG is expected by the end of summer 2007.

For the northern subpopulations, recent estimates of loggerhead nesting trends in Georgia from standardized daily beach surveys showed significant declines ranging from 1.5 to 1.9 percent annually (Mark Dodd, Georgia Department of Natural Resources, pers. comm., 2006). Nest totals from aerial surveys conducted by the South Carolina Department of Natural Resources showed a 3.3 percent annual decline in nesting since 1980. Another consideration that may add to the importance and vulnerability of the northern subpopulation is the sex ratios of this subpopulation. NMFS scientists have estimated that the northern subpopulation produces 65 percent males (NMFS 2001a). However, new research conducted over a limited time frame has found opposing sex ratios (Wyneken et al. 2004) so further information is needed to clarify the issue. Since nesting female loggerhead sea turtles exhibit nest fidelity, the continued existence of the northern subpopulation is related to the number of female hatchlings that are produced. Producing fewer females will limit the number of subsequent offspring produced by the subpopulation.

The remaining three subpopulations – Dry Tortugas, Florida Panhandle, and Yucatán – are much smaller, but also relevant to the continued existence of the species. Nesting surveys for the Dry Tortugas subpopulation are conducted as part of Florida's statewide survey program. Survey effort has been relatively stable during the 9-year period from 1995-2003 (although the 2002 year was missed). Nest counts ranged from 168-270 but with no detectable trend during this period (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Statewide Nesting Beach Survey Data). Nest counts for the Florida Panhandle subpopulation are focused on index beaches rather than all beaches where nesting occurs. Currently, there is not enough information to detect a trend for the subpopulation (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute, Index Nesting Beach Survey Database). Similarly, nesting survey effort has been inconsistent among the Yucatán nesting beaches and no trend can be determined for this subpopulation. However, there is some optimistic news. Zurita et al. (2003) found a statistically significant increase in the number of nests on seven of the beaches on Quintana Roo, Mexico, from 1987-2001 where survey effort was consistent during the period.

Threats

The diversity of a sea turtle's life history leaves them susceptible to many natural and human impacts, including impacts while they are on land, in the benthic environment, and in the pelagic environment. Hurricanes are particularly destructive to sea turtle nests. Sand accretion and rainfall that result from these storms as well as wave action can appreciably reduce hatchling success. For example, in 1992, all of the eggs over a 90-mile length of coastal Florida were destroyed by storm surges on beaches that were closest to the eye of Hurricane Andrew (Milton et al. 1994). Also, many nests were destroyed during the 2004 hurricane season. Other sources of natural mortality include cold stunning and biotoxin exposure.

Anthropogenic factors that impact hatchlings and adult female turtles on land, or the success of nesting and hatching include: beach erosion, beach armoring and nourishment, artificial lighting, beach cleaning, increased human presence, recreational beach equipment, beach driving, coastal construction and fishing piers, exotic dune and beach vegetation, and poaching. An increase in human presence at some nesting beaches or close to nesting beaches has led to secondary threats such as the introduction of exotic fire ants, feral hogs, dogs and an increased presence of native species (e.g., raccoons, armadillos, and opossums) which raid and feed on turtle eggs. Although sea turtle nesting beaches are protected along large expanses of the northwest Atlantic coast (e.g., Merritt Island, Archie Carr, and Hobe Sound National Wildlife Refuges), other areas along these coasts have limited or no protection. Sea turtle nesting and hatching success on unprotected high density east Florida nesting beaches from Indian River to Broward County are affected by all of the above threats.

Loggerhead sea turtles are affected by a completely different set of anthropogenic threats in the marine environment. These include oil and gas exploration, coastal development, and transportation, marine pollution, underwater explosions, hopper dredging, offshore artificial lighting, power plant entrainment and/or impingement, entanglement in debris, ingestion of marine debris, marina and dock construction and operation, boat collisions, poaching, and fishery interactions. Loggerheads in the pelagic environment are exposed to a series of longline fisheries, which include the Atlantic highly migratory species (HMS) pelagic longline fisheries, an Azorean longline fleet, a Spanish longline fleet, and various longline fleets in the Mediterranean Sea (Aguilar et al. 1995; Bolten et al. 1996). Loggerheads in the benthic environment in waters off the coastal United States are exposed to a suite of fisheries in federal and state waters including trawl, purse seine, hook and line, gillnet, pound net, longline, and trap fisheries (see further discussion in Section 4.2, Environmental Baseline).

3.2.1.3 Summary of Status for Loggerhead Sea Turtles

The abundance of loggerhead turtles on nesting beaches throughout the Pacific basin has declined dramatically over the past 10 to 20 years. Data from 1995 estimated the Japanese nesting aggregation at 1,000 female loggerhead turtles (Bolten et al. 1996), but it has probably declined since 1995 and continues to decline (Tillman 2000). The nesting aggregation in Queensland, Australia, was as low as 300 females in 1997.

In the Atlantic Ocean, absolute population size is not known, but based on extrapolation of nesting information, loggerheads are likely much more numerous than in the Pacific Ocean. NMFS recognizes five subpopulations of loggerhead sea turtles in the western north Atlantic based on genetic studies. Cohorts from all of these are known to occur within the action area of this consultation. The South Florida subpopulation may be critical to the survival of the species in the Atlantic Ocean because of its size (over 90 percent of all U.S. loggerhead nests are from this subpopulation). In the past, this nesting aggregation was considered second in size only to the nesting aggregation on islands in the Arabian Sea off Oman (Ross 1979; Ehrhart 1989; NMFS and USFWS 1991b). However, the status of the Oman colony has not been evaluated recently and it is located in an area of the world where it is highly vulnerable to disruptive events such as political upheavals, wars, catastrophic oil spills, and lack of strong protections for sea turtles (Meylan et al. 1995). Given the lack of updated information on this population, the status of loggerheads in the Indian Ocean basin overall is essentially unknown.

All loggerhead subpopulations are faced with a multitude of natural and anthropogenic effects that negatively influence the status of the species. Many anthropogenic effects occur as a result of activities outside of U.S. jurisdiction (i.e., fisheries in international waters).

3.2.2 Kemp's Ridley Sea Turtle

The Kemp's ridley was listed as endangered on December 2, 1970. Internationally, the Kemp's ridley has been considered the most endangered sea turtle (Zwinenberg 1977; Groombridge 1982; TEWG 2000). Kemp's ridleys nest primarily at Rancho Nuevo, a stretch of beach in Mexico, Tamaulipas State. This species occurs mainly in coastal areas of the Gulf of Mexico and the northwestern Atlantic Ocean. Occasional individuals reach European waters (Brongersma 1972). Adults of this species are usually confined to the Gulf of Mexico, although adult-sized individuals sometimes are found on the east coast of the United States.

3.2.2.1 Atlantic Ocean

Life History and Distribution
The TEWG (1998) estimates age at maturity from 7-15 years. Females return to their nesting beach about every 2 years (TEWG 1998). Nesting occurs from April into July and is essentially limited to the beaches of the western Gulf of Mexico, near Rancho Nuevo in southern Tamaulipas, Mexico. The mean clutch size for Kemp's ridleys is 100 eggs/nest, with an average of 2.5 nests/female/season.

Little is known of the movements of the post-hatchling stage (pelagic stage) within the Gulf of Mexico. Studies have shown the post-hatchling pelagic stage varies from 1-4 or more years, and the benthic immature stage lasts 7-9 years (Schmid and Witzell 1997). Benthic immature Kemp's ridleys have been found along the eastern seaboard of the United States and in the Gulf of Mexico. Atlantic benthic immature sea turtles travel northward as the water warms to feed in the productive, coastal waters off Georgia through New England, returning southward with the onset of winter (Lutcavage and Musick 1985; Henwood and Ogren 1987; Ogren 1989). Studies suggest that benthic immature Kemp's ridleys stay in shallow, warm, nearshore waters in the northern Gulf of Mexico until cooling waters force them offshore or south along the Florida coast (Renaud 1995).

Stomach contents of Kemp's ridleys along the lower Texas coast consisted of nearshore crabs and mollusks, as well as fish, shrimp, and other foods considered to be shrimp fishery discards (Shaver 1991). Pelagic stage Kemp's ridleys presumably feed on the available *Sargassum* and associated infauna or other epipelagic species found in the Gulf of Mexico.

Population Dynamics and Status

Of the seven extant species of sea turtles in the world, the Kemp's ridley has declined to the lowest population level. Most of the population of adult females nest on the Rancho Nuevo beaches (Pritchard 1969). When nesting aggregations at Rancho Nuevo were discovered in 1947, adult female populations were estimated to be in excess of 40,000 individuals (Hildebrand 1963). By the mid-1980s nest numbers were below 1,000 (with a low of 702 nests in 1985). However, observations of increased nesting with 6,277 nests recorded in 2000, 10,000 nests in 2005, and 12,143 nests recorded during the 2006 nesting season (Gladys Porter Zoo nesting database) show the decline in the ridley population has stopped and the population is now increasing.

A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles beginning in 1990. The increased survivorship of immature sea turtles is attributable, in part, to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets and Mexican beach protection efforts. As demonstrated by nesting increases at the main nesting sites in Mexico, adult ridley numbers have increased over the last decade. The population model used by TEWG (2000) projected that Kemp's ridleys could reach the Recovery Plan's intermediate recovery goal of 10,000 nesters by the year 2015.

Next to loggerheads, Kemp's ridleys are the second most abundant sea turtle in Virginia and Maryland waters, arriving in these areas during May and June (Keinath et al. 1987; Musick and Limpus 1997). The juvenile population of Kemp's ridley sea turtles in Chesapeake Bay is estimated to be 211 to 1,083 turtles (Musick and Limpus 1997). These juveniles frequently forage in submerged aquatic grass beds for crabs (Musick and Limpus 1997). Kemp's ridleys consume a variety of crab species, including *Callinectes spp.*, *Ovalipes spp.*, *Libinia sp.*, and *Cancer spp.* Mollusks, shrimp, and fish are consumed less frequently (Bjorndal 1997). Upon leaving Chesapeake Bay in autumn, juvenile ridleys migrate down the coast, passing Cape Hatteras in December and January (Musick and Limpus 1997). These larger juveniles are joined there by juveniles of the same size from North Carolina sounds, as well as smaller juveniles from

New York and New England, to form one of the densest concentrations of Kemp's ridleys outside of the Gulf of Mexico (Musick and Limpus 1997; Epperly et al. 1995a; Epperly et al. 1995b).

Threats
Kemp's ridleys face many of the same natural threats as loggerheads, including destruction of nesting habitat from storm events, natural predators at sea, and oceanic events such as cold stunning. Although cold stunning can occur throughout the range of the species, it may be a greater risk for sea turtles that utilize the more northern habitats of Cape Cod Bay and Long Island Sound. For example, in the winter of 1999-2000, there was a major cold-stunning event where 218 Kemp's ridleys, 54 loggerheads, and 5 green turtles were found on Cape Cod beaches ~~(R. Prescott, pers. comm., 2001). Annual cold-stunning events do not always occur~~ at this magnitude; the extent of episodic major cold-stunning events may be associated with numbers of turtles utilizing Northeast waters in a given year, oceanographic conditions, and the occurrence of storm events in the late fall. Many cold-stunned turtles can survive if found early enough, but cold-stunning events can still represent a significant cause of natural mortality.

Although changes in the use of shrimp trawls and other trawl gear have helped to reduce mortality of Kemp's ridleys, this species is also affected by other sources of anthropogenic impacts similar to those discussed above. For example, in the spring of 2000, five Kemp's ridley carcasses were recovered from the same North Carolina beaches where 275 loggerhead carcasses were found. Cause of death for most of the turtles recovered was unknown, but the mass mortality event was suspected to have been from a large-mesh gillnet fishery operating offshore in the preceding weeks. The five ridley carcasses that were found are likely to have been only a minimum count of the number of Kemp's ridleys that were killed or seriously injured as a result of the fishery interaction because it is unlikely that all of the carcasses washed ashore.

3.2.2.2 Summary of Kemp's Ridley Status

The only major nesting site for ridleys is a single stretch of beach near Rancho Nuevo, Tamaulipas, Mexico (Carr 1963). The number of nests observed at Rancho Nuevo and nearby beaches increased at a mean rate of 11.3 percent per year from 1985 to 1999. Current totals are 12,059 nests in Mexico in 2006 (August 8, 2006, e-mail from Luis Jaime Peña - Conservation Biologist, Gladys Porter Zoo). Kemp's ridleys mature at an earlier age (7-15 years) than other chelonids, thus "lag effects" as a result of unknown impacts to the non-breeding life stages would likely have been seen in the increasing nest trend beginning in 1985 (USFWS and NMFS 1992).

The largest contributors to the decline of Kemp's ridleys in the past were commercial and local exploitation, especially poaching of nests at the Rancho Nuevo site, as well as the Gulf of Mexico trawl fisheries. The advent of TED regulations for trawlers and protections for the nesting beaches has allowed the species to begin to rebound. Many threats to the future of the species remain, including interactions with fishery gear, marine pollution, foraging habitat destruction, illegal poaching of nests and potential threats to the nesting beaches from such sources as global climate change, development, and tourism pressures.

3.2.3 Hawksbill Sea Turtle

The hawksbill turtle was listed as endangered under the precursor of the ESA on June 2, 1970, and is considered Critically Endangered by the International Union for the Conservation of Nature (IUCN). The hawksbill is a medium-sized sea turtle, with adults in the Caribbean ranging in size from approximately 62.5 to 94.0 cm straight carapace length. The species occurs in all ocean basins, although it is relatively rare in the Eastern Atlantic and Eastern Pacific, and absent from the Mediterranean Sea. Hawksbills are the most tropical of the marine turtles, ranging from approximately 30°N to 30°S latitude. They are closely associated with coral reefs and other hard-bottom habitats, but they are also found in other habitats including inlets, bays and coastal lagoons (NMFS and USFWS 1993). There are five regional nesting populations with ~~more than 1,000 females nesting annually. These populations are in the~~ Seychelles, Mexico, Indonesia, and two in Australia (Meylan and Donnelly 1999). There has been a global population decline of over 80 percent during the last three generations (105 years) (Meylan and Donnelly 1999).

3.2.3.1 Pacific Ocean

Anecdotal reports throughout the Pacific indicate that the current Pacific hawksbill population is well below historical levels (NMFS 2004b). It is believed that this species is rapidly approaching extinction in the Pacific because of harvesting for its meat, shell, and eggs as well as destruction of nesting habitat (NMFS 2001). Hawksbill sea turtles nest in the Hawaiian Islands as well as the islands and mainland of southeast Asia, from China to Japan, and throughout the Philippines, Malaysia, Indonesia, Papua New Guinea, the Solomon Islands, and Australia (NMFS 2004b). However, along the eastern Pacific Rim where nesting was common in the 1930s, hawksbills are now rare or absent (NMFS 2004b).

3.2.3.2 Atlantic Ocean

In the Western Atlantic, the largest hawksbill nesting population occurs in the Yucatán Peninsula of Mexico (Garduño-Andrade et al. 1999). With respect to the United States, nesting occurs in Puerto Rico, the USVI, and the southeast coast of Florida. Nesting also occurs outside of the United States and its territories in Antigua, Barbados, Costa Rica, Cuba, and Jamaica (Meylan 1999a). Outside of the nesting areas, hawksbills have been seen off of the U.S. Gulf of Mexico states and along the eastern seaboard as far north as Massachusetts, although sightings north of Florida are rare (NMFS and USFWS 1993).

The best estimate of age at sexual maturity for hawksbill sea turtles is about 20-40 years (NMFS 2004b). Reproductive females undertake periodic (usually non-annual) migrations to their natal beach to nest. Movements of reproductive males are less well known, but are presumed to involve migrations to their nesting beach or to courtship stations along the migratory corridor (Meylan 1999b). Females nest an average of 3-5 times per season (Meylan and Donnelly 1999). Clutch size is larger on average (up to 250 eggs) than that of other turtles (Hirth 1980). Reproductive females may exhibit a high degree of fidelity to their nest sites.

The life history of hawksbills consists of a pelagic stage that lasts from the time they leave the nesting beach as hatchlings until they are approximately 22-25 cm in straight carapace length (Meylan and Donnelly 1999), followed by residency in developmental habitats (foraging areas where juveniles reside and grow) in coastal waters. Adult foraging habitat, which may or may not overlap with developmental habitat, is typically coral reefs, although other hard-bottom communities and occasionally mangrove-fringed bays may be occupied. Hawksbills show fidelity to their foraging areas over several years (van Dam and Díez 1998).

The hawksbill's diet is highly specialized and consists primarily of sponges (Meylan 1988). Other food items, notably corallimorphs and zooanthids, have been documented to be important in some areas of the Caribbean (Leon and Díez 2000).

Estimates of the annual number of nests at hawksbill sea turtle nesting sites are of the order of hundreds to a few thousand. Nesting within the southeastern United States and U.S. Caribbean is restricted to Puerto Rico (>650 nests/yr), the USVI (~400 nests/yr), and, rarely, Florida (0-4 nests/yr) (Meylan 1999a; Florida Fish and Wildlife Conservation Commission; Florida Marine Research Institute's Statewide Nesting Beach Survey data 2002). At the two principal nesting beaches in the U.S. Caribbean where long-term monitoring has been carried out, populations appear to be increasing (Mona Island, Puerto Rico) or stable (Buck Island Reef National Monument, St. Croix, USVI) (Meylan 1999a).

As described for other sea turtle species, hawksbill sea turtles are affected by habitat loss, habitat degradation, fishery interactions, and poaching in some parts of their range. There continues to be a black market for hawksbill shell products ("tortoiseshell"), which likely contributes to the harvest of this species.

3.2.3.3 Summary of Status for Hawksbill Sea Turtles

Worldwide, hawksbill sea turtle populations are declining. They face many of the same threats affecting other sea turtle species. In addition, there continues to be a commercial market for hawksbill shell products, despite protections afforded to the species under U.S. law and international conventions.

3.2.4 Leatherback Sea Turtle

The leatherback sea turtle was listed as endangered throughout its global range on June 2, 1970. Leatherbacks are widely distributed throughout the oceans of the world, and are found in waters of the Atlantic, Pacific, and Indian Oceans (Ernst and Barbour 1972). Leatherback sea turtles are the largest living turtles and range farther than any other sea turtle species. The large size of adult leatherbacks and their tolerance to relatively low temperatures allows them to occur in northern waters such as off Labrador and in the Barents Sea (NMFS and USFWS 1995). Adult leatherbacks forage in temperate and subpolar regions from 71°N to 47°S latitude in all oceans and undergo extensive migrations to and from their tropical nesting beaches. In 1980, the leatherback population was estimated at approximately 115,000 adult females globally (Pritchard 1982). That number, however, is probably an overestimation as it was based on a particularly good nesting year in 1980 (Pritchard 1996). By 1995, the global population of adult females had declined to 34,500 (Spotila et al. 1996). Pritchard (1996) also called into question the population estimates from Spotila et al. (1996), and felt they may be somewhat low, because it ended the modeling on data from a particularly bad nesting year (1994) while excluding nesting data from 1995, which was a good nesting year. However, Spotila et al. (1996) represents the best overall estimate of adult female leatherback population size.

3.2.4.1 Pacific Ocean

Based on published estimates of nesting female abundance, leatherback populations have collapsed or have been declining at all major Pacific basin nesting beaches for the last two decades (Spotila et al. 1996, NMFS and USFWS 1998, Sarti et al. 2000, Spotila et al. 2000). For example, the nesting assemblage on Terengganu, Malaysia – which was one of the most significant nesting sites in the western Pacific Ocean – has declined severely from an estimated 3,103 females in 1968 to two nesting females in 1994 (Chan and Liew 1996). Nesting assemblages of leatherback turtles are in decline along the coasts of the Solomon Islands, a historically important nesting area (D. Broderick, pers. comm., in Dutton et al. 1999). In Fiji, Thailand, Australia, and Papua New Guinea (East Papua), leatherback turtles have only been known to nest in low densities and scattered colonies.

Only an Indonesian nesting assemblage has remained relatively abundant in the Pacific basin. The largest extant leatherback nesting assemblage in the Indo-Pacific lies on the north Vogelkop coast of Irian Jaya (West Papua), Indonesia, with over 3,000 nests recorded annually (Putrawidjaja 2000, Suarez et al. 2000). During the early-to-mid 1980s, the number of female leatherback turtles nesting on the two primary beaches of Irian Jaya appeared to be stable. More recently, this population has come under increasing threats that could cause this population to experience a collapse that is similar to what occurred at Terengganu, Malaysia. In 1999, for example, local Indonesian villagers started reporting dramatic declines in sea turtle populations near their villages (Suarez 1999). Unless hatchling and adult turtles on nesting beaches receive more protection, this population will continue to decline. Declines in nesting assemblages of leatherback turtles have been reported throughout the western Pacific region, with nesting assemblages well below abundance levels observed several decades ago (e.g., Suarez 1999).

In the western Pacific Ocean and South China Seas, leatherback turtles are captured, injured, or killed in numerous fisheries, including Japanese longline fisheries. The poaching of eggs, killing of nesting females, human encroachment on nesting beaches, beach erosion, and egg predation by animals also threaten leatherback turtles in the western Pacific.

In the eastern Pacific Ocean, nesting populations of leatherback turtles are declining along the Pacific coast of Mexico and Costa Rica. According to reports from the late 1970s and early 1980s, three beaches on the Pacific coast of Mexico supported as many as half of all leatherback turtle nests for the eastern Pacific. Since the early 1980s, the eastern Pacific Mexican population of adult female leatherback turtles has declined to slightly more than 200 individuals during 1998-99 and 1999-2000 (Sarti et al. 2000). Spotila et al. (2000) reported the decline of the leatherback turtle population at Playa Grande, Costa Rica, which had been the fourth largest nesting colony in the world. Between 1988 and 1999, the nesting colony declined from 1,367 to 117 female leatherback turtles. Based on their models, Spotila et al. (2000) estimated that the colony could fall to less than 50 females by 2003-2004. Leatherback turtles in the eastern Pacific Ocean are captured, injured, or killed in commercial and artisanal swordfish fisheries off Chile, Columbia, Ecuador, and Peru, and purse seine fisheries for tuna in the eastern tropical Pacific Ocean, and California/Oregon drift gillnet fisheries. Because of the limited data, we cannot provide high-certainty estimates of the number of leatherback turtles captured, injured, or killed through interactions with these fisheries. However, between 8-17 leatherback turtles were estimated to have died annually between 1990 and 2000 in interactions with the California/Oregon drift gillnet fishery; 500 leatherback turtles are estimated to die annually in Chilean and Peruvian fisheries; 200 leatherback turtles are estimated to die in direct harvests in Indonesia; and before 1992, the North Pacific driftnet fisheries for squid, tuna, and billfish captured an estimated 1,000 leatherback turtles each year, killing about 111 of them each year.

Although all causes of the declines in leatherback turtle colonies in the eastern Pacific have not been documented, Sarti et al. (1998) suggest that the declines result from egg poaching, adult and sub-adult mortalities incidental to high seas fisheries, and natural fluctuations due to changing environmental conditions. Some published reports support this suggestion. Sarti et al. (2000) reported that female leatherback turtles have been killed for meat on nesting beaches like Píedra de Tiacoyunque, Guerrero, Mexico. Eckert (1997) reported that swordfish gillnet fisheries in Peru and Chile contributed to the decline of leatherback turtles in the eastern Pacific. The decline in the nesting population at Mexiquillo, Mexico, occurred at the same time that effort doubled in the Chilean driftnet fishery. In response to these effects, the eastern Pacific population has continued to decline, leading some researchers to conclude that the leatherback is on the verge of extinction in the Pacific Ocean (e.g., Spotila et al. 1996, Spotila et al. 2000). The NMFS assessment of three nesting aggregations in its February 23, 2004, opinion supports this conclusion: If no action is taken to reverse their decline, leatherback sea turtles nesting in the Pacific Ocean either have high risks of extinction in a single human generation (for example, nesting aggregations at Terrenganu and Costa Rica) or they have a high risk of declining to levels where more precipitous declines become almost certain (e.g., Irian Jaya) (NMFS 2004a).

3.2.4.2 Atlantic Ocean

In the Atlantic Ocean, leatherbacks have been recorded as far north as Newfoundland, Canada, and Norway, and as far south as Uruguay, Argentina, and South Africa (NMFS SEFSC 2001). Female leatherbacks nest from the southeastern United States to southern Brazil in the western Atlantic and from Mauritania to Angola in the eastern Atlantic. The most significant nesting beaches in the Atlantic, and perhaps in the world, are in French Guiana and Suriname (NMFS SEFSC 2001). Genetic analyses of leatherbacks to date indicate that within the Atlantic basin there are genetically different nesting populations; the St. Croix nesting population (U.S. Virgin Islands), the mainland nesting Caribbean population (Florida, Costa Rica, Suriname/French Guiana), and the Trinidad nesting population (Dutton et al. 1999). When the hatchlings leave the nesting beaches, they move offshore but eventually utilize both coastal and pelagic waters. Very little is known about the pelagic habits of the hatchlings and juveniles, and they have not been documented to be associated with the *Sargassum* areas as are other species. Leatherbacks are deep divers, with recorded dives to depths in excess of 1,000 m (Eckert et al. 1999, Hayes et al. 2004).

Life History and Distribution

Leatherbacks are a long-lived species, living for over 30 years. They reach sexual maturity somewhat faster than other sea turtles (except Kemp's ridley), with an estimated range from 3-6 years (Rhodin 1985) to 13-14 years (Zug and Parham 1996). They nest frequently (up to 10 nests per year) during a nesting season and nest about every 2-3 years. During each nesting, they produce 100 eggs or more in each clutch and, thus, can produce 700 eggs or more per nesting season (Schultz 1975). However, a significant portion (up to approximately 30 percent) of the eggs can be infertile. Thus, the actual proportion of eggs that can result in hatchlings is less than this seasonal estimate. The eggs incubate for 55-75 days before hatching. Based on a review of all sightings of leatherback sea turtles of <145 cm curved carapace length (ccl), Eckert (1999) found that leatherback juveniles remain in waters warmer than 26°C until they exceed 100 cm ccl.

Although leatherbacks are the most pelagic of the sea turtles, they enter coastal waters on a seasonal basis to feed in areas where jellyfish are concentrated. Leatherback sea turtles feed primarily on cnidarians (medusae, siphonophores) and tunicates.

Evidence from tag returns and strandings in the western Atlantic suggests that adult leatherback sea turtles engage in routine migrations between boreal, temperate, and tropical waters (NMFS and USFWS 1992). A 1979 aerial survey of the outer continental shelf from Cape Hatteras, North Carolina, to Cape Sable, Nova Scotia showed leatherbacks to be present throughout the area with the most numerous sightings made from the Gulf of Maine south to Long Island. Leatherbacks were sighted in waters where depths ranged from 1-4,151 m, but 84.4 percent of sightings were in areas where the water was less than 180 m deep (Shoop and Kenney 1992). Leatherbacks were sighted in waters of a similar sea surface temperature as loggerheads; from 7-27.2°C (Shoop and Kenney 1992). However, this species appears to have a greater tolerance for colder waters because more leatherbacks were found at the lower temperatures (Shoop and Kenney 1992). This aerial survey estimated the in-water leatherback population from near Nova Scotia, Canada to Cape Hatteras, North Carolina at approximately 300-600 animals.

Population Dynamics and Status

The status of the Atlantic leatherback population is less clear than the Pacific population. The total Atlantic population size is undoubtedly larger than in the Pacific, but overall population trends are unclear. In 1996, the entire western Atlantic population was characterized as stable at best (Spotila et al. 1996), with numbers of nesting females reported to be on the order of 18,800. A subsequent analysis by Spotila (pers. comm.) indicated that by 2000, the western Atlantic nesting population had decreased to about 15,000 nesting females. The nesting aggregation in French Guiana has been declining at about 15 percent per year since 1987 (NMFS SEFSC 2001). However, from 1979-1986, the number of nests was increasing at about 15 percent annually which could mean that the current 15 percent decline could be part of a nesting cycle which coincides with the erosion cycle of Guiana beaches described by Schultz (1975). In Suriname, leatherback nest numbers have shown large recent increases (with more than 10,000 nests per year since 1999 and a peak of 30,000 nests in 2001), and the long-term trend for the overall Suriname and French Guiana population may show an increase (Girondot 2002 in Hilterman and Goverse 2003). The number of nests in Florida and the U.S. Caribbean has been increasing at about 10.3 percent and 7.5 percent, respectively, per year since the early 1980s, but the magnitude of nesting is much smaller than that along the French Guiana coast (NMFS SEFSC 2001). Also, because leatherback females can lay 10 nests per season, the recent increases to 400 nests per year in Florida may represent as few as 40 individual female nesters per year.

In summary, the conflicting information regarding the status of Atlantic leatherbacks makes it difficult to characterize the current status. Numbers at some nesting sites are increasing, but are decreasing at other sites. Tag return data emphasize the wide-ranging nature of the leatherback and the link between South American nesters and animals found in U.S. waters. For example, a nesting female tagged May 29, 1990, in French Guiana was later recovered and released alive from the York River, Virginia. Another nester tagged in French Guiana on June 21, 1990, was later found dead in Palm Beach, Florida (STSSN database). Genetic studies performed within ~~the Northeast Distant Fishery Experiment indicate that the leatherbacks captured in the Atlantic~~ highly migratory species pelagic longline fishery were primarily from the French Guiana and Trinidad nesting stocks (over 95 percent). Individuals from West African stocks were surprisingly absent (Roden et al. In press).

There are a number of problems contributing to the uncertainty of the leatherback nest counts and population assessments. The nesting beaches of the Guianas (Guyana, French Guiana, and Suriname) and Trinidad are by far the most important in the western Atlantic. However, beaches in this region undergo cycles of erosion and reformation, so that the nesting beaches are not consistent over time. Additionally, leatherback sea turtles do not exhibit the same degree of nest-site fidelity demonstrated by loggerhead and other hardshell sea turtles, further confounding analysis of population trends using nesting data. Reported declines in one country and reported increases in another may be the result of migration and beach changes, not true population changes. Nesting surveys, as well as being hampered by the inconsistency of the nesting beaches, are themselves inconsistent throughout the region. Survey effort varies widely in the seasonal coverage, aerial coverage, and actual surveyed sites. Surveys have not been conducted consistently throughout time, or have even been dropped entirely as the result of wars, political turmoil, funding vagaries, etc. The methods vary in assessing total numbers of nests and total numbers of females. Many sea turtle scientists agree that the Guianas (and some would include Trinidad) should be viewed as one population and that a synoptic evaluation of nesting at all beaches in the region is necessary to develop a true picture of population status (Reichart et al. 2001). No such region-wide assessment has been conducted recently.

The most recent, complete estimates of regional leatherback populations are in Spotila et al. (1996). As discussed above, nesting in the Guianas may have been declining in the late 1990s but may have increased again in the early 2000s. Spotila et al. estimated that the leatherback population for the Atlantic basin, including all nesting beaches in the Americas, the Caribbean, and West Africa totaled approximately 27,600 nesting females, with an estimated range of 20,082-35,133. We believe that the current population probably still lies within this range, taking into account the reported nesting declines and increases and the uncertainty surrounding them. We therefore choose to rely on Spotila et al.'s (1996) published total Atlantic population estimates, rather than attempt to construct a new population estimate here, based on our interpretation of the various, confusing nesting reports from areas within the region.

Threats

Zug and Parham (1996) pointed out that the main threat to leatherback populations in the Atlantic is the combination of fishery-related mortality (especially entanglement in gear and drowning in trawls) and the intense egg harvesting on the main nesting beaches. Other important ongoing threats to the population include pollution, loss of nesting habitat, and boat strikes.

Of sea turtle species, leatherbacks seem to be the most vulnerable to entanglement in fishing gear. This susceptibility may be the result of their body type (large size, long pectoral flippers, and lack of a hard shell), their attraction to gelatinous organisms and algae that collect on buoys and buoy lines at or near the surface, possibly their method of locomotion, and perhaps their attraction to the lightsticks used to attract target species in longline fisheries. They are also ~~susceptible to entanglement in gillnets and pot/trap lines (used in various fisheries) and capture~~ in trawl gear (e.g., shrimp trawls).

Leatherbacks are exposed to pelagic longline fisheries in many areas of their range. Unlike loggerhead turtle interactions with longline gear, leatherback turtles do not usually ingest longline bait. Instead, leatherbacks are foul hooked by longline gear (e.g., on the flipper or shoulder area) rather than getting mouth hooked or swallowing the hook (NMFS SEFSC 2001). According to observer records, an estimated 6,363 leatherback sea turtles were caught by the U.S. Atlantic tuna and swordfish longline fisheries between 1992-1999, of which 88 were released dead (NMFS SEFSC 2001). The U.S. fleet accounts for only 5 to 8 percent of the hooks fished in the Atlantic Ocean, and adding up the under-represented observed takes of the other 23 countries that actively fish in the area would lead to annual take estimates of thousands of leatherbacks over different life stages. Basin-wide, Lewison et al. (2004) estimated that 30,000-60,000 leatherback sea turtle captures occurred in Atlantic pelagic longline fisheries in the year 2000 alone (note that multiple captures of the same individual are known to occur, so the actual number of individuals captured may not be as high).

Leatherbacks are also susceptible to entanglement in the lines associated with trap/pot gear used in several fisheries. From 1990-2000, 92 entangled leatherbacks were reported from New York through Maine (Dwyer et al. 2002). Additional leatherbacks stranded wrapped in line of unknown origin or with evidence of a past entanglement (Dwyer et al. 2002). Fixed gear fisheries in the mid-Atlantic have also contributed to leatherback entanglements. In North Carolina, two leatherback sea turtles were reported entangled in a crab pot buoy inside Hatteras Inlet (D. Fletcher, pers. comm. to S. Epperly in NMFS SEFSC 2001). A third leatherback was reported entangled in a crab pot buoy in Pamlico Sound near Ocracoke. This turtle was disentangled and released alive; however, lacerations on the front flippers from the lines were evident (D. Fletcher, pers. comm. to S. Epperly in NMFS SEFSC 2001). In the Southeast, leatherbacks are vulnerable to entanglement in Florida's lobster pot and stone crab fisheries. In the U.S. Virgin Islands, where one of five leatherback strandings from 1982 to 1997 was due to entanglement (Boulon 2000), leatherbacks have been observed with their flippers wrapped in the line of West Indian fish traps (R. Boulon, pers. comm. to J. Braun-McNeill in NMFS SEFSC 2001). Because many entanglements of this typically pelagic species likely go unnoticed, entanglements in fishing gear may be much higher.

Leatherback interactions with the southeast Atlantic shrimp fishery, which operates predominately from North Carolina through southeast Florida (NMFS 2002), have also been a common occurrence. Leatherbacks, which migrate north annually, are likely to encounter shrimp trawls working in the coastal waters off the Atlantic coast from Cape Canaveral, Florida, to the Virginia/North Carolina border. Leatherbacks also interact with the Gulf of Mexico shrimp fishery. For many years, TEDs required for use in these fisheries were less effective at excluding leatherbacks than the smaller, hard-shelled turtle species. To address this problem, on February 21, 2003, the NMFS issued a final rule to amend the TED regulations. Modifications to the design of TEDs are now required in order to exclude leatherbacks and large and sexually mature loggerhead and green turtles.

Other trawl fisheries are also known to interact with leatherback sea turtles. In October 2001, a Northeast Fisheries Science Center observer documented the take of a leatherback in a bottom otter trawl fishing for Loligo squid off of Delaware; TEDs are not required in this fishery. The winter trawl flounder fishery, which did not come under the revised TED regulations, may also interact with leatherback sea turtles.

Gillnet fisheries operating in the nearshore waters of the mid-Atlantic states are also suspected of capturing, injuring, and/or killing leatherbacks when these fisheries and leatherbacks co-occur. Data collected by the NEFSC Fisheries Observer Program from 1994 through 1998 (excluding 1997) indicate that a total of 37 leatherbacks were incidentally captured (16 lethally) in drift gillnets set in offshore waters from Maine to Florida during this period. Observer coverage for this period ranged from 54 to 92 percent.

Poaching is not known to be a problem for nesting populations in the continental U.S. However, in 2001 the NMFS Southeast Fishery Science Center (SEFSC) noted that poaching of juveniles and adults was still occurring in the U.S. Virgin Islands and the Guianas. In all, four of the five strandings in St. Croix were the result of poaching (Boulon 2000). A few cases of fishermen poaching leatherbacks have been reported from Puerto Rico, but most of the poaching is on eggs.

Leatherback sea turtles may be more susceptible to marine debris ingestion than other species due to their pelagic existence and the tendency of floating debris to concentrate in convergence zones that adults and juveniles use for feeding areas and migratory routes (Lutcavage et al. 1997, Shoop and Kenney 1992). Investigations of the stomach contents of leatherback sea turtles revealed that a substantial percentage (44 percent of the 16 cases examined) contained plastic (Mrosovsky 1981). Along the coast of Peru, intestinal contents of 19 of 140 (13 percent) leatherback carcasses were found to contain plastic bags and film (Fritts 1982). The presence of plastic debris in the digestive tract suggests that leatherbacks might not be able to distinguish between prey items and plastic debris (Mrosovsky 1981). Balazs (1985) speculated that the object might resemble a food item by its shape, color, size or even movement as it drifts about, and induce a feeding response in leatherbacks.

It is important to note that, like marine debris, fishing gear interactions and poaching are problems for leatherbacks throughout their range. Entanglements are common in Canadian waters where Goff and Lien (1988) reported that 14 of 20 leatherbacks encountered off the coast of Newfoundland/Labrador were entangled in fishing gear including salmon net, herring net, gillnet, trawl line and crab pot line. Leatherbacks are reported taken by many other nations that participate in Atlantic pelagic longline fisheries, including Taipei, Brazil, Trinidad, Morocco, Cyprus, Venezuela, Korea, Mexico, Cuba, U.K., Bermuda, People's Republic of China, Grenada, Canada, Belize, France, and Ireland (see NMFS SEFSC 2001, for a description of take records). Leatherbacks are known to drown in fish nets set in coastal waters of Sao Tome, West Africa (Castroviejo et al. 1994, Graff 1995). Gillnets are one of the suspected causes for the decline in the leatherback sea turtle population in French Guiana (Chevalier et al. 1999), and gillnets targeting green and hawksbill turtles in the waters of coastal Nicaragua also incidentally catch leatherback turtles (Lagueux et al. 1998). Observers on shrimp trawlers operating in the northeastern region of Venezuela documented the capture of six leatherbacks from 13,600 trawls (Marcano and Alio-M 2000). An estimated 1,000 mature female leatherback sea turtles are caught annually in fishing nets off of Trinidad and Tobago with mortality estimated to be between 50 to 95 percent (Eckert and Lien 1999). However, many of the turtles do not die as a result of drowning, but rather because the fishermen butcher them in order to get them out of their nets (NMFS SEFSC 2001).

3.2.4.3 Summary of Leatherback Status

In the Pacific Ocean, the abundance of leatherback turtle nesting individuals and colonies has declined dramatically over the past 10 to 20 years. Nesting colonies throughout the eastern and western Pacific Ocean have been reduced to a fraction of their former abundance by the combined effects of human activities that have reduced the number of nesting females. In addition, egg poaching has reduced the reproductive success of the remaining nesting females. At current rates of decline, leatherback turtles in the Pacific basin are a critically endangered species with a low probability of surviving and recovering in the wild.

In the Atlantic Ocean, our understanding of the status and trends of leatherback turtles is much more confounded, although the picture does not appear nearly as bleak as in the Pacific. The number of female leatherbacks reported at some nesting sites in the Atlantic Ocean has increased, while at others they have decreased. Some of the same factors that led to precipitous declines of leatherbacks in the Pacific also affect leatherbacks in the Atlantic: leatherbacks are captured and killed in many kinds of fishing gear and interact with fisheries in state, federal, and international waters. Poaching is a problem and affects leatherbacks that occur in U.S. waters. Leatherbacks also appear to be more susceptible to death or injury from ingesting marine debris than other turtle species.

3.2.5 Green Sea Turtle

Federal listing of the green sea turtle occurred on July 28, 1978, with all populations listed as threatened except for the Florida and Pacific coast of Mexico breeding populations, which are endangered. The nesting range of the green sea turtles in the southeastern United States includes sandy beaches of mainland shores, barrier islands, coral islands, and volcanic islands between Texas and North Carolina, the U.S. Virgin Islands (USVI) and Puerto Rico (NMFS and USFWS 1991a). Principal U.S. nesting areas for green sea turtles are in eastern Florida, predominantly Brevard through Broward counties (Ehrhart and Witherington 1992). Green sea turtle nesting also occurs regularly on St. Croix, USVI, and on Vieques, Culebra, Mona, and the main island of Puerto Rico (Mackay and Rebholz 1996).

3.2.5.1 Pacific Ocean

Green turtles are thought to be declining throughout the Pacific Ocean, with the exception of Hawaii, from a combination of overexploitation and habitat loss (Seminoff 2002). In the western Pacific, the only major (>2,000 nesting females) populations of green turtles occur in Australia and Malaysia, with smaller colonies throughout the area. Indonesia has a widespread distribution of green turtles, but has experienced large declines over the past 50 years. Hawaii green turtles are genetically distinct and geographically isolated, and the population appears to be increasing in size despite the prevalence of fibropapilloma and spirochidiasis (Aguirre et al. 1998 in Balazs and Chaloupka 2003). In the eastern Pacific, mitochondrial DNA analysis has indicated that there are three key nesting populations: Michoacan, Mexico; Galapagos Islands, Ecuador; and Islas Revillagigedos, Mexico (Dutton 2003). There is also sporadic green turtle nesting along the Pacific coast of Costa Rica.

3.2.5.2 Atlantic Ocean

Life History and Distribution

The estimated age at sexual maturity for green sea turtles is between 20-50 years (Balazs 1982; Frazer and Ehrhart 1985). Green sea turtle mating occurs in the waters off the nesting beaches. Each female deposits 1-7 clutches (usually 2-3) during the breeding season at 12-14 day intervals. Mean clutch size is highly variable among populations, but averages 110-115 eggs/nest. Females usually have 2-4 or more years between breeding seasons, whereas males may mate every year (Balazs 1983). After hatching, green sea turtles go through a post-hatchling pelagic stage where they are associated with drift lines of algae and other debris. At approximately 20 to 25 cm carapace length, juveniles leave pelagic habitats and enter benthic foraging areas (Bjorndal 1997).

Green sea turtles are primarily herbivorous, feeding on algae and sea grasses, but also occasionally consume jellyfish and sponges. The post-hatchling, pelagic-stage individuals are assumed to be omnivorous, but little data are available.

Green sea turtle foraging areas in the southeastern United States include any coastal shallow waters having macroalgae or sea grasses. This includes areas near mainland coastlines, islands, reefs, or shelves, and any open-ocean surface waters, especially where advection from wind and currents concentrates pelagic organisms (Hirth 1997; NMFS and USFWS 1991a). Principal benthic foraging areas in the southeastern United States include Aransas Bay, Matagorda Bay, Laguna Madre, and the Gulf inlets of Texas (Doughty 1984; Hildebrand 1982; Shaver 1994), the Gulf of Mexico off Florida from Yankeetown to Tarpon Springs (Caldwell and Carr 1957; Carr 1984), Florida Bay and the Florida Keys (Schroeder and Foley 1995), the Indian River Lagoon System, Florida (Ehrhart 1983), and the Atlantic Ocean off Florida from Brevard through Broward counties (Wershoven and Wershoven 1992; Guseman and Ehrhart 1992). Adults of both sexes are presumed to migrate between nesting and foraging habitats along corridors adjacent to coastlines and reefs.

Population Dynamics and Status

The vast majority of green sea turtle nesting within the southeastern United States occurs in Florida (Meylan et al. 1995; Johnson and Ehrhart 1994). Green sea turtle nesting in Florida has been increasing since 1989 (Florida Fish and Wildlife Conservation Commission, Florida Marine Research Institute Index Nesting Beach Survey Database). Current nesting levels in Florida are reduced compared to historical levels, reported by Dodd (1981). However, total nest counts and trends at index beach sites during the past decade suggest the numbers of green sea turtles that nest within the southeastern United States are increasing.

Although nesting activity is obviously important in determining population distributions, the remaining portion of the green turtle's life is spent on the foraging and developmental grounds. Some of the principal feeding pastures in the western Atlantic Ocean include the upper west coast of Florida and the northwestern coast of the Yucatán Peninsula. Additional important foraging areas in the western Atlantic include the Mosquito and Indian River Lagoon systems and nearshore wormrock reefs between Sebastian and Ft. Pierce Inlets in Florida, Florida Bay, the Culebra archipelago and other Puerto Rico coastal waters, the south coast of Cuba, the Mosquito Coast of Nicaragua, the Caribbean Coast of Panama, and scattered areas along Colombia and Brazil (Hirth 1997). The summer developmental habitat for green turtles also encompasses estuarine and coastal waters from North Carolina to as far north as Long Island Sound (Musick and Limpus 1997).

There are no reliable estimates of the number of immature green sea turtles that inhabit coastal areas (where they come to forage) of the southeastern United States. However, information on incidental captures of immature green sea turtles at the St. Lucie Power Plant (they have averaged 215 green sea turtle captures per year since 1977) in St. Lucie County, Florida (on the Atlantic coast of Florida) show that the annual number of immature green sea turtles captured has increased significantly in the past 26 years (FPL 2002).

It is likely that immature green sea turtles foraging in the southeastern United States come from multiple genetic stocks; therefore, the status of immature green sea turtles in the southeastern United States might also be assessed from trends at all of the main regional nesting beaches, principally Florida, Yucatán, and Tortuguero. Trends at Florida beaches were previously discussed. Trends in nesting at Yucatán beaches cannot be assessed because of a lack of consistent beach surveys over time. Trends at Tortuguero (ca. 20,000-50,000 nests/year) showed a significant increase in nesting during the period 1971-1996 (Bjorndal et al. 1999), and more recent information continues to show increasing nest counts (Troëng and Rankin 2004). Therefore, it seems reasonable that there is an increase in immature green sea turtles inhabiting coastal areas of the southeastern United States; however, the magnitude of this increase is unknown.

Threats

The principal cause of past declines and extirpations of green sea turtle assemblages has been the over-exploitation of green sea turtles for food and other products. Although intentional take of green sea turtles and their eggs is not extensive within the southeastern United States, green sea turtles that nest and forage in the region may spend large portions of their life history outside the region and outside U.S. jurisdiction, where exploitation is still a threat. However, there are still significant and ongoing threats to green sea turtles from human-related causes in the United States. These threats include beach armoring, erosion control, artificial lighting, beach disturbance (e.g., driving on the beach), pollution, foraging habitat loss as a result of direct destruction by dredging, siltation, boat damage, other human activities, and interactions with fishing gear. Sea sampling coverage in the pelagic driftnet, pelagic longline, southeast shrimp trawl, and summer flounder bottom trawl fisheries has recorded takes of green turtles. There is also the increasing threat from green sea turtle fibropapillomatosis disease. Presently, this disease is cosmopolitan and has been found to affect large numbers of animals in some areas, including Hawaii and Florida (Herbst 1994; Jacobson, 1990; Jacobson et al. 1991).

3.2.5.3 Summary of Status for Atlantic Green Sea Turtles

Green turtles range in the western Atlantic from Massachusetts to Argentina, including the Gulf of Mexico and Caribbean, but are considered rare in benthic areas north of Cape Hatteras (Wynne and Schwartz 1999). Green turtles face many of the same natural and anthropogenic threats as for loggerhead sea turtles described above. In addition, green turtles are also susceptible to fibropapillomatosis, which can result in death. In the continental United States, green turtle nesting occurs on the Atlantic coast of Florida (Ehrhart 1979). Recent population estimates for the western Atlantic area are not available. The pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in Florida in 1989. However, given the species' late sexual maturity, caution is warranted about over-interpreting nesting trend data collected for less than 15 years.

4 ENVIRONMENTAL BASELINE

This section contains a description of the effects of past and ongoing human activities leading to the current status of the species, their habitat, and the ecosystem, within the action area. The environmental baseline is a snapshot of the factors affecting the species and includes federal, state, tribal, local, and private actions already affecting the species, or that will occur contemporaneously with the consultation in progress. Unrelated, future federal actions affecting the same species that have completed formal or informal consultation are also part of the environmental baseline, as are implemented and ongoing federal and other actions within the action area that may benefit listed species.

4.1 Status of Sea Turtles in the Action Area

Sea turtles found in the immediate project area may travel widely throughout the Atlantic, Gulf of Mexico, and Caribbean Sea, and individuals found in the action area can potentially be affected by activities anywhere within this wide range. Thus, the status of the species in the action area is the same as the species' range-wide status discussed in section 3 above.

4.1.2 Federal Actions

In recent years, NMFS has undertaken numerous ESA section 7 consultations to address the effects of federally-permitted fisheries and other federal actions on threatened and endangered sea turtle species. Each of those consultations sought to develop ways of reducing the probability of adverse effects of the action on sea turtles. Similarly, recovery actions NMFS has undertaken under the ESA are addressing the problem of take of sea turtles in the fishing and shipping industries and other activities such as COE dredging operations. The summary below of anticipated sources of incidental take of sea turtles from federal actions includes only those actions which have already concluded or are currently undergoing formal section 7 consultation.

Fisheries
Adverse effects on threatened and endangered sea turtles from several types of fishing gear occur in the action area. These gears, including gillnet, hook-and-line (i.e., vertical line), and trawl gear; have all been documented as interacting with sea turtles. For all fisheries for which there is a fishery management plan (FMP) or for which any federal action is taken to manage that fishery, the impacts have been evaluated via section 7 consultation. Formal section 7 consultations have been conducted on the Southeast shrimp trawl fishery, which is the only federally-managed fishery operating in the action area.

The Southeast shrimp trawl fishery affects more sea turtles than all other activities combined (NRC 1990). On December 2, 2002, NMFS completed the opinion for shrimp trawling in the southeastern United States under proposed revisions to the TED regulations (68 FR 8456, February 21, 2003). This opinion determined that the shrimp trawl fishery under the revised TED regulations would not jeopardize the continued existence of any sea turtle species. This determination was based, in part, on the opinion's analysis that shows the revised TED regulations are expected to reduce shrimp trawl related mortality by 94 percent for loggerheads and 97 percent for leatherbacks. An incidental take statement (ITS) has been issued for the take of sea turtles in this fishery. More detailed information can be found in the opinion (NMFS 2002).

Formal section 7 consultations have also been conducted for the issuance of several exempted fishing permits (EFP). These opinions have concluded the proposed activities may adversely affect but were not likely to jeopardize the continued existence of any sea turtles. ITSs for each EFP issued were provided.

Vessel and Military Operations
Potential sources of adverse effects from federal vessel operations in the action area include operations of the U.S. Department of Defense (DOD), Navy (USN), Air Force and Coast Guard (USCG), the Environmental Protection Agency, the National Oceanic and Atmospheric Administration (NOAA), and the COE. NMFS has conducted formal consultations with the USCG, the USN, and NOAA on some of their vessel operations. Through the section 7 process, where applicable, NMFS has and will continue to establish conservation measures for all these agency vessel operations to avoid or minimize adverse effects to listed species. At the present time, however, they present the potential for some level of interaction. Refer to the Biological Opinions for the USCG (NMFS 1995; NMFS 1996; NMFS 1998) and the USN (NMFS 1997a) for details on the scope of vessel operations for these agencies and conservation measures being implemented as standard operating procedures.

Since the USN consultation only covered operations out of Mayport, Florida, potential still remains for USN vessels to adversely affect sea turtles within the action area. Similarly, operations of vessels by other federal agencies within the action area (NOAA, EPA, COE) may adversely affect sea turtles. However, the in-water activities of those agencies are limited in scope, as they operate a limited number of vessels or are engaged in research/operational activities that are unlikely to contribute a large amount of risk.

Dredging
The construction and maintenance of federal navigation channels and sand mining ("borrow") areas has also been identified as a source of sea turtle mortality. Hopper dredges move relatively rapidly (compared to sea turtle swimming speeds) and can entrain and kill sea turtles as the drag arm of the moving dredge overtakes the slower moving sea turtle. On September 22, 1995, NMFS completed the Regional Biological Opinion (RBO) issued to the COE, New Orleans and Galveston Districts, on hopper dredging of channels in Texas and Louisiana. NMFS reinitiated consultation with all Gulf of Mexico COE districts (i.e., Galveston, New Orleans, Mobile, and Jacksonville) on November 19, 2003, and issued an ITS for the entire Gulf of Mexico from the U.S.-Mexico border to Key West. This opinion determined that all channel dredging (i.e., maintenance dredging) and sand mining by hopper dredges in the Gulf of Mexico under the purview of the COE's Gulf districts would not jeopardize the continued existence of any sea turtle species. NMFS amended the GRBO on June 24, 2005 (Revision 1), and subsequently amended it a second time on January 9, 2007 (Revision 2).

ESA Permits
The ESA allows the issuance of permits to take ESA-listed species for the purposes of scientific research (section 10(a)(1)(a)). In addition, the ESA allows for the NMFS to enter into cooperative agreements with states developed under section 6 of the ESA, to assist in recovery actions of listed species. Prior to issuance of these authorizations, the proposal must be reviewed for compliance with section 7 of the ESA.

Sea turtles are the focus of research activities authorized by a section 10 permit under the ESA. There are currently 31 active scientific research permits (NMFS unpublished data) directed toward sea turtles that are applicable to the action area of this opinion. Authorized activities range from photographing, weighing, and tagging sea turtles incidentally taken in fisheries, blood sampling, tissue sampling (biopsy), and performing laparoscopy on intentionally captured turtles. The number of authorized takes varies widely depending on the research and species involved but may involve the taking of hundreds of turtles annually. Most takes authorized under these permits are expected to be non-lethal. Before any research permit is issued, the proposal must be reviewed under the permit regulations (i.e., must show a benefit to the species). In addition, since issuance of the permit is a federal activity, issuance of the permit by the NMFS must also be reviewed for compliance with section 7(a)(2) of the ESA to ensure that issuance of the permit does not result in jeopardy to the species.

4.1.3 State or Private Actions

Vessel Traffic
Commercial traffic and recreational pursuits can have an adverse effect on sea turtles through propeller and boat strike damage. Private vessels participate in high-speed marine events concentrated in the southeastern United States and are a particular threat to sea turtles, and occasionally to marine mammals as well. The magnitude of these marine events is not currently known. NMFS and the USCG (who permit these events) have consulted on some of these events, but a complete analysis has not been completed. NMFS has also consulted with other agencies, such as MMS and FERC, on vessel transit interactions with listed species.

State Fisheries
Several coastal state fisheries are known to incidentally take listed species, but information on these fisheries is sparse (NMFS 2001a). Various fishing methods used in these commercial and recreational fisheries, including trawling, pot fisheries, gillnets, and vertical line are all known to incidentally take sea turtles, but information on these fisheries is sparse (NMFS 2001a). Most state data are based on extremely low observer coverage or sea turtles were not part of data collection; thus, these data provide insight into gear interactions that could occur but are not indicative of the magnitude of the overall problem. The 2001 HMS Biological Opinion (NMFS 2001b) has an excellent summary of turtles taken in state fisheries throughout the action area.

To address data gaps, several state agencies have initiated observer programs to collect information on interactions between listed species and certain gear types. Other states have closed nearshore waters to gear-types known to have high encounter rates with listed species. Depending on the fishery in question, many state permit holders also hold federal permits; therefore, existing section 7 consultations on federal fisheries may address some of the state fishery impacts.

Additional information on impact of take (i.e., associated mortality) is also needed for analysis of impacts to sea turtles from these fisheries. Certain gear types may have high levels of sea turtle takes, but very low rates of serious injury or mortality. For example, hook-and-line takes rarely are dead upon retrieval of gear, but trawls and gillnets frequently result in immediate mortality. Leatherbacks seem to be susceptible to a more restricted list of fisheries, while hardshell turtles, particularly loggerheads, seem to appear in data from almost all state fisheries. The HMS opinion also summarizes sea turtle interactions with flynets and various trawl techniques that occur within the action area.

Texas, Louisiana, Mississippi, and Florida have placed restrictions on gillnet fisheries within state waters such that very little commercial gillnetting takes place in southeastern waters.

Observations of state recreational fisheries have shown that loggerhead, leatherback, and green sea turtles are known to bite baited hooks, and loggerheads frequently ingest the hooks. Hooked turtles have been reported by the public fishing from boats, piers, and beach, banks, and jetties and from commercial fishermen fishing for reef fish and for sharks with both single rigs and bottom longlines (NMFS 2001b). A detailed summary of the known impacts of hook-and-line incidental captures to loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

4.1.4 Other Potential Sources of Impacts in the Environmental Baseline

A number of activities that may indirectly affect listed species in the action area of this consultation include ocean dumping and disposal, aquaculture, and anthropogenic marine debris. The impacts from these activities are difficult to measure. Where possible, conservation actions are being implemented to monitor or study impacts from these sources. Close coordination is occurring through the section 7 process on both dredging and disposal sites to develop monitoring programs and ensure that vessel operators do not contribute to vessel-related impacts.

Marine Pollution
Sources of pollutants in the Gulf of Mexico coastal regions include atmospheric loading of pollutants such as PCBs, stormwater runoff from coastal towns, cities and villages, runoff into rivers emptying into the bays, groundwater and other discharges, and river input and runoff. Nutrient loading from land-based sources such as coastal community discharges is known to stimulate plankton blooms in closed or semi-closed estuarine systems. The effects on larger embayments are unknown. Although pathological effects of oil spills have been documented in laboratory studies of marine mammals and sea turtles (Vargo et al. 1986), the impacts of many other anthropogenic toxins have not been investigated.

Acoustic Impacts
Acoustic impacts can include temporary or permanent injury, habitat exclusion, habituation, and disruption of other normal behavior patterns. Although focused on marine mammals, sea turtles may benefit from increased research on acoustics and reduction in noise levels.

4.1.5 Conservation and Recovery Actions Shaping the Environmental Baseline

NMFS has implemented a series of regulations aimed at reducing potential for incidental mortality of sea turtles in commercial fisheries. In particular, NMFS has required the use of TEDs in southeast U.S. shrimp trawls since 1989. It has been estimated that TEDs exclude 97 percent of the sea turtles caught in such trawls. These regulations have been refined over the years to ensure that TED effectiveness is maximized through proper placement and installation, configuration (e.g., width of bar spacing), floatation, and more widespread use. Analyses by Epperly and Teas (2002) indicated that the minimum requirements for the escape opening dimensions in TEDs in use at that time were too small, and that as many as 47 percent of the loggerheads stranding annually along the Atlantic Seaboard and Gulf of Mexico were too large to fit through existing openings. On February 21, 2003, NMFS published a final rule to require larger escape openings in TEDs used in the Southeast shrimp trawl fishery (68 FR 8456, February 21, 2003). Based upon the analyses in Epperly et al. (2002), leatherback and loggerhead sea turtles will greatly benefit from the new regulations, with expected reductions of 97 percent and 94 percent, respectively, in mortality from shrimp trawling. Several states (e.g., Florida, Georgia, South Carolina, Texas) have regulations requiring the use of TEDs in state-regulated shrimp trawl fisheries, and the federal regulations also apply in state waters.

NMFS has also been active in public outreach efforts to educate fishermen regarding sea turtle handling and resuscitation techniques. There is also an extensive network of Sea Turtle Stranding and Salvage Network (STSSN) participants along the Atlantic and Gulf of Mexico coasts who not only collect data on dead sea turtles, but also rescue and rehabilitate any live stranded sea turtles.

Loggerheads, leatherbacks, greens, and Kemp's ridleys are known to bite a baited hook, frequently ingesting the hook. Hooked turtles have been reported by the public fishing from boats, piers, beaches, banks, and jetties. Necropsies have revealed hooks internally, which often were the cause of death. In 2006, the Marine Recreational Fishery Statistics Survey (MRFSS) added a survey question regarding sea turtle interactions within recreational fisheries; NMFS is exploring potential revisions to MRFSS to quantify recreational encounters with sea turtles on a permanent basis. Detailed summaries of the impact of hook-and-line incidental captures on loggerhead sea turtles can be found in the TEWG reports (1998; 2000).

The Recovery Plans for loggerhead and Kemp's ridley sea turtles are in the process of being updated. Recovery teams comprised of sea turtle experts have been convened and are currently working towards revising these plans based upon the latest and best available information.

5 EFFECTS OF THE ACTION

In this section of the opinion, we assess the direct and indirect effects of the proposed action on listed species within the action area (i.e., Matagorda Ship Channel bounded by a one-mile buffer area, existing and proposed dredged material placement, restoration, and nourishment areas, and the associated ODMDS in Calhoun County, Texas). The analysis in this section forms the foundation for our jeopardy analysis in section 7. A jeopardy determination is reached if we would reasonably expect a proposed action to cause reductions in numbers, reproduction, or distribution that would appreciably reduce a listed species' likelihood of surviving and recovering in the wild. The status of each listed sea turtle species likely to be adversely affected by the proposed action is reviewed in Section 3. Sea turtle species are listed because of their global status; a jeopardy determination must therefore find the proposed action will appreciably reduce the likelihood of survival and recovery of each species globally.

The quantitative and qualitative analyses in this section are based upon the best scientific and commercial data available on sea turtle biology and the effects of the proposed action. When analyzing the effects of any action, it is important to consider indirect effects as well as the direct effects. Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. Indirect effects include aspects such as habitat degradation, reduction of prey/foraging base, etc.

Previous biological opinions have documented that hopper dredging occasionally results in sea turtle entrainment and death, even with seasonal dredging windows, turtle deflector dragheads in place, and concurrent relocation trawling. For example, in the western Gulf of Mexico from February 1995 through March 2007, a total of 66 lethal takes (13 Kemp's ridleys, 27 loggerheads, and 26 greens) by GDCOE hopper dredging activities were documented during the dredging of 90.49 million cubic yards of material (U.S. Army Corps of Engineers Sea Turtle Data Warehouse, http://el.erdc.usace.army.mil/seaturtles/index.cfm). Of that total, one green, two Kemp's ridley, and three loggerhead sea turtle takes occurred during maintenance dredging specifically in the Matagorda Ship Channel area (*Ibid*).

Satellite telemetry work funded by COE and conducted by the NMFS Galveston Laboratory demonstrates the nearshore occurrence of Kemp's ridleys near northern Gulf channels. Kemp's ridleys remained within 10 NM of shore for greater than 95 percent of the observed time, with 90 percent of the observed locations within 5 NM (M. Renaud, NMFS Galveston Laboratory, pers. comm.). Movements out of northern Gulf waters in response to cooling temperatures occurred during December, and Kemp's ridleys returned with warming waters in March.

Seasonal abundance of sea turtles utilizing nearshore waters of the northwest Gulf of Mexico varies with species and location. Green turtles within subtropical habitats of the Laguna Madre are the region's only year-round, inshore occupants. Other species, especially the Kemp's ridley, are transient users of the coastal zone that venture toward tidal passes and into bays during May-August when food sources and other environmental factors are favorable. The May-August period has yielded over 80 percent of the sea turtle captures (n=516) recorded by Texas A&M researchers (Landry et al. 1994). Based on strandings, reported incidental captures, observer data, aerial surveys, and telemetry tracks, loggerheads are distributed ubiquitously in the Gulf, generally occurring in all areas, both inshore and offshore.

Habitat Effects of Hopper Dredging

The proposed dredging of Matagorda Ship Channel will directly alter the benthos through the removal of sediments. During dredging, water quality may be negatively impacted (i.e., increased turbidity) for short durations, although the area normally is extremely turbid. The widening and deepening of Matagorda Ship Channel will permanently and directly alter sediment quality in the portion of the channels to be modified. However, while sea turtles may be encountered in and near shipping channels, these areas do not provide preferred foraging opportunities. Therefore, any direct or indirect habitat impacts by dredging are expected to be insignificant in regard to ESA-listed sea turtle species.

Estimated Turtle Takes by Dredges

The proposed project would generate approximately 46.5 mcy of dredged material. Hopper dredges will be largely utilized in the offshore areas, producing 3.2 mcy of dredged material. Clamshell dredges will also be utilized in Matagorda Bay, an area expected to produce approximately 8.8 mcy (i.e., 19 percent) of the new work material. However, a hopper dredge may also do the work tentatively assigned to the clamshell dredge, which is expected to produce approximately 8.8 mcy of material, resulting in a total of 12 mcy of new work dredged material. Hydraulic dredges will be used to remove the remainder; hydraulic dredges are not known to adversely affect sea turtles (NMFS 2007). Hopper dredging Matagorda Ship Channel has generated 2.15 mcy of material from 1995-2007, which resulted in 6 turtle takes (3 loggerhead, 2 Kemps' ridley, and 1 green sea turtle). Most (67 percent) of these turtles were associated with dredging in August 2006. Regardless, on average, in the project area one turtle take is associated with every 0.36 mcy of dredged material (2,151,717 cubic yards/6 turtles). This average would translate into an expected take of 33 (12 mcy/0.36 turtle per mcy) turtles (14 loggerhead, 13 green, and 6 Kemp's ridley sea turtles based on reported takes in GDCOE dredging projects) during the course of the proposed dredging, based on the use of hopper dredges completing the work also tentatively assigned to clamshell dredges. Should clamshell dredges be used to complete their assigned work (i.e., 8.8 mcy), hopper dredges would only generate 3.2 mcy of dredged material and result in only 9 turtle takes (4 loggerhead, 4 green, and 1 Kemp's ridley). However, since hopper dredges may be employed in lieu of clamshell dredges, the more conservative estimate of 33 takes must be used. Furthermore, this estimate is based on the implementation of relocation trawling to prevent additional lethal takes by hopper dredges; in the complete absence of relocation trawling, takes by hopper dredges could be higher.

Effects of Relocation Trawling Activities in Association with Hopper Dredging
Relocation trawling has been successful at temporarily displacing Kemp's ridley, loggerhead, leatherback, and green sea turtles from channels in the Atlantic and Gulf of Mexico during periods when hopper dredging was imminent or ongoing. Some turtles captured during relocation trawling operations return to the dredge site and are subsequently recaptured. Sea turtle relocation studies by Standora et al. (1993) at Canaveral Channel relocated 34 turtles to six release sites of varying distances north and south of the channel. Ten turtles returned from southern release sites, and seven from northern sites, suggesting that there was no significant difference between directions. Return times observed suggested that there was a direct correlation between relocation distance and likelihood of return or length of return time to the channel when sea turtles were relocated to the south. No correlation was observed between the northern release sites and the time or likelihood of return. The study found that relocation of turtles to the site 70 km (43 miles) south of the channel would result in a return time of over 30 days.

REMSA, a private company contracted to conduct relocation trawling, captured, tagged, and relocated 69 turtles in a 7-day period at Canaveral Channel in October 2002, with no recaptures; turtles were relocated a minimum of 3-4 miles away (T. Bargo, REMSA, pers. comm. to Eric Hawk, June 2, 2003). Twenty-four hour per day relocation trawling conducted by REMSA at Aransas Pass Entrance Channel (Corpus Christi Ship Channel) from April 15, 2003, to July 7, 2003, relocated 71 turtles from 1.5-5 miles from the dredge site, with 3 recaptures (T. Bargo, REMSA, pers. comm. to Eric Hawk, July 24, 2003). One turtle released on June 14, 2003, approximately 1.5 miles from the dredge site, was recaptured four days later; another turtle captured June 9, 2003, and released about three miles from the dredge site was recaptured nine days later. Subsequent releases occurred five miles away. Of these 68 subsequent capture/releases, 1 turtle released on June 22, 2003, was recaptured 13 days later (REMSA Final Report, Sea Turtle Relocation Trawling, Aransas Pass, Texas, April-July 2003).

Relocation trawling activities initiated by GDCOE in 2007 have resulted in the capture, tagging, and relocation of 65 green, 25 Kemp's ridley, and 12 loggerhead sea turtles. Recent relocation trawling within the immediate project area in August 2006 (i.e., Matagorda Ship Channel) resulted in 21 loggerheads and 6 Kemp's ridley sea turtles captured in 11 days.

Prior to 1997, most relocation trawling in association with hopper dredging was performed by the COE under an ESA section 10 incidental take/research permit. Since then, however, relocation trawling has primarily been conducted by private companies. Since approximately October 1999, Coastwise Consulting, Inc., has conducted over 1,600 days of relocation trawling at Wilmington, North Carolina; Kings Bay and Savannah, Georgia; Pensacola, Florida; and Sabine Pass, Galveston, Freeport, Matagorda Pass, and Corpus Christi, Texas (C. Slay, e-mail to E. Hawk, January 25, 2007). During the course of that work, over 770 loggerhead, Kemp's ridley, green, hawksbill, and leatherback sea turtles were successfully captured, tagged, and released; only one leatherback mortality has been documented, which was attributed to illegal artificial reef material deployed within a designated borrow area. On the Atlantic coast, REMSA has also successfully tagged and relocated over 140 turtles in the last several years, most notably, 69 turtles (55 loggerheads and 14 greens) in a 7-day period at Canaveral Channel in October 2002, with no significant injuries. Other sea turtle relocation contractors (R. Metzger in 2001; C. Oravetz in 2002) have also successfully and non-injuriously trawl-captured and released sea turtles out of the path of oncoming hopper dredges. More recently in the Gulf of Mexico, REMSA captured, tagged, and relocated 71 turtles at Aransas Pass with no apparent ill effects to the turtles. Three injured turtles captured were subsequently transported to University of Texas Marine Science Institute rehabilitation facilities for treatment (two had old, non-trawl related injuries or wounds; the third turtle may have sustained an injury to its flipper, apparently from the door chain of the trawl, during capture). Three of the 71 captures were recaptures and were released around 1.5, three, and five miles, respectively, from the dredge site; none exhibited any evidence their capture, tag, release, and subsequent recapture, was in any way detrimental.

The turtles' capture and handling can result in raised levels of stressor hormones, and can cause some discomfort during tagging procedures. Based on past observations obtained during similar research trawling for turtles, these physiological effects are expected to dissipate within a day (Stabenau and Vietti 1999). Since turtle recaptures are rare, and recaptures that do occur typically happen several days to weeks after initial capture, cumulative adverse effects of recapture are not expected.

The Gulf and South Atlantic Fisheries Development Foundation's August 31, 1998, "Alternatives to TEDs: Final Report," presents data on 641 South Atlantic shallow tows (only one tow was in water over 27.4 m), all conducted under restricted tow times (55 minutes during April through October and 75 minutes from November through March), and 584 Gulf of Mexico nearshore tows conducted under the same tow time restrictions. Offshore effort in the Gulf of Mexico consisted of 581 non-time restricted tows, which averaged 7.8 hours per tow. All totaled, 323 turtle observations were documented: 293 in the nearshore South Atlantic efforts, and 30 in the Gulf efforts (24 nearshore and 6 offshore). Of the 293 South Atlantic turtles (219 loggerhead, 68 Kemp' ridley, 5 green, and 1 leatherback), only 274 were used in the analyses (201 loggerhead, 67 Kemp's ridley, 5 green, and 1 leatherback) because 12 escaped from the nets after being seen and 7 were caught in try nets. Of the 274 South Atlantic turtles captured using restricted tow times, only 5 loggerheads and 1 Kemp's ridley died because of the interaction. For the Gulf efforts, 26 turtles (8 loggerhead, 16 Kemp's ridley, and 2 green) were captured, resulting in three mortalities (1 loggerhead inshore, 1 loggerhead, and 1 green offshore). Excluding all six offshore tows and both offshore mortalities (because of the prolonged, non-restricted tow times), we are left with 1,225 time-restricted tows (584 + 641) resulting in 298 trawl-captured turtles (274 + 24) resulting in seven mortalities, i.e., 2.3 percent of the interactions resulted in death.

Rarely, even properly conducted relocation trawling can result in accidental sea turtle deaths. Henwood (T. Henwood, pers. comm. to E. Hawk, December 6, 2002) noted that trawl-captured loggerhead sea turtles died on several occasions during handling on deck during winter trawling in Canaveral Channel in the early 1980s, after short (approximately 30 minutes) tow times.

However, Henwood also noted that a significant number of the loggerheads captured at Canaveral during winter months appeared to be physically stressed and in "bad shape" compared to loggerheads captured in the summer months from the same site, which appeared much healthier and robust. Stressed turtles or unhealthy turtles or turtles exposed to repeated forced submergences are more likely to be injured or killed during relocation trawling than healthy turtles.

In November 2002, during relocation trawling conducted in York Spit, Virginia, a Kemp's ridley sea turtle was likely struck by one of the heavy trawl doors or it may have been struck and killed by another vessel shortly before trawl net capture. The hopper dredge was not working in the area at the time (T. Bargo, pers. comms. and e-mails to E. Hawk, December 6 and 9, 2002). ~~Additionally, during relocation trawling conducted off Destin, Florida, on December 2, 2006, a~~ leatherback turtle was captured and killed. However, this mortality occurred after the trawler encountered a large section of debris, potentially illegally dumped artificial reef material, which likely impacted the sea turtle (C. Slay, pers. comms. and e-mails to E. Hawk, December 4, 2006).

NMFS typically limits tow times for relocation trawling to 42 minutes or less measured from the time the trawl doors enter the water when setting the net to the time the trawl doors exit the water during haulback ("doors in - doors out"). The National Research Council (NRC) report "Decline of the Sea Turtles: Causes and Prevention" (NRC 1990) suggested that limiting tow durations to 40 minutes in summer and 60 minutes in winter would yield sea turtle survival rates that approximate those required for the approval of new TED designs, i.e., 97 percent. The NRC report also concluded that mortality of turtles caught in shrimp trawls increases markedly for tow times greater than 60 minutes.

Four lethal sea turtle takes during August 2006 maintenance dredging of the Matagorda Ship Channel occurred during concurrent relocation trawling activities that captured 27 sea turtles. In contrast, during relocation trawling in January-February 2004 no sea turtles were captured during 427 tows in Matagorda Ship Channel (U.S. Army Corps of Engineers Sea Turtle Data Warehouse); however, one turtle was taken by hopper dredge during the concurrent relocation trawling activities.

No hawksbill sea turtle mortalities have been recorded during relocation trawling, and relocation-trawling takes of this species are extremely rare. One leatherback sea turtle mortality was associated with relocation trawling off Destin, Florida, in December 2006; however, this incident was attributed to illegally-deployed and unmarked artificial reef material within a borrow site, and was considered a freak event. Therefore, NMFS believes that the possibility of relocation trawling take mortality occurring to either of these species is discountable.

In summary, NMFS believes that properly conducted and supervised relocation trawling (i.e., observing NMFS-recommended trawl speed and tow-time limits, and taking adequate precautions to release captured animals) and tagging is unlikely to result in adverse effects (i.e., injury or death) to sea turtles. NMFS estimates that, overall, sea turtle trawling and relocation efforts will result in considerably less than 0.5 percent mortality of captured turtles, primarily due to their being previously stressed or diseased or if struck by trawl doors or accidents on deck. On the other hand, hopper dredge entrainments invariably result in injury, and are almost always fatal. In the regional biological opinions on hopper dredging, NMFS requires relocation trawling and tagging as methods of reducing sea turtle entrainment in hopper dredges and to document the effects of relocation trawling, according to criteria defined in the ITS.

Estimated Turtle Takes by Relocation Trawler

Even though relocation trawling involves directed take of turtles, it constitutes a legitimate RPM because it reduces the level of almost certain lethal and injurious take of sea turtles by hopper dredges, and allows the turtles captured non-injuriously by trawl to be relocated out of the path of the dredges. Without relocation trawling, the number of lethal takes of sea turtles by hopper dredging would likely be significantly greater than the estimated number discussed above and specified in the ITS. The number of non-lethal sea turtles takes expected by relocation trawlers ~~does not directly translate into potential lethal takes by hopper dredges in the absence of~~ relocation trawling, due to the differences in footprint between the two gears. The spread of a relocation trawler is much greater than the intake of a hopper dredge, therefore, the trawler will encounter a significantly greater number of sea turtles. However, it is reasonable to assume that in the absence of relocation trawling the number of lethal takes would increase, but predicting a precise number (i.e., lethal take by hopper dredging in the absence of relocation trawling) would be problematic due to the fact that the COE has consistently used relocation trawling as a standard practice for the majority of its projects in the Gulf of Mexico in recent years. The Consultation Handbook (for Procedures for Conducting Consultation and Conference Activities Under Section 7 of the Endangered Species Act, U.S. Fish and Wildlife Service and National Marine Fisheries Service, March 1998) expressly authorizes such directed take as an RPM at page 4-54. Therefore, NMFS will in this section evaluate the expected level of turtle take through required relocation trawling, so that these levels can be included in the evaluation of whether the proposed action will jeopardize the continued existence of the species.

The number of turtles relocated by trawlers in association with Gulf of Mexico hopper dredging projects varies considerably by project area, amount of effort, and time of year. For example, in 2006 the dredging of the Houston-Galveston Navigation Channels, which produced 3.7 million cubic yards of material (i.e., similar to what is expected in the proposed action), resulted in 7 loggerheads relocated in 60 days of trawling. However, in 2006 over approximately 15 days, 34 green sea turtles were relocated during the dredging of the Brownsville Entrance Channel. Furthermore, sea turtle distribution can be very patchy, resulting in significant differences in number of turtle takes by relocation trawler. For example, in 2003, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released in 3 months of relocation trawling, while the aforementioned Houston-Galveston project in 2006 only experienced 7 turtles in 2 months.

Due to the amount of required work and the duration of the project (i.e., 2 years), NMFS estimates that relocation trawling associated with the proposed action will take no more than 182 sea turtles during the course of the proposed work (43 loggerhead, 128 Kemp's ridley, 1 hawksbill, 1 leatherback, and 9 green sea turtles based on frequency data in Epperly et al. 2002). This estimate is based on the amount of work required for the proposed project (i.e., duration of two years), recent history of relocation trawler takes in the Gulf of Mexico, the possibility that a significant pulse of turtles could be encountered by relocation trawlers (e.g., 2003 event at Aransas Pass), and increased presence of sea turtles in coastal waters as turtle populations recover and new TED regulations take effect leading to increased trawl capture rates. As stated in the RPMs and Terms and Conditions of this opinion's ITS, relocation trawling is required under specific circumstances. While unlikely, Matagorda Ship Channel relocation trawling may result in lethal sea turtle takes. Due to the amount of work involved and the number of potential captures by relocation trawlers over the two years of the proposed project (i.e.,.182 captures), based on a 0.5 percent mortality rate of captured turtles we predict 1 of the captures (most likely Kemp's ridley, based on frequency data in Epperly et al. 2002) will result in a sea turtle mortality (0.5 percent mortality rate * 182 captures = 0.9 mortalities). The remaining 181 takes are not expected to be injurious or lethal due to the short duration of the tow times (15 to 30 minutes per tow; not more than 42 minutes, as per Term and Condition No. 13) and required safe-handling procedures.

Effects and Desirability of Tagging and Taking Genetic Samples From Relocated Animals
Tagging prior to release will help NMFS learn more about the habits and identity of trawl-captured animals after they are released, and if they are recaptured they will enable improvements in relocation trawling design to further reduce the effect of the take. External and internal flipper tagging (e.g., with Inconel and PIT tags) is not considered a dangerous procedure by the sea turtle research community, is routinely done by thousands of volunteers in the United States and abroad; and can be safely accomplished with minimal training. NMFS knows of no instance where flipper tagging has resulted in mortality or serious injury to a trawl-captured sea turtle. Such an occurrence would be extremely unlikely because the technique of applying a flipper tag is minimally traumatic and relatively non-invasive; in addition, these tags are attached using sterile techniques. Important growth, life history, and migratory behavior data may be obtained from turtles captured and subsequently relocated. Therefore, these turtles should not be released without tagging (and scanning for pre-existing tags).

Analysis of genetic samples may provide information on sea turtle populations such as life history, nesting beach identification, and distribution/stock overlap, which may ultimately benefit sea turtle protection measures.

Collection of Tissue Samples
Tissue sampling is performed to determine the genetic origins of captured sea turtles, and learn more about turtle nesting beach/population origins. This is important information because some populations, e.g., the northern subpopulation of loggerheads nesting in the Southeast Region, may be declining. For all tissue sample collections, a sterile 4- to 6-mm punch sampler is used. Researchers who examined turtles caught two to three weeks after sample collection noted that the sample collection site was almost completely healed (Witzell, pers. comm.). NMFS does not expect that the collection of a tissue sample from each captured turtle will cause any additional stress or discomfort to the turtle beyond that experienced during capture, collection of measurements, and tagging. Tissue sampling procedures are specified in the terms and conditions of this opinion.

Disorientation Effects of Hopper Dredge and Pumpout Barge Deck Lighting
NMFS believes that female sea turtles approaching nesting beaches, and neonates (i.e., hatchlings) emerging from nests and exiting their natal beaches, may be adversely affected by bright offshore lights from hopper dredges or hopper dredge pumpout barges operating in the

nearshore (0-3 NM) environment. Females approaching the beach to nest could be deterred from nesting by bright lights in the nearshore environment. Hatchlings emerging from their nests could be attracted away from the shortest path to the water and instead crawl or swim toward the bright lights of a nearshore hopper dredge or anchored pumpout barge (instead of crawling or swimming seaward toward the open horizon), thus increasing their exposure time to predation. NMFS recently received a report from a National Park Service biologist at Gulf Islands National Seashore (M. Nicholas, pers. comm. to E. Hawk, September 29, 2003) who relocated a clutch of 97 Perdido Key hatchlings on September 28, 2003. The biologist felt that the hatchlings were in danger of being attracted to a nearby operating, brightly lit hopper dredge which was dredging one-half to one mile offshore in Pensacola Entrance Channel. NMFS considers it prudent that hopper dredges and hopper dredge pumpout barges operating within 3 NM of sea turtle nesting beaches during sea turtle nesting and sea turtle hatchling emergence season (May 1-October 31, annually), should shield essential deck lighting and reduce or extinguish non-essential deck lighting to the maximum extent possible consistent with vessel personnel safety and U.S. Coast Guard navigation requirements, to reduce potential disorientation effects, potential reduced or aborted nesting, and potential increased hatchling mortality from increased exposure to predators. This is consistent with U.S. Fish and Wildlife Service biological opinion requirements and Florida Wildlife Commission requirements for beach nourishment projects where nesting sea turtles may be present, and was jointly developed by these agencies, the Florida Department of Environmental Protection, and the U.S. Army Corps of Engineers, Jacksonville District (R. Trindell, pers. comm. to E. Hawk, September 30, 2003).

Effects of Dredged Material Disposal on Sea Turtles

Typically, dredged materials from channel maintenance dredging activities are disposed of down current of the navigation channels being maintained (by agitation dredging and sidecasting), or in designated disposal areas which are adjacent to and run approximately parallel to the navigation channels, or in nearby designated offshore disposal areas (to minimize transit time of the hopper dredge to and from the dredging site). Alternatively, they are used beneficially for barrier island restoration and creation of island, wetland, marsh, and shallow-water habitats, or to renourish eroded mainland beaches.

NMFS believes the proposed disposal activities are unlikely to adversely affect sea turtles. These species are highly mobile and should be able to easily avoid a descending sediment plume discharged at the surface by a hopper dredge opening its hopper doors, or pumping its sediment load over the side. NMFS also believes that foraging habitat for sea turtles is not likely a limiting factor in the Gulf of Mexico, and thus the temporary removal of relatively small areas (compared to remaining foraging habitat) of potential foraging habitat by burial with dredged material sediment will not measurably adversely affect sea turtles. Turtles will typically forage further offshore where non-ephemeral limestone ledges supporting algal/sponge growth are located. These ledges are not routinely covered by shifting sands, as they are prone to in the high wave-energy nearshore environment. Disposal activities involving beach renourishment that would only potentially adversely affect sea turtles in their onshore nesting activities, or their nests, are under the purview of the U.S. Fish and Wildlife Service.

Effects of Bed-leveling Mechanical Dredging Devices
Bed-leveling is often associated with hopper dredging (and other types of dredging) operations. Bed-leveling "dredges" do not use suction. They redistribute sediments, rather than removing them. Plows, I-beams, or other seabed-leveling mechanical dredging devices are often used to lower high spots left in channel bottoms and dredged material deposition areas by hopper dredges or other type dredges. Some evidence indicates that they may be responsible for occasional sea turtle mortalities (NMFS 2003b). Sea turtles may be crushed as the leveling device, which weighs about 30 to 50 tons and is typically fixed with cables to a derrick mounted on a barge pushed or pulled by a tugboat at about one to two knots, passes over and crushes a turtle which failed to move out of the way and is not pushed out of the way by the sediment wedge "wave" generated by and moving ahead of the device. Sea turtles at Brunswick Harbor, Georgia, may have been crushed and killed by recent bed-leveling "clean-up dredging" which commenced after the hopper dredge finished its work in a particular area. Brunswick Harbor is also one of the sites where sea turtles captured by relocation trawlers sometimes show evidence of brumating (over-wintering) in the muddy channel bottom, which could explain why, if they were crushed by bed-level type dredges, they failed to react quickly enough to avoid the bed-leveler. However, the use of bed-levelers is probably preferable to the use of hopper dredges for cleanup operations, since turtles foraging/resting/brumating on irregular bottoms are probably more likely to be entrained by suction dragheads (because sea turtle deflector dragheads are less effective on uneven bottoms), hopper dredges move considerably faster than bed-leveler "dredges," and bed-levelers do not use suction.

Although there are no confirmed reports to date which definitively implicate bed-levelers with sea turtle takes, NMFS believes that a possibility exists that bed-leveling mechanical dredging may kill sea turtles during leveling/cleanup operations associated with hopper dredging projects where bed-levelers are used. Takes by bed-leveler type dredges will be difficult to ascertain and determine responsibility for because bed-levelers do not entrain turtle parts, and no dredged materials come aboard for observers to monitor. Furthermore, bed-leveler impacted turtles may not float ashore for several days, if at all. However, if compelling STSSN observer reports and evidence indicate that a turtle was killed by a bed-leveler associated with the hopper dredging project covered by this opinion, reinitiation of consultation will be required.

6 CUMULATIVE EFFECTS

Cumulative effects are the effects of future state, local, or private activities that are reasonably certain to occur within the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. Within the action area, the major future change in human activities that is anticipated is associated with eastward expansion of oil and gas exploration and extraction in the Gulf of Mexico and would involve a federal action. The action area's present use for commercial and recreational fishing is expected to continue at the present levels of intensity in the near future. Residential development in coastal Texas is likely to increase as part of the nationwide trend of human migration to the coasts. This trend likely will not have a major effect on the action area's ability to function as a foraging habitat for turtles. As discussed in the Environmental Baseline Section, however, listed species of turtles migrate throughout the Gulf of Mexico and may be affected during their life cycles by non-federal activities outside the action area.

Throughout the coastal Gulf of Mexico, and particularly in Louisiana, the loss of thousands of acres of wetlands is occurring due to natural subsidence and erosion, as well as reduced sediment input from the Mississippi River. Impacts caused by residential, commercial, and agricultural developments appear to be the primary causes of wetland loss in Texas.

Oil spills from tankers transporting foreign oil, as well as the illegal discharge of oil and tar from vessels discharging bilge water will continue to affect water quality in the Gulf of Mexico. Cumulatively, these sources and natural oil seepage contribute most of the oil discharged into the ~~Gulf of Mexico. Floating tar sampled during the 1970s, when bilge discharge was still legal,~~ concluded that up to 60 percent of the pelagic tars sampled did not originate from the northern Gulf of Mexico coast.

Marine debris will likely persist in the action area in spite of marine pollution prohibitions. In Texas and Florida, approximately half of the stranded turtles examined have ingested marine debris (Plotkin and Amos 1990; Bolten and Bjorndal 1991). Although entanglements affect fewer individuals than ingestion of debris, entanglement in marine debris may contribute more frequently to the death of sea turtles.

Coastal runoff and river discharges carry large volumes of petrochemical and other contaminants from agricultural activities, cities and industries into the Gulf of Mexico. The coastal waters of the Gulf of Mexico have more sites with high contaminant concentrations than other areas of the coastal United States, due to the large number of waste discharge point sources. Sea turtles may be exposed to and accumulate these contaminants during their life cycles, with unknown effects.

State regulated commercial and recreational fishing activities in Gulf of Mexico waters probably take endangered species. These takes are not reported and are unauthorized. It is expected that states will continue to license/permit large vessel and thrill-craft operations, which do not fall under the purview of a federal agency and will issue regulations that will affect fishery activities. NMFS will continue to work with states to develop ESA section 6 agreements and section 10 permits to enhance programs to quantify and mitigate these takes. Increased recreational vessel activity in inshore waters of the Gulf of Mexico will likely increase the number of turtles taken by injury or mortality in vessel collisions. Recreational hook-and-line fisheries have been known to lethally take sea turtles, including Kemp's ridleys. In a study conducted by the NMFS Galveston Laboratory between 1993 through 1995, 170 ridleys were reported associated with recreational hook-and-line gear; including 18 dead stranded turtles, 51 rehabilitated turtles, 5 that died during rehabilitation, and 96 that were released by fishermen (Cannon and Flanagan 1996). The Sea Turtle Stranding and Salvage Network (STSSN) also receives stranding reports that identify carcass anomalies that may be associated with the recreational fishery (entangled in line or net, fish line protruding, fish hook in mouth or digestive tract, fish line in digestive tract. The reports do not distinguish between commercial or recreational sources of gear, such as hook, net, and line, which may be used in both sectors. Cumulatively, fishery entanglement anomalies are noted in fewer than 4 percent of the stranded sea turtle carcasses reported between 1990 and 1996, and some carcasses carry more than one anomaly (e.g., fishing line in digestive tract/fishing line protruding from mouth or cloaca); therefore, summing these reports may result in some double counting.

7 JEOPARDY ANALYSIS

The analyses conducted in the previous sections of this opinion serve to provide a basis to determine whether the proposed action would be likely to jeopardize the continued existence of any ESA-listed sea turtles. In Section 5, we have outlined how the proposed dredging and sediment disposal can affect sea turtles, and the extent of those effects in terms of estimates of the numbers of sea turtles caught and/or injured/killed. Now we turn to an assessment of each species' response to this impact, in terms of overall population effects from the estimated take, ~~and whether those effects of the proposed action, when considered in the context of the status of~~ the species (Section 3), the environmental baseline (Section 4), and the cumulative effects (Section 6), will jeopardize the continued existence of the affected species.

"To jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and the recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species (50 CFR 402.02). Thus, in making this determination for each species, we must look at whether there will be a reduction in the reproduction, numbers, or distribution. Then, if there is a reduction in one or more of these elements, we evaluate whether it will cause an appreciable reduction in the likelihood of both the survival and the recovery of the species.

7.1 Effects of the Action on the Likelihood of Survival in the Wild

This section analyzes the effects of the action on the likelihood of survival of each species in the wild. We evaluate whether anticipated take of each species will result in any reduction in reproduction, numbers, or distribution of that species that may appreciably increase its risk of extinction in the wild.

In the following analysis, we demonstrate that although some short-term reduction in numbers and reproduction is expected, the anticipated take of Kemp's ridley, loggerhead, hawksbill, leatherback, and green sea turtles will not appreciably increase the risk of extinction of these species in the wild.

Changes in distribution, even short-term, are not expected to result from the widening and deepening of the Matagorda Ship Channel. Interactions with vessels and/or relocation trawlers may elicit startle or avoidance responses and the effects of the proposed action may result in temporary changes in behavior of sea turtles (minutes to hours) over small areas, but are not expected to reduce the distribution of any sea turtle species. The removal of 34 sea turtles is anticipated during the proposed project. Because all the potential takes are expected to occur anywhere in the action area and sea turtles generally have large ranges in which they disperse, no reduction in the distribution of Kemp's ridley, loggerhead, hawksbill, leatherback, and/or green sea turtles is expected from the take of these individuals.

The non-lethal take of 181 sea turtles by relocation trawlers (43 loggerhead, 127 Kemp's ridley, 1 hawksbill, 1 leatherback, and 9 green sea turtles based on frequency data in Epperly et al. 2002) is not expected to have any measurable impact on the reproduction or numbers of sea turtles. Any negative effects experienced by sea turtles captured and released by relocation trawlers are expected to be minimal and temporary in nature. Although the range of impacts of non-lethal takes are variable, all are expected to be fully recoverable such that no reductions in reproduction or numbers of Kemp's ridley, loggerhead, hawksbill, leatherback, and/or green sea turtles are anticipated.

The lethal take of 33 turtles (14 loggerhead, 13 green, and 6 Kemp's ridley sea turtles based on reported takes in GDCOE dredging projects) by hopper dredges and 1 turtle (most likely a ~~Kemp's ridley sea turtle based on frequency data in Epperly et al. 2002) by relocation trawlers~~ over the duration of the proposed project (i.e., 2 years) will result in short-term effects on individuals. The removal of 33 sea turtles by hopper dredges and 1 by relocation trawlers would result in an instantaneous, but temporary reduction in total population numbers. Thus, the action will result in a reduction of sea turtle numbers. Sea turtle mortality resulting from hopper dredges could result in the loss of reproductive value of an adult turtle. For example, an adult loggerhead sea turtle can lay 3 or 4 clutches of eggs every 2 to 4 years, with 100 to 130 eggs per clutch. The annual loss of one adult female sea turtle, on average, could preclude the production of thousands of eggs and hatchlings, of which a small percentage are expected to survive to sexual maturity. Thus, the death of a female eliminates an individual's contribution to future generations, and the action will result in a reduction in sea turtle reproduction.

All life stages are important to the survival of the species; however, it is important to note that individuals of one life stage are not equivalent to those of other life stages. For example, loggerhead sea turtles have very long developmental times before reaching maturity (up to 38 years). Individuals in earlier life stages are subject to many potential sources of mortality, both natural and human-induced, prior to reaching sexual maturity. Only a fraction of pelagic juveniles are ever expected to contribute to the population through reproduction, and thus are not as valuable to the population as a breeding age adult. The loss of a certain number of pelagic juveniles, therefore, is less of a threat to the species' survival compared to an equal loss of sexually-mature adults.

The relatively low number of expected sea turtle mortalities (i.e., 14 loggerhead, 13 green, and 7 Kemp's ridley sea turtles over 2 years), while detectable, is not significant when scaled against the population size. Considering their population sizes in the Western North Atlantic, we believe the Kemp's ridley, loggerhead, and green sea turtle populations are sufficiently large enough to persist and recruit new individuals to replace those expected to be taken. For example, the TEWG (1998) estimated the total loggerhead population of benthic individuals in U.S. waters – a subset of the whole Western Atlantic population – at over 200,000. Based on this estimate, the potential mortality of 14 loggerhead over the duration of the proposed action (i.e., 2 years) would be less than 0.00007 percent of the current total eastern U.S. population.

The total population of Kemp's ridleys is not known, but nesting has been increasing significantly in the past several years (9 to 13 percent per year) with a trajectory that should meet or exceed recovery goals. Kemps' ridleys mature and nest at an age of 7-15 years, which is earlier than other chelonids. A younger age at maturity may be a factor in the response of this species to recovery actions. A period of steady increase in benthic immature ridleys has been occurring since 1990 and appears to be due to increased hatchling production and an apparent increase in survival rates of immature sea turtles beginning in 1990. The increased survivorship of immature sea turtles is attributable, in part, to the introduction of turtle excluder devices (TEDs) in the United States and Mexican shrimping fleets and Mexican beach protection efforts. The TEWG (2000) projected that Kemp's ridleys could reach the Recovery Plan's intermediate recovery goal of 10,000 nesters by the year 2015. Based on the above analysis, and similar to the conclusion reached for loggerhead sea turtles, the anticipated lethal take of seven (six by hopper dredge, one by relocation trawlers) Kemp's ridley sea turtle on the population would not be expected to be detectable.

Recent green sea turtle population estimates for the western Atlantic area are not available. However, the pattern of green turtle nesting shows biennial peaks in abundance, with a generally positive trend during the ten years of regular monitoring since establishment of index beaches in Florida in 1989. Therefore, similar to the above analyses, the expected lethal take of 13 green sea turtles over two years on the population would not be expected to be detectable.

Although the anticipated mortalites would result in an instantaneous reduction in absolute population numbers, it is not likely these small reductions would appreciably increase the risk of extinction of sea turtles considering the following. For a population to remain stable, sea turtles must replace themselves through successful reproduction at least once over the course of their reproductive lives, and at least one offspring must survive to reproduce itself. If the hatchling survival rate to maturity is greater than the mortality rate of the population, the loss of breeding individuals would be replaced through recruitment of new breeding individuals from successful reproduction of non-taken sea turtles. Even given a declining trend of a major nesting subpopulation (e.g., loggerhead sea turtles), the present population sizes of Kemp's ridley, loggerhead, and green sea turtles are sufficiently large for their persistence.

Based on the above analysis, we believe that the lethal and non-lethal takes of Kemp's ridley, loggerhead, hawksbill, leatherback, and green sea turtles associated with the proposed action are not reasonably expected to cause, directly or indirectly, an appreciable reduction in the likelihood of survival of these species of sea turtles in the wild.

7.2 Effects of the Action on the Likelihood of Recovery in the Wild

The above analysis on the effects of the action on the likelihood of each species' survival in the wild considered the effects of the numbers of lethal and/or non-lethal takes anticipated for each species. Although no change in distribution was concluded for any species, we concluded lethal takes would result in an instantaneous reduction in absolute population numbers that may also reduce reproduction, but the short-term reductions are not expected to appreciably reduce the likelihood of survival of any species in the wild. The following analysis considers the effects of the take on the likelihood of recovery in the wild. We consider the recovery objectives in the recovery plans prepared for each species that relate to population numbers or reproduction that may be affected by the predicted reductions in the numbers or reproduction of sea turtles resulting from the proposed action.

The Atlantic recovery plan for the United States population of the loggerhead sea turtles (NMFS and USFWS 1991a) lists the following relevant recovery objective over a period of 25 continuous years:

- The adult female population in Florida is increasing and in North Carolina, South Carolina, and Georgia, it has returned to pre-listing nesting levels (NC = 800 nests/season; SC = 10,000 nests/season; GA = 2,000 nests/season).

The recovery plan for Kemp's ridley sea turtles (USFWS and NMFS 1992) lists the following relevant recovery objective:

- ~~Attain a population of at least 10,000 females nesting in a season.~~

The recovery plan for the population of the hawksbill sea turtles (NMFS and USFWS 1993) lists the following relevant recovery objectives over a period of 25 continuous years:

- The adult female population is increasing, as evidenced by a statistically significant trend in the annual number of nests at five index beaches, including Mona Island and BIRNM; and
- The numbers of adults, subadults, and juveniles are increasing, as evidenced by a statistically significant trend on at least five key foraging areas within Puerto Rico, USVI, and Florida.

The Atlantic recovery plan for the United States population of the leatherback sea turtles (NMFS and USFWS 1992) lists the following relevant recovery objective:

- The adult female population increases over the next 25 years, as evidenced by as statistically significant trend in the number of nests at Culebra, Puerto Rico, St. Croix, USVI, and along the east coast of Florida.

The Atlantic recovery plan for the population of green sea turtles (NMFS and USFWS 1991b) lists the following relevant recovery objectives over a period of 25 continuous years:

- The level of nesting in Florida has increased to an average of 5,000 nests per year for at least 6 years; and
- A reduction in stage class mortality is reflected in higher counts of individuals on foraging grounds.

The potential lethal take of 33 turtles (14 loggerhead, 13 green, and 6 Kemp's ridley sea turtles based on reported takes in GDCOE dredging projects) by hopper dredges and 1 turtle (most likely a Kemp's ridley sea turtle based on frequency data in Epperly et al. 2002) by relocation trawlers over 2 years will result in a reduction in overall population numbers in any given year. We have already determined this take is not likely to reduce population numbers over time due to current population sizes and expected recruitment. Non-lethal takes of sea turtles by relocation trawlers will not affect the adult female nesting population or number of nests per nesting season.

Thus, the proposed action will not result in an appreciable reduction in the likelihood of Kemp's ridley, loggerhead, hawksbill, leatherback, and/or green sea turtles' recovery in the wild.

7.3 Summary

The proposed widening of Matagorda Ship Channel will not appreciably reduce the likelihood of the survival and recovery in the wild of any of the five species of sea turtles considered in this biological opinion. We conclude that the anticipated reduction in numbers and reproduction by take of sea turtles by hopper dredges and relocation trawlers associated with the proposed action, combined with the non-lethal takes resulting from relocation trawling, when evaluated in the context of each species' status, the environmental baseline, and the cumulative effects, are not expected to jeopardize the continued existence of Kemp's ridley, loggerhead, hawksbill, leatherback, and/or green sea turtles.

8 CONCLUSION

We have analyzed the best available data, the current status of the species, environmental baseline, effects of the proposed action, and cumulative effects to determine whether the proposed action is likely to jeopardize the continued existence of any sea turtle species. Our sea turtle analyses focused on the impacts and population response of loggerhead, Kemp's ridley, hawksbill, leatherback, and green sea turtles in the Gulf of Mexico (i.e., Atlantic basin). However, the impact of the effects of the proposed action on the Atlantic populations must be directly linked to the global populations of the species, and the final jeopardy analysis is for the global populations as listed in the ESA. Because the proposed action will not reduce the likelihood of survival and recovery of any Atlantic populations of sea turtles, it is our opinion that the proposed action is also not likely to jeopardize the continued existence of loggerhead, Kemp's ridley, hawksbill, leatherback, or green sea turtles.

9 INCIDENTAL TAKE STATEMENT (ITS)

Section 9 of the ESA and protective regulations issued pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the RPMs and terms and conditions of the ITS.

Section 7(b)(4)(c) of the ESA specifies that in order to provide an incidental take statement for an endangered or threatened species of marine mammal, the taking must be authorized under section 101(a)(5) of the MMPA. Since no incidental take of listed marine mammals is expected or has been authorized under section 101(a)(5) of the MMPA, no statement on incidental take of endangered whales is provided and no take is authorized. Nevertheless, GDCOE must immediately notify (within 24 hours, if communication is possible) the NMFS' Office of Protected Resources should a take of a listed marine mammal occur.

9.1 Anticipated Amount or Extent of Incidental Take

Based on historical distribution data and observations from past COE projects, loggerhead, hawksbill, Kemp's ridley, and green sea turtles may occur in the action area and may be taken by hopper dredges, relocation trawlers, and bed-leveling devices used in the proposed action. Incidental take is anticipated; therefore, terms and conditions necessary to minimize and monitor takes are established. NMFS anticipates incidental take, by injury or mortality, will consist of 33 turtles (14 loggerhead, 13 green, and 6 Kemp's ridley sea turtles based on reported takes in GDCOE dredging projects) by hopper dredges and 1 turtle (most likely Kemp's ridley sea turtle based on frequency data in Epperly et al. 2002) by relocation trawlers, and 181 non-injurious takes ~~(43 loggerhead, 127 Kemp's ridley, 1 hawksbill, 1 leatherback, and 9 green sea turtles~~ based on frequency data in Epperly et al. 2002) by relocation trawling over the course of the proposed project (i.e., 2 years).

9.2 Effect of the Take

NMFS has determined the anticipated level of incidental take specified in Section 9.1 is not likely to jeopardize the continued existence of loggerhead, Kemp's ridley, hawksbill, leatherback, and green sea turtles.

9.3 Reasonable and Prudent Measures

NMFS has determined that the following RPMs are necessary and appropriate to minimize impacts of the incidental take of sea turtles during the proposed action. The RPMs that NMFS believes are necessary to minimize the impacts of the proposed hopper dredging have been discussed with the COE in the past and are standard operating procedures, and include the use of temporal dredging windows, intake and overflow screening, use of sea turtle deflector dragheads, observer and reporting requirements, and sea turtle relocation trawling. The following RPMS and associated terms and conditions are established to implement these measures, and to document incidental takes. Only incidental takes that occur while these measures are in full implementation are authorized. These restrictions remain valid until reinitiation and conclusion of any subsequent section 7 consultation.

Seasonal Dredging Windows, Observer Requirements, Deflector Dragheads, and Relocation Trawling

Experience has shown that injuries sustained by sea turtles entrained in the hopper dredge dragheads are usually fatal. Current regional opinions for hopper dredging require seasonal dredging windows and observer monitoring requirements, deflector dragheads, and conditions and guidelines for relocation trawling, which NMFS believes are necessary to minimize effects of these removals on listed sea turtle species that occur in inshore and nearshore Gulf waters.

1. <u>Temperature- and date-based dredging windows</u>

Sea turtles generally move inshore with warming waters and offshore with cooling waters. In east coast channels, Dickerson et al. (1995) found reduced sea turtle abundance with water temperatures less than 16°C. They found that 1,008 trawls conducted at or below 16°C captured 22 turtles (4.4 percent), while 1,791 trawls conducted above 16°C resulted in 473 (95.6 percent) captures. Dickerson et al. also found that sea turtles tend to avoid water temperatures less than 15°C; however, hopper dredging Kings Bay, Georgia, between March 1-12, 1997, with surface water temperatures of 57-58°F (13.9-14.4°C) resulted in 11 turtle takes in nine days (NMFS 1997b).

Recognizing the relationship between water temperature and sea turtle presence and based on work by the NMFS Galveston Laboratory (Renaud et al. 1994, 1995) funded by the COE, NMFS wrote in its September 22, 1995, Regional Biological Opinion (RBO) to the Galveston and New Orleans Districts that sea turtles might be taken by hopper dredges "in all ship channels in the ~~northern Gulf when temperatures exceed 12°C," and that "Lacking seasonal water temperature~~ data, NMFS believes takes may occur from April through November northeast of Corpus Christi, Texas." Consequently, Term and Condition No. 3 of the 1995 RBO required that observers be aboard hopper dredges year-round from Corpus Christi southwest to the Mexican border, but "If no turtle take is observed in December, then observer coverage can be terminated during January and February or until water temperatures again reach 12°." It also required that "In channels northeast of Corpus Christi (except for Mississippi River – Southwest Pass), observers shall be aboard whenever surface water temperatures are 12°C or greater, and/or between April 1 and November 30."

NMFS published a final rule (67 FR 71895, December 3, 2002) effective January 2, 2003, to reduce the impact of large-mesh gillnet fisheries on the Atlantic Coast on sea turtles. This rule was directed primarily at the monkfish fishery, which uses large-mesh gillnets and operates in the area when sea turtles are present. The rule reduces impacts on endangered and threatened species of sea turtles by closing portions of the Mid-Atlantic Exclusive Economic Zone (EEZ) waters to fishing with gillnets with a mesh size larger than 8-inch (20.3-cm) stretched mesh. The timing of the restrictions was based upon an analysis of sea surface temperatures for the above areas. Sea turtles are known to migrate into and through these waters when the sea surface temperature is 11°C or greater (Epperly and Braun-McNeill 2002). The January 15 date for the re-opening of the areas north of Oregon Inlet, North Carolina, to the large-mesh gillnet fisheries was also based upon the 11°C threshold and is consistent with the seasonal boundary established for the summer flounder fishery-sea turtle protection area (50 CFR 223.206(d)(2) (iii)(A)). In summary, NMFS believes that the 11°C threshold established to protect East Coast sea turtles is reasonable and prudent to protect sea turtles in the Gulf of Mexico from hopper dredging operations.

A 1991 jeopardy Opinion to the COE's South Atlantic District on hopper dredging of southeastern U.S. channels first identified a December 1 and March 31 "hopper dredging window" as necessary to minimize sea turtle interactions. Subsequent studies by the COE (Dickerson et al. 1995) in six southeastern channels suggested that the existing windows were accurate. Sea turtles are generally less abundant in coastal waters of both the Southeast and the Gulf of Mexico during this time period compared to other times of the year since water temperatures are coolest.

Temperature- and date-based dredging windows appear to have been very effective in reducing sea turtle entrainments. Observer requirements and monitoring including assessment and relocation trawling have provided valuable real-time estimates of sea turtle abundance, takes, and distribution which have been helpful to COE project planning efforts. Evidence that the windows and observer requirements are effective and valuable is that, throughout its 8-year lifetime (the 1995 RBO was superseded by the GMRBO in 2003), neither the Galveston or New Orleans District's hopper dredging projects ever exceeded their anticipated incidental takes authorized by the 1995 RBO.

2. Observer Requirements

NMFS-approved observers monitor dredged material inflow and overflow screening baskets on many projects; however, screening is only partially effective and observed, documented takes provide only partial estimates of total sea turtle mortality. NMFS believes that some listed species taken by hopper dredges go undetected because body parts are forced through the sampling screens by the water pressure and are buried in the dredged material, or animals are crushed or killed but not entrained by the suction and so the takes may go unnoticed. The only mortalities that are documented are those where body parts either float, are large enough to be caught in the screens, and can be identified as from sea turtle species. However, this opinion estimates that with 4-inch inflow screening in place, the observers probably detect and record at least 50 percent of total mortality.

3. Deflector Dragheads

V-shaped, sea turtle deflector dragheads prevent an unquantifiable yet significant number of sea turtles from being entrained and killed in hopper dredges each year. Without them, turtle takes during hopper dredging operations would unquestionably be higher. Draghead tests conducted in May-June 1993 by the COE's Waterways Experimental Station (WES), now known as the Engineering Research and Development Center (ERDC), in clear water conditions on the sea floor off Fort Pierce, Florida, with 300 mock turtles placed in rows, showed convincingly that the newly-developed WES deflector draghead "performed exceedingly well at deflecting the mock turtles." Thirty-seven of 39 mock turtles encountered were deflected, 2 turtles were not deflected, and none were damaged. Also, "the deflector draghead provided better production rates than the unmodified California draghead, and the deflector draghead was easier to operate and maneuver than the unmodified California flat-front draghead." The V-shape reduced forces encountered by the draghead, and resulted in smoother operation. V-shaped deflecting dragheads are now a widely accepted conservation tool, the dredging industry is familiar with them and their operation, and they are used by all COE Districts conducting hopper dredge operations where turtles may be present.

4. Relocation Trawling

Relocation trawling has proved to be a useful conservation tool in most dredging projects where it has been implemented. The September 22, 1995, RBO included a conservation recommendation for relocation trawling which stated that "Relocation trawling in advance of an operating dredge in Texas and Louisiana channels should be considered if takes are documented early in a project that requires use of a hopper dredge during a period in which large number of sea turtles may occur." That RBO was amended by NMFS (Amendment No. 1, June 13, 2002) to change the conservation recommendation to a term and condition of the RBO. Overall, it is NMFS' opinion that the COE Districts choosing to implement relocation trawling have benefited from their decisions. For example, in the GDCOE, Freeport Harbor Project (July 13-September 24, 2002), assessment and relocation trawling resulted in one loggerhead capture. In Sabine Pass (Sabine-Neches Waterway), assessment and relocation trawling in July-August 2002 resulted in five loggerhead and three Kemp's ridley captures. One turtle was killed by the dredge; this occurred while the relocation trawler was in port repairing its trawl net (P. Bargo, pers. comm. 2002). In the Jacksonville District, sea turtles have been relocated out of the path of hoppers dredges operating in Tampa Bay and Charlotte Harbor or their entrance channels. During St. ~~Petersburg Harbor and Entrance Channel dredging in the fall of 2000, a pre-dredging risk~~ assessment trawl survey resulted in capture, tagging, and relocation of two adult loggerheads and one subadult green turtle. In February 2002 during the Jacksonville District's Canaveral Channel emergency hopper dredging project for the Navy, two trawlers working around the clock captured and relocated 69 loggerhead and green turtles in seven days, and no turtles were entrained by the hopper dredge. In the Wilmington District's Bogue Banks Project in North Carolina, two trawlers successfully relocated five turtles in 15 days between March 13 and 27, 2003; one turtle was taken by the dredge. In 2003, Aransas Pass relocation trawling associated with hopper dredging resulted in 71 turtles captured and released (with three recaptures) in three months of dredging and relocation trawling. Five turtles were killed by the dredge. No turtles were killed after relocation trawling was increased from 12 to 24 hours per day (T. Bargo, pers. comm. to E. Hawk, October 27, 2003). In 2006, trawling associated with the dredging of the Houston-Galveston Navigation Channels resulted in 7 loggerheads relocated in 60 days of trawling (U.S. Army Corps of Engineers Sea Turtle Data Warehouse, http://el.erdc.usace.army.mil/seaturtles/index.cfm). From January through May 2007, relocation trawling activities in GDCOE channel projects have resulted in the capture and relocation of 65 green, 25 Kemp's ridley, and 12 loggerhead sea turtles as of May 23 (*Ibid*).

This opinion authorizes the per-fiscal-year non-lethal non-injurious take (minor skin abrasions resulting from trawl capture are considered non-injurious), external flipper-tagging, and taking of tissue samples of 181 sea turtles (43 loggerhead, 127 Kemp's ridley, 1 hawksbill, 1 leatherback, and 9 green sea turtles based on frequency data in Epperly et al. 2002) in association with any relocation trawling conducted during the course of the proposed project. This take is limited to relocation trawling conducted during actual hopper dredging. Relocation trawling performed to reduce endangered species/hopper dredge interactions is subject to the requirements detailed in the terms and conditions of this opinion.

NMFS estimates that one turtle may be killed or injured pursuant to relocation trawling associated with the proposed project. NMFS shall be immediately notified of any mortalities/injuries sustained by protected species during relocation/assessment trawling.

Summary
NMFS believes that seasonal dredging windows, deflector dragheads, observer and screening requirements, and relocation trawling have proved convincingly over the last decade to be an excellent combination of reasonable and prudent measures for minimizing the number and

impact of sea turtle takes, enabling NMFS to assess the quantity of turtles being taken, and allowing the COE to meet its essential dredging requirements to keep federal navigation channels open.

There are increased costs associated with observers and relocation trawling (recent estimates are \$3,500-\$5,000/day for 24 hours of relocation trawling and \$150-\$200/day for a hopper dredge endangered species observer); delays sometimes occur, particularly when two turtles are taken in 24 hours, or when clay-like materials clog the inflow screening boxes; and dredging projects may take longer to complete. However, overall, NMFS believes that loss of production associated with the deflector draghead is insignificant, while saving significant numbers of sea turtles from almost-certain death by dismemberment in suction dragheads; increased production costs~~, including costs of observers and relocation trawlers, pale in comparison~~ to overall project costs; and NMFS' experience over the past decade with the COE's South Atlantic districts (SAD) and Gulf of Mexico's districts has shown that federal hopper dredging projects get completed in a timely fashion. Also, allowable overdredging by the COE reduces to some degree the need for frequent maintenance dredging, and the conservation measures required by the biological opinions in place result in significantly reduced dredge interactions with sea turtles–interactions which usually prove fatal.

NMFS considers that PIT tagging, external flipper tagging, and tissue sampling of turtles captured pursuant to relocation trawling, including genetic analysis of tissue samples taken from dredge- and trawl-captured turtles, will provide benefits to the species by providing data which will enable NMFS to make determinations on what sea turtle stocks are being impacted, and how that may change over time as the population growth rates change among the different stocks (S. Epperly, pers. comm. to E. Hawk).

9.4 Terms and Conditions

In order to be exempt from liability for take prohibited by section 9 of the ESA, the GDCOE must comply with the following terms and conditions, which implement the RPMs described above. These terms and conditions are non-discretionary.

1. Hopper Dredging (RPM 1): Hopper dredging activities shall be completed, whenever possible, between December 1 and March 31, when sea turtle abundance is lowest throughout Gulf coastal waters.

2. Non-hopper Type Dredging (RPM 1): Pipeline or hydraulic dredges, because they are not known to take turtles, must be used whenever possible between April 1 and November 30.

3. Observers (RPM 2): The GDCOE shall arrange for NMFS-approved protected species observers to be aboard the hopper dredges to monitor the hopper bin, screening, and dragheads for sea turtles and their remains. Observer coverage sufficient for 100 percent monitoring (i.e., two observers) of hopper dredging operations is required aboard the hopper dredges between April 1 and November 30, and whenever surface water temperatures are 11°C or greater.

4. Operational Procedures: During periods in which hopper dredges are operating and NMFS-approved protected species observers are *not* required, (as delineated in No. 3 above), the GDCOE must:

a. Advise inspectors, operators, and vessel captains about the prohibitions on taking, harming, or harassing sea turtles.

b. Instruct the captain of the hopper dredge to avoid any turtles and whales encountered while traveling between the dredge site and offshore disposal area, and to immediately contact the GDCOE if sea turtles or whales are seen in the vicinity.

~~c. Notify NMFS if sea turtles are observed in the dredging area, to coordinate further~~ precautions to avoid impacts to turtles.

d. Notify NMFS immediately by phone (727/824-5312), fax (727/824-5309), or e-mail **(takereport.nmfsser@noaa.gov)** if a sea turtle or other threatened or endangered species is taken by the dredge.

5. Screening (RPM 2): When sea turtle observers are required on hopper dredges, 100 percent inflow screening of dredged material is required and 100 percent overflow screening is recommended. If conditions prevent 100 percent inflow screening, inflow screening may be reduced gradually, as further detailed in the following paragraph, but 100 percent overflow screening is then required.

a. Screen Size: The hopper's inflow screens should have 4-inch by 4-inch screening. If the GDCOE, in consultation with observers and the draghead operator, determines that the draghead is clogging and reducing production substantially, the screens may be modified sequentially: mesh size may be increased to 6-inch by 6-inch, then 9-inch by 9-inch, then 12-inch by 12-inch openings. Clogging should be greatly reduced with these flexible options; however, further clogging may compel removal of the screening altogether, in which case effective 100 percent overflow screening is mandatory. The GDCOE shall notify NMFS beforehand if inflow screening is going to be reduced or eliminated, and provide details of how effective overflow screening will be achieved.

b. Need for Flexible, Graduated Screens: NMFS believes that this flexible, graduated-screen option is necessary, since the need to constantly clear the inflow screens will increase the time it takes to complete the project and therefore increase the exposure of sea turtles to the risk of impingement or entrainment. Additionally, there are increased risks to sea turtles in the water column when the inflow is halted to clear screens, since this results in clogged intake pipes, which may have to be lifted from the bottom to discharge the clay by applying suction.

6. Dredging Pumps: Standard operating procedure shall be that dredging pumps shall be disengaged by the operator when the dragheads are not firmly on the bottom, to prevent impingement or entrainment of sea turtles within the water column. This precaution is especially important during the cleanup phase of dredging operations when the draghead

frequently comes off the bottom and can suck in turtles resting in the shallow depressions between the high spots the draghead is trimming off.

7. Sea Turtle Deflecting Draghead (RPM 3): A state-of-the-art rigid deflector draghead must be used on all hopper dredges at all times.

8. Dredge Take Reporting and Final Report: Observer reports of incidental take by hopper dredges must be faxed to NMFS' Southeast Regional Office (phone: 727/824-5312, fax: 727/824-5309, or electronic mail: **takereport.nmfsser@noaa.gov**) by onboard NMFS-approved protected species observers, the dredging company, or the GDCOE within 24 hours of any sea turtle or other listed species take observed.

   A final report summarizing the results of the hopper dredging and any documented sea turtle or other listed species takes must be submitted to NMFS within 30 working days of completion of the dredging project. Reports shall contain information on project location (specific channel/area dredged), start-up and completion dates, cubic yards of material dredged, problems encountered, incidental takes and sightings of protected species, mitigative actions taken (if relocation trawling, the number and species of turtles relocated), screening type (inflow, overflow) utilized, daily water temperatures, name of dredge, names of endangered species observers, percent observer coverage, and any other information the GDCOE deems relevant.

9. Sea Turtle Strandings: The GDCOE Project Manager or designated representative shall notify the Sea Turtle Stranding and Salvage Network (STSSN) state representative (contact information available at: http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp) of the start-up and completion of hopper dredging operations and bed-leveler dredging operations and ask to be notified of any sea turtle strandings in the project area that, in the estimation of STSSN personnel, bear signs of potential draghead impingement or entrainment, or interaction with a bed-leveling type dredge.

   Information on any such strandings shall be reported in writing within 30 days of project end to NMFS' Southeast Regional Office. Because the deaths of these turtles, if hopper dredge or bed-leveler dredge related, have already been accounted for in NMFS' jeopardy analysis, these strandings will not be counted against the GDCOE's take limit.

10. Reporting - Strandings: The GDCOE shall provide NMFS' Southeast Regional Office with a report detailing incidents, with photographs when available, of stranded sea turtles that bear indications of draghead impingement or entrainment.

11. Relocation Trawling Report (RPM 4): The GDCOE shall provide NMFS' Southeast Regional Office with an end-of-project report within 30 days of completion of any relocation trawling. This report may be incorporated into the final report summarizing the results of the hopper dredging project.

12. Conditions Requiring Relocation Trawling (RPM 4): Handling of sea turtles captured during relocation trawling in association with the dredging project shall be conducted by

NMFS-approved protected species observers. Relocation trawling shall be undertaken by the GDCOE where any of the following conditions are met:

a. Two or more turtles are taken in a 24-hour period in the project.

b. Four or more turtles are taken in the project.

13. Relocation Trawling (RPM 4): Any relocation trawling conducted or contracted by the GDCOE to temporarily reduce or assess the abundance of these listed species during a hopper dredging project in order to reduce the possibility of lethal hopper dredge interactions, is subject to the following conditions:

a. Trawl Time: Trawl tow-time duration shall not exceed 42 minutes (doors in - doors out) and trawl speeds shall not exceed 3.5 knots.

b. Handling During Trawling: Sea turtles captured pursuant to relocation trawling shall be handled in a manner designed to ensure their safety and viability, and shall be released over the side of the vessel, away from the propeller, and only after ensuring that the vessel's propeller is in the neutral, or disengaged, position (i.e., not rotating). Resuscitation guidelines are attached (Appendix I).

c. Captured Sea Turtle Holding Conditions: Sea turtles may be held briefly for the collection of important scientific measurements, prior to their release. Captured sea turtles shall be kept moist, and shaded whenever possible, until they are released, according to the requirements of Term and Condition No. 13-e, below.

d. Scientific Measurements: When safely possible, all turtles shall be measured (standard carapace measurements including body depth), tagged, weighed, and a tissue sample taken prior to release. Any external tags shall be noted and data recorded into the observers log. Only NMFS-approved protected species observers or observer candidates in training under the direct supervision of a NMFS-approved protected species observer shall conduct the tagging/measuring/weighing/tissues sampling operations.

NMFS-approved protected species observers may conduct more invasive scientific procedures (e.g., blood letting, laparoscopies, external tumor removals, anal and gastric lavages, mounting satellite or radio transmitters, etc.) and partake in or assist in "piggy back" research projects but only if the observer holds a valid federal sea turtle research permit (and any required state permits) authorizing the activities, either as the permit holder, or as designated agent of the permit holder, and has first notified NMFS' Southeast Regional Office, Protected Resources Division.

e. Take and Release Time During Trawling - Turtles: Turtles shall be kept no longer than 12 hours prior to release and shall be released not less than 3 nm from the dredge site. If two or more released turtles are later recaptured, subsequent turtle captures shall be released not less than 5 nm away. If it can be done safely, turtles may be transferred onto another vessel for transport to the release area to enable the relocation trawler to keep sweeping the dredge site without interruption.

f. Injuries: Injured sea turtles shall be immediately transported to the nearest sea turtle rehabilitation facility. Minor skin abrasions resulting from trawl capture are considered non-injurious. The GDCOE shall ensure that logistical arrangements and support to accomplish this are pre-planned and ready. The GDCOE shall bear the financial cost of sea turtle transport, treatment, and rehabilitation.

g. Flipper Tagging: All sea turtles captured by relocation trawling shall be flipper-tagged prior to release with external tags which shall be obtained prior to the project from ~~the University of Florida's Archie Carr Center for Sea Turtle Research. This opinion~~ serves as the permitting authority for any NMFS-approved protected species observer aboard these relocation trawlers to flipper-tag with external tags (e.g., Inconel tags) captured sea turtles. Columbus crabs or other organisms living on external sea turtle surfaces may also be sampled and removed under this authority.

h. PIT-Tag Scanning: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler to PIT-tag captured sea turtles. PIT tagging of sea turtles is not required to be done if the NMFS-approved protected species observer does not have prior training or experience in said activity; however, if the observer has received prior training in PIT tagging procedures, then the observer shall PIT tag the animal prior to release (in addition to the standard external tagging):

Sea turtle PIT tagging must then be performed in accordance with the protocol detailed at NMFS' Southeast Fisheries Science Center's Web page: http://www.sefsc.noaa.gov/seaturtlefisheriesobservers.jsp. (See Appendix C on SEFSC's "Fisheries Observers" Web page);

PIT tags used must be sterile, individually-wrapped tags to prevent disease transmission. PIT tags should be 125-kHz, glass-encapsulated tags–the smallest ones made. Note: If scanning reveals a PIT tag and it was not difficult to find, then do not insert another PIT tag; simply record the tag number and location, and frequency, if known. If for some reason the tag is difficult to detect (e.g., tag is embedded deep in muscle, or is a 400-kHz tag), then insert one in the other shoulder.

i. Other Sampling Procedures: All other tagging and external or internal sampling procedures (e.g., blood letting, laparoscopies, external tumor removals, anal and gastric lavages, mounting satellite or radio transmitters, etc.) performed on live sea turtles are not permitted under this opinion unless the observer holds a valid sea turtle research permit authorizing the activity, either as the permit holder or a designated agent of the permit holder.

j. PIT-Tag Scanning and Data Submission Requirements: All sea turtles captured by relocation trawling or dredges shall be thoroughly scanned for the presence of PIT tags prior to release using a multi-frequency scanner powerful enough to read multiple frequencies (including 125-, 128-, 134-, and 400-kHz tags) and read tags deeply embedded in muscle tissue (e.g., manufactured by Trovan, Biomark, or Avid). Turtles whose scans show they have been previously PIT tagged shall nevertheless be externally flipper tagged. Sea turtle data collected (PIT tag scan data and external tagging data) shall be submitted to NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149. All sea turtle data collected shall be submitted in electronic format within 60 days of project completion to Lisa.Belskis@noaa.gov and Sheryan.Epperly@noaa.gov. Sea turtle external flipper tag and PIT tag data generated and collected by relocation trawlers shall also be submitted to the Cooperative Marine Turtle Tagging Program (CMTTP), on the appropriate CMTTP form, at the University of Florida's Archie Carr Center for Sea Turtle Research.

k. Handling Fibropapillomatose Turtles: NMFS-approved protected species observers are not required to handle viral fibropapilloma tumors if they believe there is a health hazard to themselves and choose not to. When handling sea turtles infected with fibropapilloma tumors, observers must maintain a separate set of sampling equipment for handling animals displaying fibropapilloma tumors or lesions.

14. <u>Requirement and Authority to Conduct Tissue Sampling for Genetic Analyses (RPM 2)</u>: This opinion serves as the permitting authority for any NMFS-approved protected species observer aboard a relocation trawler or hopper dredge to tissue-sample live- or dead-captured sea turtles without the need for an ESA section 10 permit.

<u>All</u> live or dead sea turtles captured by relocation trawling and hopper dredging (for both GDCOE-conducted and GDCOE-permitted activities) <u>shall</u> be tissue-sampled prior to release. Sampling shall continue uninterrupted until such time as NMFS determines and notifies the GDCOE in writing.

Sea turtle tissue samples shall be taken in accordance with NMFS' SEFSC procedures for sea turtle genetic analyses (Appendix II of this opinion). The GDCOE shall ensure that tissue samples taken during the dredging project are collected and stored properly and mailed every three months until completion of the dredging project to: NOAA, National Marine Fisheries Service, Southeast Fisheries Science Center, Attn: Lisa Belskis, 75 Virginia Beach Drive, Miami, Florida 33149.

15. <u>Training - Personnel on Hopper Dredges</u>: The GDCOE must ensure that all contracted personnel involved in operating hopper dredges (whether privately-funded or federally-funded projects) receive thorough training on measures of dredge operation that will minimize takes of sea turtles. It shall be the goal of the hopper dredging operation to establish operating procedures that are consistent with those that have been used successfully during hopper dredging in other regions of the coastal United States, and which have proven effective in reducing turtle/dredge interactions. Therefore, COE Engineering Research and Development Center experts or other persons with expertise in

this matter shall be involved both in dredge operation training, and installation, adjustment, and monitoring of the rigid deflector draghead assembly.

16. Dredge Lighting (RPM 1): From May 1 through October 31, sea turtle nesting and emergence season, all lighting aboard hopper dredges and hopper dredge pumpout barges operating within 3 nm of sea turtle nesting beaches shall be limited to the minimal lighting necessary to comply with U.S. Coast Guard and/or OSHA requirements. All non-essential lighting on the dredge and pumpout barge shall be minimized through reduction, shielding, lowering, and appropriate placement of lights to minimize illumination of the water to reduce potential disorientation effects on female sea turtles approaching the nesting beaches and sea turtle hatchlings making their way seaward from their natal beaches.

10 CONSERVATION RECOMMENDATIONS

Pursuant to section 7(a)(1) of the ESA, the following conservation recommendations are made to assist the GDCOE in contributing to the conservation of sea turtles and Gulf sturgeon by further reducing or eliminating adverse impacts that result from hopper dredging.

1. Channel Conditions and Seasonal Abundance Studies: Channel-specific studies should be undertaken to identify seasonal relative abundance of sea turtles within Gulf of Mexico channels. The December 1 through March 31 dredging window and associated observer requirements listed above may be adjusted (after consultation and authorization by NMFS) on a channel-specific basis, if (a) the GDCOE can provide sufficient scientific evidence that sea turtles are not present or that levels of abundance are extremely low during other months of the year, or (b) the GDCOE can identify seawater temperature regimes that ensure extremely low abundance of sea turtles in coastal waters, and can monitor water temperatures in a real-time manner. Surveys may indicate that some channels do not support significant turtle populations, and hopper dredging in these channels may be unrestricted on a year-round basis. To date, sea turtle deflector draghead efficiency has not reached the point where seasonal restrictions can be lifted.

2. Draghead Modifications and Bed Leveling Studies: The GDCOE should supplement other efforts to develop modifications to existing dredges to reduce or eliminate take of sea turtles, and develop methods to minimize sea turtle take during "cleanup" operations when the draghead maintains only intermittent contact with the bottom. Some method to level the "peaks and valleys" created by dredging would reduce the amount of time dragheads are off the bottom. NMFS is ready to assist the GDCOE in conducting studies to evaluate bed- leveling devices and their potential for interaction with sea turtles, and develop modifications if needed.

3. Draghead Evaluation Studies and Protocol: Additional research, development, and improved performance is needed before the V-shaped rigid deflector draghead can replace seasonal restrictions as a method of reducing sea turtle captures during hopper dredging activities. Development of a more effective deflector draghead or other entrainment-deterring device (or combination of devices, including use of acoustic

deterrents) could potentially reduce the need for sea turtle relocation or result in expansion of the winter dredging window. NMFS should be consulted regarding the development of a protocol for draghead evaluation tests. NMFS recommends that GDCOE coordinate with ERDC, SAD, the Association of Dredge Contractors of America, and dredge operators (Manson, Bean-Stuyvesant, Great Lakes, Natco, etc.) regarding additional reasonable measures they may take to further reduce the likelihood of sea turtle takes.

4. Continuous Improvements in Monitoring and Detecting Takes: The GDCOE should seek continuous improvements in detecting takes and should determine, through research and development, a better method for monitoring and estimating sea turtle takes by hopper dredge. ~~Observation of overflow and inflow screening is only partially effective and~~ provides only partial estimates of total sea turtle mortality.

 Overflow Screening: The GDCOE should encourage dredging companies to develop or modify existing overflow screening methods on their company's dredge vessels for maximum effectiveness of screening and monitoring. Horizontal overflow screening is preferable to vertical overflow screening because NMFS considers that horizontal overflow screening is significantly more effective at detecting evidence of protected species entrainment than vertical overflow screening.

 Preferential Consideration for Horizontal Overflow Screening: The GDCOE should give preferential consideration to hopper dredges with horizontal overflow screening when awarding hopper dredging contracts for areas where new materials, large amounts of debris, or clay may be encountered, or have historically been encountered. Excessive inflow screen clogging may in some instances necessitate removal of inflow screening, at which point effective overflow screening becomes more important.

5. Section 10 Research Permits, Relocation Trawling, Piggy-Back Research, and 50 CFR Part 223 Authority to Conduct Research on Salvaged, Dead Specimens: NMFS recommends that GDCOE, either singly or combined with other COE Districts, apply to NMFS for an ESA section 10 research permit to conduct endangered species research on species incidentally captured during relocation trawling. For example, satellite tagging of captured turtles could enable the GDCOE to gain important knowledge on sea turtle seasonal distribution and presence in navigation channels and also, as mandated by section 7(a)(1) of the ESA, to utilize their authorities in furtherance of the purposes of the ESA by carrying out programs for the conservation of listed species. SERO shall assist the GDCOE with the permit application process.

 NMFS also encourages the GDCOE to cooperate with NMFS' scientists, other federal agencies' scientists, and university scientists holding appropriate research permits to make fuller use of turtles taken or captured by hopper dredges and relocation trawlers pursuant to the authority conferred by this opinion. NMFS encourages "piggy-back" research projects by duly-permitted individuals or their authorized designees. Section 10-permitted piggy-back projects could include *non-lethal* research of many types, including blood letting, laparoscopies, anal and gastric lavages, mounting satellite or radio transmitters, etc.

Important research can be conducted without a section 10 permit on salvaged dead specimens. Under current federal regulations (see 50 CFR 223.206 (b): Exception for injured, dead, or stranded [threatened sea turtle] specimens), "Agents. . . of a Federal land or water management agency may. . . salvage a dead specimen which may be useful for scientific study." Similar regulations at 50 CFR 222.310 provide "salvaging" authority for endangered sea turtles.

6. Draghead Improvements - Water Ports: NMFS recommends that the GDCOE require or ~~at least recommend to dredge operators that all dragheads on hopper dredges contracted~~ by the GDCOE for dredging projects be eventually outfitted with water ports located in the *top* of the dragheads to help prevent the dragheads from becoming plugged with sediments. When the dragheads become plugged with sediments, the dragheads are often raised off the bottom (by the dredge operator) with the suction pumps on in order to take in enough water to help clear clogs in the dragarm pipeline, which increases the likelihood that sea turtles in the vicinity of the draghead will be taken by the dredge. Water ports located in the top of the dragheads would relieve the necessity of raising the draghead off the bottom to perform such an action, and reduce the chance of incidental take of sea turtles.

   NMFS supports and recommends the implementation of proposals by ERDC and SAD personnel for various draghead modifications to address scenarios where turtles may be entrained during hopper dredging (Dickerson and Clausner 2003). These include: 1) An adjustable visor, 2) water jets for flaps to prevent plugging and thus reduce the requirement to lift the draghead off the bottom, and 3) a valve arrangement (which mimics the function of a "Hoffer" valve used on cutterhead type dredges to allow additional water to be brought in when the suction line is plugging) that will provide a very large amount of water into the suction pipe thereby significantly reducing flow through the visor when the draghead is lifted off the bottom, reducing the potential to take a turtle.

7. Economic Incentives for No Turtle Takes: The GDCOE should consider devising and implementing some method of significant economic incentives to hopper dredge operators such as financial reimbursement based on their satisfactory completion of dredging operations, or *X* number of cubic yards of material moved, or hours of dredging performed, *without taking turtles*. This may encourage dredging companies to research and develop "turtle friendly" dredging methods; more effective, deflector dragheads; pre-deflectors; top-located water ports on dragarms; etc.

8. Sedimentation Limits to Protect Resources (Hardbottoms/Reefs): NMFS recommends water column sediment load deposition rates of no more than 200 $mg/cm^2/day$, averaged over a 7-day period, to protect coral reefs and hardbottom communities from dredging-associated turbidity impacts to listed species foraging habitat.

9. Sodium Vapor Lights on Offshore Equipment: On offshore equipment (i.e., hopper dredges, pumpout barges) shielded low-pressure sodium vapor lights are highly recommended for lights that cannot be eliminated.

11 REINITIATION OF CONSULTATION

This concludes formal consultation on the proposed widening of the Matagorda Ship Channel involving a combination of mechanical, pipeline, and hopper dredges. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) The amount or extent of taking specified in the incidental take statement is exceeded; (2) new information reveals effects of the action may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to listed species or critical habitat that was not considered in the biological opinion; or (4) a new species is listed or critical habitat designated that may be affected by the identified action.

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APPENDIX I

SEA TURTLE HANDLING AND RESUSCITATION GUIDELINES

Any sea turtles taken incidentally during the course of fishing or scientific research activities must be handled with due care to prevent injury to live specimens, observed for activity, and returned to the water according to the following procedures:

A) Sea turtles that are actively moving or determined to be dead (as described in paragraph (B)(4) below) must be released over the stern of the boat. In addition, they must be released only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels.

B) Resuscitation must be attempted on sea turtles that are comatose or inactive by:

1) Placing the turtle on its bottom shell (plastron) so that the turtle is right side up and elevating its hindquarters at least 6 inches (15.2 cm) for a period of 4 to 24 hours. The amount of elevation depends on the size of the turtle; greater elevations are needed for larger turtles. Periodically, rock the turtle gently left to right and right to left by holding the outer edge of the shell (carapace) and lifting one side about 3 inches (7.6 cm) then alternate to the other side. Gently touch the eye and pinch the tail (reflex test) periodically to see if there is a response.

2) Sea turtles being resuscitated must be shaded and kept damp or moist but under no circumstance be placed into a container holding water. A water-soaked towel placed over the head, carapace, and flippers is the most effective method in keeping a turtle moist.

3) Sea turtles that revive and become active must be released over the stern of the boat only when fishing or scientific collection gear is not in use, when the engine gears are in neutral position, and in areas where they are unlikely to be recaptured or injured by vessels. Sea turtles that fail to respond to the reflex test or fail to move within 4 hours (up to 24, if possible) must be returned to the water in the same manner as that for actively moving turtles.

4) A turtle is determined to be dead if the muscles are stiff (rigor mortis) and/or the flesh has begun to rot; otherwise, the turtle is determined to be comatose or inactive and resuscitation attempts are necessary.

Any sea turtle so taken must not be consumed, sold, landed, offloaded, transshipped, or kept below deck.

These requirements are excerpted from 50 CFR 223.206(d)(1). Failure to follow these procedures is therefore a punishable offense under the Endangered Species Act.

APPENDIX II

PROTOCOL FOR COLLECTING TISSUE FROM SEA TURTLES FOR GENETIC ANALYSIS

Method for Dead Turtles

<<<IT IS CRITICAL TO USE A NEW SCALPEL BLADE AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES>>>

1) Put on a new pair of latex gloves.
2) Use a new disposable scalpel to cut out an approx. 1 cm (½ in) cube (bigger is NOT better) piece of muscle. Easy access to muscle tissue is in the neck region or on the ventral side where the front flippers "insert" near the plastron. It does not matter what stage of decomposition the carcass is in.
3) Place the muscle sample on a hard uncontaminated surface (plastron will do) and make slices through the sample so the buffer solution will penetrate the tissue.
4) Put the sample into the plastic vial containing saturated NaCl with 20 percent DMSO.*
5) Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.
6) Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.
7) Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.
8) Wrap parafilm around the cap of the vial by stretching it as you wrap.
9) Place vial within whirl-pak and close.
10) Dispose of the scalpel.
11) Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify the location on the turtle where the sample was obtained.
12) Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

Method for Live Turtles

<<< IT IS CRITICAL TO USE A NEW BIOPSY PUNCH AND GLOVES FOR EACH TURTLE TO AVOID CROSS-CONTAMINATION OF SAMPLES >>>

1) Turn the turtle over on its back.
2) Put on a new pair of latex gloves.
3) Swab the entire cap of the sample vial with alcohol.
4) Wipe the ventral and dorsal surfaces of the rear flipper 5-10 cm from the posterior edge with the Betadine/iodine swab.
5) Place the vial under the flipper edge to use the cleaned cap as a hard surface for the punch.
6) Press a new biopsy punch firmly into the flesh as close to the posterior edge as possible and rotate one complete turn. Cut all the way through the flipper to the cap of the vial.
7) Wipe the punched area with Betadine/iodine swab; rarely you may need to apply pressure to stop bleeding.
8) Use a wooden skewer to transfer the sample from the biopsy punch into the plastic vial containing saturated NaCl with 20 percent DMSO.*

9) Use the pencil to write the stranding ID number (observer initials, year, month, day, turtle number by day), species, state and carapace length on the waterproof paper label and place it in the vial with the sample. EXAMPLE: For a 35.8 cm curved carapace length green turtle documented by Jane M. Doe on July 15, 2001 in Georgia, the label should read "JMD20010715-01, C. mydas, Georgia, CCL=35.8 cm". If this had been the third turtle Jane Doe responded to on July 15, 2001, it would be JMD20010715-03.

10) Label the outside of the vial with the same information (stranding ID number, species, state and carapace length) using the permanent marker.

11) Place clear scotch tape over the writing on the vial to protect it from being smeared or erased.

12) Wrap parafilm around the cap of the vial by stretching it as you wrap.

13) Place vial within whirl-pak and close.

14) Dispose of the biopsy punch.

15) Note on the stranding form that a part was salvaged, indicating that a genetic sample was taken and specify ~~the location on the turtle where the sample was obtained.~~

16) Submit the vial with the stranding report to your state coordinator. State coordinators will forward the reports and vials to NMFS for processing and archiving.

***The 20 percent DMSO buffer in the plastic vials is nontoxic and nonflammable. Handling the buffer without gloves may result in exposure to DMSO. This substance soaks into skin very rapidly and is commonly used to alleviate muscle aches. DMSO will produce a garlic/oyster taste in the mouth along with breath odor. The protocol requires that you WEAR gloves each time you collect a sample and handle the buffer vials.**

The vials (both before and after samples are taken) should be stored at room temperature or cooler. If you don't mind the vials in the refrigerator, this will prolong the life of the sample. DO NOT store the vials where they will experience extreme heat (like in your car!) as this could cause the buffer to break down and not preserve the sample properly.

Questions:
Sea Turtle Program
NOAA/NMFS/SEFSC
75 Virginia Beach Drive
Miami, FL 33149
305-361-4207

THANK YOU FOR COLLECTING SAMPLES FOR SEA TURTLE GENETIC RESEARCH!!

Genetic Sample Kit Materials

- latex gloves
- alcohol swabs
- Betadine/iodine swabs
- 4-6 mm biopsy punch – sterile, disposable (Moore Medical Supply 1-800-678-8678, part #0052442)
- wooden skewer
- single-use scalpel blades (Fisher Scientific 1-800-766-7000, cat. # 08-927-5A)
- plastic screw-cap vial containing saturated NaCl with 20 percent DMSO, wrapped in parafilm
- waterproof paper label, ¼" x 4"
- pencil to write on waterproof paper label
- permanent marker to label the plastic vials
- scotch tape to protect writing on the vials

- piece of parafilm to wrap the cap of the vial
- whirl-pak to return/store sample vial

Enclosure 4 – Public Involvement

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects
Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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Contents

1.0 INTRODUCTION

On January 24, 2017, a public scoping meeting was held to provide the public with information about the preparation of a Draft Environmental Impact Statement (DEIS) and concurrent U.S. Army Corps of Engineers (USACE) Feasibility Study, the proposed Project, how the public can participate in the process, and gather information regarding public questions, concerns, and issues regarding the proposed Project. Further information regarding the public scoping meetings is detailed below.

1.1 PROJECT BACKGROUND

The Environmental Impact Statement (EIS) and Feasibility Study for the proposed Matagorda Ship Channel (MSC) Project are intended to identify and evaluate a combination of modifications to improve the efficiency and safety of the Matagorda Ship Channel.

The USACE is leading this study in collaboration with the non-Federal sponsor, the Port of Calhoun Authority. The Corps leads the development of the EIS and their own Feasibility Study. The EIS preparation and Feasibility Study will be conducted concurrently to result in a single integrated Feasibility Study and EIS document.

In December 2016, a *Notice of Intent to Prepare a Draft Environmental Impact Statement for the Matagorda Ship Channel, TX* was published in the Federal Register.

The study will evaluate a range of alternatives for deepening and widening the MSC from offshore in the Gulf of Mexico (Gulf) through the Point Comfort turning basin. Modifications to the existing 26- mile long navigation channel are needed to reduce transportation costs and increase operational efficiencies of maritime commerce movement through the channel. The existing MSC is comprised of an entrance channel about 4 miles long from the Gulf through a man-made cut across Matagorda Peninsula. The bayside channel is about 22 miles long across Matagorda and Lavaca Bays to Point Comfort with a turning basin at Point Comfort. Offshore and through the Matagorda Peninsula, the channel has a 300-foot bottom width and is maintained at a depth of 40 feet mean lower low water (MLLW). Generally, in Matagorda and Lavaca Bays, the channel has a 200-foot wide bottom width and is authorized to a project depth of 38 feet MLLW. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet MLLW and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The DIFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan (DMMP) for the material that would generated by construction and operation of the modified channel.

2.0 PUBLIC SCOPING MEETING PROCESS SUMMARY

The overall public scoping meeting process consisted of the following elements:

• Publishing a *Notice of Intent to Prepare a Draft Environmental Impact Statement for the Matagorda Ship Channel, TX* in the Federal Register

- Distributing a public notice announcing the upcoming public scoping meeting and its location to newspapers
- Distributing public notices by mail to federal, state, and other government agencies and officials, and other interested parties
- Holding an interagency workshop with state and federal agencies to discuss problems and opportunities related to the project
- Holding a public scoping meeting to provide the public with information about the preparation of a Draft DEIS and concurrent USACE Feasibility Study, the proposed Project, how the public may participate in the process, and gather information regarding public questions, concerns, and issues regarding the proposed project
- Reviewing and considering all comments received during the comment period, and those received after the comment period to the extent practicable

3.0 PUBLIC NOTIFICATIONS

Notifications were made available to the public through published notices.

3.1 NOTICE OF INTENT

The *Notice of Intent to Prepare a Draft Environmental Impact Statement for the Matagorda Ship Channel, TX* was prepared by the USACE and published in the Federal Register, Volume 81, No. 247, on Friday, December 23, 2016. The Federal Register notice is included in **Attachment A**.

3.2 ADVERTISING

Legal notices were published in the *Victoria Advocate* announcing the date, time, location, purpose of the public scoping meeting, and the opportunity for hearing impaired or language translation services if requested.

Affidavits of publication and copies of the legal notices are included in **Attachment B**.

4.0 INTERAGENCY MEETING

The interagency workshop took place on April 27, 2017, from 1:00 to 3:00 p.m., at the USACE Galveston District Headquarters, 2000 Fort Point Road, Galveston, Texas. The purpose of the workshop was to gain early agency stakeholder input as recommended by ER 1105-2-100 on the problems and opportunities related to improving deep draft navigation in the planned reaches of the Matagorda Ship Channel.

Letters inviting stakeholder agencies to participate as cooperating agencies were distributed on December 16, 2016. Copies of the letters are included in **Attachment C**.

5.0 TRIBAL CONSULTATIONS

Six tribal consultation letters were distributed on December 23, 2016, and Texas tribes were invited to participate in the interagency meeting. Copies of the letters are included in **Attachment C**.

6.0 PUBLIC SCOPING MEETINGS

The public scoping meeting took place on January 24, 2017, at Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, Texas, 77979 from 5:30 p.m. to 7:30 p.m.

The public scoping meetings were held in an open house style. Upon arrival, attendees were asked to sign in and were provided with a written comment form. A total of 83 people signed in. Copies of the sign-in sheets can be found in **Attachment D.**

Attendees were invited to view a narrated informational presentation and informational display stations around the room and discuss the proposed project with project representatives from USACE and the Port of Calhoun Authority. Display stations provided project background information and information about the NEPA and concurrent Feasibility Study process. Project representatives were available to answer questions and have one-on-one dialogue with scoping meeting attendees.

During the open house, the public was invited to engage project team members in discussion about problems and opportunities and ask questions. Attendees were invited to submit their comments in writing at the scoping meeting or at any time during the comment period via mail, or e-mail.

6.1 PUBLIC SCOPING MEETING COMMENTS RECEIVED

Six written comments were received at the scoping meetings. Several verbal comments were received in verbal discussions by members of the project team. Written comments received at the scoping meeting and throughout the commenting period will be incorporated into the DEIS, as appropriate. Copies of written comments received are included in **Attachment E**.

USACE accepts and considers all comments throughout the NEPA process; however, those submitted after February 13, 2017, may not be represented in the DEIS.

Attachment A – Notice of Intent

that cause creek flows to back up and rise would be widened to increase channel conveyance and thus reduce water surface elevation. Included in this widening is a proposed project element to align the channel with a CalTrans project to increase flow capacity at Highway 101 and adjacent frontage roads. Impacts from these activities will be evaluated in the FS/EIS.

c. Alternative 3 includes constructing floodwalls along the channel. This Alternative would consider the addition of floodwalls in Reach 2 as a stand-alone measure and in combination with the bridge replacement and channel widening in Alternative 2.

d. Alternative 4 would consider the addition of a bypass culvert as a stand-alone measure and in combination with the bridge replacement and channel widening in Alternative 2. This alternative may include floodwalls, though at a reduced scale compared to Alternative 3. This alternative includes a new bypass inlet located a few hundred feet upstream from University Avenue that would divert high flows to a culvert beneath Woodland Avenue or a street in Palo Alto. A box culvert would follow a roadway in the downstream direction for approximately 1.0 to 1.5 miles to an outlet structure where high flows would be returned to the creek.

4. Environmental Considerations. In all cases, environmental considerations will include riparian habitat, aquatic habitat, sediment budget, fish passage, recreation, public access, aesthetics, cultural resources, and environmental justice as well as other potential environmental issues of concern.

5. Scoping Process. The USACE and SFCJPA are seeking input from interested federal, state, and local agencies, Native American representatives, and other interested private organizations and parties through provision of this notice and holding of a scoping meeting. The purpose of this meeting is to solicit input regarding the environmental issues of concern and the alternatives that should be discussed in the integrated FS/EIS. The public scoping meeting will be held on January 18, 2017 at 6:30 p.m. at the Laurel School Upper Campus, 275 Elliott Drive in Menlo Park, CA.

6. Availability of integrated FS/EIS. The public will have an additional opportunity in the NEPA process to comment on the proposed alternatives after the draft integrated FS/EIS is released to the public in 2017. It is being issued pursuant to section 102(2)(c) of the National Environmental Policy Act (NEPA) of 1969 as implemented by the Council on Environmental Quality regulations (40 CFR parts 1500–1508).

John C. Morrow,

Lieutenant Colonel, Corps of Engineers District Engineer.

[FR Doc. 2016–30985 Filed 12–22–16; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare a Draft Environmental Impact Statement for the Matagorda Ship Channel, TX, Feasibility Study

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of Intent.

SUMMARY: The U.S. Army Corps of Engineers (USACE) intends to prepare a Draft Integrated Feasibility Report and Environmental Impact Statement (DIFR–EIS) to assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel (MSC) in Calhoun and Matagorda counties, Texas. The DIFR–EIS will evaluate potential impacts of a range of alternatives, including the No Action alternative, structural and non-structural alternatives which address proposed navigation improvements in the study area. The DIFR–EIS will also present an assessment of impacts associated with the placement of dredged material, including potential new upland, confined placement areas, beneficial use of dredged material sites, and at Ocean Dredged Material Disposal Sites (ODMDS). The U.S. Environmental Protection Agency, as the lead Federal agency for designation of an ODMDS under Section 102 of the Marine Protection, Research and Sanctuaries Act of 1972, will utilize this assessment and public comments on the DIFR–EIS to evaluate the potential designation of a new ODMDS. The non-Federal sponsor for the study is the Calhoun Port Authority.

DATES: Comments on the scope of the DIFR–EIS will be accepted through February 13, 2017.

ADDRESSES: Scoping comments may be sent to: *MSC-Feasibility@usace.army.mil* or to USACE, Galveston District, (Attn: RPEC Coastal Section), P.O. Box 1229, Galveston, TX 77553–1229.

FOR FURTHER INFORMATION CONTACT: Galveston District Public Affairs Office at 409–766–3004 or *swgpao@usace.army.mil.*

SUPPLEMENTARY INFORMATION:

1. *Authority.* The study is authorized under Section 216 of the 1970 Rivers and Harbor Act, Public Law 91–611, 91st Congress, H.R. 19877, dated 31 December 1970.

2. *Proposed Action.* The study will evaluate a range of alternatives for deepening and widening the MSC from offshore in the Gulf of Mexico (Gulf) through the Point Comfort turning basin. Modifications to the existing 26-mile long navigation channel are needed to reduce transportation costs and increase operational efficiencies of maritime commerce movement through the channel. The existing MSC is comprised of an entrance channel about 4 miles long from the Gulf through a man-made cut across Matagorda Peninsula. The bayside channel is about 22 miles long across Matagorda and Lavaca Bays to Point Comfort with a turning basin at Point Comfort. Offshore and through the Matagorda Peninsula, the channel has a 300-foot bottom width and is maintained at a depth of 40 feet mean lower low water (MLLW). Generally, in Matagorda and Lavaca Bays, the channel has a 200-foot wide bottom width and is authorized to a project depth of 38 feet MLLW. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from −38 feet to −50 feet MLLW and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from −40 feet to −55 fee MLLW and at widths ranging from 300 feet to 600 feet. The DIFR–EIS will also evaluate the impacts and potential benefits of a dredged material management plan (DMMP) for the material that would generated by construction and operation of the modified channel.

3. *Scoping.* A scoping meeting will be held on January 24, 2017 at the Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, TX 77979, from 5:30 to 7:30 p.m. USACE requests public scoping comments to: (a) Identify the affected public and agency concerns; (b) identify the scope of significant issues to be addressed in the DIFR–EIS; (c) identify the critical problems, needs, and significant resources that should be considered in the DIFR–EIS; and (d) identify reasonable measures and alternatives that should be considered in the DIFR–EIS. Scoping comments are requested to be postmarked by February 13, 2017.

4. *Coordination.* Further coordination with environmental agencies will be conducted under the National

Environmental Policy Act, the Fish and Wildlife Coordination Act, the Clean Water Act, the Clean Air Act, the National Historic and Preservation Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Marine Protection, Research and Sanctuaries Act and the Coastal Zone Management Act under the Texas Coastal Management Program, among others.

5. *Availability of DIFR–EIS.* The DIFR–EIS is currently scheduled for release for public review and comment in April 2018.

Dated: December 14, 2016.

Lars N. Zetterstrom,

Colonel, U.S. Army, Commanding.

[FR Doc. 2016–30986 Filed 12–22–16; 8:45 am]

BILLING CODE 3720–58–P

DEPARTMENT OF EDUCATION

[Docket ID ED–2016–OM–0108]

Privacy Act of 1974; System of Records

AGENCY: Office of Management, Department of Education.

ACTION: Notice of an altered system of records.

SUMMARY: In accordance with the Privacy Act of 1974, as amended (Privacy Act), the Department of Education (the Department or ED) publishes this notice of an altered system of records entitled ''Student Loan Repayment Benefits Case Files'' (18–05–15). The system contains records and related correspondence on employees who are being considered for student loan repayment benefits under the Department's Personnel Manual Instruction 537–1 entitled ''Repayment of Federal Student Loans,'' as well as individuals who have been approved for and are receiving such benefits. The information maintained in the system of records entitled ''Student Loan Repayment Benefits Case Files'' consists of one or more of the following: Request letters from selecting officials or supervisors with supporting documentation; employees' (or potential employees') names, home and work addresses, Social Security numbers, student loan account numbers, loan balances, repayment schedules, repayment histories, and repayment status; and the loan holders' names, addresses, and telephone numbers. The information that will be maintained in the altered system of records will be collected through various sources, including directly from the individual to whom the information applies, lending institutions holding student loans for the individual to whom the information applies, officials of the Department, and official Department documents.

DATES: Submit your comments on this altered system of records notice on or before January 23, 2017.

The Department filed a report describing the altered system of records covered by this notice with the Chair of the Senate Committee on Homeland Security and Governmental Affairs, the Chair of the House Committee on Oversight and Government Reform, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget (OMB), on December 15, 2016. This altered system of records will become effective on the later of: (1) The expiration of the 40-day period for OMB review on January 24, 2017 unless OMB waives 10 days of the 40-day review period for compelling reasons shown by the Department; or (2) January 23, 2017, unless the altered system of records notice needs to be changed as a result of public comment or OMB review. The Department will publish any changes resulting from public comment or OMB review.

ADDRESSES: Submit your comments through the Federal eRulemaking Portal or via postal mail, commercial delivery, or hand delivery. We will not accept comments submitted by fax or by email or those submitted after the comment period. To ensure that we do not receive duplicate copies, please submit your comments only once. In addition, please include the Docket ID at the top of your comments.

- *Federal eRulemaking Portal:* Go to *www.regulations.gov* to submit your comments electronically. Information on using *Regulations.gov*, including instructions for accessing agency documents, submitting comments, and viewing the docket, is available on the site under the ''help'' tab.
- *Postal Mail, Commercial Delivery, or Hand Delivery:* If you mail or deliver your comments about this altered system of records, address them to: Cassandra Cufee-Graves, Director, Office of Human Resources, Learning and Development Division, U.S. Department of Education, 400 Maryland Avenue SW., Washington, DC 20202–4573.

Privacy Note: The Department's policy is to make all comments received from members of the public available for public viewing in their entirety on the Federal eRulemaking Portal at *www.regulations.gov*. Therefore, commenters should be careful to include in their comments only information that they wish to make publicly available.

Assistance to Individuals with Disabilities in Reviewing the Rulemaking Record: On request, we will supply an appropriate aid, such as a reader or print magnifier, to an individual with a disability who needs assistance to review the comments or other documents in the public rulemaking record for this notice. If you want to schedule an appointment for this type of aid, please contact the person listed under **FOR FURTHER INFORMATION CONTACT**.

FOR FURTHER INFORMATION CONTACT: Cassandra Cufee-Graves, Director, Office of Human Resources, Learning and Development Division. Telephone: (202) 453–5588.

If you use a telecommunications device for the deaf (TDD) or a text telephone (TTY), you may call the Federal Relay Service (FRS) at 1–800–877–8339.

SUPPLEMENTARY INFORMATION:

Introduction: The Privacy Act (5 U.S.C. 552a) requires the Department to publish in the **Federal Register** this notice of an altered system of records maintained by the Department. The Department's regulations implementing the Privacy Act are contained in the Code of Federal Regulations (CFR) in 34 CFR part 5b. The Privacy Act applies to information about an individual that contains individually identifiable information that is retrieved by a unique identifier associated with each individual, such as a name or Social Security number. The information about each individual is called a ''record,'' and the system, whether manual or computer-based, is called a ''system of records.'' The Privacy Act requires each agency to publish notices of systems of records in the **Federal Register** and to prepare reports for OMB whenever the agency publishes a new system of records or makes a significant change to an established system of records. Each agency is also required to send copies to the Chair of the Senate Committee on Governmental Affairs and the Chair of the House Committee on Government Reform. These reports are intended to permit an evaluation of the probable or potential effect of the proposal on the privacy or other rights of individuals.

The Student Loan Repayment Benefits Case Files (18–05–15) system of records was last published in the **Federal Register** on May 29, 2002 (67 FR 37411). The system is being altered to add a routine use to permit the Department to make a disclosure in the case of a breach of personally identifiable information in the system as well as a routine use to

Attachment B – Public Notice

The State of Texas,
County of Victoria

Before me, the undersigned authority, on this day personally appeared Olivia Garza.

Who being by me duly sworn, states on oath that she is the Senior Accounting Clerk of Victoria Advocate. A newspaper published in Victoria, Victoria County, Texas and has general circulation in Calhoun, Dewitt, Goliad, Gonzales, Jackson, Karnes, Lavaca, Matagorda, Refugio, Wharton and Victoria Counties.

The attached printed notice for US ARMY CORPS OF ENGINEERS LEGAL #2017029 was published in the Victoria Advocate on the following dates:

JANUARY 22, 2017

Olivia Garza

OLIVIA GARZA
RETAIL ACCOUNTING

Sworn to and subscribed before me this 24TH day of JANUARY 2017.

Veronica Gonzales

Notary Public in and for Victoria County, Texas

NOTARY PUBLIC STATE OF TEXAS
VERONICA GONZALES
My Commission Expires
November 25, 2017

NOTICE OF PUBLIC SCOPING MEETING
MATAGORDA SHIP CHANNEL, TEXAS
CHANNEL IMPROVEMENT FEASIBILITY STUDY AND ENVIRONMENTAL IMPACT STATEMENT

Interested parties are hereby notified of and invited to attend a public scoping meeting to be conducted by the U.S. Army Corps of Engineers and the Calhoun Port Authority on:

JANUARY 24, 2017 | 5:30 – 7:30 PM
BAUER CIVIC CENTER
2300 HIGHWAY 35 NORTH, PORT LAVACA, TEXAS 77979

The meeting will provide an opportunity for all persons to identify significant issues related to proposed modifications of the Matagorda Ship Channel. A Draft Integrated Feasibility Report and Environmental Impact Statement will be prepared to assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. Written comments must be postmarked by February 13, 2017. The Notice of Intent to prepare an Environmental Impact Statement is available at
http://www.swg.usace.army.mil/BusinessWithUs/PlanningEnvironmentalBranch/DocumentsforPublicReview.aspx

Comments may be mailed or emailed to:
U.S. ARMY ENGINEER DISTRICT, GALVESTON
ATTENTION: MATAGORDA SHIP CHANNEL FEASIBILITY STUDY, CESWF-PEC-CC
P.O. BOX 1229, GALVESTON, TEXAS 77553-1229
or
MSC-Feasibility@usace.army.mil

Attachment C – Letters to Stakeholders

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Ray Newby
Texas General Land Office
Coastal Resources Program
P.O. Box 12873
Austin, Texas 78711-2873

Dear Mr. Newby:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

We are inviting the participation of your agency as a Cooperating Agency pursuant to Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR §1501.6 and §1508.5). The purpose of this request is to formalize, via designation as a Cooperating Agency, the continuing coordination and active participation by resource agencies in the MSC Feasibility Study. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following review periods for the IFR-EIS have been established in accordance with the current project schedule:

Review of Draft IFR-EIS – 45-day review period begins April 2018
State & Agency Review of Final IFR-EIS – 30-day review begins May 2019

We appreciate this opportunity to invite your participation as a Cooperating Agency and request that you advise us as to whether the report review periods shown above are acceptable. In addition, we would like to invite you to participate in the MSC Feasibility Study scoping meeting, which will be held from 5:30 to 7:30 pm on January 24, 2017 at the Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, Texas 77979. Please contact Janelle Stokes of my staff at (409) 766-3039 or at janelle.s.stokes@usace.army.mil.

Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

David Bernhart
Assistant Regional Administrator
National Marine Fisheries Service
Southeast Regional Office
Protected Resources Division
263 13th Avenue South
St. Petersburg, Florida 33701-5505

Dear Mr. Bernhart:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

We are inviting the participation of your agency as a Cooperating Agency pursuant to Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR §1501.6 and §1508.5). The purpose of this request is to formalize, via designation as a Cooperating Agency, the continuing coordination and active participation by resource agencies in the MSC Feasibility Study. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following submittals and review periods have been established in accordance with the current project schedule:

Corps submits Draft Biological Assessment – Mar 2017
Review of Draft IFR-EIS – 45-day review period begins April 2018
National Marine Fisheries Service completes Biological Opinion - July 2018
State & Agency Review of Final IFR-EIS – 30-day review begins May 2019

We appreciate this opportunity to invite your participation as a Cooperating Agency and request that you advise us as to whether the report review periods shown above are acceptable. In addition, we would like to invite you to participate in the MSC Feasibility Study scoping meeting, which will be held from 5:30 to 7:30 pm on January 24, 2017 at the Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, Texas 77979. Please contact Janelle Stokes of my staff at (409) 766-3039 or at janelle.s.stokes@usace.army.mil.

Sincerely,

E. W. Verwers

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Rusty Swafford
Branch Supervisor
National Marine Fisheries Service
Habitat Conservation Division
4700 Avenue U
Galveston, TX 77551

Dear Mr. Swafford:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Scott Alford
District Conservationist
US Department of Agriculture
National Resources Conservation Service
7705 West Bay Road 77523
Baytown, TX

Dear Mr. Alford:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

We are inviting the participation of your agency as a Cooperating Agency pursuant to Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR §1501.6 and §1508.5). The purpose of this request is to formalize, via designation as a Cooperating Agency, the continuing coordination and active participation by resource agencies in the MSC Feasibility Study. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following review periods for the IFR-EIS have been established in accordance with the current project schedule:

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Peter Schaefer
Texas Commission on Environmental Quality
Water Quality Division
P.O. Box 13087, MC-150
Austin, TX 78711-3087

Dear Mr. Schaefer:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

We are inviting the participation of your agency as a Cooperating Agency pursuant to Council on Environmental Quality Regulations for Implementing the National Environmental Policy Act (40 CFR §1501.6 and §1508.5). The purpose of this request is to formalize, via designation as a Cooperating Agency, the continuing coordination and active participation by resource agencies in the MSC Feasibility Study. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following review periods for the IFR-EIS have been established in accordance with the current project schedule:

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Ms. Rebecca Hensley
Regional Director, Ecosystem Resources Program
Texas Parks and Wildlife Department
1502 FM 517 East
Dickinson, TX 77539

Dear Ms. Hensley:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Ms. Karla Guthrie, Ph.D.
Team Lead, Bays and Estuaries Program
Texas Water Development Board
P.O. Box 13231
Austin, TX 78711-3231

Dear Dr. Guthrie:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

E.W. Verwers

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Matthew Mahoney
Waterways Program Coordinator
Texas Department of Transportation, Maritime Division
118 E. Riverside Drive
Austin, Texas 78704

Dear Mr. Mahoney:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Chuck Ardizzone
Project Leader
US Fish and Wildlife Service
Texas Coastal Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058

Dear Mr. Ardizzone:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the bayside channels of the MSC at depths ranging from –38 feet to –50 feet mean lower low water (MLLW) and at widths ranging from 200 feet to 400 feet, and alternatives to modify and extend the Entrance Channel to depths ranging from –40 feet to –55 fee MLLW and at widths ranging from 300 feet to 600 feet. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Award scope for Coordination Act Report (CAR) – January 2017
Receive Draft CAR -- September 2017
Receive Final CAR -- July 2018
Review of Draft IFR-EIS – 45-day review period begins April 2018
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We appreciate this opportunity to invite your participation as a Cooperating Agency and request that you advise us as to whether the report review periods shown above are acceptable. In addition, we would like to invite you to participate in the MSC Feasibility Study scoping meeting, which will be held from 5:30 to 7:30 pm on January 24, 2017 at the Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, Texas 77979. Please contact Janelle Stokes of my staff at (409) 766-3039 or at janelle.s.stokes@usace.army.mil.

Sincerely,

E. W. Ver

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Ms. Jo Ann Battise
Chairperson
Alabama-Coushatta Tribe of Texas
571 State Park Road 56
Livingston, Texas 77351

Dear Chairperson Battise:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

In partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the Corps offers you the opportunity to review and comment on the potential of the proposed study to significantly affect protected tribal resources, tribal rights, or Indian lands. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following review periods for the IFR-EIS have been established in accordance with the current project schedule:

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Sincerely,

E. W. Verwers

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Jimmy Arterberry
Tribal Administrator
The Comanche Nation
P.O. Box 908
Lawton, Oklahoma 73502

Dear Administrator Arterberry:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

In partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, the Corps offers you the opportunity to review and comment on the potential of the proposed study to significantly affect protected tribal resources, tribal rights, or Indian lands. Furthermore, we would like to coordinate our review schedule for study completion so that all reviews and approvals will, to the maximum extent practicable, be conducted concurrently. This concurrent coordination is required by Section 2045 of the Water Resources Development Act of 2007 and Section 1001 of the Water Resources Reform Development Act of 2014. The following review periods for the IFR-EIS have been established in accordance with the current project schedule:

Review of Draft IFR-EIS – 45-day review period begins April 2018
State & Agency Review of Final IFR-EIS – 30-day review begins May 2019

We appreciate this opportunity to invite your participation as a Cooperating Agency and request that you advise us as to whether the report review periods shown above are acceptable. In addition, we would like to invite you to participate in the MSC Feasibility Study scoping meeting, which will be held from 5:30 to 7:30 pm on January 24, 2017 at the Bauer Civic Center, 2300 Highway 35 North, Port Lavaca, Texas 77979. Please contact Janelle Stokes of my staff at (409) 766-3039 or at janelle.s.stokes@usace.army.mil.

Sincerely,

E. W. Ver

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Lovelin Poncho
Chairman
Coushatta Tribe of Louisiana
1940 C.C. Bel Road
Elton, Louisiana 70532

Dear Chairman Poncho:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Mattew M. Komalty
Chairman
Kiowa Indian Tribe of Oklahoma
100 Kiowa Way
Carnegie, Oklahoma 73015

Dear Chairman Komalty:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Danny Breuninger, Jr.
President
Mescalero Apache Tribe
P.O. Box 227
Mescalero, New Mexico 88340

Dear President Breuninger:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

E. W. Ver

Eric W. Verwers
Director, Regional Planning and
Environmental Center

DEPARTMENT OF THE ARMY
GALVESTON DISTRICT, CORPS OF ENGINEERS
P. O. BOX 1229
GALVESTON, TEXAS 77553-1229

December 16, 2016

Regional Planning and Environmental Center

Mr. Russell Martin
President
Tonkawa Tribe of Oklahoma
1 Rush Buffalo Road
Tonkawa, Oklahoma 74654

Dear President Martin:

The U.S. Army Corps of Engineers, Galveston District (Corps) intends to prepare an Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study. The Corps and the non-federal sponsor, the Calhoun Port Authority, would like to invite your agency to participate as a Cooperating Agency in the development of the IFR-EIS. The IFR-EIS will assess the social, economic and environmental effects of widening and deepening the Matagorda Ship Channel in Calhoun and Matagorda counties, Texas. In addition to No Action, specific alternatives to be evaluated are expected to include nonstructural measures, structural alternatives to modify the depth of the bayside channels of the MSC and alternatives to modify the depths and extend the length of the Entrance Channel into the Gulf of Mexico. The IFR-EIS will also evaluate the impacts and potential benefits of a dredged material management plan that may include new upland, confined placement areas, beneficial use of dredged material sites, and Ocean Dredged Material Disposal Sites.

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Sincerely,

E W Ver

Eric W. Verwers
Director, Regional Planning and
Environmental Center

Attachment D – Public Scoping Meeting Attendees

m mm

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
✓ Cecil + Joan Anderson		268 Ocean Dr. South, P.L. Tex	Cecil630@tisd.net	
✓ DAVID ADRIAN	MATAGORDA BAY PILOTS	P.O. BOX 836 PORT LAVACA	david@matagordabaypilots.com	
✓ Martha Toler			lanmar.woodhi @gmail.com	lanmar.woodhi@gmail.com
✓ TONY HOLLADAY	CALHOUN PORT AUTHORITY	POINT COMFORT	JTHOLLAD@TISD.NET	X
✓ STEVE SVETLIK	NORTHSTAR MIDSTREAM	1975 FM 1593 POINT COMFORT, TX 77978	(Business CARD)	
✓ WILLIAM V SCHUSTERET		PO Box 744 SEADRIFT TX 77983	SchuswU@yahoo.com	
✓ Shannon Salyer	District Atty's Office	P.O. Box 1001 PL TX 77979	shannon.salyer@calhouncotx.org	
✓ Robert Howe Howe		22 Boundary	rhportlavaca@aol.com	
✓ anne Burt		28 Red Snapper Dr. P.L. 77979	e.anne.burt@gmail.com	
✓ JERRY DYKES		1324 NORTH OCEAN DR. 77979		
✓ GWEN SALYER		1695 Ocean Dr N P.L. 77979	mbpalmlady@yahoo	
✓ LANCE R. TOLER	POWDERHORN	96 St JOSEPH St 77979	LANMAR.WOODHI@GMAIL.COM	
✓ RANDY FRNKA		99 AVRIL PT. LAVACA TX 77979		
✓ William Quast	Benchmark Eco	PO Box 158 Katy TX 77492		
✓ Miranda Malek	Calhoun Port Auth			
✓ DAVID HALL	Calhoun County	202 S. ANN Port Lavaca		✓

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
~~Arnold Twomley~~	~~Point Comfort Marine~~			
Rod NEAL	MIRAGE INDUSTRIAL GROUP	347 POWDER HORN	Rod@MIRAGEINDUSTRIALGROUP.COM	
JOE Westfall		1719 BONHAM Victoria TX 77901		
TOM RODINO	RODINO, INC.	183 HeronOaks Rockport TX 78382	TOM@RODINOINC.COM	
JIM WOOD	SAND POINT RANCH LP	1555 ASHFORD Hollow Houston 77077	JWOOD1555@ATT.NET	NO
WAYNE Mims	MAGNOLIA BEACH	44 MORRIS AVE PORT LAVACA TX.		
Joe Noel	Magnolia Beach	79 Sally st Port lavaca 77979		
Liz Dykes	Magnolia Beach	1374 N Ocean Dr Port lavaca 77979	baittackle01@gmail.com	
John Bailey	Magnolia Beach	1374 N Ocean Dr		
Garry D. Jistel	Magnolia Beach	1937 CR 250 Cameron, Tx 76520	garrydj55@yahoo.com	NO
SUSAN FRNKA	M B	99 AVRIL DR. PL, TX 77979		
C E JONES		94 Silk Stocking PL TX 77979		
MARTHA M. GUETHLE	HOME OWNER - OLIVIA	31338 SUNLIGHT DR. BULVERDE, TX. 78163		NO
Dell Weatherford	Calhoun Port Authority		dell@TISD.net	~~Calhoun Port~~ yes ~~Auth~~
Josh Waghorne	Alamo Beach	~~280~~ PO Box 165 Port Lavaca Tx 77979		
Robert Marek	Horizon Environmental		Robert.Marek@Horizon-Environ.com	
Curtiss Casa		P.O. Box 273 POC 77982	CAPTLOWTIDE@AIRMAIL.NET	

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Mickey Andoin		139 LaLucia	mickeyandoin@ymail.com	
David Guillot		442 Coleto Bluff Rd Victoria 77905	DAVIDALLANGUILLOT@GMAIL.COM	
Stasey Beach	Harvest Pipeline		SBEACH@HILCORP.COM	
Doug Schiller		39 Sandcastle Dr, P.L.	TXSN8V@aol.com	
Murray Schiller		39 Sandcastle Dr. P.L.	M2STX@aol.com	
John McKnight	Harvest Pipeline		jmcknight@hilcorp.com	
Joseph Konarsky		2801 CR 424 Taylor Tx 76574	ksky26@gmail.com	
Bryant Davis		17801 McClain Cemetery Road Rogers TX 76569		
Bruce Cowan	Resident Island Pen	POB 268 POC TX 77982	BubbasDeck@aol.com	
Kimberly Cowan	Resident Island Pen	POB 268 POC TX 77982	KSC407@yahoo.com	
Lydia Falk	Resident Alamo Beach	PO Box 1723 Port Lavaca 77979	downsizing1946@gmail.com	
Kayla Meyer	Port Lavaca Wave Newspaper	107 E. Austin Port Lavaca Tx 77979	kmeyer@plwave.com	
Karen Cash		2205 E Amaqua Cove Victoria 77901		
John Rogers	CCHC	PO Box 1795 Port Lavaca 77979	jan@russellcain.com	
Peggy Dobbins	Magnolia Beach Community	8942 State Hwy " "	pld2036@aol.com	
Keith Schmidt	Self & Alcoa Remediation Group	871 Bay Meadow Dr Port Lavaca TX; Alcoa P.O. Box 101 Point Comfort, TX 77978	Keith.Schmidt@alcoa.com	

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Otto Sanford		P.O. Box 524 Lolita Tx 77971	ocsanford@Gmail.com	
Bonnie Banks		1567 N. Ocean Dr. P.L. 77979	bonnieb@tisd.net	
Houston Banks		1567 N Ocean D. PL 77979	houstonb@cts-site	
Elaine Darby	Anchor QEA	3901 S. Mopac, Bldg V, Suite 150 Austin Tx 78746 ~~Houston~~	edarby@AnchorQEA.com	
Justin Boyd	Anderson Machinery	1553 Farm Rd Port Lavaca, 77979	justinb@amcovt.com	
Sandy Witte	Roberts Roberts Odefey Witte & Wall	PO Box 9 P.L	sandy@portlavacalaw.com	
Fred Whipling	136 Hartman ~~Road~~ - P.L. - SH/FT		CHARDY55@YAHOO.COM	
CHARLES HARDY	HARVEST PIPELINE			
Sara Sneath	Victoria Advocate	311 E. Constitution Victoria, TX 77901	ssneath@vicad.com	
Ryan Easton	TPWD		ryan.easton@tpwd.texas.gov	
John & Rhonda Hubbard	Alamo Beach LP	PO Box 431 Robstown TX 78380	john@atlastubular.com	
RANDY BOYD	CALHOUN PORT		RANDY@RLBCONTRACTING.COM	CALHOUN PORT AUTHORITY CHAIRMAN
Tom Andrews	MBVFD	PO BOX 318 PORT LAVACA	?HAOULEJ1@HOTMAIL.COM	PRESIDENT
Leroy & Karen Smith		PO Box 533 Port O'Connor TX 77982	kms310@yahoo.com	
TANIA French	Port LAVACA Wave	P.O. Box 88 Port LAVACA, TX 77979	tfrench@plwave.com	
Mary Margaret Read & Rodney Read		4240 Gohlke Rd Ledbetter TX	rread@cvctx.com	
ADAM SMITH		267 STONE OAK DR. INEZ, TX 77968	asmith140@yahoo.com	

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Jason Zeplin	TGLO	6300 Ocean Dr #5848 Corpus Christi TX 78412	jason.zeplin@glo.texas.gov	
Dale Falk		73 Sandcastle Dr Port Lavaca 77979	realvikings@gmail.com	
MATTHEW MAHONEY	TX DOT		matthew.mahoney@txdot.gov	
J.C Melcher melcher	CCND Port	Box 124 Port Lav Tx 77979		
ED CAMPBELL	Self	233 E MAIN, PL, TX 77979	CAMPBELL@WALTEREDEN.COM	
Sherri Dixon	self	2672 W. Bay Shore Dr. Palacios 77465		
Earl Bathillo	CPA	808 Peabody, Edna, TX 77957		
Harvey Hodges	Self	5748 FM 1090 Port LAVACA TX		
Winston Denton	TPWD	1502 FM 517 E, Dickinson, TX 77539	winston.denton@tpwd.texas.gov	
Bobbie Vickery	Calhoun Co Sheriffs Office CCSO	211 S. Ann Port Lavaca Tx 77979	bobbie.vickery@calhouncotx.org	Sheriff

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Colleen Roco	Texas Parks & Wildlife Dept.	1502 FM 517 E Dickinson Tx 77531	colleen.roco@tpwd.texas.go	NO

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Carol Wootton	Congressman Blake Farenthola		carol.wootton@mail.house.gov	representing
Jack & Bonnie Glover		P.O. Box 274 Seadrift 77983	gloverb@calcoisd.org	
Jim Andrews	Point Comfort Towing	PO Box 509 Point Comfort	james.andrews@harbordocking.com	No
Rhonda Cummins	Texas Sea Grant	186 Henry Barber Way, Port Lavaca 77979	rcummins@tamu.edu	Appointed County Ext-Agent

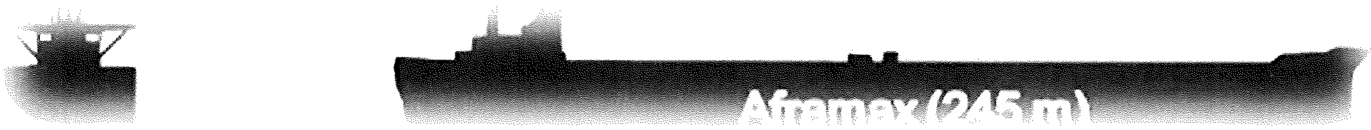
Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

	Name Syma	Organization	Mailing Address	Email Address	Elected Official?
✓	Clyde Syma ~~Calhoun County~~	Calhoun County Prct 3 Commison		ClydeSyma@CalhounCoTX.orc	✓

Sign-In Sheet
Matagorda Ship Channel, Texas Feasibility Study
Public Scoping Meeting - Port Lavaca, Texas
January 24, 2017

Name	Organization	Mailing Address	Email Address	Elected Official?
Neil Henthorne	Benchmark Ecological Services		nhenthorne@benchmarkeco.com	
LESLIE HARTMAN	TX PARKS & WILDLIFE	2200 HARRISON PALACIOS 77465	leslie.hartman@tpwd.texas.gov	
TELL BOHORNEY	MATAGORDA BAY PILOTS	715 SADDLEHORN PORT LAVACA TX	milamtel@yahoo.com	
Crystal Miner	Matagorda Bay Pilots	715 Saddlehorn Port lavaca TX		

Attachment E – Public Scoping Meeting Comments



Comment Form

Please return your completed form before you leave. You may also mail your comments to:
USACE – Galveston District
Attn: RPEC Coastal Section **<u>Comments are due by February 13, 2017.</u>**
P.O. Box 1229
Galveston, TX 77533-1229
<u>MSC-Feasibility@usace.army.mil</u>

1.Name / Representing: Jim Andrews - Point Comfort Towing (Harbor Tugs)

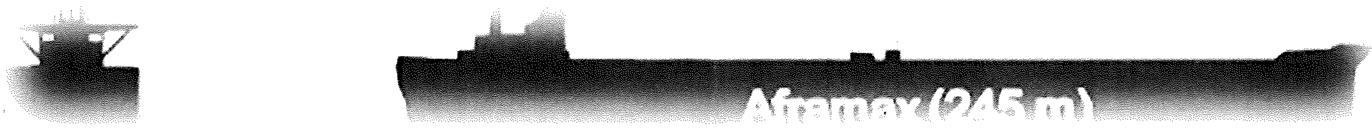
2.Address [Optional]: Po Box 509 Point Comfort Texas 77987

3.Email [Optional]: james.andrews@harbordocking.com

4.Please provide your comments concerning the Matagorda Ship Channel, Texas Feasibility Study in the blanks below.

STRONGLY IN FAVOR. THE ECONOMIC STRENGTH & POWER OF HOUSTON & TEXAS WERE BUILT UPON THE EXPANSION AND MAINTENANCE OF THE HOUSTON SHIP CHANNEL. NOW OVER 100 YEARS LATER, THE REGIONAL ECONOMY IS SET TO EXPAND FURTHER, BUT MUCH OF HOUSTON & CORPUS CHRISTI IS DEVELOPMENTALLY SATURATED. EXPANSION MAY CONTINUE UNABATED, BRINGING ALONG WITH IT AN INCREASED TAX BASE, BY SUPPORTING THE EXPANSION & DEEPENING OF THE MATAGORDA SHIP CHANNEL.

MATAGORDA SHIP CHANNEL, TEXAS
PUBLIC SCOPING Meeting 24 JANUARY 2017



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P.O. Box 1229
Galveston, TX 77533-1229
<u>MSC-Feasibility@usace.army.mil</u>

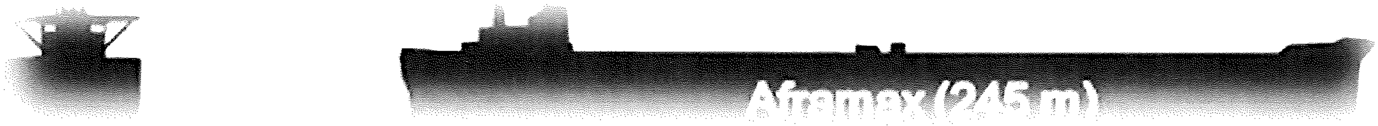
1.Name / Representing: RANDY & SUSAN FRNKA

2.Address [Optional]: 99 AVRIL DR., Port Lavaca, TX 77979

3.Email [Optional]: sjgoff1501@aol.com

4.Please provide your comments concerning the Matagorda Ship Channel, Texas Feasibility Study in the blanks below.

1) DO NOT WANT CLAY FROM SHIP CHANNEL put on Magnolia BEACH SHELL W/ SAND OVER IT. It is a shell beach, not sand.
2) EROSION FROM SHIP TRAFFIC IS TAKING AWAY FROM MAGNOLIA BEACH, A SOLUTION TO KEEPING WHAT IS LEFT &/OR ADDING MORE BACK TO IT IS NECESSARY.
3) WE LIVE HERE & ENJOY THE BEACH DAILY TO WALK ON & FISH AT TIMES.
4) WE NEED A HARD STRUCTURE TO KEEP SHIPS FROM ERODING MAGNOLIA BEACH, LIKE GRANITE OR CONCRETE JETTIES.
5) IT IS THE LAST "FREE" BEACH IN TX, people come →



Comment Form

FROM SURROUNDING COUNTIES TO ENJOY WITH THEIR FAMILIES.

6) MANY RV's COME TO ENJOY MAGNOLIA BEACH, FROM AS FAR AWAY AS QUEBEC & ONTARIO, CANADA, & FROM MANY STATES OF USA.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

January 25, 2017

Eric W. Verwers
Director, Regional Planning and Environmental Center
Department of the Army
Galveston District, Corps of Engineers
P.O. Box. 1229
Galveston, TX 77553

SUBJECT: Integrated Feasibility Report and Environmental Impact Statement (IFR-EIS) for the Matagorda Ship Channel (MSC) Feasibility Study

Dear Mr. Verwers:

In accordance with your letter dated December 16, 2016, the U.S. Environmental Protection Agency, the Region 6 NEPA office, has no comments to offer on the proposed project based on the information submitted.

Thank you for this opportunity to comment. If you have any questions, please contact Eli Martinez of my staff at (214) 655-2119 or at martinez.eli@epa.gov for assistance.

Sincerely,

Robert Houston

Robert Houston
Chief, Special Projects Section

31 January 2017

USACE - Galveston District
Attn: RPEC Coastal Section
P.O. Box 1229
Galveston, TX 77533

To Whom it May Concern,

My husband and I attended the January 24th Public Scoping Meeting regarding the Matagorda Ship Channel. We recognize the obligation to hold such a meeting and appreciate the efforts put forth by your entire team.

With that being said, we wish to register our concern that Alamo Beach was not included among the list of stakeholders. Unless we do not understand what qualifies a community as a stakeholder, we at Alamo Beach would like to be included in the Stakeholder list.

We, and many others at Alamo Beach, are in favor of the expansion of the ship channel. We want to see Port Lavaca thrive economically. The increased shipping traffic and port use would be a major component in keeping Port Lavaca a growing community.

We, as well as others on Alamo Beach, have several concerns resulting from the proposed expansion of the Matagorda Ship Channel.

- First and foremost are the proposed "islands" resulting from the material removed from the bay to facilitate the increased width and depth. We would like to invoke "NIMBY" (Not In My Back Yard). The details of these "islands" are not yet known to us. For instance, how close to the shoreline would they be constructed? How high above the bay's surface would they protrude? Finally, how large would they be?

- We strongly believe that it would be better not to spoil the beauty of the inhabited coastal communities. Rather, we suggest that the

dredged material be deposited on the far side (and uninhabited) portion of the Matagorda Ship Channel. Speaking for many here on Alamo Beach, we voiced these very same concerns during the 2009 meeting in which this expansion and the dredged materials were discussed.

- Our other concern results from the choice not to create "islands" in the bay, but rather, depositing the dredged material on land. We would protest vigorously if we were not given assurances that the material removed from the bay and placed on land would not pose a risk to the environment, as well as to us personally.

- Although we were told at the meeting that the mercury contamination deposited by Alcoa was controlled by the efforts resulting from the "Super Fund" and the flow of water in the bay directs it toward upper Lavaca Bay, we insist on seeing documentation describing the securing of the mercury contamination.

- Enclosed is a copy of the Victoria Advocate which quotes us and reiterates our concerns.

Please include us on your mailing/eMail master list. We will appreciate being updated on this project.

Murray Schiller
Doug Schiller

Murray and Douglas Schiller

39 Sandcastle Drive
Port Lavaca, TX 77979

m2stx@aol.com

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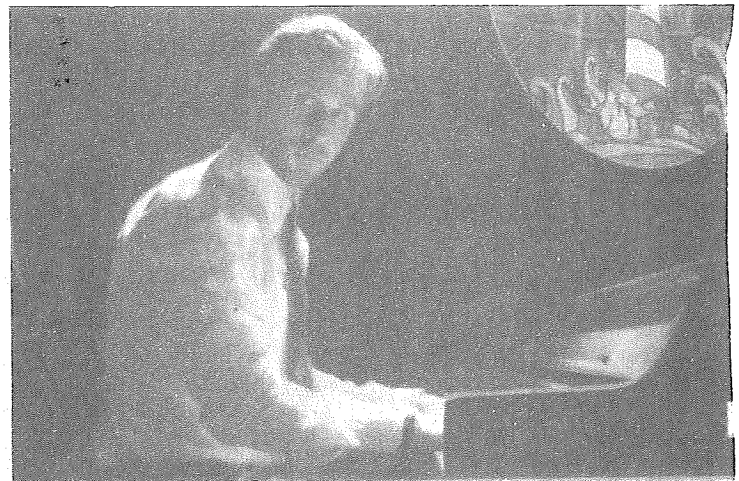


Wednesday, January 25, 2017 171ST YEAR NO. 260, 20 PAGES, ©2017, VICTORIA ADVOCATE PUBLISHING CO.

TRANSPORTATION

Project dredges up concerns

Work on Matagorda channel could help fight erosion, but others worry about polluted soil

BY SARA SNEATH
SSNEATH@VICAD.COM

PORT LAVACA – The Calhoun County Port Authority is splitting the cost of a study with the federal government on the feasibility of deepening and widening the Matagorda Ship Channel.

The channel was originally built in 1910 and dredged to its current depth of 38 feet in 1966. But larger ships that traverse the channel have to "light load," or decrease the amount of cargo onboard to ensure they don't drag the seafloor.

The 26-mile ship channel from Lavaca Bay to the Gulf of Mexico is the Crossroads' link to the global market, according to the Calhoun County Port Authority. But the channel is too shallow for modern vessels to enter or exit at full capacity. Deepening and widening the ship path is necessary for the port to stay competitive and keep its market share of maritime commerce.

A previous study on the project was funded by Calhoun Liquefied Natural Gas. But the undertaking came to a halt around 2008 when natural gas prices plummeted.

SEE CHANNEL, A6

TO COMMENT

Comments about the Matagorda Ship Channel Project must be submitted by Feb. 13. The comments can be emailed to MSCFeasibility@usace.army.mil or mailed to U.S. Army Engineer District, Galveston, Attention: Matagorda Ship Channel Feasibility Study, CESWF-PEC-CC, P.O. Box 1229, Galveston, TX 77553-1229.

CHANNEL: Public comments accepted through Feb. 13

CONTINUED FROM A1

The new study being funded in part by the federal government will eventually be sent to Congress in hopes that the federal government will find the project financially feasible, said Calhoun Port Authority director Charles Hausmann.

"For this port to grow, this is what we're going to have to do," he said.

A public meeting Tuesday night in Port Lavaca allowed those interested to voice their concerns and comments about the project.

Leroy and Karen Smith own a cabin on Matagorda Peninsula and came to the meeting because they were concerned about where the material dredged up from the sea floor would be placed.

Extending the channel 1 mile and digging it 8 to 10 feet deeper and 200 to 300 feet wider would create 46.5 million cubic yards of dredged material. That's enough to fill the Empire State Building 33 times.

The Smiths want the dredge material placed on the bayside of the island, where erosion has eaten away a swath of land. One house has already washed away, they said.

Murray and Douglas Schiller live on Alamo Beach. The couple is also concerned about where the material dug up from the channel will be placed.

"We're not opposed to the channel," she said. "We're just concerned about our property depreciating."

The Schillers are worried the material will be placed on the front of their property, blocking their view of the water. They're also concerned about what is in the sediment.

From 1966 to 1970, Alcoa Point Comfort Operations discharged mercury-laden wastewater into Lavaca Bay. An island in Lavaca Bay, where much of the mercury has been contained, is a Superfund site, a federal status reserved for the country's most polluted areas.

The Schillers said they want to know that any dredged material placed on land doesn't have mercury, which could leach into the water table.

But Houston Banks, who lives on Magnolia Beach, wants the sediment used along the shore, where land has been lost to erosion. Locals estimate that in some areas as much as 200 yards of Magnolia Beach has been taken by the water.

The Galveston District of the U.S. Army Corps of Engineers will continue taking comments about the project until Feb. 13, said Sheridan Willey, the project manager.

The comments will be addressed as part of the study process.

①

Hi,
I am Bobby Harabis
we have a place on the
Beach and it has
about eroded away,
We have lost so much
Beach here.
I have to ask
Whey cant some sort of
Deep Water Port be
used here, Off load the
ships on the other side
of the Island, use pipe
line, and sterage on the
barrier, from Island, move
pipe line TO The
customer.

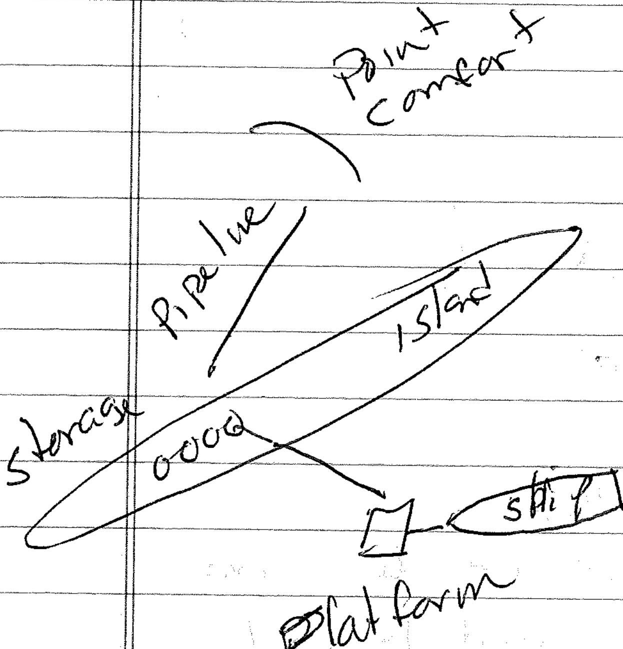
(2) Bringing larger loads in here will only hasten the erosion. Please Help Save our Beach.

With what the Ship traffic has done + what we lost in T.S. Bill, we are almost out of beach in some places.

Ive been here my entire life, and Photos from just 10 years ago would blow your mind, from 30 years ago, almost unbelievable.

Please Consider all options before making the channel wider, and deeper please send a mail response or email bobbyharabis@yahoo.com

Call 361 212-2564



~~I Ko~~

I Know some Guy's
we'll come build it.
I think it would work.

Have a Great Day!

Seriously,
I think it can be done.
If you need help I
Know a Guy that built an
entire Universe in 6 Days

Enclosure 5 – USFWS Coordination

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects

Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Texas Coastal Ecological Services Field Office
17629 El Camino Real, Suite 211
Houston, Texas 77058
281/286-8282 / (FAX) 281/488-5882

In Reply Refer To:
FWS/R2/02ETT
X00-2017-CPA-
0007

September 25, 2017

Colonel Lars Zetterstrom
District Commander
Attention: Ms. Janelle Stokes
Galveston District, U.S. Army Corps of Engineers
Post Office Box 1229
Galveston, Texas 77553-1229

Dear Colonel Zetterstrom:

The U.S. Fish and Wildlife Service (Service) is collaborating with the U.S. Army Corps of Engineers (Corps) on the evaluation of the "Matagorda Ship Channel Expansion Channel Improvement Project (MSC ECIP)" located in Calhoun and Matagorda Counties, Texas. This project aims to improve ship movement throughout the 27-mile channel for the purpose of reducing maritime transportation costs, increase operational efficiencies of commodities moving through the Port of Port Lavaca-Point Comfort, and to improve navigation safety. The alternatives under evaluation are similar to those previously evaluated by the 2009 Matagorda Ship Channel Improvement Project Environmental Impact Statement; however, new impacts, mitigation modeling, and a revised dredge material management plan are expected under the new project. A Notice of Intent was subsequently filled on December 23, 2016 to begin the current MSC ECIP. Improvement features to be considered under the current study include:

- Turning basin improvements
- Vessel passing lanes
- Environmental analysis of the bay reach (48 feet deep by 400 feet wide)
- Dredge material management plan

The Corps will evaluate an array of ship channel improvement alternatives that may include: deepening and widening portions of existing channels; relocation of existing or creation of new turning basins; addition of jetty/hard structures; and creation of passing lanes. Our comments are of a general nature and focused on the overall project footprint instead of evaluating each of the currently proposed improvements which will be described in the forthcoming Fish and Wildlife Coordination Act Report (FWCAR).

The purpose of this letter is to provide the Service's comments and recommendations regarding the MSC ECIP while identifying planning constraints that may influence the Service's ability to fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act

(FWCA, 48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). This PAL is prepared under the authority of the FWCA; however, it does not constitute the final report of the Secretary of the Interior as required by Section 2(b) of the FWCA. The Service will provide copies of this letter to the National Marine Fisheries

Service (NMFS) and the Texas Parks and Wildlife Department (TPWD); if any comments are received on this letter they will be forwarded under a separate cover. Comments in this letter are also provided under the National Environmental Policy Act (NEPA) of 1969 (83 Stat. 852; 42 U.S.C. 4321 et seq.) as a cooperating agency for the MSC ECIP and the Endangered Species Act (Act of 1973.

The Service bases this evaluation on the current data, modeling, and analyses made available by Corps sources and Service files. The Service understands construction of the project is subject to Congressional approval and the Tentatively Selected Plan funding will occur sometime in the future with or without project modifications. Additional Service involvement is necessary for subsequent detailed planning, habitat analysis, engineering, design, and construction phases of each planning effort is required to fulfill our responsibilities under the FWCA. Since there may be a significant time lag between the study and construction phases, the Service recommends the Corps reinitiate coordination under a separate FWCA agreement when construction funding is made available. This will allow the Service to conduct a comprehensive review of the project footprint, impacts, and update recommendations based on environmental conditions at the time of construction.

Background

The Calhoun Port Authority of Calhoun County (CPA) requested the Corps evaluate the need for improvements to the existing Matagorda Ship Channel (MSC) given no major improvements have occurred since original construction in 1910 (U.S. Fish and Wildlfe Service, 2001). The MSC has undergone incremental improvements with the current 36-ft deep channel configuration completed in 1966. Since then, the Corps conducted two reconnaissance studies that identified present configuration as a constraint to maritime commerce. Currently, the bay reach of the MSC is maintained between a depth of -36 and -38 feet and vessels currently calling on the port and adjacent businesses must light-load to reach final port destinations. This deep draft channel is ranked 46th nationally in terms of total tonnage, 34th in foreign trade, and 68th in domestic trade (TxDOT, 2017). The Port receives approximately 420 ships, 1,000 barges, and 3,600 railcar transits annually with an annual economic impact of $12.3 billion. CPA currently has five deep water berths, six brown water barge berths, a port-owned multi-user pipeline corridor from Victoria Barge Canal to public docks, 39,000 acres of port-owned bay bottom, and 1,000+ acres of green-field land for future development. The CPA is expanding their facility and is in the permitting and design phase for three deep water petrochemical berths and four barge berths (TxDOT, 2017). Channel improvements are warranted based on the increases in channel users, a significant increase in size of maritime vessels, and an increased need for a port by nearby Eagle Ford Shale. The CPA handles a variety of products including petroleum, aluminum ore, chemicals, and allied products. Several local industrial plants: Alcoa World Alumina, L.L.C., INEOS Nitriles, Formosa Plastics Corporation, Invista, J.R. Simplot and crude oil/condensate users: North Star Midstream, NGL Energy Partners, and Arrowhead Offshore Pipeline use the MSC and would benefit from channel modifications. The Corps identified the study area as outlined below in **Figure 1**.

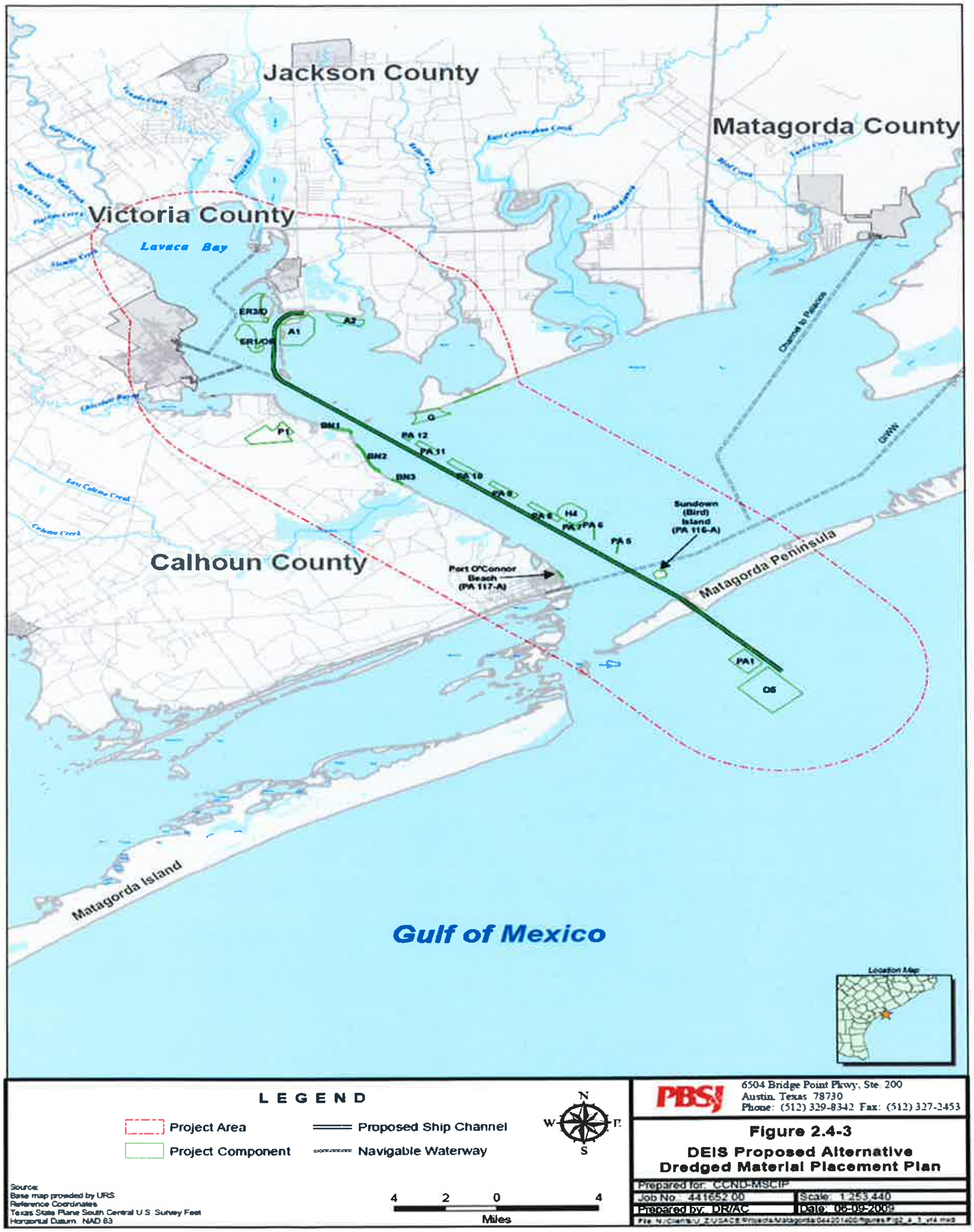

Figure 1 Matagorda Ship Channel Expansion Channel Improvement Project Study Area
Source: U.S. Army Corps of Engineers, 2009

The Service provided recommendations to the Corps throughout previous planning efforts on MSC projects as seen in **Table 1**.

Table 1 Previous Service involvement with the Corps and the MSC

Document Name	**Year**
Recommendations for Dredge Material Maintenance for the MSC	2001
Department of Army Permit 24071 Scoping Comments	2006
Department of Army Permit 24071 Response Letter (U.S. Fish and Wildlife Service, 2007)	2007
Draft Environmental Impact Statement Response Letter (U.S. Fish and Wildlife Service, 2007)	2007
Department of Army Permit 24071 Additional Comment Letter (U.S. Fish and Wildlife Service, 2007)	2007
Revised Biological Assessment Response Letter (U.S. Fish and Wildlife Service, 2008)	2008
Biological Assessment Response Letter (U.S. Fish and Wildlife Service, 2009)	2009
Permit Application SWG-2006-00092 Letter (U.S. Fish and Wildlife Service, 2009)	2009

Alcoa/Point Comfort Lavaca Bay National Priorities Listed Site
The 3,500 acre Alcoa facility functions as an aluminum refining and manufacturing facility located on the east shore of Lavaca Bay, a sub bay system of the larger Matagorda Bay. Between 1948 and the present, Alcoa constructed and operated several types of manufacturing process at this location including alumina refining, aluminum smelting, carbon paste and briquette manufacturing, gas processing, and chlor-alkali processing. The site (Alcoa Plant, Dredge Island, portions of Lavaca Bay, Cox Bay, Cox Creek, Cox Lake, and western Matagorda Bay) was added to the National Priorities List under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) on March 25, 1994 based on levels of mercury found in several species of finfish and crabs in Lavaca Bay in 1988. As a result of the elevated mercury levels in shallow sediments and fauna close to the facility, Alcoa entered into a Memorandum of Agreement (MOA) with the Texas Trustee Council (representatives from state and federal natural resource agencies) in 1997. The resulting MOA identified and implemented restoration actions aimed at making the environment and public whole for the resource injuries or losses caused by releases of hazardous substances from the Alcoa facility. Temporarily and permanently affected habitats in this area included tidal flats, salt marshes, oyster reefs, shallow soft-bottom sediments, terrestrial uplands associated with islands and shorelines, and resulted in a fish closure of the immediate area.

Ongoing efforts by Alcoa to remediate and restore the affected area included sediment removal, sediment monitoring, and sampling conducted in open and closed areas of Lavaca Bay, sampling mercury levels in red drum *Sciaenops ocellatus* and blue crab *Callinectes sapidus*, hydraulic containment system, removal actions at Dredge Island, natural recovery of areas not dredged,
and marsh removal north of Dredge Island (located in Lavaca Bay, west of the facility buildings and is approximately 420 acres). These actions focused on one goal: to reduce levels of mercury in finfish so

the fish closure can be lifted (Texas Trustees, 2001). Most recent findings indicate (Environmental Protection Agency, 2017):

- remedial actions are effective in reducing mercury levels in sediment
- mercury levels in prey blue crab show downward trends
- levels of mercury in red drum continue to remain elevated in the closed area
- residual sources of mercury impacting sediment may exist
- adjacent marshes are potential areas of enhanced methylation even when total mercury levels are low

As a result of these findings, EPA believes there are possible ongoing sources of contamination and these include, but may not be limited to, sloughing of the Alcoa and Witco Channel walls, erosion along Dredge Island edges, possible shipping induced resuspension of sediments at Witco Harbor, erosion of Mainland Shoreline #3 (MS3), and resuspension of open water sediments particularly in Causeway Cove. Consequently, Alcoa will take the following actions during 2017: excavate marsh habitat sediment (15,000 cubic yards) at Causeway Cove, dredge 61,000 cubic yards of sediment from MS3, and dredge an additional 300,000 cubic yards from the Witco Channel, MS3 marshes, and adjacent areas. Alcoa will continue conducting annual sediment and fish/shellfish sampling to determine if additional response is required (Environmental Protection Agency, 2017).

Habitats within the Project Area

Matagorda Bay, located on along Texas mid coast, is the third largest estuarine system in Texas behind Galveston Bay and Laguna Madre and covers approximately 422 square miles. Generally, Matagorda Bay is two meters deep and includes Lavaca Bay, Tres Palacious Bay, and East Matagorda Bay. Smaller outlets include Turtle Bay, Carancahua Bay, Keller Bay, and Cox Bay. Matagorda Bay is separated from the Gulf of Mexico by Matagorda Peninsula and is the mouth of the larger Lavaca and Colorado Rivers. Five saltwater inlets connecting to the Matagorda Bay system to the Gulf are: Pass Cavallo, the MSC landcut, Greens Bayou, the Colorado River Delta Complex, and Brown Cedar Cut. Freshwater inflow into Matagorda Bay occurs through the Lavaca-Navidad Rivers and other smaller rivers and creeks.


Aquatic Resources within the Matagorda
Ship Channel Improvement Project
Legend
Matagorda Ship Channel
<all other values>
WETLAND_TY
Estuarine and Marine Deepwater
Estuarine and Marine Wetland
Freshwater Emergent Wetland
Freshwater Forested/Shrub Wetland
Freshwater Pond
Lake
Other
Riverine
Seagrasses
Oyster Locations
N
W
E
S
0 1.25 2.5 5 7.5 10 Miles
Produced by: Donna Anderson
Texas Ecological Services Office
Projection: WGS 1984
Datum: WGS 1984
September 11, 2017
Some datasets provided by TNRIS
Map image is the intellectural property of ESRI and is used herein under license. Copyright 2017and its licensors. All rights reserved.

Figure 2 Aquatic resources within Matagorda Bay

Open Bay Bottom
The open bay bottom habitat of Matagorda Bay is the second largest habitat type in the bay and is made up of mostly soft rippling mud and silt that is not covered by oysters and vegetation. Over the years, the area of open bay bottom has increased mainly due to oyster removal and dredging activities. Biological decomposition, a major function for the breakdown of plant material, occurs in this habitat, where it is eventually re-suspended in the water column to provide food for fish and other wildlife species. Wildlife usage of and negative impacts by deepening and widening construction of Matagorda's Bay's open bay bottom were recognized in Service's letters noted in **Table 1** (USFWS 2001, 2007, 2009).

Submerged Aquatic Vegetation
One of the most biologically productive, recreationally and economically valuable habitats, seagrass beds provide feeding and nursery habitat for waterfowl, fish, shrimp, crabs and other important estuarine species as well as sea turtles, manatees, and countless invertebrates that are produced within, or migrate to seagrasses (U.S. Fish and Wildlife Service, 2015). Seagrass helps to dampen the effects of strong currents, prevent erosion, enhance water clarity, provide protection to fish and invertebrates, and prevent scouring of bay bottom areas. Sea grasses are usually found in calm, shallow Gulf waters where higher salinities, light, and nutrients are plentiful. Excessive freshwater inflows into a bay system can decrease salinities to near brackish conditions, and depending on the duration of the fresh conditions, some seagrass species are not physiologically capable of tolerating extreme conditions and may die. Accordingly, species richness and diversity may be lost resulting in colonization by one or two persistent species creating a uniform bed of seagrasses. The reduced diversity of seagrass beds may affect usage by commercial and recreationally important finfish species and limit sea turtle and manatee foraging.

The majority of Texas seagrass meadows occur along the middle and lower Texas coast where waters are warm, clear, and have higher salinities. Almost 80% of the remaining seagrass habitat in Texas is located in the Laguna Madre System and however currently abundant, this resource remains threatened. In 1994, surveys revealed only 1.7% or 3,830 acres of Texas seagrasses occur north of Pass Cavallo in Matagorda Bay. Biotic and abiotic threats to seagrasses such as storms, excessive grazing by herbivores, disease, and anthropogenic threats due to point and non-point sources of pollution, decreasing water clarity, excessive nutrient runoff, sedimentation, sea level rise, and prop scarring negatively affect these diverse communities.

Shoalgrass *Halodule wrightii,* widgeongrass *Ruppia maritima*, and turtlegrass *Thalassia Testudinum,* have been documented in Matagorda Bay (White, Tremblay, Waldinger, & Calnan, 2002). Shoalgrass and wideongrass are mapped in Keller Bay and Carancahua Bay to the east of Matagorda Bay and north of Port O'Connor in Boggy Bayou. The Seagrass Conservation Plan of Texas (Texas Parks and Widlife Department, 1999) documents the presence of shoalgrass, widgeongrass, and clovergrass *Halophila engelmannii* in the Matagorda Bay system.

Restoration efforts to benefit seagrasses have some success along the Texas coast. The Service along with other federal, state, and local partners work cooperatively to restore seagrass meadows along the coast utilizing a combination of hand planting and specially designed boats which rapidly injects nutrients, plant growth hormones and sprigs of seagrass in the bottom substrate. Although there are strong restoration efforts underway, continued damage from prop scaring, anchors, and ill-timed dredge material deposition threaten coastal seagrass beds all along the Texas coast.

The Service recognizes the importance of dredge material placement to the overall resiliency of seagrass bed ecosystems. Strategically placed and timed dredge material deposition can provide elevational lift in light of sea level rise. However, it is critically important to note that destruction of sea grass beds is also attributed to dredging. Mechanical processes disturb sea grasses and deposition or burial of sea grasses with excessive amounts of dredge material have had detrimental effects along the Texas coast. Close coordination with resource agency staff is critical when proceeding with dredge material deposition in sea grass habitat and should not be attempted until a fully developed and vetted sea grass management plan is made available.

Oyster Reef

Most oyster reefs are found in subtidal or intertidal areas, near passes, cuts, and along the edges of marsh habitat. Historically, oyster reefs dominated by Eastern oyster *Crassostrea vircinic,* were prominent (approximately 40,000 acres) in Lavaca and Matagorda Bays. However oyster populations in Matagorda Bay have declined as a result of over harvesting, disease, storm events, and human induced impacts. As a result of the Corps previous deepening and widening efforts in 2009, the CPA mapped oyster reefs in Matagorda Bay **(Figure 3)**. The lower portions of the MSC appear to be void of oyster reef while scattered reefs are more prominent along the upper portions of the channel and beyond into the bays. Oyster reef is as an essential habitat for finfish and is known to support a higher abundance, biomass and species richness of most fish species than either marsh or shallow non-vegetated bay bottoms. Additionally, reefs may attenuate wave energy and reduce erosion, provide protection for other nearby habitats such as submerged aquatic vegetation or salt marsh.

Oyster habitat should be avoided during construction activities; however, should the Corps find that avoidance of oyster shell and reef habitat is not in the best interest of the CPA, the Service strongly urges the Corps to coordinate with the Studies' Inter –agency Coordination Team (ICT), and specifically TPWD to identify oyster reef restoration opportunities in Matagorda and adjacent bay systems. The Service recommends mitigation efforts with full in-kind compensation for any impacts to oyster habitat. The Corps plans to conduct oyster modeling and the Service understands and approves of the Corps choice of the Swannack (Swannack, Reif, & Soniat, 2014) oyster model in the evaluation of direct and indirect impacts to oyster habitat within the study area. The Service will evaluate the Swannack model and results in the FWCAR.

Oyster restoration is ongoing in the Matagorda Bay complex. The most recent addition of 54 acres of oyster reef habitat was created on Half Moon Reef in Matagorda Bay. After 3 years of monitoring, this restoration project demonstrates a thriving oyster reef community with average oyster sizes increasing by more than 550 percent between January 2014 and May 2016. Additionally, biodiversity on the reef tends to be 40% higher than on adjacent bay bottom (The Nature Conservancy, n.d.). The reef's diversity attracts larger prey species to the reef making Half Moon Reef a well-known fishing destination in Matagorda Bay.

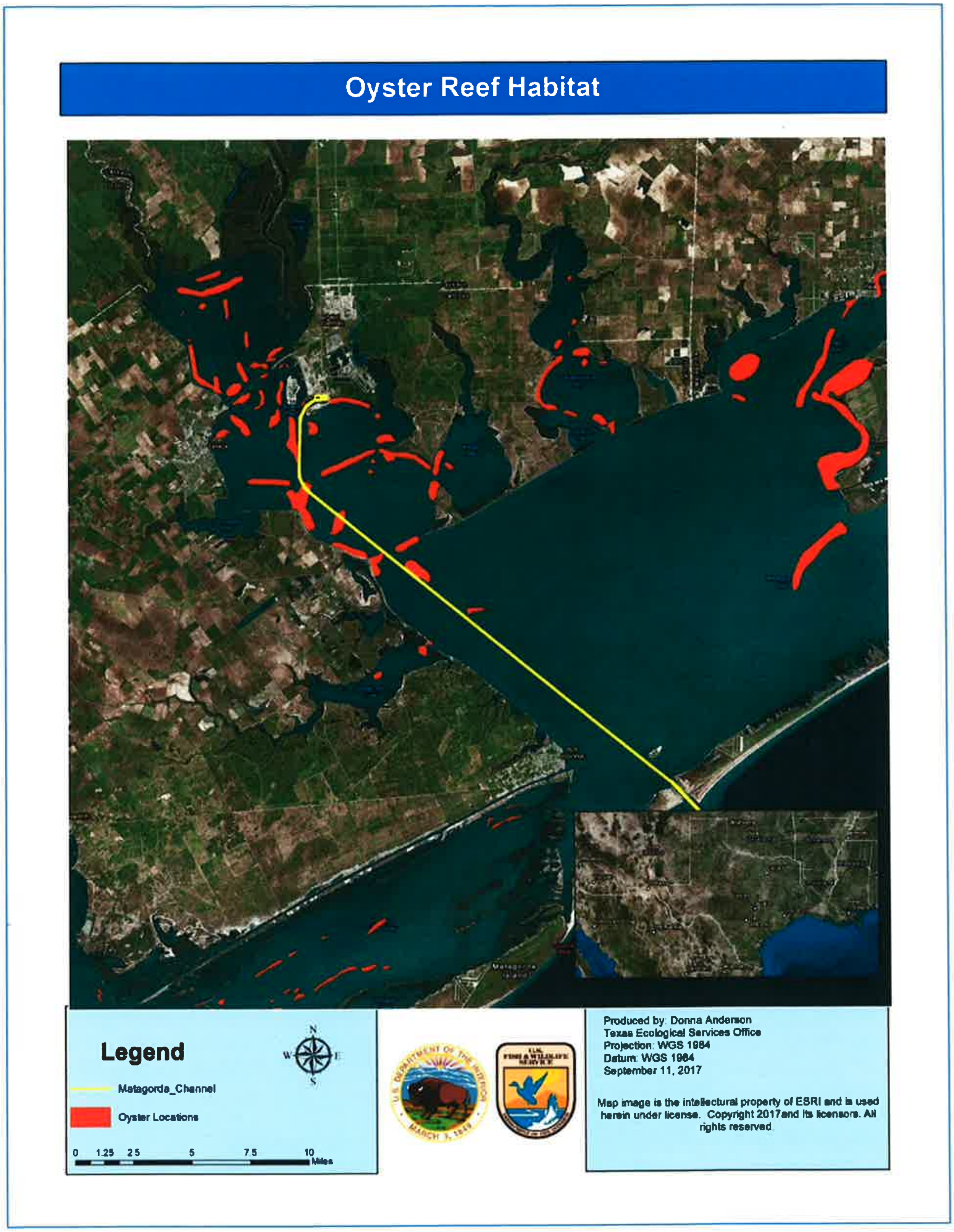

Figure 3 Matagorda and associated bays mapped oyster reefs

Coastal Marshes
Coastal marsh habitat armors shorelines from erosion, filters pollutants, enhances water quality and promotes primary production (Mitsch & Gosselink, 1993). In general, coastal marshes serve as nurseries for fish and shellfish and serve as buffer zones helping to slow and absorb storm surges that might otherwise do greater damage farther inland. Coastal marsh and wetland habitats within the project area are well documented by the Service in the reports listed in **Table 1** and the continued loss of this signifcant natural resource remains a concern. Maintaining the economic values, fish and wildlife resources, and aesthetic qualities of the Texas Coast depends on re-establishing and restoring its wetlands. The Service continues to support creation and restoration efforts by the CPA, other natural resource agencies, non-governmental organizations, and the public. Should the Corps not be able to avoid impacts to coastal marsh habitat, we recommend the Corps engage the ICT to determine appropriate habitat impact modeling and restoration or mitigation site selection.

Estuarine and marine wetlands
Fringe or estuarine wetlands are tidal in nature, are extremely productive, occur along the edges of Matagorda Bay and some of the land features found within the bay. Prevalent flora of the estuarine and marine wetlands include smooth cordgrass *Spartina alterniflora*, saltwort *Batis maritime*, saltgrass *Distichlis spicata* and glasswort *Salicornia* spp. Estuarine wetlands are valuable for commercial and recreational fishery species with most species completing all or part of all of its life cycle in this habitat. We encourage the Corps to avoid this habitat during construction activities to the greatest extent practicable. However, if the Corps decides that avoidance is not possible, the Service recommends appropriate modeling and analysis with complete in-kind compensation to fully offset impacts to the existing functions and values of wetland habitat.

Freshwater Emergent Wetlands
Freshwater wetlands are primarily found in areas where rainfall runoff accumulates in relic depressions and stream channels. Closer to the coast, this wetland type can be found inland of salt or estuarine wetlands and intertidal swales (Dick & Hunt, 2012). These wetlands tend to have reduced salinties and are suitable for plants such as sedges, rushes, and coastal arrowhead *Sagittaria lancifolia*. While many freshwater wetlands are found on the mainland within the project area, some of the dredge placement and disposal areas (filled placement areas not currently being used or upgraded) provide excellent freshwater emergent wetlands. These wetlands provide valuable stop-over habitat for many migrating species such as waterfowl, raptors, shorebirds, and should be avoided during construction activities. However, if the Corps deems that avoidance is not possible, the Service recommends mitigation with full in-kind compensation for any impacts.

Fish and Wildlife Impacts
Threatened and Endangered Species

According to Section 7(a)(2) of the Act and the implementing regulations, it is the responsibility of each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed species. Based upon an inventory of listed species and other current information, the federal action agency determines if any endangered or threatened species may be affected by the proposed action. The Service's Consultation Handbook (http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.htm) is available online for further information on definitions and process.

The Service recommends the Corps conduct a review for threatened and endangered species two years prior to construction. In order to obtain information regarding fish and wildlife resources concerning a specific project or project area, we recommend the Corps first utilize the Service developed Information, Planning, and Conservation (IPaC) System. The IPaC system is designed for easy, public access to information about the natural resources for which the Service has trust or regulatory responsibility such as threatened and endangered species, migratory birds, National Refuge lands, and the National Wetland Index. One of the primary goals of the IPaC system is to provide this information in a manner that assists project proponents in planning their activities within the context of natural resource conservation. The IPaC system can also assist people through the various regulatory consultation, permitting and approval processes administered by the Service, helping achieve more effective and efficient results for both the project proponents and natural resources. The IPaC system can be found at:https://ecos.fws.gov/ipac/

Critical Habitat
Critical habitat is defined as the specific areas within the larger geographic area, occupied by the species at the time it was listed that contain the physical or biological features essential to the conservation of the endangered and threatened species. Critical habitat may also include areas not occupied by the species at the time of listing but are essential to its conservation. The Act requires Federal agencies to use their authorities to conserve endangered and threatened species and to consult with the Service about actions that they carry out, fund, or authorize to ensure that they will not destroy or adversely modify critical habitat. The prohibition against destruction and adverse modification of critical habitat protects such areas in the interest of conservation.

We have reviewed our files and determined that critical habitat for the federally endangered piping plover lies within the study area boundaries and is outlined in red in **Figure 4**. During MSC interagency meetings, Corps staff indicated that adverse modifications to critical habitat will not occur as a result of this proposed project; however, these modifications will be fully considered during an upcoming Matagorda Ship Channel Jetty Modification Study. The Service strongly recommends the Corps evaluate the cumulative effects that all MSC modifications may have on critical habitat.

The whooping crane *Gus americanus* winters on the Aransas National Wildlife Refuge (ANWR) and its critical habitat lies southwest of the project area, however the whooping crane may utilize wetlands within the project boundaries (**Figure 5**).

Figure 4 Piping plover critical habitat

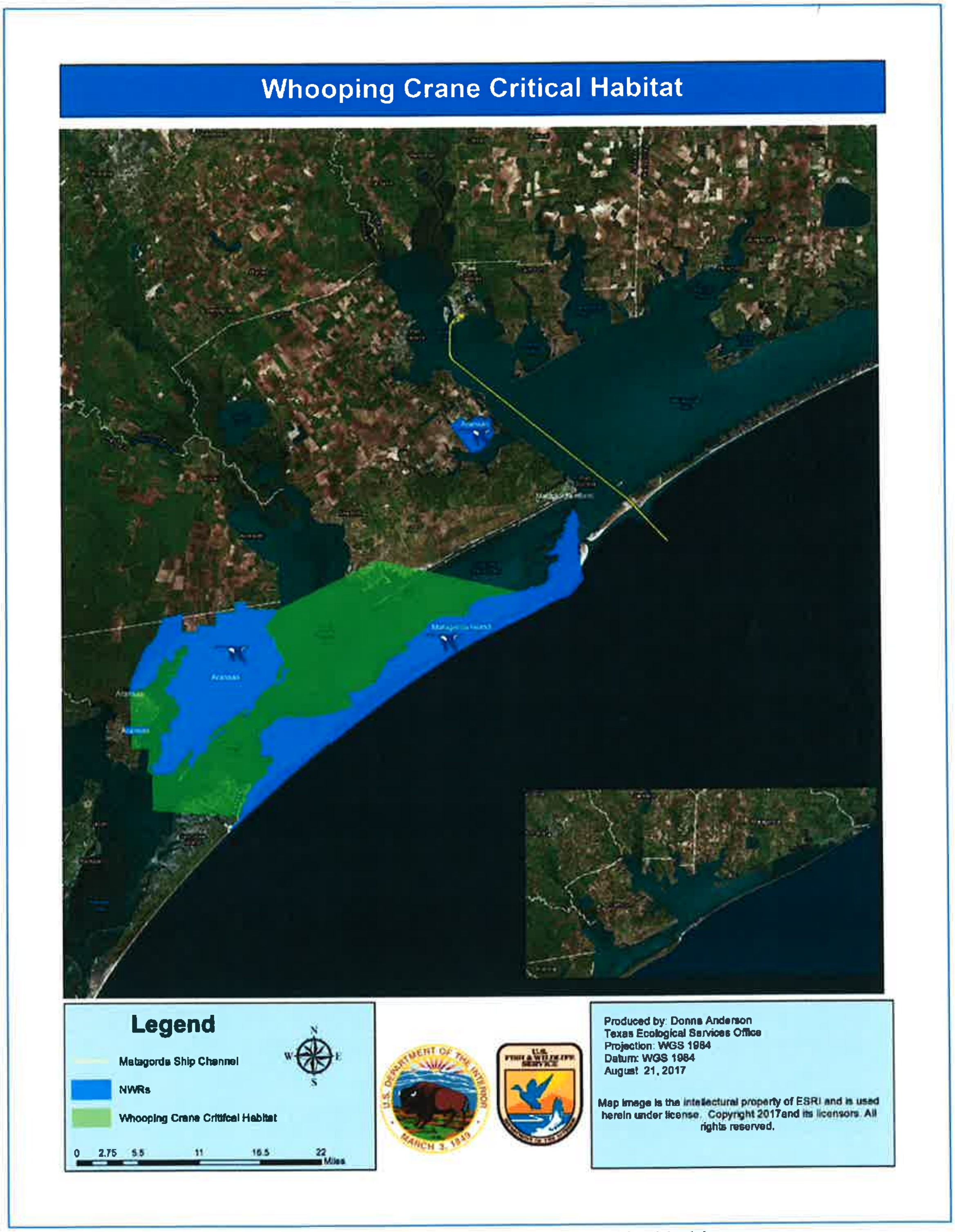

Figure 5 NWRs and whooping crane critical habitat

Finfish and Shellfish

Close to 95 percent of all finfish and shellfish are dependent in some way on the coastal areas where fresh water from streams and rivers mix with salt water from the Gulf of Mexico creating food rich estuaries (USEPA, 1999). Many aquatic species migrate into the estuaries to spawn, while others send young to the estuaries for protection against predators with most fish and shellfish migrating back to the Gulf of Mexico as adults. Almost 85% of recreationally important fish species use coastal wetlands and estuarine habitats during at least one life stage (Lellis-Dibble, McGlynn, & Bigford, 2008). Marshlands adjacent to the bay systems tend to provide significant quantities of organic material which forms the base of the food chain in the estuaries. Matagorda and the surrounding bays are critically important to commercial and recreation users. Recreational and commercially important species such as Gulf menhaden *Brevoortia patronus,* bay anchovy *Anchoa mitchilli*, white shrimp *Litopenaeus setiferus*, brown shrimp *Farfantepaneus aztecus*, hardhead catfish *Arius felis*, blue crab *Callinectes sapidus,* Atlantic croaker *Micropogonias undulatus*, and sand seatrout *Cynoscion arenarius* are abundant within the Matagorda Bay marsh and estuary complexes (Armstrong, Brody, & Funicelli, 1987).

Texas routinely accounts for almost a quarter of the red snapper harvested in the Gulf of Mexico and one quarter of all domestic shrimp landed in the United States. In Texas, shrimping accounts for 85% of both the landings and overall economic value in the commercial fishing industry (Audubon Nature Institute, 2017). In 2015, 52.6 million pounds of brown shrimp and 16.6 pounds of white shrimp were landed resulting in revenues of $96.8 million and $46.6 million (National Oceanic and Atmospheric Administration, 2015; Texas State Historical Association, 2015) respectively in Texas. Brown shrimp landing in Texas account for 49% of the total harvest in the Gulf of Mexico.

Finfish are usually highly mobile and the Service believes any impacts to those species will be minimal and temporary. However, increases in suspended sediments and turbidity levels from dredging and disposal operations, could under certain conditions, result in adverse effects on marine animals and plants by reducing light penetration into the water column and by the actual physical disturbance. Likewise, shellfish can suffer from breathing problems associated with clogged and damaged feeding apparatus and young fish can have increased fatalities when sediments become trapped in their gills from heavily turbid waters (Wilbur & Clarke, D.G., 2001).

Whooping crane

The whooping crane is the tallest North American bird with males approaching 1.5 meters in height, is snowy white with black primary feathers on the wings, and a bare red face and crown. These birds form monogamous pairs for life and all whooping cranes return to the same breeding territory in Wood Buffalo National Park, Canada to nest in late April or May. Most birds reenter the wintering grounds of ANWR by late October to mid-November where they migrate singly, in pairs, in family groups or in small flocks. The flock is closely monitored on the wintering grounds as climactic events, food resources, and human disturbance can interfere with spring migration. Due to the location of the project within the coastal salt marsh, the Service is informing you of the potential for occurrences of the federally listed endangered whooping crane. The ANWR is comprised mainly of salt marshes dominated by salt grass, saltwort, smooth cordgrass, glasswort, and sea ox-eye daisy. Whooping cranes in recent years, have been observed utilizing similar salt marshes outside of the historic wintering grounds in and around the critical habitat designated areas and may be encountered within the project area.

Colonial Waterbirds

In general, natural and dredge spoil islands host nesting colonies for most North American seabirds as well as many of the last populations of endemic landbird species (Golder, Allen, Cameron, & Wilder, 2008). The Texas Colonial Waterbird Society recognizes five historic and three active colonies within the project area. Several of these sites lie along the MSC (highlighted with an * below in **Table 2**) and direct and indirect impacts to these sites resulting from construction activities should be avoided during the breeding season. The Service defines the breeding season for colonial waterbirds as February 1 to September 1: however, this can vary from colony to colony necessitating site inspections to confirm that all nestlings have fledged.

Approximately 23 species of colonial-nesting waterbirds (gulls, terns, herons, egrets, spoonbills, and skimmers) occur in the Matagorda Bay estuary, feeding in wetland and bay areas and nesting during the April – July period, primarily on two large offshore nesting islands, Sundown and Lavaca Bay Spoil (Snake) Islands. The average number of breeding pairs for Lavaca Bay and western Matagorda Bay indicate a downward trend since 2001 (2001-2011 24,872 pairs and 2012-2017 20,781 pairs). Average number of species and total number of nesting pairs for these two important islands the previous five years (2013 – 2017) are as follows: Sundown Island (TCWC 609-300) avg. 17,618 breeding pairs, 19 species; Lavaca Bay Spoil (63-770) (TCWC 609-121) avg. 4,172 breeding pairs, 20 species. These two nesting islands, lie along the MSC, are two of the largest and most diverse nesting colonies in coastal Texas, and rival, in terms of size, diversity, and complexity, any along the Gulf of Mexico.

On most islands, invasive predators such as rats, raccoons, and coyotes depredate nests and pose a severe threat to nesting bird populations. Actions to eradicate predators have prevented extinction of vulnerable bird populations. Continued comprehensive restoration of priority islands for breeding birds is needed as many islands are still overrun by invasive species. The Service has identified 8 historic colonial waterbird colonies within the project area. These islands or sites are no longer suitable due to the presence of invasive predator species, overgrown vegetation, lack of open ground nesting habitat, erosion or subsidence, or the lack of available forage sites in close proximity to nesting habitat.

Table 2 Colonial Waterbird colonies in or near the project area

Colony Name	TCWBS Code
Mouth of Lavaca River	609-122
Point Comfort-Alcoa	609-120
Mouth of Chocolate Bayou	609-221
Lavaca Bay Spoils 51-63	609-220
*Lavaca Bay Spoils 63-77	609-121
Matagorda Bay Spoil 39-51	609-240
*Sundown Island	609-300
Olivia Shell Bars	609-143

The construction of bird islands using new work dredged matieral is well documented, but it was not until the 1970s that the importance of this dredged material to nesting waterbirds was realized (Golder, Allen, Cameron, & Wilder, 2008). Dredge spoil islands created out of local sand and clays provide immediate nesting opportunties for bare ground nesters such as terns and skimmers. Successional vegetation including mangroves, bacharris, and other shrub spieces provide suitable nesting habitat for three species of egrets, five species of herons, white ibis *Eudocimus albus*, and rosette spoonbills *Platalea ajaja*. This and subsequent projects could positively contribute to the colonial waterbird populations across the Gulf of Mexico.

The Service published the *Birds of Conservation Concern (BCC) 2008* (U.S. Fish and Wildlife Service, 2008) with the overall goal to accurately identify the migratory and non-migratory bird species (beyond those already designated as federally threatened or endangered) that represent our highest conservation priorities and to draw attention to species in need of conservation action. The following are five species (**Table 3**) on the BCC list that may utilize the habitat types within the study area:

Table 3 BCC species within the MSC ECIP study area

Reddish egret	*Egretta rufescens*	coastal marshes and ponds
American Oystercatcher	*Haematopus palliatus*	sandy beaches, mudflats, and occasionally rocky shores where mollusk prey can be found
Gull billed tern	*Sterna nilotica*	sandy beaches and mudflats
Sandwich tern	*Thalasseus sandvicensis*	sandy beaches and mudflats
Black skimmer	*Rynchops niger*	sandy or gravelly bars and beaches, shallow bays, estuaries, and salt marsh pools
Least tern	*Sterna antillarum athalassos*	broad, level expanses of open sandy or gravelly beach, dredge spoil and other open shoreline areas, and more rarely, inland on broad river valley sandbars

Marsh, bird islands, and placement areas created by large scale Corps projects are suitable habitat for shorebirds to forage, nest, and may play a critical life cycle role as other coastal habitats erode and become less suitable. The recent State of North America's Birds 2016 (North American Bird Conservation Initiative, 2016) identifies the seabird guild as declining. This guild continues to be severely threatened by: invasive predators on nesting islands; accidental bycatch by commercial fishing vessels; overfishing of forage fish stocks; pollution; and climate change. By adopting broad best management practices such as the continued building of bird islands, managing invasive species and vegetation on existing islands and placement areas, the Corps will help to ensure the growth of colonial waterbird populations and shorebirds along the Texas mid-coast and at the broader Gulf of Mexico level for years to come.

Other Migrating Birds

Annual migration or large scale movements of birds between their breeding (summer) homes and their nonbreeding (winter) grounds occurs mainly due to availability of food resources and nesting locations. The coastal and bay shorelines provide stop over and fall-out habitat for many neotropical birds migrating across the Gulf of Mexico to their breeding grounds in the northern United States and Canada. These weary and energy-drained birds seek wooded areas to feed and recharge before taking flight again. Most Texas birds are not year-round residents and are considered to be seasonal residents or migrants. The Texas mid-coast, located within the Central flyway, is critically important habitat for migrating birds due to their use of uplands, wetlands, beaches and marshes as feeding, resting and nesting sites. There are 338 Neotropic North American species and 333 have been documented in Texas (Haggerty & Meuth, 2015). Various species of hawks and raptors are common on the landscape throughout the year, however most are considered migrants with greatest concentrations found primarily during the winter months. South of the project area, Hawk Watch (2016) reports 488,559 migrants in Corpus Christi, Texas in September 2016 and broad-winged hawks comprised greater than 95% of the total count. The Service has extensively documented the importance of the Texas coastal habitats to resident and migratory birds throughout the letter and reports listed in **Table1** and continues to recommend avoiding migratory bird habitat all together.

The Service documents 1,026 species protected under the Migratory Bird Treaty Act (MBTA) of 1918. The MBTA protects most North American native bird species (except games birds, including ducks, geese, doves and some shorebirds) even those that are not considered long-range migrants. Further, the MBTA makes it illegal for anyone to take, possess, import, export, transport, sell, purchase, barter, or offer for sale, purchase, or barter, any migratory bird, or the parts, nest, or eggs of such a bird except under the terms of a valid permit issued pursuant to the Federal regulations.

Sea turtles

Five species of sea turtles are found in U.S. waters and nest on U.S. beaches: leatherback *Dermochelys coriacea*, hawksbill *Eretmochelys imbricata*, loggerhead *Caretta caretta*, green *Chelonia mydas,* and Kemp's ridley *Lepidochelys kempii*. The leatherback, hawksbill and green sea turtles rarely nest in the southeastern U.S., but offshore waters are important feeding, resting, and migratory corridors. Texas sea turtle nesting season begins March 15 and ends on October 1 and includes the Kemps ridley, loggerhead, and green sea turtles (Shaver, 2017). Should the Corps determine that beach nourishment or shoreline protection are viable options for dredge material on Matagorda Island, the Service recommends the Corps evaluate these actions for specific impacts to nesting sea turtles under Section 7 of the Act. As per the Memorandum of Understanding dated July 18, 1977 between the Service and NMFS where NMFS shall have sole jurisdiction over sea turtles when in the marine environment including waters adjacent to sea turtle nesting beaches and the Service shall have sole jurisdiction over sea turtles when on land. We recommend the Corps contact NMFS for guidance on evaluating impacts to sea turtles pursuant to their legal responsibilities.

Essential Fish Habitat

Estuarine wetlands and associated shallow waters within the project area have been identified as Essential Fish Habitat (EFH) for postlarval, juvenile and sub-adult stages of brown shrimp, white shrimp, and red drum. EFH in the nearshore, marine-portion of the project area and in the lower portions of the estuary has also been designated as EFH for an array of other species. EFH requirements vary depending upon species and life stage. Categories of EFH in the project area include estuarine emergent wetlands, estuarine water column, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on federally managed fisheries and their EFH is provided in the 2005 generic amendment of the Fishery Management Plans for the Gulf of Mexico, prepared by the Gulf of Mexico Fishery Management Council (GMFMC). That generic amendment was prepared in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), (P.L. 104-297).

We recommend the Corps initiate consultation with National Marine Fisheries Services, Southeast Regional Office in St. Petersburg, Florida at (813) 348-1630 to determine specific impacts to EFH as a result of the proposed MSC ECIP.

Beneficial Use of Dredge Material

The development of a well thought out plan addressing how dredge material will be used over the life of this project (50 years) is critical to a successful and environmentally responsible outcome. The Corps has historically included the Service and other natural resource agencies in the development of past MSC DMMPs. The Service recommends the Corps adopt an aggressive dredge material policy aimed at using a minimum of 50% and preferrably 75% of the dredge material beneficially. The Corps has supported numerous research projects aimed at identifying uses for dredge material in lieu of costly upland placement areas and boasts several projects where sucessful dredged material placement has restored or replaced lost wetland habitat and function. However, the Corps only beneficially used 11 % (1.64 million cubic yards [mcy]) of the 14.58 mcy of material dredged in FY15 in Texas (Frabrotta, 2016). We urge the Corps to develop a DMMP identifing markets for commerical and other end users of dredge material products as well as identifying technologies that will aid in pumping/or barging the material greater distances with reduced costs. Developing costly upland placement areas assures that sediment removed during initial construction and subsequent maintenance phases are permanetly removed from the system ultimately disrupting natural processes that help sustain local marsh habitats.

Maintenance material can be used to create wetland features that buffer the effects of increased vessel size and frequency from the widening of the MSC. We recomend all features consider some type of levee armoring to mitigate excessive wave action or have a design using sacrifical berms until a functioning mature marsh is established. New work material, while suitable for levee construction, could be benefically used to create bird islands ultimatley supporting thousands of nesting colonial waterbirds throughout Matagorda Bay and the Gulf of Mexico. In other areas along the Texas coast, bird islands closer to mainland shorelines are more likely to expereince predator disturbance and could lead to island abandonment. Bird island design should incorporate large areas of marsh, uplands, beach, and sea grass beds (bird usage of these habitats are well documented throughout the seasons), distance to foraging grounds, optimal island size, vegetation, and distance to nearest mainland shoreline.

Strategically placed earthen terraces (also uses new work material) can successfully control wave action promoting shoreline stabilization and marsh growth over time. New work material can be transported to oustide of the traditional six miles pumping radius to other areas of Matagorda Bay or other bay systems where an island(s) or terracing project may be of need. The Service strongly supports long term creative solutions where sediments are responsibly returned to the aquatic ecosytem and wildlife habitats are restored, enhanced, and protected. Considerations of sea level rise and the evolving science surrounding the beneficial use of dredge material, particulary for the creation and maintenace of colonial waterbird nesting islands should be incorporated into the project design in order to optimize the positive environmental goals for a placement area (Frederick, 2006). The Service will continue to coordinate with the ICT to determine suitable placement of wetland and island features should this option become available.

Recommendations

As a result of the previous extensive coordination efforts on the MSC between the Service and the Corps, numerous hydrodynamic, oyster, salinity, and sedimentation studies were conducted resulting in a better understanding of the complex ecosystem dynamics of Matagorda Bay. While most of these surveys are outdated and not applicable for this study effort, the Service supports the Corps desire to include future modeling efforts to determine potential impacts with the associated alternatives. The Service requests access to the modeling data, reports, and summaries as they become available and understands that not all of the modeling or surveys may not be completed and reviewed in time for the final FWCA report. As such, Service recommendations may be limited and only reflect what information is made available. Should surveys and modeling reports become available after the final FWCA report is submitted, the Service recommends a supplemental FCWA report aimed at addressing those additional modeling and mitigation issues not previously accounted for in the first FWCA report.

The Service does not object to the Corps providing greater accessibility and safety measures for shipping traffic to access the Matagorda Ship Channel provided the following fish and wildlife recommendations are incorporated into future project planning and implementation:

1. Conduct oyster sampling efforts in coordination with the ICT to confirm live shell and cultch material presence/absence in areas of the MSC that lie within Matagorda Bay. Should live oyster shell be found, the Service recommends complete avoidance of the shell or reef. If avoidance is not possible, the Service recommends the Corps minimize dredging and siltation impacts within 500-ft of the project area and fully coordinate with the ICT prior to the commencement of any dredging activities. Mitigation for any direct or indirect oyster impacts will be fully compensated as coordinated with the ICT.
2. The Service agrees with the Corps' use of the Swannack (2014) model to quantify unavoidable impacts to shell and oyster habitat within the study area. Results from the modeling efforts shall be used to develop a mitigation plan to be coordinated with the ICT.
3. Provide data/modeling reports documenting the hydrodynamic changes forecasted in Matagorda Bay as a result of the preferred alternatives for the Service's evaluation.
4. The Service urges the Corps to adopt a policy/standard operating procedure to use at least 50 % and preferably 75% of maintenance dredge and new work material beneficially over the 50-year time period of this federal project. As such, we recommend the Corps re-evaluate the DMMP to include beneficial use opportunities in lieu of disposing of the material offshore or to confined upland disposal sites. Additionally, we urge the Corps to evaluate transporting new work and maintenance material to areas outside of the typical 6-mile pump distance to other areas along the Matagorda Bay shoreline and along the Gulf Inter-coastal Waterway (GIWW) as cost alternatives to placement area construction and levee rising. Dredged material can be used to combat changes in water levels, erosion, and subsidence in most marsh habitats found along Matagorda Bay and the entire GIWW.
5. The Service strongly urges the Corps to continue coordination with EPA and Alcoa to assess the ongoing mercury contamination issues associated with the Alcoa/Point Comfort facility. Future restoration associated with the Matagorda Channel Improvement Project could be negatively impacted as a result of the ongoing contamination and we request the Corps provide timely updates regarding the results of ongoing monitoring efforts.
6. All new work and maintenance material should be thoroughly tested for contaminants using the standards outlined in the EPA's Inland Testing and Ocean Dumping Manuals prior to being used in any beneficial use projects, placement in upland confinement, or offshore disposal sites. Should data suggest toxic levels of contaminants are present, the Service recommends disposal of the material in accordance to EPA guidelines and within an approved landfill site.
7. The Service strongly supports long term solutions where sediments are responsibly returned to the aquatic ecosytem. New material from deepening or widening measures is usually suitable for island construction, while finer dredged materials and sands may be used for marsh or sand mound creation or restoration. The Service can assist with appropriate location and design of new island(s), marsh, mound, or terracing projects within and outside of the immediate study area. Island specifics may include construction of a 2 to 12-acre island, approximately 8ft above mean high water or flood stage at least one half mile (preferably one mile) or offshore in a nearby bay. The island should include a sloping sand beach, preferably protected by a rock breakwater structure similar in design to Evia Island in Galveston Bay. Fully coordinate and vet all island and marsh design plans through the ICT prior to commencement of any construction.
8. We recommend presence/absence seagrass surveys be conducted in areas where seagrass habitat is suspected prior to construction or dredging for any project elements. Survey findings should be submittedto the Corps MSC and Seagrass ICTs for reveiw. Impacts to seagrass habitat should be avoided. Coordination with the Corps' Seagrass ICT will ensure proper survey protocols and protection measures are implemented. Additionally, any dredge material identifyed as beneficial use for seagrass habitat should be coordinated with the ICT prior to the depostion of matieral.

9. Any beach nourishment features will be thoroughly coordinated and vetted through the ICT and specifically the Service as critical habitat modifications would likely need to undergo formal consultation pursuant to Section 7 of the Act. However, general beach placement guidelines will need to be adhered to (and may not be limited to the following): material placed on the beach will be beach quality sand consistent in grain size, color and composition with the existing beach, and free of hazardous contaminants with a gradual slope to minimize scarping.
10. Specific to the whooping crane, the Service has the following general recommendations: no work is to be done in designated critical habitat. Project equipment that may be a collision hazard (guy wires that support dredging equipment, telecommunication towers on dredges, antenna or similar items located on dredges) will be marked using red plastic balls or other suitable marking devices sized and spaced, and lighted during inclement weather conditions when low light and/or fog is present and implemented from October 1 through April 30. A Spill Response Plan will be prepared and implemented prior to the onset of construction activities. These actions do not alleviate the Corps responsibility of evaluating project actions and initiating formal Section 7 consultation and should not be construed as such.
11. The Service encourages the Corps to initiate coordination during the design phases of the project and prior to the commencement of any construction activities in Matagorda Bay so the site specific best management practices (BMPs) can be developed. Measures should be implemented to avoid or minimize the adverse effects of pollution, sedimentation, and erosion by limiting soil disturbances, scheduling work when the fewest number of fish are likely to be present, managing likely pollutants, and limiting the harm that may be caused by accidental discharges of pollutants and sediments. BMPs attempt to minimize impacts to fish and wildlife species within the immediate construction and nearby areas and may consist of floating turbidity curtains, limiting certain construction activities to daylight hours, limiting the use of or shielding lights at night, no vegetation removal or soil disturbance should be allowed outside of the project area, removal of mature trees providing soil or bank stabilization should be coordinated with the Service and TPWD, erosive banks should be stabilized using bioengineering solutions and minimize the use of riprap, and using monitors in open water areas to identify sensitive species.
12. Construction of any improvement features (as defined on page 1) shall occur at least 1,000 feet away from a colonial waterbird rookery site during the breeding season of February 1 to September 1.
13. Avoid contact with any colonial waterbird rookery sites that may be within the project area. These sites are most likely active February 1 through September 1.
14. Newly created marsh sites shall be planted as early as possible to minimize erosion. Plants and planting schedules should be fully vetted and coordinated with the ICT. The Service may recommend delayed plantings so as to allow for natural vegetative recruitment and threatened and endangered species utilization when possible.
15. Any newly created sand mound projects shall be placed in low energy wave environments, include wave protection measures (e.g. temporary erodible berms), and be constructed to mitigate wave fetch.
16. Avoid impacts to all existing marshes. If the Corps deems impacts to be unavoidable, the Service recommends mitigation for any direct or indirect wetland impacts with full compensation as coordinated with the ICT.
17. The Corps shall initiate coordination with NMFS regarding EFH, sea turtle impacts, and mitigation issues within the project area.
18. Cumulative effects from this and the Texas Coastal Study project must be considered when developing project features and mitigation plans. We recommend the federal sponsor along with the Corps work in coordination with counterparts from the Texas Coastal Study to develop complimentary project features and mitigation plans.

19. The Service supports acquisition, restoration and preservation of natural resources within the project area and is willing to assist the Corps in identifying suitable areas in need.
20. Should this project move to the design and construction phases, the Service recommends the Corps evaluate the project's effects on threatened and endangered species and other natural resources by using the IPaC system at http://ecos.fws.gov/ipac/and initiate any necessary consultation procedures pursuant to Section 7 of the Act.
21. The Corps should identify and protect areas where shoreline erosion is imminent as a result of the channel's widening efforts. Modeling of current and future anticipated vessel traffic along with projected hydrodynamics should provide a fundamental analysis identifying shoreline impacts from the proposed project. The Service supports protecting shorelines using non-structure or living shoreline methods as an alternative to hard structures such as bulkhead or riprap. However, we are not opposed to the use of hard structures should the identified shorelines need additional protection from increased wave fetch and future erosion. The Service further recommends the Corps coordinate with the MSC ICT when making these shoreline protection determinations.
22. The Corps and the CPA should work with local industry and shipping companies to develop a comprehensive and environmentally responsible MSC wide DMMP that uses sediment responsibly for the foreseeable future. The creation and modification of placement areas are costly alternatives and more times than not, is the preferred alternative. The Service's National Wildlife Refuge System has nearby refuges that would greatly benefit from dredge material and barging the material out of the study area should be considered as an alternative to upland or offshore disposal.
23. We recommend the Corps evaluate the selected improvement measures for impacts to units protected under the Coastal Barrier Resource Act of 1982.

We appreciate the opportunity to identify and highlight key natural resources within the project area and the fish and wildlife that inhabit them. The Service believes the recommendations in this letter will guide the Corps in developing an environmentally sound project that eliminates or significantly reduces negative impacts natural resources within the project area. We look forward to working with the Corps and our partners on the ICT to further define the alternatives and develop a Tentatively Selective Plan that meets the goals of the project while remaining environmentally responsible. Please contact staff biologist, Donna Anderson or myself at 281-286-8282 with any questions.

Sincerely,

Charles Ardizzone
Field Supervisor

Cc: Winston Denton, TPWD
Rusty Swafford, NMFS
Barbara Keiler, EPA

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Enclosure 6 – Section 404(b)(1) Short Form

Matagorda Ship Channel, TX

Section 216 – Review of Completed Projects
Integrated Draft Feasibility Report and Environmental Impact Assessment

April 2018

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MATAGORDA SHIP CHANNEL, PORT LAVACA, TEXAS

EVALUATION OF SECTION 404(b)(1) GUIDELINES (SHORT FORM)

PROPOSED PROJECT: Matagorda Ship Channel Improvement Project Draft Integrated Feasibility Report and Environmental Impact Statement

	Yes	No*
1. Review of Compliance (230.10(a)-(d))		
A review of the proposed project indicates that:		
a. The placement represents the least environmentally damaging practicable alternative and, if in a special aquatic site, the activity associated with the placement must have direct access or proximity to, or be located in the aquatic ecosystem, to fulfill its basic purpose (if no, see section 2 and information gathered for EA alternative). (See Appendix F)	**X**	
b. The activity does not appear to:		
1) Violate applicable state water quality standards or effluent standards prohibited under Section 307 of the Clean Water Act; (See Appendix B, Section 4.9.3)	**X**	
2) Jeopardize the existence of Federally-listed endangered or threatened species or their habitat; and (See Appendix B, Section 4.13)	**X**	
3) Violate requirements of any Federally-designated marine sanctuary (if no, see section 2b and check responses from resource and water quality certifying agencies). (See Appendix B, Enclosure 2)	**X**	
c. The activity will not cause or contribute to significant degradation of waters of the U.S. including adverse effects on human health, life stages of organisms dependent on the aquatic ecosystem, ecosystem diversity, productivity and stability, and recreational, aesthetic, an economic values (if no, see values, Section 2) (See Appendix B, Section 4.9.3)	**X**	
d. Appropriate and practicable steps have been taken to minimize potential adverse impacts of the discharge on the aquatic ecosystem (if no, see Section 5) (See Appendix B, Section 4.9.3)	**X**	

	Not Applicable	Not Significant	Significant*
2. Technical Evaluation Factors (Subparts C-F) (where a 'Significant' category is checked, add explanation below.)			
a. Physical and Chemical Characteristics of the Aquatic Ecosystem (Subpart C) (See Appendix B, Section 4.9.3)			
1) Substrate impacts		**X**	
2) Suspended particulates/turbidity impacts		**X**	
3) Water column impacts		**X**	
4) Alteration of current patterns and water circulation		**X**	

5) Alteration of normal water fluctuation/hydroperiod		X	
6) Alteration of salinity gradients		X	
b. Biological Characteristics of the Aquatic Ecosystem (Subpart D)			
1) Effect on threatened/endangered species and their habitat		X	
2) Effect on the aquatic food web		X	
3) Effect on other wildlife (mammals, birds, reptiles and amphibians)		X	
	Not Applicable	**Not Significant**	**Significant***
2. Technical Evaluation Factors (Subparts C-F) (where a 'Significant' category is checked, add explanation below.)			
c. Special Aquatic Sites (Subpart E)			
1) Sanctuaries and refuges	X		
2) Wetlands Approximately 1.1 acre of low marsh will be impacted by placement in an area previously used for agricultural purposes. Approximately 17.9 acres of high marsh will be impacted by placement at a confined bay placement area. (See Appendix B, Section 4.10 and Enclosure 1)			X
3) Mud flats	X		
4) Vegetated shallows	X		
5) Coral reefs	X		
6) Riffle and pool complexes	X		
d. Human Use Characteristics (Subpart F) (See Appendix B, Section 4.12)			
1) Effects on municipal and private water supplies	X		
2) Recreational and Commercial fisheries impacts		X	
3) Effects on water-related recreation	X		
4) Aesthetic impacts		X	
5) Effects on parks, national and historical monuments, national seashores, wilderness areas, research sites, and similar preserves	X		

3. Evaluation of Dredged or Fill Material (Subpart G)	
a. The following information has been considered in evaluating the biological availability of possible contaminants in dredged or fill material (check only those appropriate) (See Appendix F)	
1) Physical characteristics	
2) Hydrography in relation to known or anticipated sources of contaminants	X

3) Results from previous testing of the material or similar material in the vicinity of the project	**X**
4) Known, significant sources of persistent pesticides from land runoff or percolation	
5) Spill records for petroleum products or designated (Section 311 of Clean Water Act) hazardous substances	
6) Other public records of significant introduction of contaminants from industries, municipalities or other sources	**X**
7) Known existence of substantial material deposits of substances which could be released in harmful quantities to the aquatic environment by man-induced discharge activities	

List appropriate references:

1) Moffatt and Nichol**.** 2006. Sedimentation Study, Matagorda Ship Channel Improvement Project. Prepared by Mofatt and Nichol. 11011 Richmond Avenue, Suite 200, Houston, TX 77042. October, 2006.
2) PBS&J. 2009. Final Environmental Impact Statement (FEIS) for USACE regarding The Proposed Matagorda Ship Channel Improvement Project, Austin, TX
3) URS. 2014. Section 204(f) Feasibility Report for Calhoun Port Authority, Matagorda Ship Channel Improvement, Houston, TX
4) URS. 2006. Matagorda Sedimentary Analysis. Prepared by: URS Corporation, 10550 Richmond Avenue, Suite 155, Houston, TX 77042. October, 2006.

		No
b. An evaluation of the appropriate information in 3a above indicates that there is reason to believe the proposed dredged or fill material is not a carrier of contaminants, or that levels of contaminants are substantively similar at extraction and placement sites and not likely to degrade the placement sites, or the material meets the testing exclusion criteria.	**X**	

	Yes
4. Placement Site Delineation (230.11(f)) (See Appendix F)	
a. The following factors as appropriate, have been considered in evaluating the placement site:	
1) Depth of water at placement site	**X**
2) Current velocity, direction, and variability at placement site	**X**
3) Degree of turbulence	**X**
4) Water column stratification	**X**
5) Discharge vessel speed and direction	**X**
6) Rate of discharge	**X**
7) Fill material characteristics (constituents, amount, and type of material, settling velocities)	**X**
8) Number of discharges per unit of time	**X**
9) Other factors affecting rates and patterns of mixing (specify)	**X**

List appropriate references:

	Yes	No
b. An evaluation of the appropriate factors in 4a above indicates that the placement site and/or size of mixing zone are acceptable.	X	

	Yes	No
5. Actions to Minimize Adverse Effects (Subpart H)		
All appropriate and practicable steps have been taken, through application of recommendations of 230.70-230.77 to ensure minimal adverse effects of the proposed discharge.	X	

List actions taken:

1) Silt curtains will be utilized to prevent inadvertent discharge of fill material into adjacent wetlandfs or waterbodies. Forestry BMPs will be utilized to prevent disturbance of forest floors.

	Yes	No*
6. Factual Determination (230.11)		
A review of appropriate information as identified in items 2-5 above indicates that there is minimal potential for short- or long-term environmental effects of the proposed discharge as related to:		
a. Physical substrate at the placement site (review Sections 2a. 3, 4, and 5 above)	X	
b. Water circulation, fluctuation and salinity (review Sections 2a. 3, 4, and 5)	X	
c. Suspended particulates/turbidity (review Sections 2a. 3, 4, and 5)	X	
d. Contaminant availability (review Sections 2a. 3, and 4)	X	
e. Aquatic ecosystem structure and function (review Sections 2b and c, 3, and 5)	X	
f. Placement site (review Sections 2, 4, and 5)	X	
g. Cumulative impacts on the aquatic ecosystem	X	
h. Secondary impacts on the aquatic ecosystem		

7. Evaluation Responsibility	
a. This evaluation was prepared by:	**Harmon Brown**
Position:	**Biologist, PEC-C**

8. Findings	
a. The proposed placement site for discharge of or fill material complies with the Section 404(b)(1) Guidelines.	**X**
b. The proposed placement site for discharge of dredged or fill material complies with the Section 404(b)(1) Guidelines with the inclusion of the following conditions:	

List of conditions:

c. The proposed placement site for discharge of dredged or fill material does not comply with the Section 404(b)(1) Guidelines for the following reason(s):	
1) There is a less damaging practicable alternative	
2) The proposed discharge will result in significant degradation of the aquatic ecosystem	
3) The proposed discharge does not include all practicable and appropriate measures to minimize potential harm to the aquatic ecosystem	

____________________ Date	______________________________________ DOUG SIMS Chief, PEC-C

NOTES:

* A negative, significant, or unknown response indicates that the permit application may not be in compliance with the Section 404(b)(1) Guidelines.

Negative responses to three or more of the compliance criteria at the preliminary stage indicate that the proposed projects may not be evaluated using this "short form" procedure. Care should be used in assessing pertinent portions of the technical information of items 2a-e before completing the final review of compliance.

Negative response to one of the compliance criteria at the final stage indicates that the proposed project does not comply with the Guidelines. If the economics of navigation and anchorage of Section 404(b)(2) are to be evaluated in the decision-making process, the "short form" evaluation process is inappropriate.