DRAFT ENVIRONMENTAL ASSESSMENT

MATAGORDA SHIP CHANNEL
UPPER REACH PLACEMENT AREA
RELOCATION PROJECT

CALHOUN COUNTY,

TEXAS

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LIST OF ACRONYMS AND ABBREVIATIONS

APE	area of potential effect
BEG	Bureau of Economic Geology
BOB	BOB Hydrographics, LLC
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CESWG	U.S. Army Corps of Engineers, Galveston District
CEQ	Commission on Environmental Quality
CFR	Code of Federal Regulations
CIRP	Coastal Inlets Research Program
CO	carbon monoxide
DOER	Dredging Operations and Environmental Research
E	endangered
EA	environmental Assessment
EFH	essential fish habitat
EPA	U.S. Environmental Protection Agency
ERDC	U.S. Army Engineer Research and Development Center
ESA	Endangered Species Act of 1973
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
GIWW	Gulf Intracoastal Waterway
GMFMC	Gulf of Mexico Fishery Management Council
GRN	Global Restoration Network
HAPC	Habitat Area of Particular Concern
HTRW	Hazardous, Toxic, and Radioactive Waste
Inland Testing Manual	*Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual*
mcy	million cubic yards
MLT	mean low tide
MSC	Matagorda Ship Channel
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Services
NO_2	nitrogen dioxide
NPL	National Priority List or Superfund
NRHP	National Register of Historic Places
O_3	ozone
Ocean Testing Manual	*Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual*
PA	placement area
PAH	polycyclic aromatic hydrocarbons
Pb	lead

PM_{10}	particulate matter equal to or less than 10 microns in diameter
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
ppt	parts per thousand
R&D	Research and Development
RSM	Regional Sediment Management
SA	survey area
SAV	submerged aquatic vegetation
SO_2	sulfur dioxide
T	threatened
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
THC	Texas Historical Commission
TPWD	Texas Parks and Wildlife Department
TRI	Toxic Release Inventory
TSWQS	Texas Surface Water Quality Standards
TWDB	Texas Water Development Board
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
Western PA	dredged material placement areas located west of the Matagorda Ship Channel

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INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Galveston District (CESWG), has prepared this Environmental Assessment (EA) to evaluate the potential impacts associated with the utilization of dredged material placement areas (PA) located west of the Matagorda Ship Channel (MSC) ("Western PA") in order to significantly reduce channel shoaling in the upper reaches of the Matagorda Bay and lengthen the time between dredging cycles in this area. Presently, dredged sediments from channel maintenance are disposed in open-water placement areas adjacent to the eastern edge of the channel. The navigation project is located in the vicinities of Port O'Connor, Port Lavaca, and Point Comfort in Matagorda and Calhoun Counties, Texas (Figure 1). This EA has been prepared in accordance with the National Environmental Policy Act (42 USC 4321 et seq.) and the Council on Environmental Quality's (CEQ) Regulations (40 CFR 1500-1508), and USACE Engineering Regulation ER 200-2-2. The following sections include a discussion of the purpose and need for the proposed action, the authority for the proposed action, alternatives to the proposed action, important resources affected by the proposed action, and the direct, indirect, and cumulative impacts of the proposed action.

PURPOSE AND NEED FOR THE PROPOSED ACTION

The MSC is a deep-draft federal navigation channel that was originally authorized in 1910 to be seven feet deep by 89 foot wide under House Doc. 1082, 60th Congress, 2nd Session. In 1958, the 25 mile (40 kilometer) section into Matagorda Bay was authorized to 38-foot-deep mean low tide (MLT) by 300-foot-wide entrance channel extending through a jettied inlet and connecting the Gulf of Mexico and Matagorda Bay. The main channel in the bay was authorized to 36 feet deep by 200 feet wide and terminates at a 1,000-foot by 1,000-foot-wide turning basin at Point Comfort in Lavaca Bay.

Currently, dredged sediments from channel maintenance are disposed in open-water placement areas adjacent to the eastern edge of the MSC (Figure '2). Critical shoaling in upper reaches of the MSC has caused annual draft restrictions, resulting in the need for annual maintenance dredging projects to ensure safe passage of commercial shipping.

The excessive shoaling is mainly due to the disposal of dredged sediments into adjacent open-water areas from which the material quickly migrates back into the channel. Additionally, sedimentation from the upper Lavaca Bay contributes to the high shoaling rate in the upper reach. Presently, dredging to the authorized depth without advanced maintenance decreases the duration of channel availability to fewer than 6 months per year. Measures to control shoaling in the MSC would significantly benefit the project by increasing the duration of channel availability to greater than the present 6 months per year and conserving limited maintenance funding by increasing the

cycle time between dredging.

To reduce the channel infilling rate and provide a remedial solution in the upper reach of the MSC, three Research and Development (R&D) programs at the U.S. Army Engineer Research and Development Center (ERDC) worked collectively to investigate and perform numerical modeling of sediment transport for the MSC in the Matagorda Bay system. These three R&D programs were as follows: The Regional Sediment Management (RSM) Program, Coastal Inlets Research Program (CIRP), and Dredging Operations and Environmental Research (DOER) Program. The results of the collaborative efforts of these programs are the bases of the alternatives considered and the proposed action.

Figure 1: Project Vicinity Map

Figure 2: Project Location Map

AUTHORITY FOR THE PROPOSED ACTION

The U.S. Army Corps of Engineers, Galveston District (USACE) under the authority of Section 404 (33 U.S.C. 1344) of the Clean Water Act, Section 10 (33 U.S.C. 403) of the Rivers and Harbors Act, and Section 103 of the Marine Protection Research and Sanctuary Act (33 U.S.C. 1413), is the lead agency for the permit action. This Environmental Assessment was prepared as required by the National Environmental Policy Act (NEPA) to present an evaluation of potential impacts associated with the proposed Matagorda Ship Channel Upper Reach Placement Area Relocation Project.

The existing MSC is approximately 26 miles long extending from the 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. The in-bay channel is authorized to a project depth of –36 feet (ft) mean low tide (MLT), plus 2ft of advanced maintenance depth and an additional 2ft of over depth to compensate for physical conditions and inaccuracies in the dredging process. The channel has a 200-ft bottom width with 3 horizontal to 1 vertical sideslope ratios. The entrance channel in the Gulf is maintained at –38ft MLT plus 3ft of advanced maintenance depth and 2ft of over depth and 10 to 1 sideslopes. The USACE is responsible for the continued maintenance dredging of both the entrance and in-bay channels of the MSC (DEIS 2007).

PRIOR REPORTS

- Matagorda Ship Channel DEIS 2007
- MSC Dredge Contamination Report 2006
- ERDC Sediment Management Study 2013

PUBLIC CONCERNS

Public concerns regarding dredging projects commonly include (1) use of the dredged material for beneficial use, (2) affects to recreation and water quality, (3) the protection of environmental resources, and (4) maintaining navigable channels for commerce and trade.

Throughout the planning and development of the proposed project, public views and concerns have been considered and are reflected in this EA document. The main project objectives, evaluating impacts of various alternatives and identifying potential Western PA locations, have been planned in a socially and environmentally friendly manner.

DESCRIPTION OF THE PROPOSED ACTION

The proposed action consists of utilization of the Western PAs located adjacent to the western edge of the navigation channel. Modeling, consisting of placement of material for a period of 6 months within the Western PA alternative, yielded a projected decrease in shoaling of 25 percent, with 2.89 million cubic yards (mcy) (wet volume). In addition, the utilization of the Western PAs should not cause circulation issues because they are submerged. Therefore, the RSM team recommended the utilization of the Western PA for further analysis in the implementation phase.

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives considered during plan formulation, in addition to the No-Action and the proposed Western PA Alternatives, included (1) a confined artificial island south of Port Comfort, located in the northeast portion of the bay, to contain the dredged material from the upper channel; (2) extension of an existing geotube east of the upper channel, to close the gaps between dredged material PAs; and (3) application of nautical depth concept and higher resolution survey techniques.

Based on channel surveys and field data collection in the past, ERDC evaluated potential action alternatives to reduce the sediment accretion in the upper MSC through numerical modeling. Alternative modeling was performed by modifying the existing USACE Coastal Modeling System grid for each alternative and running a simulation for the 6-month period from September 2006 to February 2007. The cumulative sediment volume change was then compared in three channel sections, Reach 1, Reach 2, and Reach 3. The application of nautical depth concept and higher resolution survey techniques was not modeled but is discussed in general terms in this section. For additional information, refer to Appendix A for the 2013 USACE ERDC Sediment Management Study.

No-Action Alternative

Under the No-Action Alternative, no action would be undertaken by CESWG. The critical shoaling in the upper reaches of the MSC would continue, causing annual draft restrictions that result in the need for annual maintenance dredging projects. Project funding is typically limited, and dredging to the authorized depth without advanced maintenance would decrease the duration of channel availability to fewer than 6 months per year.

Confined Artificial Island Alternative

The artificial island alternative consists of a confined artificial island south of Port Comfort that would be located in the northeast portion of the bay, to contain the dredged material from the upper channel. Modeling of this alternative decreased the shoaling in the upper channel region by 7 percent, resulting in the deposition of 3.58 mcy (wet volume) of material during the 6-month period. This alternative did not significantly reduce the sediment deposition in the channel reaches as compared to the proposed action and the geotube alternative.

Extension of Existing Geotube Alternative

This alternative would consist of extension of an existing geotube east of the upper channel, to close the gaps between dredged material PAs. Modeling of this alternative decreased shoaling by 26 percent, with a total of 2.85 mcy (wet volume) of material during the 6-month period modeled. However, due to maintenance requirements and the inevitable damage of geotube structures over time, geotube extension is not considered a feasible alternative. Additionally, the geotube alternative may affect bay circulation, which would pose significant issues with water circulation and possibly water quality problems, as well as other environmental issues.

Application of Nautical Depth Concept

The application of the nautical depth concept is valid where siltation material consists of fluid mud, which has such low strength characteristics that it does not cause problems for navigation. Although the upper part of the mud layer has a somewhat higher density than water, its fluid behaviors are comparable with those of water, so that a ship's hull suffers no damage when it penetrates this interface. Fluid mud flow up the MSC was observed from survey data. However, higher resolution survey techniques, as compared to conventional acoustic (echosounding) depth measurement, would be needed to enable a more definitive identification of such areas.

ENVIRONMENTAL SETTING

GENERAL

The proposed project is located in Calhoun County in the Coastal Prairies province within the Gulf Coastal Plain physiographic region in southeast Texas. The coastal prairie landscape consists of nearly flat prairie ranging in elevation from 0 feet to 300 feet, with nearly flat geologic strata of deltaic sands and muds (Bureau of Economic Geology [BEG] 1996). Land elevations adjacent the project location range from sea level along the coastal shorelines, up to approximately 5 feet at the interior of spoil islands, and up to approximately 25 feet at man-made levees at the northern end (U.S. Geological Survey 2016a, 2016b, and 2016c). The region is sparsely populated beyond the small coastal communities of Point Comfort and Port Lavaca at the shores of Lavaca Bay, and Port O'Connor and Palacios at the shores of Matagorda Bay.

The Lavaca Bay system, where the proposed Western PA is situated within Calhoun County, is part of the larger Matagorda Bay system, which also includes Carancahua Bay, Turtle Bay, and Tres Palacios Bay, as well as smaller waterbodies like Powderhorn Lake and Oyster Lake. The Lavaca Bay system itself consists of Lavaca Bay and the smaller Cox, Keller, and Chocolate Bays, and covers an area of about 60 square miles at an average depth of 4 feet (Global Restoration Network [GRN] 2010). The Lavaca Bay system is a tidally influenced brackish environment, receiving freshwater drainage from the Lavaca River, Garcitas Creek, Placedo Creek, Catfish Bayou, and Keller Creek, and intermixes with tidal brackish waters from Matagorda Bay and saline waters of the Gulf of Mexico.

According to National Oceanic and Atmospheric Administration (2016) nautical charts, bay waters in the vicinity of the project area range from 1 to 7 feet deep, and the existing MSC is maintained at 36 to 38 feet below MLT (USACE 2007). However, water levels fluctuate within the bays and marshes according to tide and wind influences. The GIWW also bisects the MSC 12 miles south of the project area.

Lands east and west of the MSC along the coastal shoreline contain upland, marsh, and developed areas. The "Lavaca Bay Spoils," spoil island areas oriented north-south and paralleling the eastern side of the MSC, contain uplands and marsh. Protected coastal areas along Matagorda Bay are the Aransas National Wildlife Refuge 3 miles southwest of the project and the Mad Island Wilderness Management Area 29 miles east of the project.

The Western PA is located in the southwest portion of Lavaca Bay between the MSC and the western shoreline; the Western PA is south of Port Lavaca and Chocolate Bay, nearest the unincorporated communities of Alamo Beach and Magnolia Beach. The Western PA is characterized by shallow open water with depths of 4 to 7 feet. In the vicinity of the Western PA, substrate consists of a mixture of sand, silt, and clay, as well as patches of scattered shell and oyster reef and is likely non-vegetated, as the area depth is too deep for emergent vegetation and too turbid for seagrass. However, bay waters contain salinities conducive for estuarine fish and shellfish, and bay and marsh complexes provide excellent spawning and nursery areas for recreational and commercial species. Texas coasts also provide habitat for over 300 migratory and non-migratory (resident) bird species. The Lavaca Bay system provides important habitat for waterfowl, wading birds, marsh birds, and shore birds, and higher elevations of shrub-dominated spoil banks provide important stopover habitat for numerous neotropical migratory songbird species which breed in North America and spend the winter in Mexico, the Caribbean, and Central or South America.

CLIMATE

The climate of Calhoun County is humid subtropical. Warm, moist southeasterly winds from the Gulf of Mexico prevail throughout most of the year, with occasional cool, dry fronts dominated by northeast high pressure systems. The influx of cold air occurs less frequently in autumn and only rarely in summer. From the 1930s to the 2000s, Calhoun County averaged about 2.5 tropical storms and 2.5 hurricanes per decade, typically occurring from June to October (Homefacts 2017). Summer thunderstorms are common, though the area has a low risk for tornados. Average annual temperature is 70.8 degrees Fahrenheit with average monthly temperatures varying from the low 90s in July and August, to the mid-40s in December and January. Average annual precipitation is 42.8 inches with average monthly precipitation varying from 4.7 inches in September to 2.4 inches in April (U.S. Climate Data 2017)

GEOLOGY

The geology of Calhoun County was formed during the Beaumont Formation of the Quaternary period (BEG 1992). Tertiary formations underneath the area were most likely deposited in a marine environment, and over millions of years, the sediment laden rivers have deposited several thousand feet of clay, silt, sand, and gravel through the area to create the current deltaic system (Texas Board of Water Engineers 1962). Surface geology surrounding Lavaca Bay consists of predominantly clay (*Qbc*), sand (*Qbs*), and alluvium (*Qal*) areas, as well as spoil islands within Lavaca Bay (BEG 1987). This geologic foundation supports two main physiographic surfaces: coastal prairie and coastal marsh. Likewise, it supports three main ecoregions: northern humid gulf coastal prairies, floodplains and low terraces, and midcoast barrier islands and coastal marshes (BEG 2010).

Calhoun County lies over the Gulf Coast aquifer (BEG 2001), which spans from Florida to Mexico along the Gulf of Mexico and is comprised of interbedded clays, silts, sands, and gravels. The four major components of the Gulf Coast Aquifer, from shallowest to deepest, include the Chicot, Evangeline, Jasper, and Catahoula Aquifers (Texas Water Development Board "TWDB" 1995). The Chicot-Evangeline boundary runs mostly parallel to the coast and forms an outcrop about 90 miles inland (Baker 1979). Industrial, public, and private water supply wells in the Point

Comfort, Port Lavaca, and Port O'Connor communities draw from the Gulf Coast Aquifer's Beaumont Clay, Lissie Formation, and the Chicot Aquifer (TWDB 2017).

The U.S. Department of Agriculture's Natural Resources Conservation Service (2017) SSURGO soils mapping identifies the following types of soils at shores adjacent the project area: primarily clay and clay loam north and east, clay to the west, and coastal beaches and clay loam to the south. The predominant soil map units, as described below, are Ijam clay (Ic); Laewest clay, 3 to 8 percent slopes (Lc); Livia clay loam, 0 to 1 percent slopes (Lv); Livia clay loam, 2 to 5 percent slopes (Lx); Placedo clay, 0 to 1 percent slopes, frequently flooded, occasionally ponded (Pc); and Coastal beaches (PS).

Ijam clay is a poorly drained soil at mounds, with parent material from sandy and/or loamy dredge spoils. The soil profile is typically clay in the upper 80 inches, with the depth to water table within 36 inches of the surface. Frequency of flooding is rare and ponding does not occur due to its convex shape.

Laewest clay, 3 to 8 percent slopes, is a moderately well drained soil at linear flats, with parent material from clayey fluviomarine deposits derived from igneous, metamorphic, and sedimentary rock. The soil profile is typically clay in the upper 80 inches, with the depth to water table more than 80 inches deep. This soil unit does not generally flood or pond.

Livia clay loam, 0 to 1 percent slopes, is a poorly drained soil at linear flats, with parent material of loamy alluvium of the quaternary age. The soil profile is typically clay loam to 90 inches, with a clay layer from 6 to 26 inches; the depth to water table is within 30 inches of the surface. This soil unit rarely floods and does not pond.

Livia clay loam, 2 to 5 percent slopes, is a poorly drained soil at coastal plains, with parent material of loamy alluvium of the quaternary age. The soil profile is typically silt loam from 0 to 4 inches, silty clay from 4 to 54 inches, and clay from 54 to 84 inches. The depth to water table is within 30 inches of the surface. This soil unit rarely floods and does not pond.

Placedo clay, 0 to 1 percent slopes, frequently flooded, occasionally ponded is a very poorly drained soil at floodplains, with parent material of Holocene ag–clayey alluvium over loamy alluvium derived from igneous, metamorphic, and sedimentary rock. The soil profile is typically silty clay from 0 to 8 inches, clay from 8 to 36 inches, clay loam from 36 to 62 inches, and loam from 62 to 80 inches. The water table is at the surface, and this soil unit frequently floods and occasionally ponds.

Coastal beaches is a very poorly drained soil at beaches, with parent material of beach sand of Holocene age. The soil profile is typically fine sand from 0 to 60 inches, with the water table from 0 to 6 inches. This soil unit frequently floods.

IMPORTANT RESOURCES

This section contains a description of important resources and the impacts of the proposed action on these resources. The important resources described in this section are recognized by laws, executive orders, regulations, and other standards of national, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Important resources within the proposed project area include wetlands, aquatic resources, fisheries, essential fish habitat, wildlife, threatened and endangered species, water quality, air quality, recreational resources, nautical archaeology, socio-economics and environmental justice, and hazardous, toxic, and radioactive wastes. Cumulative impacts will be evaluated in a subsequent section at the end of this document. No prime or unique farmlands, as defined by the Farmland Protection Policy Act, would be affected by the proposed project. Similarly, the proposed action would have no adverse socio-economic impact on the nearest communities of Port Lavaca and Port Comfort. By providing storage capacity for dredged material removed from the MSC in the area, the project helps to ensure that navigation-related commerce in multiple port towns is protected. Finally, the proposed action would cause no adverse impact to the area's floodplain, a resource requiring consideration per Executive Order 1988 (Floodplain Management).

WETLANDS

This resource is institutionally important because of the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968. Wetlands are technically important because they provide necessary habitat for various species of plants, fish, and wildlife; serve as groundwater recharge areas; provide storage areas for storm and flood waters; serve as natural water filtration areas; provide protection from wave action, erosion, and storm damage; and provide various consumptive and non-consumptive recreational opportunities. Wetlands are publicly important because of the high value the public places on the functions and values that wetlands provide. Vegetated wetlands are important to fish and wildlife resources in the area and are in critical need of restoration.

Existing Conditions

Wetlands in the vicinity of the project area are tidally influenced (intertidal or subtidal) and classified as estuarine emergent; estuarine scrub-shrub; shore, mud, or sand flats; or open-water (U.S. Fish and Wildlife Service "USFWS" 2016). Vegetated wetland resources near the project area are generally confined to spoil islands and shoreline fringe areas, where substrate depths are shallow enough to support emergent vegetation or non-vegetated flats in the intertidal zone. Smooth cordgrass (*Spartina alterniflora*) is prevalent around the northern section of Dredge Island and along parts of the shoreline in proximity to the Alcoa Point Comfort facility; it also occurs in mixed stands with other marsh grasses in upper Lavaca Bay near the mouth of the Lavaca River and in portions of Cox Cove and Keller Bay (GRN 2010). Marsh-hay cordgrass (*Spartina patens*) is found in the upper reaches of Keller Bay, and shoregrass (*Distichlis littoralis*), saltgrass (*Distichlis spicata*), black rush (*Juncus roemerianus*), saltwort (*Batis maritima*), and glasswort (*Salicornia* spp.) are found along the shores and inland reaches of upper Lavaca Bay (GRN 2010).

Relative sea level rise and subsidence are local contributing factors to historical wetland changes

in the Lavaca and Matagorda Bay systems; most concerning may be the nearly doubling of the amount of open water (thus, wetland losses) from 1956 to 2008 (Tremblay and Calnan 2010).

Western PA Alternative

With the implementation of the proposed action, dredged material would be placed into the proposed disposal areas at elevations which would remain shallow open water. Vegetated wetlands would not be impacted as they are adjacent to dredge areas.

No-Action Alternative

Without implementation of the proposed action, dredged material would not be placed in the proposed disposal areas. The project area would remain as shallow open water.

AQUATIC RESOURCES

This resource is institutionally significant because of the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; Estuary Protection Act of 1968; Magnuson Fishery Conservation and Management Act of 1976, as amended; and Fish and Wildlife Coordination Act of 1958, as amended. Open waters are technically significant because they provide transitional habitat for various fish and shellfish, many of which are commercially or recreationally important. This resource is publicly significant because of the high value the public places on the functions and values that open water aquatic habitats provide.

Existing Conditions

The majority of the proposed disposal area is currently shallow, open water with substrate composed of fine sediments. These submerged lands are typically soft and almost fluid, but some areas are firm where heavier silts and sands have been deposited. Oyster reefs and scattered shell are abundant in Lavaca Bay and the Matagorda Bay system. Historical mapping, as shown in Figure 3, depicts the general distribution and change of oyster reef resources in the Lavaca Bay system. Data suggests the coverage of oyster reef has fluctuated in these bays from as little as 2,200 acres to as much as 6,500 acres of reef. Shellfish species including oysters, shrimp, and crabs are found in these estuarine waters. Many juveniles of these species use marsh fringe, shallow waters, and submerged aquatic vegetation (SAV) for grazing.

Estuarine SAV beds are typically found in waters less than 6 feet deep in areas with protection from high turbidity and wave action. Seagrass beds are a type of SAV resource along the Texas coast which generate high primary productivity and provide refuge for numerous species including shrimp, fish, crabs, and their prey (USACE 2007). Five estuarine SAV species occur in the Matagorda Bay system, including shoalgrass (*Halodule wrightii)*, widgeongrass (*Ruppia maritima*), turtlegrass (*Thalassia testudinum*), clovergrass (*Halophila engelmannir*), and manateegrass (*Syringodium filiforme*) (Adair et al. 1994, Stutzenbaker 1999). However, within the Lavaca Bay system, only shoalgrass and widgeongrass have been mapped in Keller Bay, Boggy Bayou, and Carancahua Bay (Salt Lake and Redfish Lake) (Adair et al. 1994; Texas General Land

Office 2016).

Freshwater algae and marine seaweed (*Sargassum* spp.), types of nonvascular SAV, also drift into the Lavaca Bay system (USACE 2007).

No SAV was identified within the project area due to the depth and turbidity. The nearest seagrass beds are located approximately 5 miles east of the project area, within Keller Bay (Adair et al. 1994; Texas General Land Office 2016). Additional details on the SAV assessment are presented in the marine archaeology survey provided in Appendix B.

Oyster resources surveys, were completed within a 1,500-acre survey area (SA) along the Western edge of the MSC to determine the extent of oyster resources within the Western PA Alternative.

Within SA 1, three areas totaling approximately 46.29 acres of scattered live oysters were present. Of those, approximately 0.66 acre of scattered live oysters were located within the limits of PA 16A.

Within SA 2, three areas totaling approximately 102.35 acres of scattered live oysters and two areas totaling 3.71 acres of consolidated oyster reef were identified. Of those, approximately 16.10 acres of scattered live oysters and 1.59 acres of oyster reef were located within the limits of PA 15A.

Within SA 3, five areas totaling approximately 9.58 acres of scattered live oysters and one area totaling 0.33 acre of consolidated oyster reef were identified. Of those, approximately 1.28 acres of scattered live oysters were located within the limits of PA 14A.

For additional information, refer to the oyster resources survey provided in Appendix C.

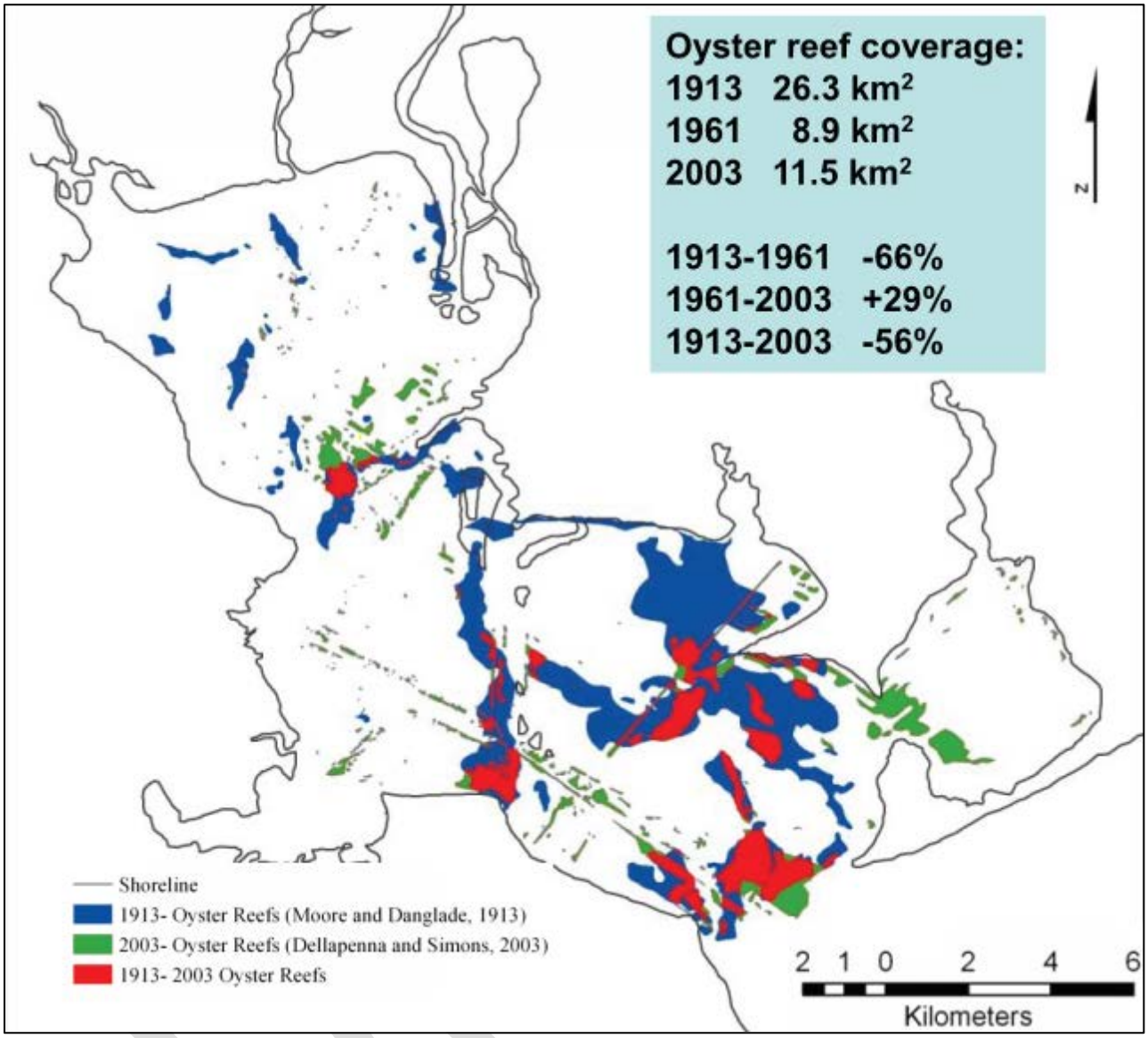

Figure 3: Historical Oyster Reef Mapping of Lavaca Bay (Dellapenna and Piper, 2010)

Western PA Alternative

With the implementation of the proposed action, it is anticipated that shallow, open-water bottoms within the project area would be covered with dredged material as a direct impact of each placement event. Open-water areas would remain open water, although with shallower depth contours on a temporary basis after each dredging event. Oyster reef could potentially be subject to elevated turbidity and minor siltation during disposal of dredge material during and shortly after each dredging event.

Placement of dredged material may directly impact and smother immobile benthic organisms found within open waters of the proposed disposal areas. More mobile aquatic species would be expected to relocate to more suitable habitat during construction activities. Indirect impacts to

aquatic habitat would generally be localized, temporary, and related to the disturbance of water bottoms during placement of material. Short-term impacts to aquatic species in the proposed disposal areas would likely occur from increased turbidity and temperature and decreased dissolved oxygen in the vicinity of the placement areas. Surrounding waters would be expected to return to ambient conditions after placement activities are completed and material settles. Placement of dredged material into the proposed disposal areas would be expected to alter the substrate elevation. Subsequently, this will directly impact water circulation, current pattern, and water fluctuation within the disposal areas and areas adjacent to the proposed disposal areas. Aquatic species would be expected to recolonize from adjacent areas after the completion of placement activities. Organisms from similar habitats adjacent to the project area would migrate to the disposal areas after settlement.

Based on the presence of oyster resources found during surveys, avoidance measures were employed to reduce the potential impacts to oysters from 25 acres to 0.19 acres. Repositioning the PAs would avoid impacts to oysters to the maximum extent practicable while reducing the dredging. During placement activities, the dredge pipe will keep a 500-foot buffer from oyster resources present within the vicinity of the Western PAs. A depiction of avoidance measures is shown in Figure 4.

No-Action Alternative

Without implementation of the proposed action, the proposed disposal areas would remain as shallow open water and no adverse indirect impacts would occur to fish and shellfish populations inhabiting the area.

Figure 4: Oyster Avoidance Map

FISHERIES

This resource is institutionally important because of the Fish and Wildlife Coordination Act of 1958, as amended. Fisheries resources are technically important because they are a critical element of many valuable freshwater and marine habitats, they are an indicator of the health of various freshwater and marine habitats, and many species are important commercial resources. Fisheries resources are publicly important because of the high priority that the public places on their aesthetic, recreational, and commercial value.

Existing Conditions

Fishing is a major recreational and commercial activity in the Lavaca and Matagorda Bay systems and surrounding waters. The marshes and waterways of the proposed project area provide important spawning and nursery habitat and a food source for a wide variety of saltwater fish species. Vegetation and marsh loss degrades the utility of the area as a nursery habitat and food source. Estuarine and saltwater species include commercial species such as black drum (*Pogonias cromis*), southern flounder (*Paralichthys lethostigma*), striped mullet (*Mugil cephalus*), and sheepshead (*Archosargus probatocephalus*), and recreational species such as spotted seatrout (*Cynoscion nebulosus*) and red drum (*Sciaenops ocellatus*). Commercial shellfish include brown shrimp (*Farfantepenaeus aztecus*), pink shrimp (*Farfantepenaeus duorarum*), white shrimp (*Litopenaeus setiferus*), blue crab (*Callinectes sapidus*), and eastern oysters (*Crassostrea virginica*). Most of these species utilize the transitional wetland habitats found in the area for shelter, nesting, feeding, cover, nursery, and other life requirements.

Estuarine bays in the area are rich in important benthic organisms, which are the foundation of aquatic and estuarine food webs. Other estuarine dependent fish species of Matagorda Bay are bay anchovy (*Anchoa mitchilli*), Atlantic croaker (*Micropogonias undulatus*), hardhead catfish (*Arius felis*), sand trout (*Cynoscion arenarius*), and Gulf menhaden (*Brevoortia patronus*) (Armstrong et al. 1987, Texas Parks and Wildlife Department [TPWD] 1975).

Western PA Alternative

With the implementation of the proposed action, direct and indirect impacts to fisheries resources would be associated with placement of dredged material in open-water bays and would be minimal, temporary, and localized to the Western PA. As a direct impact of placement of dredged material, immobile fish and benthic organisms could be adversely impacted. Impacts would also include minor displacement of mobile fish species. These impacts would be minimal and temporary, because mobile fish species would be able to avoid the discharge of sediment by moving to other areas in the vicinity with similar habitat and food sources during placement activities and could return to open-water areas in the project area after construction is completed. Placement of sediments would have indirect impacts on water conditions by temporarily increasing turbidity, temperature, and dissolved oxygen levels within the disposal areas and immediate vicinity of the placement site. These impacts are expected to be minor because turbidity levels are already high within the project area, and the effects would be temporary.

No-Action Alternative

Without implementation of the proposed action, dredged material would not be placed in the proposed disposal area, and localized direct and indirect impacts on fisheries would not occur .

ESSENTIAL FISH HABITAT

This resource is institutionally important because of the Magnuson-Stevens Fishery Conservation and Management Act ("Act"). Essential Fish Habitat (EFH) is technically important because, as the Act states, EFH includes "those waters and substrates necessary to fish for spawning, breeding, feeding or growth to maturity." EFH is publicly important because of the high value that the public places on the seafood, recreational, and commercial opportunities EFH provides. Specific categories of EFH include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), including the sub-tidal vegetation (seagrasses and algae) and adjacent intertidal vegetation (marshes and mangroves). The Gulf of Mexico Fishery Management Council (GMFMC), through the generic amendment of the Fishery Management Plans (FMP) for the Gulf of Mexico, lists the following federally managed species or species groups: red drum, reef fish, coastal migratory pelagic, shrimp, and stone crab. In addition, coastal wetlands provide nursery and foraging habitat that supports economically important marine fishery species such as spotted seatrout, southern flounder, Atlantic croaker, menhaden, striped mullet, and blue crab. These species serve as prey for Federally-managed fish species such as mackerels, snappers, groupers, billfishes, and sharks.

Existing Conditions

The Matagorda and Lavaca Bay estuarine systems are designated as EFH by GMFMC through the 2005 generic amendment of the FMP for the Gulf of Mexico. The generic amendment was prepared as required by the Magnuson-Stevens Fishery Conservation and Management Act (P.L. 104-297). Categories of EFH in the project vicinity include estuarine marsh, SAV, and estuarine mud, sand, and shell bottoms. Species managed under the FMP that occur in the waters of Calhoun County include brown shrimp, pink shrimp, white shrimp, red drum, and stone crab. The proposed disposal areas are identified as EFH for all life stages of coastal migratory pelagics; brown shrimp, pink shrimp, and white shrimp; red drum; and reef fish. Different types of EFH attract different species within the area at different life stages; see Table 1. Habitat Areas of Particular Concern (HAPC) are EFH areas recognized as high priority for conservation, management, or research because they are rare, sensitive, stressed by development, or important to ecosystem function. No HAPCs have been identified in the project area, and no EFH Areas Protected from Fishing (EFH) were identified at the project location (National Marine Fisheries Services [NMFS] 2017).

Table 1
GMFMC-Managed Species that Occur in EFH within the Project Area

Species[1]	Life Stage	EFH within Project Area [2,3]
Coastal migratory pelagics	all	all estuaries
Shrimp, brown	all	all estuaries sand/shell/soft bottom, SAV, emergent marsh, oyster reef
Shrimp, pink	all	all estuaries sand/shell/soft bottom, SAV, emergent marsh
Shrimp, white	all	all estuaries sand/shell/soft bottom, SAV, emergent marsh, oyster reef
Red drum	all	all estuaries, SAV, sand/shell/soft bottom, emergent marsh
Reef fish	all	all estuaries

Notes:
1 Source: GMFMC 2005
2 Source: TPWD 2002
3 Source: GMFMC 2004

Within the vicinity of the project area's EFH, open water (sand/shell/soft bottom), oyster reef, and emergent marsh provide nursery and foraging grounds for a variety of economically important marine species, including red drum, black drum, sand trout, spotted seatrout, southern flounder, Atlantic croaker, striped mullet, menhaden, white shrimp, brown shrimp, pink shrimp, and blue crab. Some of these estuarine-dependent species serve as prey for other species managed by GMFMC under the Magnuson-Stevens Act (e.g., red drum, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfish and sharks).

Western PA Alternative

Original locations of the Western PAs would have resulted in 25 acres of direct impact to oyster resources. The Western PAs were realigned to reduce impacts. With the implementation of the proposed action, dredged material would be placed in shallow, open-water locations in the project area to overlay mud/sand water bottoms, potentially burying up 0.19 acres of oyster reef as a direct impact, though impacts to oyster reef would be avoided to the maximum extent practicable. During placement activities, the dredge pipe will keep a 500-foot buffer from oyster resources present within the vicinity of the Western PAs.

Temporary increases in the turbidity levels of the waters in the vicinity of the proposed project area are expected to occur during and immediately after dredged material placement, but should not significantly impact EFH. Temporary direct and indirect impacts to EFH are also anticipated from the placement of the dredged material pipeline across open-water areas and oyster reef. These impacts are expected to be temporary and would not result in a long term change of EFH at the affected areas.

No-Action Alternative

Without implementation of the proposed action, dredged material would not be placed in the proposed disposal areas, and the shallow open-water bays that now characterize the proposed

disposal sites would remain the same.

WILDLIFE

This resource is institutionally important because of the Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918. Wildlife resources are technically important because they are a critical element of many valuable aquatic and terrestrial habitats, as well as an indicator of the health of these habitats, and many species are important commercial resources. Wildlife resources are publicly important because of the high priority that the public places on their aesthetic, recreational, and commercial value.

Existing Conditions

According to GRN (2010), approximately 300 bird species inhabit Lavaca Bay ecosystems. Colonial waterbirds in the area include the roseate spoonbill (*Ajaia ajaja*), great blue heron (*Ardea Herodias*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), great egret (*Casmerodius albus*), snowy egret (*Egretta thula*), willet (*Catoptrophorus semipalmatus*), and black-necked stilt (*Himantopus mexicanus*); floating and diving birds such as the white pelican (*Pelecanus erythrorhynchos*), brown pelican (*Pelecanus occidentalis*) and double-crested cormorant (*Phalacrocorax auritus*); and aerial searching birds such as Forster's tern (*Sterna forsteri*), black skimmer (*Rhynchops niger*), royal tern (*Sterna maxima*), bald eagle (*Haliaeetus leucocephalus*), and laughing gull (*Larus atricilla*). Many species, particularly grebes, loons, ducks and geese, use the bay habitats during the winter but migrate north during the remainder of the year. The Lavaca Bay dredge spoil islands east of the MSC, have been designated an Important Bird Area by the National Audubon Society (2017).

The Aransas National Wildlife Refuge spans from 3 to 40 miles south/southwest of the project area, attracting more than 400 bird species and has a diversity of habitats to support wildlife, including saltmarsh with hermit crabs and juvenile flounder; brackish marsh/waters with juvenile fish, blue crab, shellfish, whooping cranes, and herons; freshwater marshes with alligators, turtles, frogs, and snakes; coastal prairie and oak woodland with bees, butterflies, raptors, white-tailed deer, neotropical birds, and migratory birds; and barrier island with nesting sea turtles, piping plover, whooping cranes, coyotes, reddish egrets, and more (USFWS 2013).

The Matagorda Island Wildlife Management Area (managed as the Matagorda Island National Wildlife Refuge and State Natural Area), from 13 to 33 miles south/southwest of the project, similarly supports a diverse range of wildlife, including migratory birds, threatened and endangered species, deer, alligator, and other wildlife (TPWD 2017a).

Western PA Alternative

With implementation of the proposed action, direct adverse impacts to aquatic wildlife in the area are expected to be localized and temporary. Impacts would include minor displacement of wildlife and short-term loss of habitat. Displacement impacts are expected to be minor, because mobile species would move to areas beyond the work zone until completion of placement activities. However, live oysters covered by dredge material may face mortality.

No-Action Alternative

Without implementation of the proposed action, there would be little change of habitat within the proposed disposal area from its present composition of shallow, open-water habitat and oyster reef.

THREATENED AND ENDANGERED SPECIES

This resource is institutionally important because of the Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972, as amended; and the Bald and Golden Eagle Protection Act of 1962. Endangered (E) or threatened (T) species are technically important because the status of such species provides an indication of the overall health of an ecosystem. These species are publicly important because of the desire of the public to protect them and their habitats.

Existing Conditions

USFWS and the NMFS, Southeast Regional Office, Protected Resources Division share responsibility for implementing the Endangered Species Act, including the designation of threatened and endangered species and the geographic boundaries of critical habitat for threatened or endangered populations. Of the federally listed endangered or threatened species and/or their designated habitat under the purview of USFWS or NMFS within Calhoun County, critical habitat has been designated by USFWS (2017) for the piping plover and whooping crane, though outside the project area.

A records review was conducted of the USFWS Information, Planning and Conservation database (USFWS, 2017) for protected species, sensitive natural communities, and other features of concern known or suspected to occur within the project area located in Calhoun County, Texas. In addition to the file reviews, ecologists evaluated the site for the federally-listed threatened and endangered species in Table 2 and their associated habitats during detailed field surveys conducted on March 8, 2017. Descriptions of each species potentially occurring within Calhoun County, Texas are provided below.

Table 2
Federally-Listed Threatened or Endangered Species
Potentially Occurring in Calhoun County, Texas

Common Name (*Scientific Name*)	**Status**[1]
Birds	
Least tern (*Sterna antillarum*)	E
Northern aplomado falcon (*Falco femoralis septentrionalis*)	E
Piping plover (*Charadrius melodus*)	T

Red knot (*Calidris canutus rufa*)	T
Whooping crane (*Grus americana*)	E
Clams	
Golden orb (*Quadrula aurea*)	C
Texas pimpleback (*Quadrula petrina)*	C
Mammals	
Gulf Coast jaguarundi *(Puma yagouaroundi cacomitli*)	E
Ocelot (*Leopardus pardalis*)	E
West Indian manatee (*Trichechus manatus*)	T
Reptiles	
Hawksbill sea turtle (*Eretmochelys imbricata*)	E
Kemp's Ridley sea turtle (*Lepodochelys kempii*)	E
Leatherback sea turtle (*Dermochelys coriacea*)	E
Loggerhead sea turtle (*Caretta caretta*)	T

1 E = endangered; T = threatened; C = candidate

Birds

Least tern (*Sterna antillarum*) – The breeding season for the interior population of the least tern lasts from May through August and the peak of the nesting season occurs from mid-June through mid-July. During breeding season, terns usually reside close to waterbodies and forage for small fish in rivers and wetlands near nesting sites. The interior population of the least tern presently breeds in the Mississippi, Missouri, and Rio Grande river systems. Birds from the interior population winter along the Gulf of Mexico and the coasts of Central and South America. The interior population of the least tern has declined due to loss of habitat from dam construction and river channelization on major rivers throughout the Mississippi, Missouri, and Rio Grande river systems (U.S. Department of Agriculture, 2015). For purposes of the Endangered Species Act (ESA), the USFWS has assigned the endangered status to the interior population of the least tern (USFWS, 2016). No preferred habitat for the interior least tern was observed during field investigations. Therefore, no effect to the interior least tern is anticipated as a result of construction and operation of the proposed project.

Northern aplomado falcon (*Falco femoralis septentrionalis*) – The Northern aplomado falcon is federally listed as endangered in Calhoun County. The falcon adults are characterized by rufous (rust) underparts, a gray back, a long and banded tail, and a distinctive black and white facial pattern. Aplomado falcons are smaller species than the Peregrine falcons but are larger than kestrels. Habitat for the Aplomado falcon is variable throughout the species range which includes palm and oak savannahs, various desert grassland associations, and open pine woodlands. Within

these variations, the essential habitat elements appear to be open terrain with scattered trees, relatively low ground cover, an abundance of insects and small to medium-sized birds, and a supply of nest sites. Northern aplomado falcons feed on a variety of prey, including birds, insects, rodents, small snakes, and lizards. The species appears to be non-migratory throughout its range. The species nests in abandoned stick platforms of corvids and other raptors. Radio-tagged fledglings in south Texas suggest that most pairs use the vicinity of previous season's nesting platform as a hunting, roosting, and display area throughout the year. The average clutch size for a breeding pair is 3 eggs. Disturbance at nest sites and destruction of habitat are what threatens the species (USFWS, 2013). No preferred habitat for the Northern aplomado falcon was observed during field investigations. Therefore, no effect to the Northern aplomado falcon is anticipated as a result of construction and operation of the proposed project.

Piping plover (*Charadrius melodus*) – The piping plover is federally listed as threatened in Calhoun County. Piping plovers spend 3 to 4 months of the year, from late April to late July or August, on breeding grounds and winter along the Gulf and southern Atlantic coasts. Nesting occurs on open habitats along shores of rivers and lakes in the Great Plains as well as in permanent to seasonally flooded palustrine wetlands. Nests are shallow depressions about 2 centimeters deep, lined with pebbles or shell fragments and are placed on dry salt flats or open sand and gravel beaches at least 100 feet in width. Plovers feed along the water's edge on small insects, crustaceans, and mollusks, focusing on prey that is 1 centimeter or less below the ground surface (USFWS, 2003). Piping plover critical habitat is about 14 miles south of the project area, south of Seadrift and along Matagorda Island. Although the project area could harbor this species, based on the results of field investigations and literature reviews, there are no known occurrences of the piping plover within the investigated area. Therefore, no effect to the piping plover is anticipated as a result of construction and operation of the proposed project.

Red knot (*Calidris canutus rufa*) – The Red Knot is federally listed as threatened in Calhoun County. Red knots are large sandpipers with a cosmopolitan distribution. Red knots migrate in larger flocks than most other shorebirds, concentrating at important coastal migratory sites and ending at staging areas where flocks of birds gather to feed. Red knots gather in the tens of thousands to gorge themselves on the soft eggs of the horseshoe crab and marine mollusks, essentially doubling their body weight so they may continue their migration. Their migration in the spring and fall is broken into roughly 1,500-mile segments of a 10,000-mile trek from the southern tip of South America to breeding grounds in the Arctic (Niles, et al., 2007). The birds eat plant seeds, grass shoots, and other vegetable foods. Although the project area could harbor this species, based on the results of field investigations and literature reviews, there are no known occurrences of the red knot within the investigated area. Therefore, no effect to the red knot is anticipated as a result of construction and operation of the proposed project.

Whooping crane (*Grus americana*) – The whooping crane is federally listed as endangered in Calhoun County. The whooping crane is a large wading bird occurring only in North America. The whooping crane currently exists in the wild at three locations and consist of a total population of approximately 388 individuals. The largest population breeds at Wood Buffalo National Park in Alberta, Canada, and winters at Aransas National Wildlife Refuge in Aransas Pass, Texas. Whooping cranes frequent a diverse habitat, including coastal marshes and estuaries, inland marshes, lakes, ponds, wet meadows, rivers, and agricultural fields. Sixty to 80 percent of

whooping crane losses occur during the approximate 9 weeks of migration. Causes for mortality include avian tuberculosis, shooting (illegal or by hunter mistake), non-shooting trauma following fall migration, avian predation, and collision with power lines (Canadian Wildlife Service [CWS] and USFWS, 2007). The site lies approximately 46 miles southwest of the Aransas National Wildlife Refuge and is within the migration path of this species (see Figure 1 below). The 2007 recovery plan for the whooping crane (CWS and USFWS, 2007) calls for the following measures, specific to power lines and fences, which are a common cause of mortality or injury during migration:

- Bury new power lines when possible in areas frequently used by whooping cranes making low-level flights.
- Mark problem lines or modify fences to reduce collision.
- Barbed-wire fences should be of no more than 3-strand design.
- Communication towers/equipment should be kept less than 61 meters in height with a larger tower base and no guy wires. Tower lights for aviation safety should have flashing white strobe lights rather than continuous lighting. If guy wires are necessary, they should be marked.

Whooping crane critical habitat is located approximately 14 miles south of the project area, south of Seadrift and along Matagorda Island. Although the project area could harbor this species, based on the results of field investigations and literature reviews, there are no known occurrences of the whooping crane within the investigated area. Therefore, no effect to the whooping crane is anticipated as a result of construction and operation of the proposed project.

Clams

Golden orb (*Quadrula aurea*) – The golden orb is listed as a federal candidate species in Calhoun County. The golden orb is a freshwater mussel with an orange, yellow, or yellowish-brown shell with green rays, it appears to be restricted to flowing waters with sand, gravel, and cobble bottoms at depths from only a few centimeters to over 3 meters. It appears intolerant of scouring floods producing swept bedrock and boulder bottoms or excess silt and mud deposition and also appears intolerant of impoundment in most instances. The only known impounded population is largely focused on wave- and wind-swept areas, which may simulate riverine conditions (Howells et al., 1996). No preferred habitat for the golden orb (i.e., flowing waters over gravelly areas associated with large rivers or reservoirs) was observed during field investigations. Therefore, no effect to the golden orb is anticipated as a result of construction and operation of the proposed project.

The Texas pimpleback (*Quadrula petrina*), is a federal candidate and state threatened species in Karnes County. A freshwater mussel, tan to brown in color, sometimes with distinctive yellow and bright green markings; somewhat glossy (Howells et al., 1996). This species inhabits mud, gravel and sand substrates, generally in areas of the river with low flow rates. The Texas pimpleback is known to be found in the Colorado and Guadalupe River basins(Howells et al., 1996).

Mammals

Gulf Coast jaguarundi (*Puma yagouaroundi cacomitli*) – The gulf coast jaguarondi is federally listed as endangered in Nueces County. Slightly larger than a domestic cat, the Gulf Coast

jaguarundi possesses a solid-color coat, either rusty brown or charcoal gray, and is typically active during crepuscular periods. The primary diet consists of birds and small mammals, such as rodents and rabbits. Little is known about Gulf Coast jaguarundi reproduction or breeding habitat. The Gulf Coast jaguarundi is a solitary animal except during the mating season, which in Mexico reportedly lasts from November through December (Campbell, 2003). However, in Texas, young have been found in both the summer and winter (Davis and Schmidly, 1994). The preferred habitat of the Gulf Coast jaguarundi is thought to be similar to that of the ocelot, defined as having a canopy cover of 95 percent or greater, with canopy cover of 75 to 95 percent considered as sub-optimal. The most critical habitat component is most likely dense cover near the ground (less than 4 feet in height). The current range of the Gulf Coast jaguarundi extends from the South Texas brush country and Lower Rio Grande Valley into northern Mexico and Central and South America (Campbell, 2003). Based on the results of literature reviews, there are no known occurrences of the Gulf Coast jaguarundi within 2,000 feet of the survey corridor and optimal and sub-optimal habitats were not identified within the survey corridor. Brushland present within the survey corridor consisted largely of disturbed mesquite dominated scrub with relatively open canopy (45-75% canopy coverage). Therefore, based on literature reviews and field investigations, no effect to the Gulf Coast jaguarundi is anticipated as a result of construction and operation of the proposed project.

Ocelot (*Leopardus pardalis*) – The ocelot is federally listed as endangered in Nueces County. Ocelots are members of the cat (Felidae) family and range from 30 to 41 inches in length and can weigh from 15 to 30 pounds. The coat is a cream color covered with reddish-brown spots outlined in black with two stripes extending from the inside corner of the eyes over the back of the head. An ocelot's diet consists primarily of rabbits, small rodents, and birds. Ocelots give birth to two young between September and November; the kittens open their eyes 15 to 18 days after birth (Davis and Schmidly, 1994). Generally, a nocturnal animal and living within an area (home range) of about 1 to 4 square miles, the ocelot prefers dense brush or low scrubland habitats containing species such as spiny hackberry, lotebush, and blackbrush. The density of shrubs and canopy cover in relation to preferred habitat characteristics is defined as having a canopy cover of 95 percent or greater, with canopy cover of 75 to 95 percent considered as sub-optimal. The most critical habitat component is most likely dense cover near the ground (less than 4 feet in height). Historical records indicate that the ocelot once occurred throughout South Texas, the southern Edwards Plateau, and along the Coastal Plain. The modern range of the ocelot extends from the South Texas brush country and Lower Rio Grande Valley into northern Mexico (Campbell, 2003). Based on the results of literature reviews, there are no known occurrences of ocelot within 2,000 feet of the survey corridor and optimal and sub-optimal habitats were not identified within the survey corridor. Brushland present within the survey corridor consisted largely of disturbed mesquite dominated scrub with relatively open canopy (45-75% canopy coverage). Therefore, based on literature reviews and field investigations, no effect to the ocelot is anticipated as a result of construction and operation of the proposed project.

West Indian manatee (*Trichechus manatus*) – The West Indian manatee is federally listed as Threatened in Nueces County. The West Indian manatee is a large gray or brown aquatic mammal. Adults are approximately 10 feet long and weigh 1,000 pounds. Their physical structure has no hindlimbs, and their forelimbs are modified as flippers with a flattened-horizontally, rounded tail. Their body is covered with sparse hairs and stiff whiskers surround their muzzles. Manatee gender

is determined by the position of the genital openings and presence or absence of mammary glands. They are primarily herbivorous, consuming aquatic vegetation, a wide variety of marine, estuarine, and freshwater plants, including submerged, floating, and emergent vegetation, and even shoreline vegetation (USFWS, 2001). However, they will occasionally feed on fish, spending about 5 hours a day feeding, and may consume 4 to 9 percent of their body weight a day. Manatees inhabit both salt and fresh water of sufficient depth (1.5 meters to usually less than 6 meters) in canals, rivers, estuarine habitats, and saltwater bays. During summer months, the West Indian manatee will migrate as far north as coastal Virginia on the east coast and the coast of Texas on the Gulf of Mexico. The species occurred with some frequency in the Laguna Madre of Texas at the turn of the Twentieth Century, but were considered rare on the upper Texas Coast (Davis and Schmidly, 1994). During October through April, when water temperatures drop below approximately 21 to 22 degrees centigrade, manatees migrate to south Florida or form large aggregations in natural springs. The West Indian manatee, which was recently down listed from endangered to threatened, would not likely be found within the project area. Per the USFWS manatee information page (https://www.fws.gov/southeast/wildlife/mammal/manatee/), last updated on April 11, 2017, the West Indian manatee's current range does not include the Texas coast. Therefore, no effect to the West Indian manatee is anticipated as a result of construction and operation of the proposed project.

Reptiles

Hawksbill sea turtle (*Eretmochelys imbricata*) – The hawksbill sea turtle is state and federally listed as endangered in Nueces County. The hawksbill is a small-to medium-sized turtle with shell lengths up to 36 inches. They are characterized by a brown shell, mottled with dark and light spots, and streaks, which was once commonly used to make tortoiseshell jewelry. The hawksbill sea turtle has a highly variable diet consisting mostly of invertebrates such as sponges, jellyfish, crustaceans, sea urchins, and mollusks. Hawksbill turtles live in clear offshore waters of mainland and island shelves. They are more common where coral reef formations are present. Hawksbill sea turtles nest on sandy beaches, often in the proximity of coral reefs. Hawksbill sea turtles are found primarily in warmer waters of the Atlantic, Pacific, and Indian Oceans, from Japan to Australia, and the British Isles to southern Brazil. They are also found in the southern waters of Florida, the Gulf of Mexico, and the Caribbean. In Texas, the hawksbill is found in the Gulf of Mexico and occasionally on the Texas coast (TPWD, 2013). Based on the results of field investigations and literature reviews, there are no known occurrences of hawksbill sea turtles or critical habitat within the proposed project area. Therefore, no effect to the hawksbill sea turtle is anticipated as a result of construction and operation of the proposed project.

Kemp's Ridley sea turtle (*Lepidochelys kempii*) – The Kemp's Ridley sea turtle is state and federally listed as endangered in Nueces County. The Kemp's Ridley is characterized by a grayish-green, nearly circular top shell with a pale yellowish bottom shell. They are considered the smallest marine turtle at 28 inches in length and 75-100 pounds. Their diet consists mostly of crabs, shrimp, snails, clams, jellyfish, sea stars, and fish. They can be found in the Gulf of Mexico and Atlantic Ocean. Adult Kemp's primarily occupy neritic habitats. Neritic zones typically contain muddy or sandy bottoms where prey can be found (TPWD, 2013a). Based on the results of field investigations and literature reviews, there are no known occurrences of Kemp's Ridley sea turtles or critical habitat within the proposed project area. Therefore, no effect to the Kemp's Ridley sea

turtle is anticipated as a result of construction and operation of the proposed project.

Leatherback sea turtle (*Dermochelys coriacea*) – The leatherback is state and federally listed as endangered in Nueces County. The leatherback is the largest of all sea turtles, with weights of 1,300 pounds and a carapace length of up to 8 feet. This turtle is unique because of the smooth, leathery skin covering its carapace. Research on captive turtles indicates that leatherbacks grow faster than any other marine turtle. Leatherbacks feed mainly on pelagic (open ocean) soft-bodied invertebrates, such as jellyfish and tunicates. Their diet may also include squid, fish, crustaceans, algae, and floating seaweed. Highest concentrations of these prey animals are often found in areas where deep water comes to the surface (upwelling areas) and where ocean currents converge. The leatherback is a highly pelagic species that moves into coastal waters only during the reproductive season. Although small groups may move into coastal waters following concentrations of jellyfish, these turtles seldom travel in large groups. Leatherbacks primarily inhabit the upper reaches of the open ocean, but they also frequently descend into deep waters from 650 to 1,650 feet in depth. Leatherbacks can be found in the Gulf of Mexico and are a rare visitor to the Texas Gulf Coast (TPWD, 2013b). Based on the results of field investigations and literature reviews, there are no known occurrences of leatherback sea turtles or critical habitat within the proposed project area. Therefore, no effect to the leatherback sea turtle is anticipated as a result of construction and operation of the proposed project.

Loggerhead sea turtle (*Caretta caretta*) – Loggerhead sea turtles are state and federally listed as threatened in Nueces County. Loggerheads have characteristically large heads with powerful jaws. They are found worldwide in tropical and temperate waters with temperatures above 10°C. Adults weigh 170 to 500 pounds and have a carapace up to 45 inches in length. Loggerheads are capable of living in a variety of environments, such as in brackish waters of coastal lagoons and river mouths. During the winter, they may remain dormant, buried in the mud at the bottom of sounds, bays, and estuaries. The major nesting beaches are located in the southeastern United States, primarily along the Atlantic coast of Florida, North Carolina, South Carolina, and Georgia. Only minor and solitary nesting has been recorded along the coasts of the Gulf of Mexico (TPWD, 2013c). Based on the results of field investigations and literature reviews, there are no known occurrences of loggerhead sea turtles or critical habitat within the proposed project area. Therefore, no effect to the loggerhead sea turtle is anticipated as a result of construction and operation of the proposed project.

Listed sea turtles that could be found in the project area are all highly migratory and not permanent residents of the project area. With the exception of the leatherback, the listed sea turtles have been documented with nests on Texas beaches, with the vast majority of nests belonging to Kemp's ridley; documented sea turtle nest locations include Magnolia Beach, Matagorda Peninsula, and Matagorda Island (USACE 2007). For additional information, refer to Appendix D for the USFWS Information, Planning and Conservation database search results for Calhoun County, Texas (USFWS 2017).

Western PA Alternative

No species documented by TPWD or USFWS were observed in the project area boundaries or

within the project area vicinity during field investigations. Although whooping crane and piping plover critical habitat was documented within 14 miles of the project area, analysis of field investigations and literature reviews provide evidence the project area does not provide habitat suitable to harbor either species. Correspondence with TPWD and USFWS conclude that with implementation of the proposed action, no adverse impacts on threatened or endangered species are expected to occur.

No-Action Alternative

Without implementation of the proposed action, the project area would persist as an open-water habitat.

WATER QUALITY

This resource is institutionally important because of the Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968. Water quality is publicly important because of the desire of the public for recreational fishing and boating.

Existing Conditions

The mean salinity in the Matagorda Bay system ranges from 8 to 31 parts per thousand (ppt) (Ward and Armstrong 1980), depending on proximity to freshwater inflows or more saline waters of the Gulf of Mexico. Long-term average salinity in Lavaca Bay is 17.6 ppt (TWDB 2015).

The Texas Commission on Environmental Quality (TCEQ) (2014) Integrated Report of Surface Water Quality for the Clean Water Act Sections 305(b) and 303(d) has designated water quality segments for individual components of the Lavaca Bay system. Table 2 lists the segments within the vicinity of the project area: 2453 – Lavaca Bay/Chocolate Bay, 2454 – Cox Bay, and 2455 – Keller Bay. The designated uses within the water segments, as defined by Texas Surface Water Quality Standards (TSWQS), include uses such as aquatic life, recreation, general, fish consumption, and oyster waters. Table 2 also includes the water segments listed on the 303(d) list, as well as other impairments, concerns, or sources of pollution published by TCEQ (2014).

Previous water quality data collected on April 29, 2003, during the Matagorda Ship Channel – Matagorda Peninsula to Gallinipper Point Comfort sampling event was provided by USACE. Table 3 below depicts the water quality parameters collected and their corresponding location within the project vicinity.

Table 3
Water Quality Data
Matagorda Ship Channel – Matagorda Peninsula to Gallinipper Point Comfort:
April 29, 2003

Sample number	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-	M-PC-03-
	17A	17B	18A	18B	PA14A	PA14B	PA14C	REF 14A	REF 14B	REF 14C
Station	85+000	85+000	90+000	90+000	85+000	85+000	85+000	85+000	85+000	85+000
Water Depth MLT (ft.)	35.7	35.1	37.2	39.6	5.8	6.0	5.8	8.1	8.3	8.4
DO (mg/L)	7.23	7.49	6.69	7.07	7.37	7.22	7.18	7.13	7.10	7.09
pH (s.u.)	8.10	8.09	8.05	8.06	8.07	8.08	8.08	8.09	8.09	8.09
Salinity ($^0/_{00}$)	23.13	23.15	22.70	22.73	22.87	22.84	22.84	22.80	22.80	22.78
Water Temp (ºC)	24.23	24.24	24.24	24.24	24.10	24.10	24.10	24.27	24.28	24.27
Air Temp (ºC)	23.8	23.8	23.8	23.9	24.0	24.0	24.0	24.1	24.1	24.1
Latitude	N28°34'24.4"	N28°34'25.6"	N28°34'55.3"	N28°34'56.5"	N28°34'41.3"	N28°34'40.9"	N28°34'39.7"	N28°34'09.9"	N28°34'08.6"	N28°34'10.2"
Longitude	W96°32'01.5"	W96°32'00.5"	W96°32'45.4"	W96°32'44.4"	W96°31'46.9"	W96°31'45.0"	W96°31'46.2"	W96°32'14.7"	W96°32'15.1"	W96°32'16.0"
Time	11:29	11:31	11:11	11:14	11:46	11:48	11:49	11:56	11:57	11:59

Western PA Alternative

With the implementation of the proposed action, temporary direct impacts to water quality in close proximity to the project area are expected to occur during construction. Short-term direct impacts include a temporary increase in ambient water turbidity, temperature, and suspended solids concentrations in the vicinity of the work zone, with a return to normal turbidity soon after completion of each construction phase.

No-Action Alternative

Without implementation of the proposed action, existing conditions would persist and water quality would not be expected to change.

Table 4
Summary of 305(B)/303(D) Water Quality Assessment Status for Bay Segments near Project Area

Segment [1]	Name [1]	Designated Uses [1, 2]	303(d) List [3]	Other Impairments, Concerns, and Sources of Pollution [4, 5, 6]
2453	Lavaca Bay/ Chocolate Bay			
2453_01	Center portion of the bay	A, R, G, F	-	-
2453OW_01		O	-	-
2453D_01	Lavaca Bay Ship Channel Area	A, R, G, F	depressed dissolved oxygen (5c)	mercury in edible tissue (4b); NS – dissolved other 24hr min – PS, UNK, NPS; NS – aquatic life closure – PS
2453_02	North-northeastern portion of the bay near Point Comfort	A, R, G, F	-	-
2453OW_02		O	bacteria (oyster waters) (5a)	NS – DSHS shellfishing restrictions – UNK; chlorophyll-a – CS
2453_03	Chocolate Bay area	A, F	-	-
2453OW_03		O	bacteria (oyster waters) (5a)	NS – DSHS shellfishing restrictions – UNK
2454	Cox Bay			
2454_01	North end of bay near Cox Creek	A, F	-	-
2454OW_01		O	-	-
2454_02	Remainder of Cox Bay	A, R, G, F	-	-
2454OW_02		O	-	-
2455	Keller Bay			
2455_01	Upper arm	N/A	-	-
2455OW_01		O	bacteria (oyster waters) (5a)	NS – DSHS shellfishing restrictions – UNK
2455_02	Remainder of Keller Bay	A, R, G	-	-
2455OW_02		O	-	-

Notes:

[1] Source: TCEQ 2014 Texas Integrated Report – Water Bodies Evaluated.

[2] Source: TCEQ 2014 Texas Integrated Report – Water Body Assessments by Basin: Assessment Results for Basin 24 – Bays and Estuaries. Designated Use: A – Aquatic Life, R - Recreation, G - General, F – Fish Consumption, O – Oyster Waters.

[3] Source: TCEQ 2014 Texas Integrated Report – Texas 303(d) List. The water body does not meet applicable water quality standards for one or more designated uses by one or more pollutants. Category 5a – Total Maximum Daily Loads (TMDL) are underway, scheduled, or will be scheduled for one or more parameters. Category 5b - A review of the standards for one or more parameters will be conducted before a management strategy is selected, including the possible revision to the TSWQS. Category 5c - Additional data or information will be collected and/or evaluated for one or more parameters before a management strategy is selected.

[4] Source: TCEQ 2014 Texas Integrated Report – Index of Water Quality Impairments. Standard is not supported for one or more designated uses but does not require the development of a TMDL. Category 4a - All TMDLs have been completed and approved by EPA. Category 4b - Other control requirements are reasonably expected to result in the attainment of all standards. Category 4c - Nonattainment is shown to be caused by pollution, not by pollutants and that the water quality conditions cannot be changed by the allocation and control of pollutants through the TMDL process.

[5] Source: TCEQ 2014 Texas Integrated Report – Concerns. Level of Concern: CN - Concern for near-nonattainment of the TSWQS based on numeric criteria; CS - Concern for water quality based on screening levels.

[6] Source: TCEQ 2014 Texas Integrated Report – Sources of Pollution for Impairments and Concerns. NS - Non-Supporting; CN - Concern for Near Non-attainment; CS - Concern for Screening Level. PS - Point Source; NPS - Nonpoint Source; UNK - Source Unknown. DSHS – Texas Department of State Health Services.

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 and to provide for reductions in acid rain, urban air pollution, and toxic air emissions. The Clean Air Act established two types of national air quality standards:

- 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, damage to animals, crops, vegetation, and buildings.

The EPA Office of Air Quality Planning and Standards has set NAAQS for six criteria pollutants: 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). In its General Air Quality Rules (30 Texas Administrative Code [TAC] Chapter 101), TCEQ enforces the federal NAAQS.

Existing Conditions

Calhoun, Jackson, and Matagorda Counties border the proposed MSC project area, and each is currently designated as unclassifiable or in attainment for all criteria pollutants (EPA 2017). Therefore, these counties are not subject to the TCEQ State Implementation Plan, which is an enforceable plan required under the Clean Air Act and developed by TCEQ that explains how areas that are designated nonattainment will comply with the NAAQS. In addition, the proposed project area will not be subject to the General Conformity Rules, as they are applicable only to projects located in nonattainment areas.

Western PA Alternative

With the implementation of the proposed Western PA Alternative, ambient air quality is expected to be temporarily impacted by exhaust emissions from construction equipment working in the project area. However, the status of attainment for Calhoun County would not be altered with implementation of the proposed action. Maintenance dredging in the area occurs regularly and the proposed project is not expected to cause any significant additional impacts to air quality or contribute to a violation of federal or state ambient air quality standards. Once project construction activities cease, air quality within the vicinity would return to pre-construction conditions.

No-Action Alternative

Without implementation of the proposed action, air quality in the project area would not be affected by project construction equipment.

RECREATIONAL RESOURCES

This resource is institutionally important because of the Federal Water Project Recreation Act of 1965, as amended and the Land and Water Conservation Fund Act of 1965, as amended. Recreational resources are technically important because of the high economic value of recreational activities and their contribution to local, state, and national economies. Recreational resources are publicly important because of the high value that the public places on beach access, fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Texas and the large number of recreational boat registrations in Texas.

Existing Conditions

Several federal, state, and locally managed parks and recreational outlets are located near the Lavaca Bay and Matagorda Bay systems. Consumptive recreational uses of the bays includes hunting for waterfowl, fishing saltwater species, and crabbing. Other recreational activities include boating, picnicking, nature study, bird watching, and camping.

The Aransas National Wildlife Refuge is 3 miles south of the project area, and the Mad Island Wilderness Management Area is 29 miles east of the project area.

TPWD (2017) Great Texas Wildlife Trails near the project area include the Central Texas Coast's Great Texas Birding Trails, Calhoun Loop and Tres Palacios Loop. Calhoun Loop spans the western coastline of Lavaca Bay with stops at Six Mile Park, Port Lavaca Bird Sanctuary, Magnolia Beach, Magic Ridge, and Powderhorn Lake. Tres Palacios Loop spans the northern coastline of Matagorda Bay with stops such as Olivia/Port Alto, Port Lavaca Bird Sanctuary, Perry R. Bass State Marine Fisheries Research Station, Lookout Point, Trull Marsh, and Oyster Lake Road. TPWD (2017b) also maintains the Port O'Connor Paddling Trail, 11 miles southeast of the project area. Texas paddling trails are important for state and local tourism as well as recreational opportunities for the public. The Port O'Connor Paddling Trail contains 40 miles of trail with six interconnecting, shorter trail segments from Port O'Connor, Texas, to Matagorda Island; the trail provides opportunities for fishing (e.g., seatrout, redfish) and viewing of various habitats (e.g., saltwater marsh, oyster reef, open water, islands) and wildlife (e.g., shorebirds, migratory birds, waterfowl, dolphin, whitetail deer, alligator).

Local park and recreation areas surrounding Lavaca Bay include Alamo Beach, City Harbor, Fishing Pier Park, Lighthouse Beach, Nautical Landing Marina & Bayfront Peninsula, and Magnolia Beach. Beyond Lavaca Bay, near the project area in Matagorda Bay, are Boggy Bayou Park, Indianola Beach and Historic Site, Kingfisher Beach Park and pier, and Little Jetties. Sunday Beach on Matagorda Island is also a popular anchoring and camping destination (POI 2017).

Western PA Alternative

With implementation of the proposed action, recreationists on the waters of Lavaca Bay would be directly impacted through temporary displacement during construction and dredging activities. Recreationists at shorefront locations with a view of Lavaca Bay would have a temporary visual impact with the proposed activities, however, the aesthetic value of Lavaca bay would return to

normal after project completion.

No-Action Alternative

Without implementation of the proposed action, no recreational resources would be impacted.

NAUTICAL ARCHAEOLOGY

This resource is institutionally significant because of the National Historic Preservation Act of 1966, as amended; the Native American Graves Protection and Repatriation Act of 1990; and the Archeological Resources Protection Act of 1979; as well as other statutes. Cultural resources are technically significant because of their association or linkage to past events, to historically important persons, and to design and/or construction values; and for their ability to yield important information about prehistory and history. Cultural resources are publicly significant because preservation groups and private individuals support their protection, restoration, enhancement, or recovery.

Existing Conditions

Remote sensing surveys, conducted by BOB Hydrographics, LLC (BOB), have been completed on approximately 1,005 acres within the project area and surrounding project vicinity, to locate potential archaeological sites that would be affected by the placement of dredged materials as a result of the proposed MSC improvements and associated Western PAs. Seven magnetometer anomalies are located with the project survey area. Six of these anomalies–1, 2, 3, 4, 5, and 6–do not have structural characteristics visible in the sonar images and remain unidentified. One anomaly, anomaly 7, was visible in sonar images and was identified as a plugged gas well operated by Humble Oil and Refining Company (American Petroleum Institute Number 05700355). The well was drilled in 1952 and plugged in 1972. A desktop review of the cultural background determined eight previous archaeological investigations and approximately 19 wrecks reported within 3 miles of the archaeological area of potential effect (APE). For additional information, refer to the Marine Archaeology Survey provided in Appendix B.

Western PA Alternative

With the implementation of the proposed action, dredged material would be placed in shallow open-water locations in the project area within the direct vicinity of identified anomalies, potentially overlaying anomalies with dredge material as a direct impact. Construction activities will employ best management methods to avoid impacts to the maximum extent practicable. Preparatory avoidance measures will be implemented cooperatively with The Texas Historical Commission (THC) and/or National Register of Historic Places (NRHP) if any identified anomalies meet selection criteria for State Antiquities Landmark or NRHP eligibility. Additionally, the location and limits of proposed PAs will be revised in accordance with essential avoidance measures (Figure 4).

No-Action Alternative

Without implementation of the proposed action, no nautical archaeology resources would be affected.

SOCIOECONOMICS and ENVIRONMENTAL JUSTICE

Socioeconomics is a broad term used to describe aspects of a project that are either social or economic in nature. A socioeconomic analysis evaluates how elements of the human environment such as population, employment, housing, and public services might be affected by the proposed action and alternative(s) (Eatwell, 1989). Environmental justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (EPA 2017b).

Section 1508.14 of CEQ regulations states that "economic or social effects are not intended by themselves to require preparation of an environmental impact statement. When an environmental impact statement is prepared and economic or social and natural or physical environmental effects are interrelated, then the environmental impact statement will discuss all of these effects on the human environment." Therefore, the requirement to prepare socioeconomic analysis in an EA is project-specific and is dependent upon the existence of a relationship between natural or physical environmental effects and socioeconomic effects (U.S. Government Publishing Office 2012).

This section describes the socioeconomic and environmental justice characteristics of Calhoun County in which the proposed project is located.

Existing Conditions

According to U.S. Census Bureau data in 2015, the population living within Calhoun County near the project area was primarily comprised of Hispanic or Latino persons (47.9%), followed by White (43.8%), Asian or Pacific Islander persons (4.9%), Black or African American persons (2.5%) and Multi-Racial persons (1%) (U.S. Census Bureau 2015). Therefore, the proposed project would be located within a minority area.

The median household income for the project area in 2015 was $50,873, which is above the Department of Health and Human Services (DHHS) poverty guideline of $24,600 for a family of four (DHHS, 2017). The percent of persons living below poverty for the study area was 16.8%, which is slightly lower than the State of Texas (17.2%) but is not more than 10% higher than the percent living below poverty for the counties of Jackson (13.6%), Matagorda (20.5%), and Victoria (13.6%) (TAC, 2017); therefore, the study area is not considered a low-income area.

Income data for the State of Texas, Calhoun, Jackson, Matagorda, and Victoria Counties are presented below in Table 5 and are based on U.S. Census Bureau data from 2015.

Western PA Alternative

Implementation of the Western PA alternative would likely have a negligible effect on population growth trends within the study area. The population in this area is projected to grow at a moderate rate regardless of the proposed project. As a result of the Western PA alternative, demand for community facilities, services, and housing would increase at a rate that is consistent with the projected population growth. The location of these resources would generally follow development and land use plans currently identified. Most of the construction workers are likely to come from the labor force that is already living within Calhoun, Jackson, Matagorda, and Victoria counties; therefore, migration to the study area would be small if at all. It is unlikely there would be an increase in single-family home construction. However, were such a development to occur in the project area, it would be expected within and near the cities of Point Comfort, Port Lavaca, and Victoria, where vacant land is available for such development. This potential increase in new residents within the project area would also potentially increase the demand for schools, roads, and other services. Furthermore, the Western PA alternative would not result in negative socioeconomic impacts.

The minority and low-income populations living within the study area would likely experience no adverse changes to the demographic, economic, or community cohesion characteristics within their respective neighborhoods as a result of the Western PA alternative. The populations living within the study area would likely benefit from the proposed project through increased economic vitality as a result of increased efficiency from the MSC. Therefore, the Western PA alternative would not result in disproportionately high and adverse impacts on minority and low-income persons living within the project area.

Table 5
Income Statistics for the State of Texas and Counties near the Project Area

Location	Population (2015)	Median Household Income (2015)	Persons Below Poverty Level (%) (2015)
State of Texas	26,340,247	$55,653	4,530,522 (17.2)
County of Calhoun	21,895	$50,873	3,678 (16.8)
County of Jackson	14,816	$53,667	2,014 (13.6)
County of Matagorda	36,770	$45,073	7,537.85 (20.5)
County of Victoria	92,382	$55,406	12,563 (13.6)

Notes:

Source: U.S. Census Bureau 2015

No-Action Alternative

Without implementation of the proposed action, the study area would continue on its present course of economic development, population growth trends, and residential and industrial development patterns. The demand for community facilities, services, and housing would increase in response to the projected population growth. The locations of these resources would generally follow development and land use plans identified by surrounding cities and Calhoun, Jackson, Matagorda, and Victoria counties. Because no property is likely to be removed from the tax rolls,

the tax base would not be affected. The no-action alternative could possibly have a negative effect on the local economy within the project area and within Calhoun County. Without implementation of the Western PA alternative, environmental justice in the project area would not be affected.

HAZARDOUS, TOXIC, AND RADIOACTIVE WASTES

The discharge of dredged material into waters of the United States is regulated under the Clean Water Act. In the absence of a known Hazardous, Toxic, and Radioactive Waste (HTRW) concern, the proposed action may proceed without an HTRW investigation.

The USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste for Civil Works Projects, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are dredged from an area within the boundaries of a site designated by EPA or a state for a response action (either a removal or a remedial action) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) or if they are a part of a National Priority List (NPL) site under CERCLA. The NPL is also known as "Superfund."

Dredged material and sediments beneath the navigable waters proposed for dredging shall be tested and evaluated for their suitability for disposal in accordance with the appropriate guidelines and criteria adopted pursuant to Section 404 of the Clean Water Act and/or Section 103 of the Marine Protection Research and Sanctuaries Act and supplemented by the US Army Corps of Engineers Management Strategy for Disposal of Dredged Material: Containment Testing and Controls (or its appropriate updated version), as cited in Title 33, Code of Federal Regulations, Section 336.1.

The method for dredged material testing is specified in EPA/USACE's 1998 Evaluation of Dredged Material Proposed for Discharge in Waters of the U.S. – Inland Testing Manual ("Inland Testing Manual") or their 1991 Evaluation of Dredged Material Proposed for Ocean Disposal – Testing Manual ("Ocean Testing Manual"). The potential for the presence of contaminants in the dredged material is determined using the protocols in the Inland Testing Manual or the Ocean Testing Manual. Prior testing and reporting of dredged material samples taken from Lavaca Bay were conducted in February 2001 (PBS&J 2001), March 2001 (PBS&J 2001), and June 2006 (PBS&J 2006). All contaminant assessment reports reviewed found no indications from chemical analyses, bioassays, or bioaccumulation studies to indicate any concerns with the open bay placement of sediments under guidance provided by EPA/USACE (PBS&J 2006). For additional information, refer to the latest contaminate assessment report "Matagorda Peninsula to Point Comfort Contaminant Assessment Report, June 2006" provided in Appendix E.

Tables 5 through 8 below summarize previous sampling and analyses results for sediment, water, and elutriate chemistry, and sediment grain size from sample locations adjacent to the proposed project area. Data for Tables 6 through 9 below were provided by USACE from the previously completed sampling events listed below:

- Matagorda Ship Channel – Gallinipper Point to Point Comfort: January 14–16, 2003
- Matagorda Ship Channel – Matagorda Peninsula to Gallinipper Point: April 29, 2003
- Matagorda Ship Channel – Gallinipper Point to Point Comfort: November 1–2, 2011

Table 6
Concentrations of Detected Compounds in Sediment (dry weight)
Matagorda Ship Channel – Matagorda Peninsula to Gallinipper Point - 2003

Parameter	Units	Detection Limit	NOAA ERL	M-PC-03 (April 2003)				M-PC-03 (January 2003)						
				17	18	PA14	REF 14	19A	19B	19C	19D	19E	20A	20A Dup
Arsenic	mg/kg	0.3	8.2	5.73	6.37	1.54	3.67	5.74	6.59	6.11	6.04	6.05	6.3	6.46
Chromium, Total	mg/kg	1	81	11.1	12.7	1.97	6.16	16.4	18.5	17.3	18.4	18.9	18.1	16.9
Chromium III	mg/kg	1	N/A	11.1	12.7	1.97	6.16	16.4	18.5	17.3	18.4	18.9	18.1	16.9
Copper	mg/kg	1	34	8.97	9.51	1.5	4.79	10.9	12.9	11.8	11.4	11.6	11.4	11.5
Lead	mg/kg	0.3	46.7	15.0	17.0	3.33	BDL	17.3	19.2	18.4	19.3	19.3	19.5	19.7
Nickel	mg/kg	0.5	20.9	10.3	10.6	12.9	5.39	15.6	18.1	16.6	17.4	17.4	17.3	17
Zinc	mg/kg	2	150	0.23	15.3	12.9	7.46	17.3	54.9	52.1	54.5	54.4	58.4	51.8
Ammonia	mg/kg	0.1	N/A	158	167	1.76	50.4	189	106	243	237	223	258	205
TOC	%	0.1	N/A	3.32	3.61	0.61	1.85	14	19.6	21.4	20.7	19.4	20.2	21.3
Percent Solids	%	0.1	N/A	38.9	36.0	75.5	56.3	32.5	31	28.8	27.2	29.1	27.9	28.2
Concentrations of Detected Compounds (dry weight)														
Gravel	%	-	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sand	%	-	N/A	13.1	3.8	92.2	49.5	6.1	0.9	0.5	0.1	0.5	0.3	0.1
Silt	%	-	N/A	28.3	24.9	2	20.6	14.6	11.9	66.6	5.1	8.3	5.7	14.8
Clay	%	-	N/A	58.6	71.3	5.80	29.9	79.3	87.2	32.9	94.8	91.2	94	85.1

Dup = Duplicate Sample
BDL = Below Detection Limit
** For Salt Water

Table 7
Concentrations of Detected Compounds in Sediment (dry weight)
Matagorda Ship Channel – Gallinipper Point to Point Comfort - 2011

Parameter	Units	Detection Limit	NOAA ERL	M-PC-11 (November 2011)						
				19A	19A Dup	19B	19C	19D	19E	20A
Arsenic	mg/kg	0.30	8.20	5.38	6.00	6.98	5.45	5.53	6.04	7.1
Beryllium	mg/kg	1.00	N/A	1.00	1.03	1.01	0.95	0.95	1.13	1.16
Chromium, Total	mg/kg	1.00	81.0	10.6	10.9	9.52	8.51	9.7	10.8	11.7
Chromium III	mg/kg	1.00	N/A	10.6	10.9	9.52	8.51	9.7	10.8	11.7
Copper	mg/kg	1.00	34.0	7.84	7.88	8.48	7.19	7.8	8.63	9.53
Lead	mg/kg	0.30	46.7	17.1	18.0	17.4	15.9	17	19.6	19.9
Nickel	mg/kg	0.50	20.9	9.79	9.85	9.00	8.17	8.92	10.1	11
Zinc	mg/kg	2.00	150	29.6	31.5	40.1	37.6	30.3	34.0	39.8
Ammonia	mg/kg	0.10	N/A	49.1	46.7	35.2	63.6	62.7	61.0	80.7
TOC	%	0.10	N/A	0.75	0.75	1.34	0.91	1.05	1.04	1.19
Percent Solids	%	0.10	N/A	35.9	33.0	32.7	32.7	29.5	29.3	25.9
Concentrations of Detected Compounds (dry weight)										
Gravel	%	-	N/A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sand	%	-	N/A	4.1	2.6	3	2.2	2	5.2	1.7
Silt	%	-	N/A	29.8	24.1	19.8	20.6	19	17.2	19.2
Clay	%	-	N/A	66.1	73.3	77.2	77.2	79	77.6	79.1

Dup = Duplicate Sample
BDL = Below Detection Limit

** For Salt Water

Table 8
Concentrations of Detected Compounds in Water
Matagorda Ship Channel – Matagorda Peninsula to Point Comfort – 2003 & 2011

Parameter	Units	WQS**		Detection Limit	M-PC-03 (April 2003)		M-PC-03 (Janury 2003)						
		Acute	Chronic		17	18	19A	19B	19C	19D	19E	20A	20A Dup
Antimony	µg/L	N/A	N/A	3.00	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/L	149	78	1.00	3.21	3.26	2.63	2.06	2.76	3.06	2.25	2.01	2.10
Copper	µg/L	13.5	3.6	1.00	1.16	BDL	1.19	1.25	1.28	1.43	1.58	1.28	1.30
Lead	µg/L	133	5.3	1.00	1.01	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	µg/L	118	13.1	1.00	3.01	3.22	1.66	1.22	1.89	1.99	1.39	1.25	1.30
Zinc	µg/L	92.7	84.2	1.00	7.7	7.36	4.88	6.30	5.02	5.29	2.69	1.95	2.55
Ammonia	µg/L	N/A	N/A	0.03	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOC	%	N/A	N/A	0.10	3.86	3.41	8.51	4.04	5.44	4.24	6.38	6.66	5.51

Parameter	Unit	Acute	Chronic	Detection Limit			M-PC-11 (January 2011)						
							19A	19A Dup	19B	19C	19D	19E	20A
Antimony	µg/L	N/A	N/A	3.00	-	-	1.80	0.86	0.65	0.76	0.38	0.38	BDL
Arsenic	µg/L	149	78	1.00	-	-	2.90	5.01	2.84	2.84	3.12	5.15	3.38
Copper	µg/L	13.5	3.6	1.00	-	-	0.84	1.52	0.88	1.71	0.81	0.88	1.01
Lead	µg/L	133	5.3	1.00	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	µg/L	118	13.1	1.00	-	-	0.98	1.02	0.84	0.89	0.93	1.07	0.89
Zinc	µg/L	92.7	84.2	1.00	-		1.42	BDL	BDL	2.21	BDL	BDL	BDL
Ammonia	µg/L	N/A	N/A	0.03	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOC	%	N/A	N/A	0.10	-	-	4.30	3.40	4.20	3.90	3.70	4.40	4.60

Dup = Duplicate Sample
BDL = Below Detection Limit
** For Salt Water

Table 9
Concentrations of Detected Compounds in Elutriate
Matagorda Ship Channel – Matagorda Peninsula to Point Comfort – 2003 & 2011

Parameter	Units	WQS**		Detection Limit	M-PC-03 (April 2003)		M-PC-03 (Janury 2003)						
		Acute	Chronic		17	18	19A	19B	19C	19D	19E	20A	20A Dup
Antimony	µg/L	N/A	N/A	3.00	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	µg/L	149	78	1.00	3.45	3.57	2.63	2.06	2.76	3.06	2.25	2.01	2.10
Copper	µg/L	13.5	3.6	1.00	2.44	1.7	1.19	1.25	1.28	1.43	1.58	1.28	1.30
Lead	µg/L	133	5.3	1.00	2.02	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	µg/L	118	13.1	1.00	3.97	3.21	1.66	1.22	1.89	1.99	1.39	1.25	1.30
Zinc	µg/L	92.7	84.2	1.00	8.28	6.12	4.88	6.30	5.02	5.29	2.69	1.95	2.55
Ammonia	µg/L	N/A	N/A	0.03	0.96	0.62	BDL	BDL	BDL	BDL	BDL	BDL	BDL
TOC	%	N/A	N/A	0.10	5.30	4.55	8.51	4.04	5.44	4.24	6.38	6.66	5.51
Parameter	**Units**	**Acute**	**Chronic**	**Detection Limit**			**M-PC-11 (January 2011)**						
							19A	19A Dup	19B	19C	19D	19E	20A
Antimony	µg/L	N/A	N/A	3.00	-	-	2.20	BDL	0.86	0.36	BDL	BDL	BDL
Arsenic	µg/L	149	78	1.00	-	-	4.60	5.59	2.84	3.26	3.06	3.17	3.15
Copper	µg/L	13.5	3.6	1.00	-	-	3.63	1.45	1.23	0.79	2.62	1.11	0.98
Lead	µg/L	133	5.3	1.00	-	-	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Nickel	µg/L	118	13.1	1.00	-	-	1.60	1.33	1.52	1.54	1.76	1.66	1.96
Zinc	µg/L	92.7	84.2	1.00	-		4.73	0.95	5.23	4.64	8.15	BDL	6.11
Ammonia	µg/L	N/A	N/A	0.03	-	-	1.30	0.31	0.64	0.77	0.66	0.83	1.44
TOC	%	N/A	N/A	0.10	-	-	4.60	5.99	7.40	3.40	4.00	4.40	4.40

Dup = Duplicate Sample
BDL = Below Detection Limit
** For Salt Water

Correspondingly with previous contaminant assessment reports, the results from the sediment, water, and elutriate chemistry results provided by USACE for sample areas within the project vicinity, there is nothing to indicate any concern with the dredging or open water placement of these sediments under guidance provided by USACE/EPA.

As discussed below, the following EPA (2017b) program systems were elevated for potential hazardous, toxic, and waste sites in the vicinity of project dredge areas: Superfund Sites (NPL), Toxic Release Inventory (TRI), hazardous waste (RCRA Info).

Superfund Sites

Immediately north of the proposed dredge area, in Point Comfort, Texas, is the EPA Superfund Site operated by Alcoa World Alumina LLC. According to GRN (2010), Alcoa discharged mercury into Lavaca Bay from the late 1960s to early 1970s from a chlorine-alkali processing unit; coal tar processing contaminated other areas around the facility with polycyclic aromatic hydrocarbons (PAH), and in 1988, a portion of Lavaca Bay was closed for the taking of finfish and crabs for consumption after mercury levels in these resources were found to exceed levels considered safe for human consumption.

Toxic Releases

Also, immediately north of the proposed dredge area, in Point Comfort, Texas, are four EPA reporting Toxic Releases sites operated by Alcoa World Alumina LLC, Formosa Plastics Corporation Texas, Point Comfort Simplot Grower Solutions, and Seahawk Crude Condensate Terminal.

Hazardous Waste

One EPA reporting Hazardous Waste site is immediately north of the proposed dredge area, in Point Comfort, Texas and operated by Alcoa World Alumina LLC.

CUMULATIVE IMPACTS

CEQ regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time," Per 40 CFR § 1508.7.

This analysis generally follows the methodology set forth in relevant guidance (CEQ 1997; EPA 1999). Under these guidelines, inclusion of other projects within the analysis is based on identifying commonalities of impacts from past, present, and potential projects that would result from the proposed project. For an action to be included in the cumulative impact analysis, it must:

- impact a resource area potentially affected by the project;
- cause this impact within the proposed project area; or
- cause this impact within the resource-specific geographic boundary of where the project will also have an impact; and
- cause this impact within the time span for the potential impact from the proposed project.

Actions in the project area were evaluated for significance if they would generally occur within the same town, county, and/or watershed as the project. Distant projects were eliminated from further evaluation because their impacts would not likely overlap with the project's area of impact. The timeline of selected projects, as the potential for cumulative effects is dependent on the duration of the impact. Present projects were considered to overlap with the project in time of occurrence. Focus was placed on the resources identified in this EA; including groundwater, waterbodies, and wetlands; vegetation and wildlife; cultural resources; socioeconomics; geology and soils; land use, recreation, special interest areas, and visual resources; and air quality and noise.

No projects were identified following a review and analysis of publicly available data concerning past, present, and reasonable foreseeable projects with overlapping construction timelines and also located within the proposed project's area of impact. The cumulative impact of the Western PA Alternative is expected to result in positive long-term impacts to the project area. Benefits resulting from the project include reducing the frequency of maintenance dredging operations. The decrease in maintenance dredging will also reduce the frequency of temporary environmental impacts such

as sediment plumes, affects to water quality, reduction in emissions from dredge barges, and temporary impacts to commercial and recreation vessel traffic. Therefore, the proposed project's negative contribution to cumulative impacts is anticipated to be minimal or insignificant.

MITIGATION

This assessment of the potential environmental impacts to important resources finds that the proposed project would have only minimal and insignificant adverse impacts to open water habitat and fisheries resources. These impacts would be related to the loss of water bottom habitat and any associated loss of slow moving or sessile benthic organisms due to the placement of dredged material. The abundance of similar habitat within the project vicinity would further minimize the loss by providing refuge for displaced organisms. These long-term, positive, indirect impacts outweigh the adverse direct impacts caused by activities associated with the proposed action. Therefore, no impacts have been identified that would require compensatory mitigation.

COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Environmental compliance for the proposed action would be achieved upon coordination of this EA and draft Finding of No Significant Impact (FONSI) with appropriate agencies, organizations, and individuals for their review and comments; receipt and acceptance or resolution of all USFWS threatened and endangered species coordination; NMFS, Habitat Conservation Division EFH recommendations; and receipt and acceptance or resolution of all TCEQ comments on the air quality impact analysis documented in this EA. The draft FONSI will not be signed until the proposed action achieves environmental compliance with all applicable laws and regulations, as described above.

CONCLUSION

This EA has been prepared to evaluate the environmental impacts associated with the proposed utilization of dredged material Pas located west of the MSC in order to significantly reduce channel shoaling in the upper reaches of Matagorda Bay and lengthen the time between dredging cycles in this area. Disposal of dredged material could result in temporary, minor, adverse impacts to water quality, open-water habitat, fisheries resources, and recreational activities in the immediate project area; however, none of the impacts have been determined to be significant enough to warrant further investigation or mitigation measures. The USACE is modifying the shape and placement of the PAs along the western edge of the MSC to minimize the potential impacts to the maximum extent possible (Figure 4). With the avoidance measure employed as described in this document environmental impacts of the proposed action would have no significant adverse impact upon the human or natural environment.

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