2.0 AFFECTED ENVIRONMENT (*NEPA Required)

2.1 Introduction

Three Alternatives were reviewed and approved by the CEMVN vertical team (i.e., Division and HQ) and local sponsor at the designated Alternatives Milestone meeting on July 6, 2016 at CEMVN. Alternative 1, Alternative 2, and Alternative 3 (as defined in Chapter 3) were finalized so that the analysis of impacts described in this Draft SEIS could commence and be completed on schedule for a 2016 release. Those 3 original alternatives were carried forward for evaluation in this Draft SEIS while economics and cost/benefits analysis for this study were also being developed concurrently. Based on the findings of those economic analysis, additional alternatives identified and evaluated, and resulted in the identification of the Tentatively Selected Plan (TSP), Alternative 3d (refer to Chapter 3 for a description of the TSP). The TSP was a subset of plans that were evaluated under Alternative 3, and did not increase the overall environmental footprint as previously identified under Alternative 3.

This chapter evaluates existing conditions and the direct, indirect and cumulative effects on important resources associated with the no action alternative (Alternative 1).Impacts associated with other alternatives are evaluated in Chapter 4. Although the future without-project implies taking no action, Alternative 1 includes maintaining the current Operation anad Maintenance (O&M) practices to keep the river at its current dimensions. Topics in this chapter coincide with the topics of Chapter 4 in which the "future with-project" conditions are considered. Prime and unique farmlands, federally-designated scenic rivers, state designated scenic streams, and environmental justice were assessed and determined to not be significantly affected by the proposed action. These resources will not be further discussed in this report.

The study area, which is located in southeastern Louisiana, is the Mississippi River corridor below Baton Rouge, LA, and the river's major outlet to the Gulf of Mexico, Southwest Pass (Figure 2-1). This 254.4 mile river corridor runs from river mile Baton Rouge, LA to RM 22, Below Head of Passes (BHP). The original study area includes portions of East Baton Rouge, Iberville, Ascension, St. James, St. John the Baptist, St. Charles, Jefferson, Orleans, St. Bernard, and Plaquemines Parishes and other communities and port facilities adjacent to the lower Mississippi River.

This analysis will not discuss stages or datums in areas where work is not proposed or ongoing. Currently, the area of work in the lower river where work is proposed is maintained to a depth of 48.5 ft Mean Lower Low Water (MLLW). For purposes of the engineering and economic evaluation of exisiting conditions a depth of 48 ft was considered for deep-draft access from river mile (RM) 22.0 BHP in the bar channel reach up to RM 13.4 near Venice, LA. MLLW is the average height of the lowest tide recorded at a tide station each day during a 19 year period. There are 12 regularly maintained river crossings between New Orleans, LA, and Baton Rouge, LA, (Figure 2-1). Crossings (above New Orleans, LA) are maintained at 45 ft Low Water Reference Plane (LWRP). The dredged material that is dredged is disposed of in deeper parts of the river just downstream from each crossing. The Mississippi River LWRP is a hydraulic datum reference plane represented by a zero foot low water elevation established from long-term observations of the river's stages, discharge rates, and flow duration periods.

Figure 2-1 Study area corridor: Mississippi River to Gulf of Mexico via Southwest Pass

Land adjacent to the river from Venice, LA to the Gulf of Mexico is included in the study/project area as opportunities for beneficial use of dredge material to the extent such use can be performed within the limits of the federal standard (Figure 2-2). Engineering Regulation 1105-2-100 states the following in terms of the federal standard for dredged material. "Construction and maintenance dredging of Federal navigation projects shall be accomplished in the least costly manner possible. Also included in the scope of the study is the mitigation for increased saltwater intrusion, including, but not limited to the municipal water supply for all of Plaquemines Parish (above RM 64), which is put at risk for saltwater intrusion at the water intakes along the river during low water events. The study area includes the areas within the river that are currently affected by maintenance practices (dredging and disposal placement methods, shoaling controls, etc.), including major ports (Table 2-1) as well as the proposed expansion of available disposal areas.

Table 2-1 Location of Major Ports and their national rank for annual tonnage

Port / National Rank	Location
Baton Rouge (#9)	Mile 168.5 to 253
South Louisiana (#1)	Mile 114.9 to 168.5
New Orleans (#4)	Mile 81.2 to 114.9
Plaquemines (#10)	Mile 0 to 81.2

The study area also includes 143,264 acres of beneficial use disposal areas from Venice, LA, to the Gulf of Mexico that were previously cleared under NEPA. The associated NEPA documents are identified in Appendix A-1 and are incorporated here by reference. This analysis also address an additional 24,054 acres of potential beneficial use sites. Dredged material from O&M is used, up to the limit of the federal standard, to create coastal habitat in lieu of open water disposal area. The Code for Federal Standard 33 CFR 335.7 defines the Federal Standard for dredge disposal material as “the alternative or alternatives identified by the Corps which represent the least costly alternatives consistent with sound engineering practices and meeting the environmental standards established by the 404(b)(1) evaluation process or ocean dumping criteria." (33 CFR 335.7). To date, the CEMVN has constructed over 14,819 acres of intermediate marsh in the lower delta through beneficial use of dredge material (Figure 2-2, Appendix A-1). During the final feasibility design phase of the study USACE will consider whether additional dredge material placement and access lands are needed for the construction and OMRR&R of the project. In the event it is determined that such additional lands are necessary, USACE has identified and has analyzed the impacts to an area consisting of approxaimatly 24,054 acres,made up of a patchwork of predominantly shallow open water areas located amongst areas of intermittient and fragmented intermediate mash (Figure 2-2).

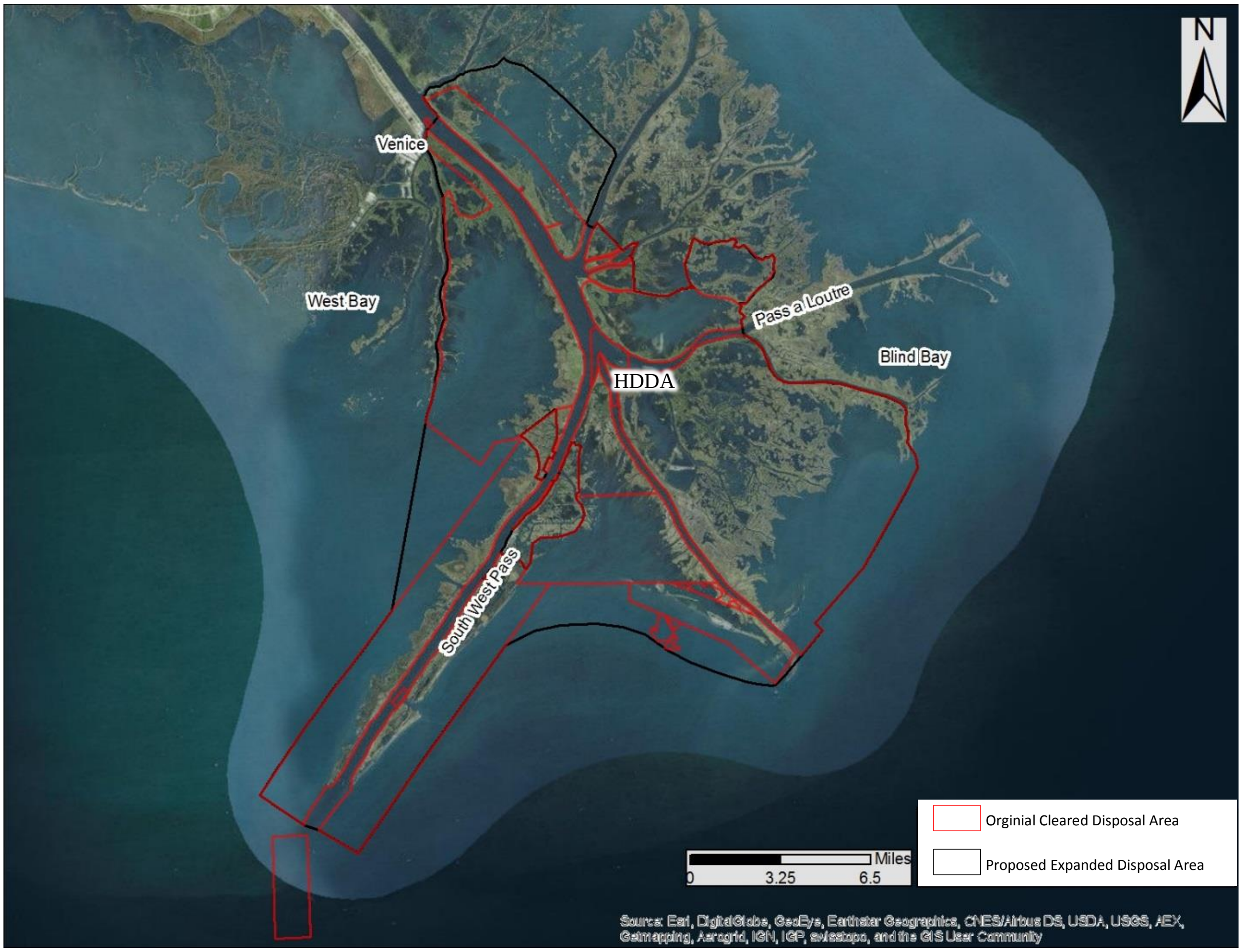

Figure 2-2 Previously cleared beneficial use disposal areas in the study are delineated in red. The proposed long-term plan includes these areas, and expands the total area by approximately 24,054 acres (delineated in black).

Figure 2-2 shows the expanded long term plan disposal area, and two open water Hopper dredge disposal areas, the Ocean Marine Dredge Disposal Area (OMDDS, in the Gulf of Mexico) and Hopper Dredge Disposal Area (HDDA, at the Head of Passes) area are also delineated. The multiple delineations in red identify portions of disposal areas that have been added to the project via multiple NEPA documents since the original study.

Climate

The climate of the study area is humid, subtropical with a slightly stronger maritime character south of New Orleans, LA. 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 rarely occurs in summer. Tropical storms and hurricanes are likely to affect the area 3 out of every 10 years, with severe storm damage approximately once every 2 or 3 decades. The majority of these occur between early June and November. Summer thunderstorms are common, and tornadoes strike occasionally. Average annual temperature in the area is 67 °F, with mean monthly temperatures ranging from 82 °F in August to 52 °F in January. Average annual precipitation is 57.0 inches, varying from a monthly average of 7.5 inches in July, to an average of 3.5 inches in October.

Land Use/Land Cover (LULC)

The only terrestrial environments directly affected by the project occur within the beneficial use disposal areas. The most recent available data for land use within the disposal area are from 2011 and are displayed in Figure 2-3. For comparison purposes, Table 2-2 display land use changes within the disposal area from 2001, 2006, and 2011 (source: National Land Cover Database). While National Land Cover Database (NLCD) 1992 data are used in discussions and comparisons of LULC change, direct comparisons with subsequent years of NLCD data is not recommended due to differences between legends and mapping methods that may not reflect real changes on the ground. For this reason, NLCD 1992 data was not used in this discussion and comparison of LULC in the Mississippi River Delta.

Louisiana’s land use governance system is largely the same today as when its governing statutes were adopted some seventy years ago (Costonis 2008). Post Hurricane Katrina (2005) developments signal that the state's policymakers now appreciate that planning conducted within the framework of a well-conceived system of land use law is one of the missing links in the state's recovery program (Costonis 2008).

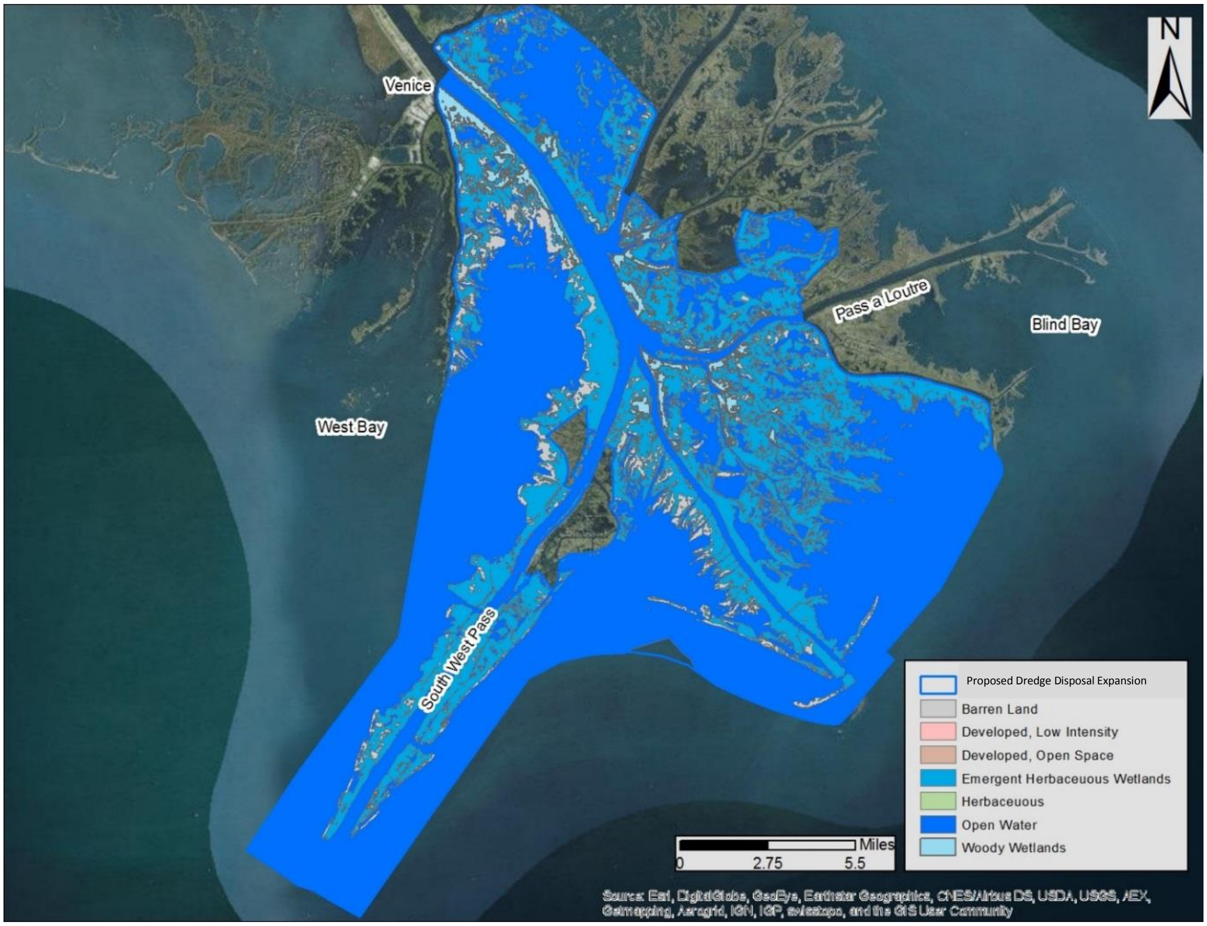

Figure 2-3 2011 land use classifications within the beneficial use disposal area long-term plan.

Table 2-2 Land Use/Land Cover Change in the Mississippi River Delta - 2001, 2006, and 2011

Land Cover/Use Type	2001 (acres)	2006 (acres)	2011 (acres)
Barren Land	7,617	7,864	6,513
Developed, Low Intensity	7	7	8
Developed, Open Space	18	18	19
Emergent Herbaceous Wetlands	46,947	46,359	43,149
Herbaceuous	31	30	23
Open Water	117,725	118,156	118,782
Woody Wetlands	4,644	4,555	4,631

The vast majority of the disposal areas in the study area, approximately 118,782 acres, are open water, which increased by 1,057-acres between 2001 and 2011. Table 2-2 illustrates the land loss trend occurring in the Mississippi River Delta and throughout the rest of coastal Louisiana. This land loss trend has been occurring since the early 1900s with commensurate negative effects on Louisiana's coastal ecosystem (USACE 2004). Many factors contribute to land loss along coastal Louisiana, including natural and anthropogenic processes such as subsidence, sea level rise, and tropical storm activity. The study area continues to experience land loss at a steady rate due to subsidence of the land surface and rising sea levels. This process is expected to continue into the future resulting in a loss of surface elevation of the geomorphic features, changes in vegetation types and land cover that characterize the study area, and increased land loss resulting in more open water areas. Between 1932 and 2010, the study area experienced a land loss of approximately 48,110.5 acres and a gain of 8,835.17 acres during the same period. Based on land loss trajectories from USGS aerial photography between 1932 and 2010, the expanded disposal area is projected to continue to lose approximately 32,960 acres over the next 50 years, or approximately 57 percent of existing land in the disposal areas (Couvillion et al. 2011). To further illustrate this trend, Figure 2-4 shows land area change in the study area from 1932 to 2010.

MRDS LAND LOSS 1932 - 2010

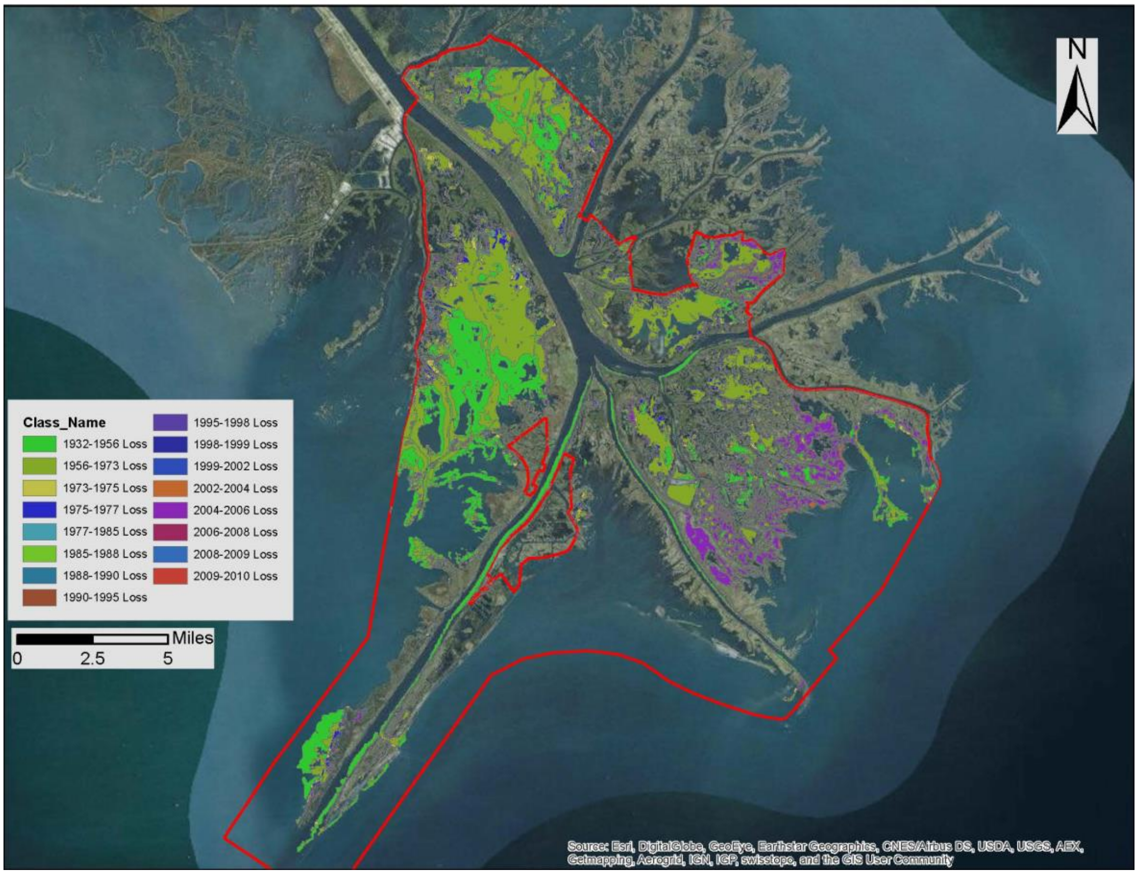

Figure 2-4 Mississippi River Deepening Study land loss 1932-2010

2.2 Water Environment

The Mississippi River has the third largest drainage basin in the world, exceeded in size only by the watersheds of the Amazon and Congo Rivers. It drains 41 percent of the 48 contiguous states of the United States. The basin covers more than 1,245,000 square miles, includes all or parts of 31 states and 2 Canadian provinces, and roughly resembles a funnel, which has its spout at the Gulf of Mexico. Waters from as far east as New York and as far west as Montana contribute to flows in the lower river (Figure 2-5). The lower alluvial valley of the Mississippi River is a relatively flat plain of about 35,000 square miles bordering on the river, which would be overflow during time of high water if it were not for human-made protective works. This valley begins just below Cape Girardeau, Missouri, is roughly 600 miles in length, varies in width from 25 to 125 miles, and includes parts of seven states (Missouri, Illinois, Tennessee, Kentucky, Arkansas, Mississippi, and Louisiana).

Figure 2-5 Mississippi River Basin, primary tributaries, large main-channel dams, and selected cities along main-stem channels. (USGS 2012)

Normal astronomical tides in Louisiana are diurnal (one high tide and one low tide per day) and can have a spring range of as much as 2 ft. The mean tidal range is approximately 0.51 ft (NOAA 2013a). Amplitudes are influenced by tides, but are generally controlled by meteorological events. Tidal influence has registered as far upstream as the Old River Complex (RM 315) during low water conditions (as in 2012). During flood stage, the operation of the Bonnet Carré Spillway dampens the tidal signal upstream of the structure and the tidal influence is not registered upstream of the Spillway at Reserve, LA, (RM 139).

2.2.1 Mississippi River

<u>Historic and Existing Conditions</u>

The Mississippi River, the largest river system in North America, is the main stem of a 12,350-mile long network of inland navigable waterways and is one of the most engineered and regulated rivers in the world (Walker and Davis 2002; Meade 2004; Finkl et al. 2006; Hudson et al. 2008; Rossi et al. 2008; Horowitz 2010; Allison et al. 2012; Camillo 2013). From the confluence of the Ohio River and Upper Mississippi River at Cairo, Illinois, the Lower Mississippi River has been channelized and shortened by about 143 miles (Baker et al. 1991). The reach of the river in Louisiana is one of the world's most commercially important and intensively managed rivers for navigation.

The Mississippi River, in combination with its largest distributary, the Atchafalaya River, discharges an average of 64,933,400,000 cubic yards (cy) of water into the Gulf of Mexico (Figure 2-6, USGS 2012). About half of the total annual discharge is contributed by the Ohio River alone, which drains the more humid regions of the basin but only constitutes one-sixth of the total basin area (Meade, 1995). Alternatively, the Missouri River drains approximately 43 percent of the MRB, but contributes only about 12 percent of the total annual water discharge. In the Mississippi River basin, the primary sources of sediment and water are decoupled. At its headwaters in Lake Itasca, MN, the average flow rate is 6 cfs. At Upper St. Anthony Falls, MN, the northern most lock and dam, the average flow rate is 12,000 cfs or 89,869 gallons per second. At New Orleans, LA, the average flow rate is 600,000 cfs (https://www.nps.gov/miss/riverfacts.htm).

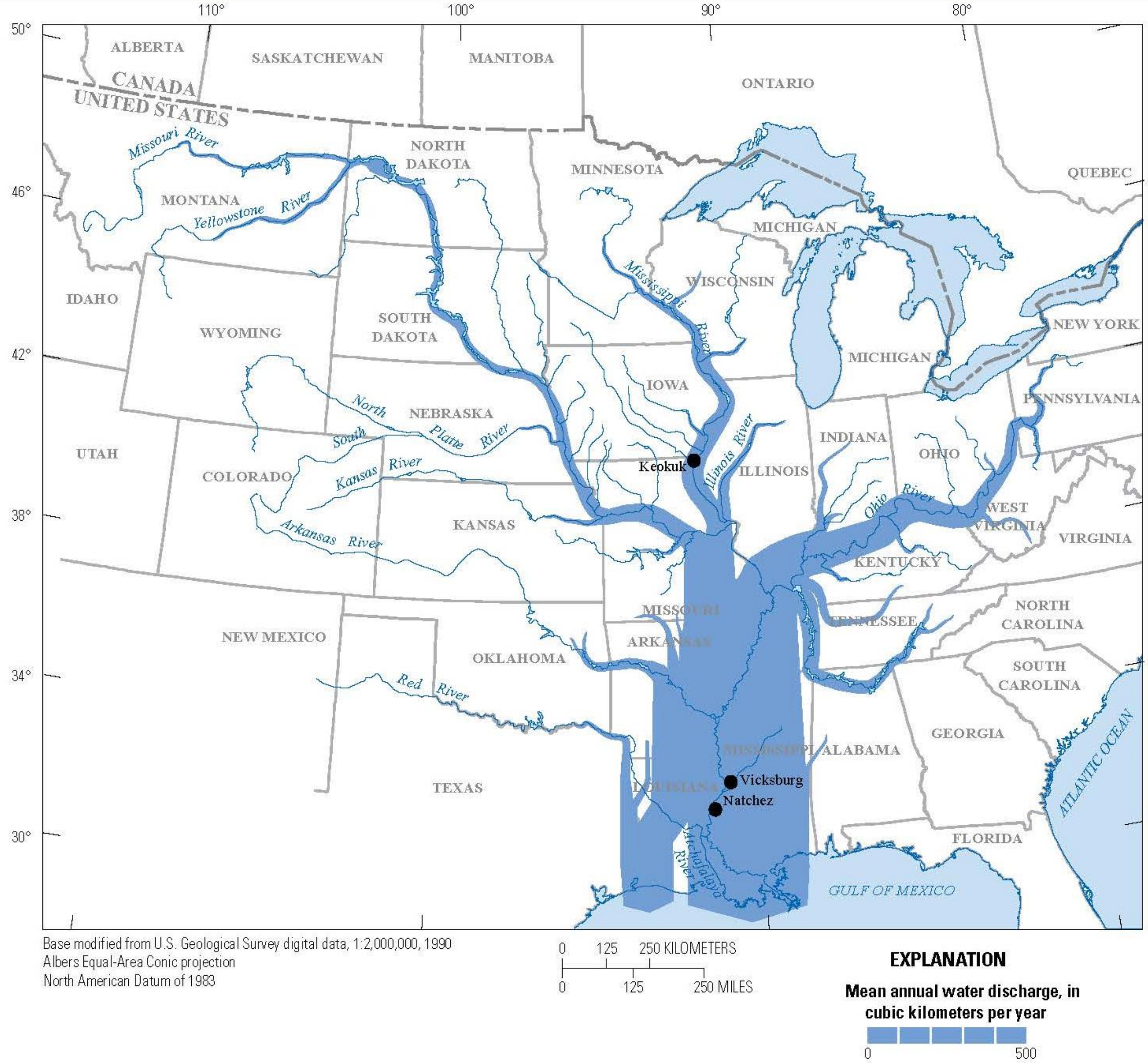

Figure 2-6 Mean annual discharge of Mississippi River and tributaries (USGS 2012)

The "Engineered Section" of the Mississippi River, the reach in Louisiana between Old River and New Orleans, LA, is an elaborate plumbing system of levees augmented by a series of floodways/spillways projects (Camillo 2013). Operation of the Old River Control Complex ensures distribution of 30 percent of the combined Mississippi River and Red Rivers pass through to the Atchafalaya Basin (Figure 2-7).

Per "Title 33 - Navigation and Navigable Waters, § 110.195 Mississippi River below Baton Rouge, LA, including South and Southwest Passes, https://www.gpo.gov/fdsys/pkg/CFR-2010-title33-vol1/pdf/CFR-2010-title33-vol1-chapI-subchapI.pdf " there are various US Coast Guard (USCG) designated anchorage areas along the authorized navigable ship channel. These anchorage areas are naturally deep areas that the USCG has designated to aid in the safe navigation of the MS River.

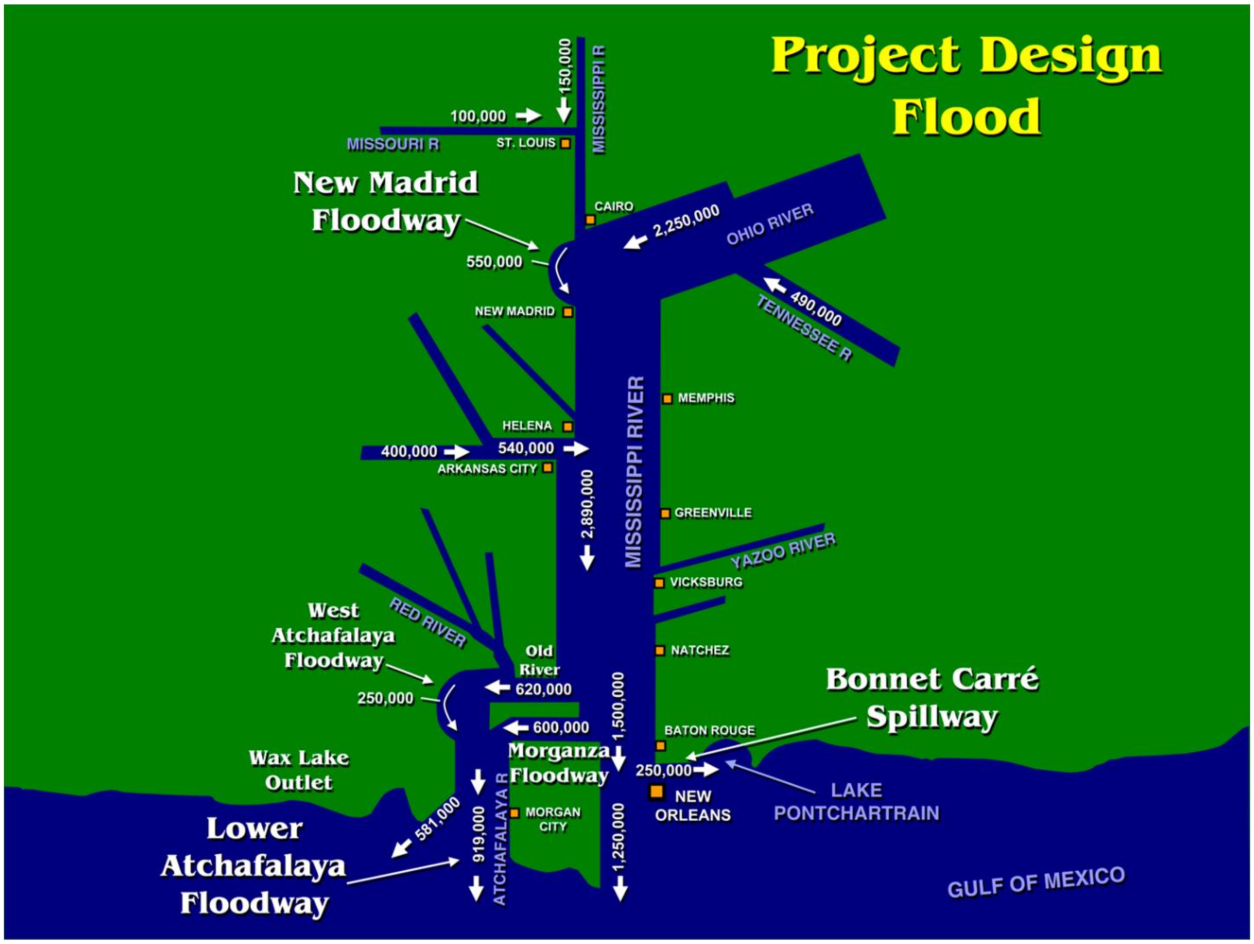

Figure 2-7 The "Engineered Section" of the Mississippi River designed to pass the project flood of 1.25 million cfs past New Orleans, LA

CEMVN O&M

The U.S. Army Corps of Engineers, New Orleans District (CEMVN) has the largest annual channel O&M program in the nation and dredges an average of 77 million cubic yards (mcy) of material annually during maintenance dredging of federal navigation channels, most of which occurs in the Mississippi River, the Calcasieu River, and the Atchafalaya River. Since 1996, river maintenance within the project area has averaged 35,778,303 cy (Appendix A-2).

Due to either the physical characteristics or the location of the dredged material, not all of the material dredged by the Corps is available for beneficial placement in the coastal ecosystem because of the previously cited federal standard. Currently, CEMVN Operations Divisions estimates approximately 38 percent of the suitable/available material dredged under the O&M program is used beneficially under the federal standard (vs. open water disposal), equating to the creation of approximately 528 acres of intermediate marsh on average. Most recently, the Louisiana Department of Natural Resources, Office of Coastal Management, in a letter dated 21 December 2015, determined that the Gulf to Baton Rouge project was consistent with the Louisiana Coastal Resources Program in accordance with Section 307 (c) of the Coastal Zone Management Act of 1972.

Another Corps project also uses dredged material beneficially across the state, including the study area, but beyond the federal standard. To date, a total of 80 acres of wetlands were created by placing HDDA dredged material in shallow open water areas of West Bay under the LCA BUDMAT program in FY 2015 (discussed further in Section 2.4). By comparison, a total of 3,194 acres of wetlands have been created by placing HDDA dredged material in shallow open water areas of the Delta National Wildlife Refuge under the Miss River Southwest Pass O&M program.

Deep Draft Crossings

Historically, maintenance dredging to 45 ft LWRP (plus 2 ft advance maintenance and 2 ft of allowable over depth) has been performed at 14 deep water crossings in the Mississippi River channel between Baton Rouge, LA, and New Orleans, LA, (Figure 2-8, Appendix A-3). Since 1980, 65 miles within 14 crossings have been dredged, as needed, at a combined annual average of 19,419,180 CY (Appendix 4).

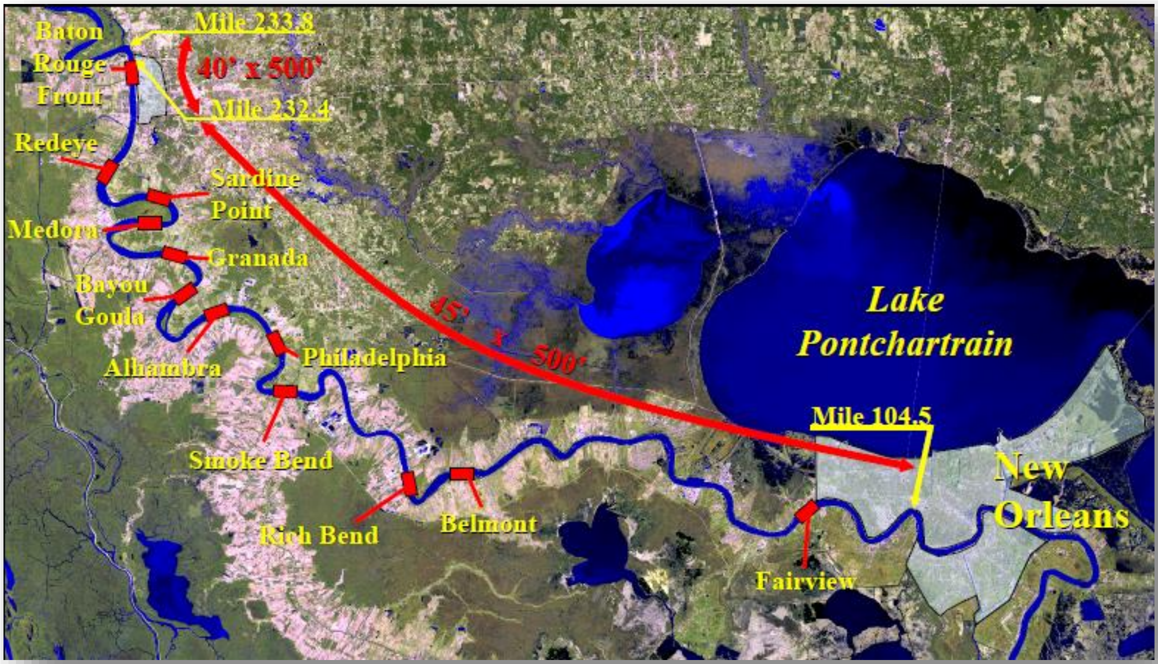

Figure 2-8 Locations of deep draft crossings between New Orleans, LA and Baton Rouge, La

There are 12 crossings that are annually maintained, three of which only require occasional maintenance. Table 2-3 list the deep draft crossings. Of the crossings listed, 81 Mile Point, Richbend and Fairview only require occasional maintenance dredging. There are two deep water crossings that are mentioned in prior NEPA documents, but no actual dredging records for these crossings can be found: Brilliant Point (mile 162.6-162.9 AHP) and Phoenix (mile 57.0-58.3 AHP). Two of these crossings, Redeye and Medora, also contain two fields of soft dikes (sand-filled geotextile material) in order to reduce additional maintenance dredging needs.

Table 2-3 List of historical deepwater crossings requiring maintenance and their locations

B.R. Front	**River Mile 234-229 AHP**
Redeye	**River Mile 226-221 AHP**
Missouri Bend	**River Mile 222-221 AHP**
Sardine Point	**River Mile 221-216 AHP**
Medora	**River Mile 214-208 AHP**
Granada	**River Mile 207-202 AHP**
Bayou Goula	**River Mile 199-196 AHP**
Alhambra	**River Mile 193-188 AHP**
Philadelphia	**River Mile 185-181 AHP**
81 Mile Point	**River Mile 180-178 AHP**

Smoke Bend	**River Mile 179-172 AHP**
Richbend	**River Mile 160-155 AHP**
Belmont	**River Mile 156-151 AHP**
Fairview	**River Mile 117-111 AHP**

Although a combination of dustpan dredges and hopper dredges are typically utilized for this maintenance effort, it is possible that cutterhead dredges or water injection dredges may also be utilized for emergencies. The dredging work within the crossings consists of the removal and disposal of shoal material above the plane of 45 ft LWRP over a width of 500 ft from Baton Rouge (mile 233.8 Above Head of Passes (AHP) to New Orleans (mile 104.5 AHP), plus removal of an additional 2 ft of shoal material as advance maintenance dredging, and removal of an additional 2 ft of shoal material as allowable overdepth dredging.

Annual maintenance of crossings averages 19,419,180 cy. The crossings are too far from potential beneficial use disposal sites to be economically acceptable by the federal standard. Shoal material removed from the deep water crossings is discharged unconfined into the open water of the Mississippi River either downriver of the dredging site or shoreward of the channel. The currents of the Mississippi River transport this shoal material downriver such that there is little to no accumulation of sediments at the discharge sites. Dredging is performed annually, typically from April through November, but schedule is dependent on the occurrence of high water stages in the river. The crossings require dredging during low water after shoaling has occurred. The crossings have a greater amount of water available during high water so shoaling can accumulate on the bottom of the river and vessels still have enough water to pass.

Lower River / Delta
Maintenance dredging is performed annually south of Venice, LA, and Southwest Pass by a combination of hopper dredges and hydraulic cutterhead dredges. Annual maintenance averages 18,500,000 cy for Southwest Pass and 3,750,000 cy for the Bar Channel. Dustpan dredges are occasionally utilized for emergency dredging situations in Southwest Pass. Dredging typically begins in January and is completed by August because Southwest Pass requires dredging during high water season while shoaling is occurring.

However, this is dependent on the timing of the Mississippi River high water season. The dredging work consists of the removal and disposal of shoal material above the plane of 48 ft MLLW approximately from Venice (RM.13.4 AHP) to the -48-foot contour in the Gulf of Mexico (RM 22.0 BHP).l The removal of an additional 6 ft of shoal material as advance maintenance dredging, and removal of an additional 2 ft of shoal material as allowable overdepth dredging has been previously cleared under NEPA from RM 12 AHP to RM 22 BHP (Appendix A-3,Figure 2-9). All other areas in the study area allow for 2 feet of advance maintenance and 2 feet of allowable overdepth.

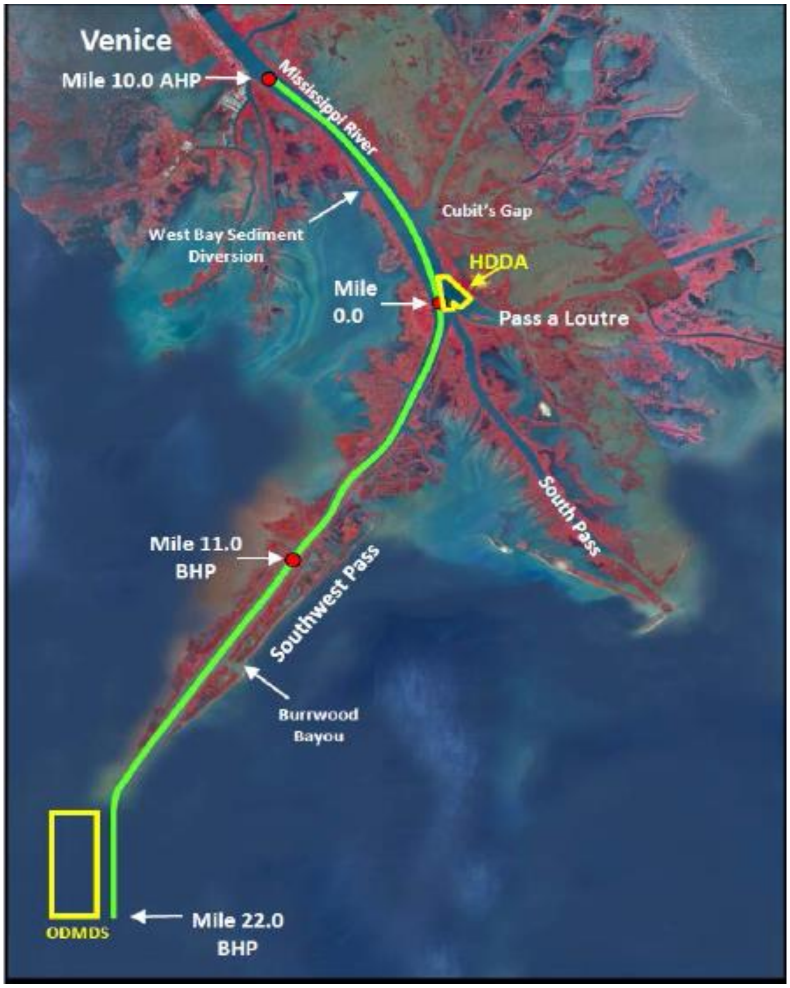

Figure 2-9 Reach of active dredging in the lower Mississippi from Venice to the Gulf of Mexico

Annual dredging typically occurs up to Mile 6.0 AHP. Shoaling in the lower river has shown a trend of migrating upriver towards Venice, LA, approximately 2.5 miles - 6.5 miles over the last 20 years. From about RM 6.0AHP to RM 13.4AHP dredging occurs as needed, but less frequently. However, the uppermost limits of dredging reach has gradually crept upriver over time. For example, as recently as 1986, dredging only went upriver to RM 3.5AHP (Cubit's Gap vicinity). Since then, dredging needs have gradually extended upriver over time as shoaling has dictated. Based on 1D modeling conducted during this study, this is believed to be at least partly due to sea level rise and the deepening of the lower river to its current dimensions (Appendix C).

Hydraulic cutterhead dredges are restricted in their use for Southwest Pass maintenance dredging work because their spudding systems, swing anchors, cables, and discharge pipelines, are considered safety hazards in some areas due to their inability to move quickly out of the channel. For these reasons, cutterhead dredges are only used to perform work in the RM 13.4 AHP to RM 1.0 AHP reach, and in the RM 1.0 BHP to RM 18.8 BHP reach. Cutterhead dredges utilize shallow, open water dredged material placement areas located on either side of the Southwest Pass navigation channel for coastal habitat creation and/or bankline stabilization and restoration within the federal standard.

Retention/closure features are not typically constructed for any placement areas, but could be built should they become necessary to prevent dredged material from entering property or waterways located adjacent to disposal sites. The exact locations and dimensions of these features would be determined in the field. All earthen retention/closure material would be obtained from within the placement site. From 2009 through 2015, approximately 40,234,782 cubic yards of shoal material (an annual average of approximately 5.8 million cubic yards) were removed from the Southwest Pass navigation channel (RM 13.4 AHP to RM 1.0 AHP reach, and in the RM 1.0 BHP to RM 18.8 BHP reach) by cutterhead dredges. A total of 2,401 acres of wetland habitat were created by placement of this material within the federal standard in shallow open water areas adjacent to the channel (Appendix A-5).

Hopper dredges, which are not considered safety hazards while working in the Southwest Pass navigation channel, are utilized for maintenance dredging throughout the entire Southwest Pass navigation channel. Hopper dredges provide the mobility and response time that is required during high shoaling periods. During these high shoaling periods, shoals develop in various unpredictable locations from RM 13.4 AHP to RM 22.0 BHP. As the shoals develop, hopper dredges are moved quickly to various assignment locations along the channel in order to restore project dimensions. Cutterhead dredges are incapable of similar rapid mobilization between different dredging assignment locations.

The HDDA is dredged about every 1 to 2 years. Approximately 1-8 mcy of dredged material could be placed in the proposed disposal area during each maintenance dredging event for the HDDA. The material placed at the HDDA is subsequently dredged through a separate cutterhead contract and is used beneficially to create and/or restore coastal habitat to the extent possible under the limitations of the Federal Standard. Coordination with the navigation industry is required for the Head of Passes Hopper Dredge Disposal Area dredging if dredged material disposal requires a discharge pipeline to cross the river, which necessitates a river closure. The first HDDA maintenance dredging effort occurred in 1998. Since that initial effort, the HDDA has been maintenance dredged 6 additional times, with the latest occurring in 2015. A total of approximately 39,458,015 cubic yards of material have been removed from the HDDA under these 7 maintenance dredging contracts. During this same period (1998 – 2015), approximately 104,157,460 cubic yards of dredged material (an annual average of approximately 7.1 million cubic yards) have been placed at the HDDA by hopper dredges working in Southwest Pass. Under the federal standard, a total of 3,194 acres of wetlands have been created by placing HDDA dredged material in shallow open water areas of the Delta National Wildlife Refuge and in West Bay.

Hopper dredges working between RM 11.0 BHP and RM 22.0 BHP dredge-and-haul to the designated ocean dredged material disposal site (ODMDS) located adjacent to, and west of, the bar channel. On rare occasions, hopper dredges working upriver of RM 11.0 BHP may utilize the Southwest Pass ODMDS for disposal. From 2009 through 2015, a total of approximately 31,569,449 cubic yards of shoal material (an annual average of approximately 4.5 million cubic yards) have been placed in the Southwest Pass ODMDS by hopper dredges. The volume of dredged material placed within the Southwest Pass ODMDS in any given year is highly variable, and fluctuates with river conditions and unpredictable shoaling patterns.

Hopper dredges working in the jetty channel and the bar channel (RM 19.5 BHP to RM 22.0 BHP) may also perform work in the agitation dredging mode. Agitation dredging involves filling a hopper dredge to capacity and allowing it to overflow. Fine sediments released into surface waters are carried out of the mouth of river to the Gulf of Mexico. Coarser/heavier sediments collect in the hopper and are ultimately hauled to the ODMDS for disposal. From 2009 through 2015, hopper dredges have only performed agitation dredging in this reach during 2015.

Open Water Disposal in Lower River

There are four designated open water (Hopper) dredge disposal sites in the lower river south of Venice, LA. The ODMDS is 2975 acres and is located west of and parallel to the SWP bar channel beginning at about RM 20.3 BHP. This area typically receives material from the RM 11.0 BHP to RM 22.0 BHP dredging reach. The HDDA is 867 acres and is situated at the Head of Passes at RM 0.0 and extends to about RM 1.0 in Pass a Loutre, RM 1.0 BHP in Southwest Pass, and RM 2.0 in South Pass. This area typically receives material from the RM 13.4 AHP to RM 11.0 BHP dredging reach. Coordination with the Navigation industry is required for the Head of Passes Hopper Dredge Disposal Area dredging if dredged material disposal requires a discharge pipeline to cross the river which necessitates a river closure. Additionally, there is a 309-acre expansion of the HDDA that extends down to about RM 2.0 in South Pass. This South Pass hopper dredge disposal site has not been used since the early 1990s (Figures 2-9, 2-10).

Figure 2-10 Previously cleared disposal areas along the lower river include approximately 4,028 combined acres of open water disposal and approximately 143,264 acres of beneficial use placement

Beneficial Use of Dredged Material

Approximately 143,264 acres of beneficial use disposal areas have been previously cleared via prior NEPA documents (Appendix A-1). Contingent upon river conditions and funding limitations, an average of 528 acres of marsh creation is expected to establish each year from annual O&M. The exact site placement is contingent on river conditions and dredging need, and identification by CEMVN of the federal standard. Although placement within the federal standard may result in the creation of valuable coastal habit during annual maintenance in lieu of open water disposal, it is important to distinguish this (navigation) project is not classified an ecosystem restoration project. It is a construction and maintenance of a deep draft navigation channel project. Any ecosystem restoration that occurs as a result of placement of dredged material is considered and incidental benefit to the objective/goal of the project, which is to maintain a deep draft navigation channel.

Currently, approximately 38 percent of the available material dredged under the O&M program is used beneficially. Due to either the physical characteristics or the location of the dredged material, not all of the material dredged by the Corps is available for beneficial placement in the coastal ecosystem. Based on the refinement of dredge material placement techniques and subsequent beneficial use monitoring between 2009-2016, a ratio of 80 acres of marsh (with a final target elevation of 2 ft or less) per 1,000,000 cubic yards of material dredged from the river (i.e., 80acres/1mcy) has been achieved. Current dredging in the lower river averages 18,500,000 cy. Since 2010, approximately 6,600,000 cy (or 35.68 percent) has been used beneficially. As such, an average of 528 acres of marsh creation is expected to establish each year via beneficial use under the Federal Standard (Figure 2-11, Appendix A-5).

Beneficial Use Monitoring

CEMVN maintains 13 major navigation channels in Louisiana that require regular maintenance dredging. More than 90 million cubic yards of sediment is dredged annually and CEMVN coordinates with state and federal natural resource agencies to determine the most appropriate methods for the disposal of dredged material and, where possible, within the limitations of the Federal Standard, to beneficially use this material to create or enhance wetlands and other habitats. CEMVN has developed long-term disposal plans, subject to the Federal Standard limitations, incorporating beneficial use for each of these navigation channels.

In 1994, the CEMVN, working in cooperation with Louisiana State University, implemented a large-scale monitoring program to quantify the amount of new habitat created and to improve dredged material placement techniques to maximize beneficial use within the Federal Standard limits. From 1995-2002, vertical photography was acquired and digital mosaics are produced for each of the study sites. GIS habitat analysis and field surveys were conducted on only those sites specified by CEMVN. The work products for the sites selected for full monitoring included dredging history maps, habitat maps for the base year, habitat maps for the selected monitoring years, and habitat change maps. From this analysis, coastal change data quantifies the creation of new coastal lands and other habitats at selected navigation channel locations. The field program included ground truthing operations to verify and update the habitat maps and field surveys to collect information about vegetation, and elevations. While CEMVN no longer performs field surveys and habitat analysis due to funding constraints, CEMVN acquires aerial photography each year to measure/track land change at beneficial use sites.

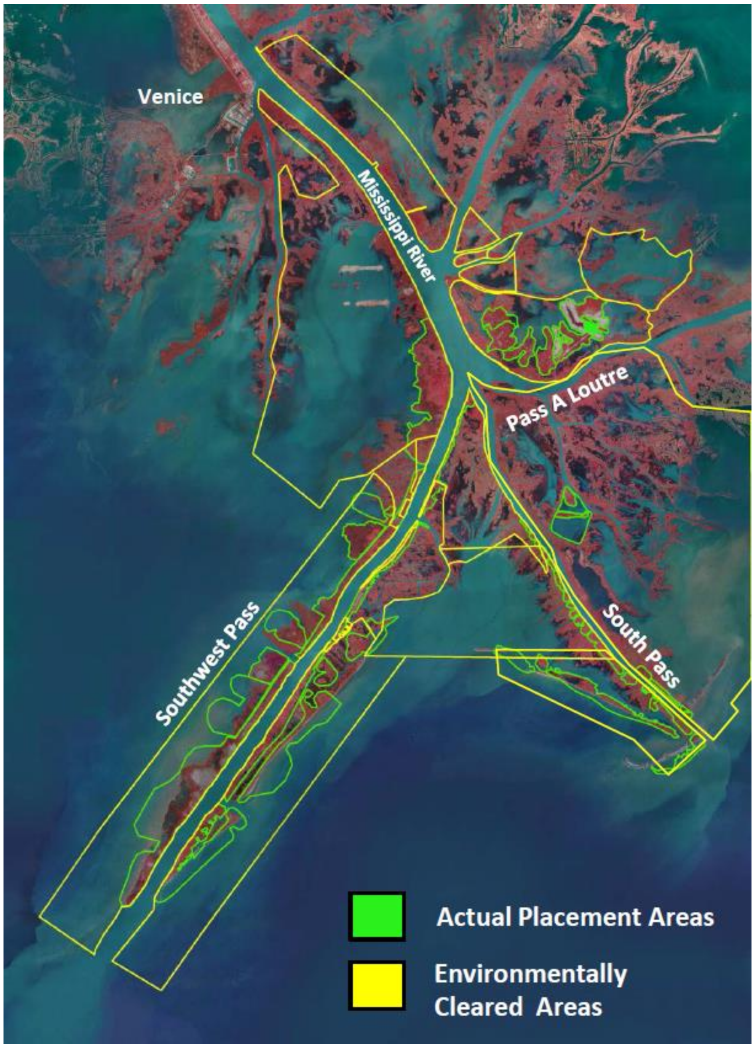

Figure 2-11 environmentally (i.e., NEPA) cleared beneficial use disposal and actual placement areas (2014)

Saltwater Wedge

The congressionally authorized enlargement of the Mississippi River's deep-draft channel from 40 ft to 45 ft (MLLW), according to USACE (2015a), causes an increase in the duration and extent of annual saltwater intrusion. The bottom profile of the Mississippi River navigation channel is deeper than the Gulf of Mexico water surface level up to RM 350 AHP. Salt water in the Gulf of Mexico is denser than the fresh water flowing in the Mississippi. Therefore, at low river flows, the Gulf's salt water moves upstream along the bottom of the River underneath less dense river fresh water. This poses a problem for the municipal water intakes along the lower Mississippi River. Water plants in Plaquemines Parish must shut down operations as saltwater reaches their water intake facilities. For communities at the lower reaches of the river, this shutdown could last longer than their storage reserves can accommodate.

To correct this problem, among other mitigation measures, a sand sill is constructed to a depth between 45.66 ft and 50.66 ft NAVD88(2004.65) near Carlisles, LA, to reduce saltwater flow and artificially arrest the saltwater wedge when conditions necessitate (Figure 2-12, Appendix A-6). Since completion of the 45-ft channel, a sand sill has been constructed three times (in 1988, in 1999, and in 2012) in order to mitigate for the increased duration and extent of saltwater intrusion above RM 64 AHP. Sill construction requires close coordination with the U.S. Coast Guard and the navigation industry because it typically requires several temporary river closures (USACE 2015a).

Figure 2-12 Location of emergency saltwater barrier sill south of Belle Chasse, LA

Other features are also included in the saltwater wedge mitigation plan and are described in detail in Chapter 3.

Future Without-Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the Mississippi River would continue, however, there would be no direct impacts under the no action alternative. Annual O&M dredging of the project area would continue at an average 35,318,498 cy per year and would establish approximately 528 acres of intermediate marsh annually. Existing conditions and trajectories of ecological change to aquatic resources would persist, as described in section 2.4. The area would be subjected to increases in relative sea level rise which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity.

The saltwater barrier sill would continue to be constructed at the same location, as necessary, during extended low water conditions (Appendix A-6). Although there may be a potential for the sediment source of the sill to be shared with outside parties, CEMVN Regulatory permits would be required, and those permits would require special conditions and limit use of the sediment source to allow the construction of the sill when necessary. Enforcement of the permit conditions are the responsibility of the Regulatory Branch of CEMVN.

2.2.2 Mississippi River Delta

Historic and Existing Conditions

The U.S. Geological Survey (Couvillion et al. 2011; Olea and Coleman 2014) provide updated estimates of persistent land change and historical land change trends from the 1932 to 2010 period of record for the entire coastal Louisiana area (Figures 2-13, 2-14). Coastal Louisiana has experienced a net decrease of -1,205,120 acres or about 25 percent of the 1932 coastal land area lost. Persistent losses account for 95% of this land area decrease. The average rate of loss from 1932 to 2010 was 15,360 acres /yr. Trend analysis from 1985 to 2010 show a wetland loss rate of 10,604.8 acres /yr, which equates to losing about one football field per hour if this loss were to occur at a constant rate.

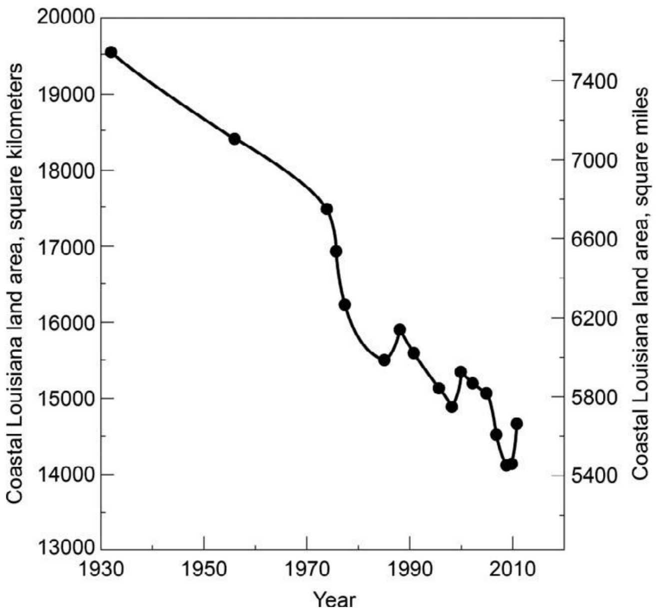

Figure 2-13 Time series of change in coastal Louisiana land area from 1932 to the end of 2010 (Couvillion et al., 2011; Olea and Coleman 2014)

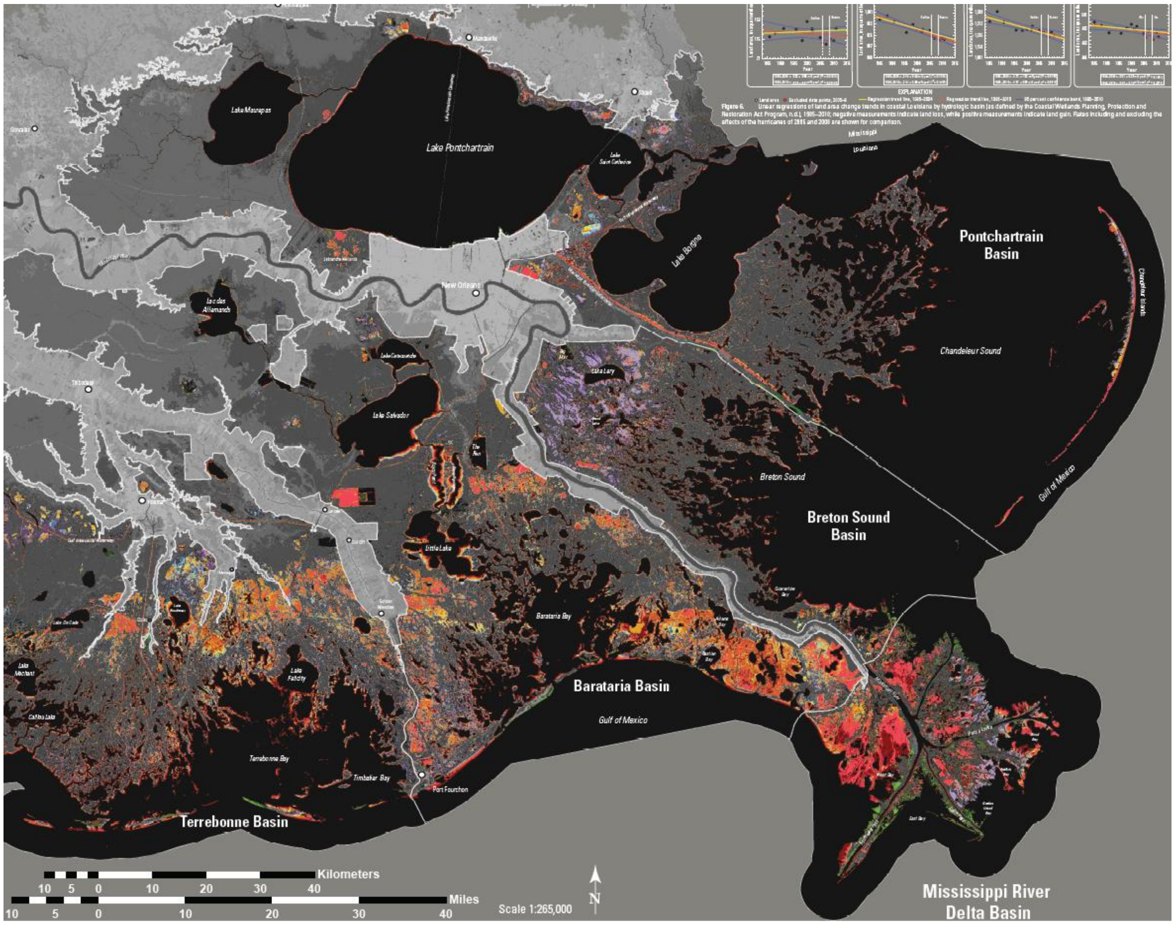

Figure 2-14 Couvillion et al., (2011) determined land area change within the Mississippi River basin experienced a net decrease of -79,385 acres or about 52% of the 1932 area

Coastal Land Loss

Coastal Louisiana has undergone drastic habitat modification during the last century, including major conversion of wetlands to open water (Barras et al. 2008; Mitsch et al. 2009; Tobin et al. 2014). Driving factors behind these changes include water-level increase, salinity alterations, grazing behavior by native and invasive species, lack of particulate deposition, and oil and gas extraction activities (Gosselink et al. 1998, Penland et al. 2001, Tobin et al. 2014). Most of the present Mississippi River fresh water, with its nutrients and sediment, flows directly into the Gulf of Mexico, largely bypassing the coastal wetlands. Levees have reduced the area of seasonally flooded wetlands along the river. Deprived of land building sediment, the wetlands are damaged by saltwater intrusion and other causative factors associated with sea level change and land subsidence, and will eventually convert to open water. Deprived of the nutrients, the plants that define the surface of the coastal wetlands die off. Once the coastal wetlands are denuded of vegetation, the fragile substrate is left exposed to the erosive forces of waves and currents, especially during tropical storm events.

Couvillion et al. (2013) models for a 2010 to 2060 simulation period under a "future-without-action" condition, determined that coastal Louisiana is at risk of losing between 523,369.2 acres and 1,155,712 acres of land over the next 50 years. The vast majority of the disposal areas in the study area is open water (approximately 85,611 acres), which has increased by 1,057-acres since 2001. This illustrates the land loss trend occurring in the Mississippi River Delta and throughout the rest of coastal Louisiana. This land loss trend has been occurring since the early 1900s with commensurate negative effects on Louisiana's coastal ecosystem (USACE 2004). In the last 80 years, coastal Louisiana has lost approximately 1,203,156 acres of land, and another estimated 1,125,071 acres are at risk of being lost over the next 50 years (CPRA, 2012; Bethel et al., 2014). Many factors contribute to land loss along coastal Louisiana, including natural and anthropogenic processes such as subsidence, sea level rise, and tropical storm activity. The study area continues to experience land loss at a steady rate due to subsidence of the land surface and rising sea levels. This process is expected to continue into the future resulting in a loss of surface elevation of the geomorphic features, changes in vegetation types and land cover that characterize the study area, and increased land loss resulting in more open water areas. Between 1932 and 2010, the disposal study area experienced a land loss of approximately 48,110.5 acres and a gain of 8,835.17 acres during the same period (Figure 2-15).

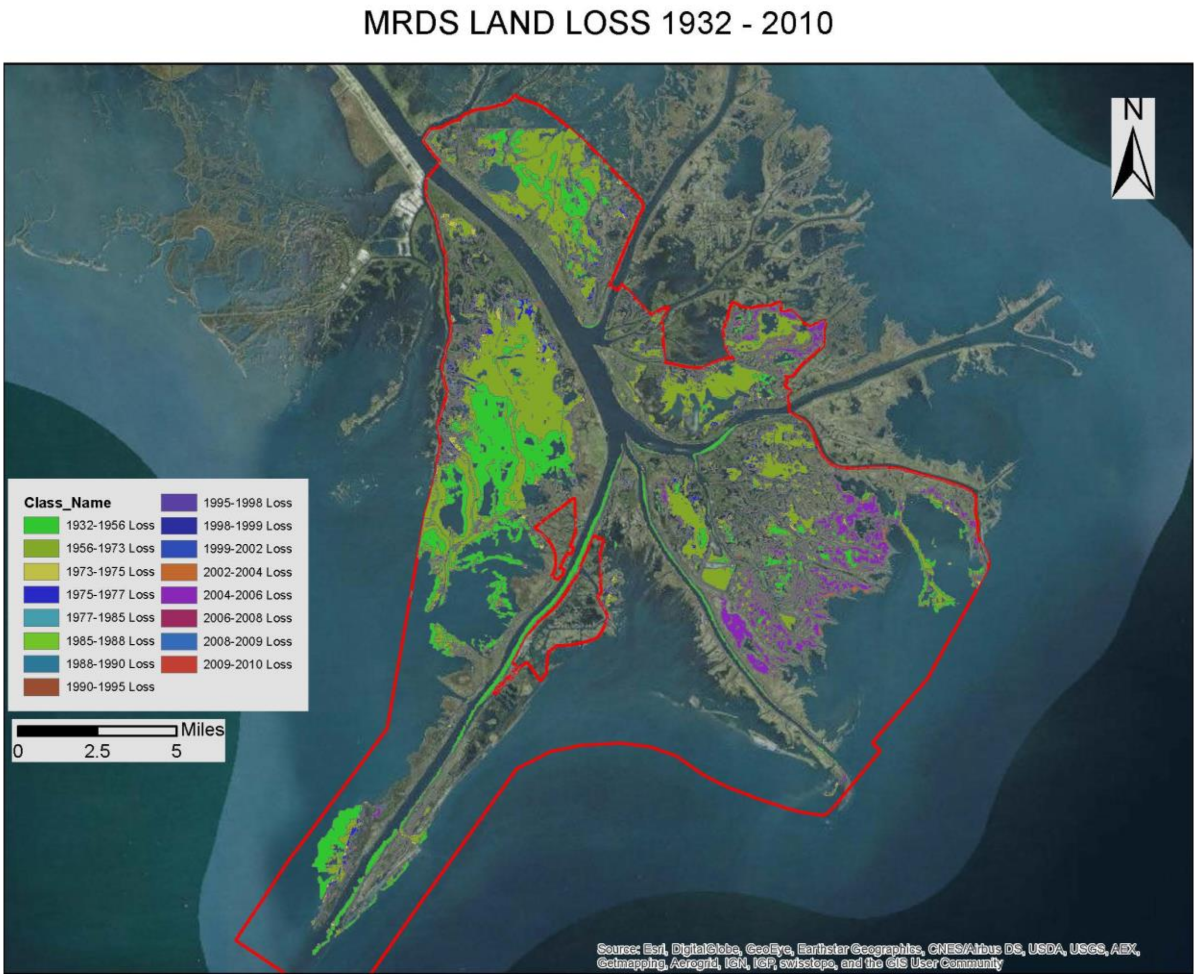

Figure 2-15 Between 1932 and 2010, the disposal study area experienced a land loss of approximately 48,110.5 acres and a gain of 8,835.17 acres during the same period

Some natural factors related to Louisiana's present day coastal land loss area include:

- land-surface subsidence and erosion have recently been considered the two primary physical processes responsible for the historical wetland loss in coastal Louisiana (USGS 2014);
- delta-plain subsidence and a deficit of terrigenous wetland sediment are the primary factors driving the rapid deterioration of the Louisiana coastal zone (Penland and Ramsey 1990);
- increasing sea-levels (Walker et al. 1987, Day and Templet 1989, Boesch et al. 1994, Thomson et al. 2001, Burkett et al. 2002, Gonzalez and Tornqvist 2006, FittzGerald et al. 2008);

- land surface subsidence and compaction (Walker 1987, Britsch and Dunbar 1993, Dokka 2006, Gonzalez and Tornqvist 2006, USGS 2014);
- changes in location of delta deposition area and natural decay of abandoned river deltas (Craig et al. 1979a,b; Walker et al. 1987; Britsch and Dunbar 1993);
- erosion by waves and other factors (Penland et al. 1990, Britsch and Dunbar 1993, Boesch et al. 1994, USGS 2014);
- storms and hurricanes (Craig et al. 1979a,b; Reed 1989; Stone et al. 1997; Day et al. 2000; Day et al. 2007; Barras 2009);
- decrease in plant vertical accretion (DeLaune et al. 1981, Reed and Cahoon 1992, Nyman et al. 1993)
- wetland grazing by native species such as muskrat and geese (Nyman 1983); and
- sedimentary loading and normal tectonic activities such as faulting, folding, and fracturing (Craig et al. 1979a,b; Dokka 2006; Dokka et al. 2006).

Human modifications over the past century have greatly accelerated coastal marsh deterioration and shoreline retreat, not only in the study area, but also in many coastal regions worldwide (Kennish 2001). Effects of human modifications on land loss in coastal Louisiana have been investigated by many researchers:

- flood risk reduction structures such as levees, dams and reservoirs, and maintenance dredging of the Mississippi River for navigation have excluded sediments, freshwater, and nutrients from much of the Louisiana coastal zone thereby eliminating a major land building and maintenance mechanism (Craig 1979; Gagliano et al. 1981; Walker 1987; Kesel 1988, 1989, 2003; Templet and Meyer-Arendt 1988; and others);
- construction of dams and reservoirs and better farming practices for soil erosion control have caused major declines of suspended sediments in the Mississippi River necessary to build and/or nourish coastal wetlands (Walker 1987; Kesel 1988, 1989; Day et al. 2003; Meade and Moody 2010);
- altered wetland hydrology, due to construction of highways, pipelines, canals, spoil banks, and access channels has disrupted natural patterns of sediment transport, facilitated saltwater intrusion and eutrophication (Craig et al. 1979a,b; Gagliano et al. 1981; Scaife et al. 1983; Deegan et al. 1984; Walker et al. 1987; Reed and Wilson 2004);

- introduction of exotic invasive species, such as the nutria, that graze on wetland plants and cause vegetation eat outs and eventual erosion of land (Craig et al. 1979a,b; Walker et al. 1987; Delaune et al. 1994; Ford and Grace 1998; Marx et al. 2004); and invasive plant species like Chinese tallow and water hyacinth which outcompete native plants; and

- tectonic faulting and subsidence due to petroleum extraction (Craig et al. 1979a,b; Walker et al. 1987; Day et al. 2000; Morton et al. 2003; Ericson et al. 2006; Morton et al. 2006).

Subsidence

Subsidence is the most complex and potentially significant biophysical influence on predictions of project outcomes in southeastern Louisiana. This document outlines a proposal for accounting for uncertainty in subsidence predictions in the Study modeling. USACE (2011) assumes that subsidence is a constant function (both past and future) calculated by subtracting the historical global sea level rise rate from ther relative rate measured at the nearest tide gauge. There are only two NOAA Co-ops tide gauges, Grand Isle and Sabine Pass North, in coastal Louisiana that meet the 40-year periods of record the 40-year benchmark described in USACE (2011). The locations of these gauges are insufficient to represent the range of conditions in coastal Louisiana (Figure 2-16).

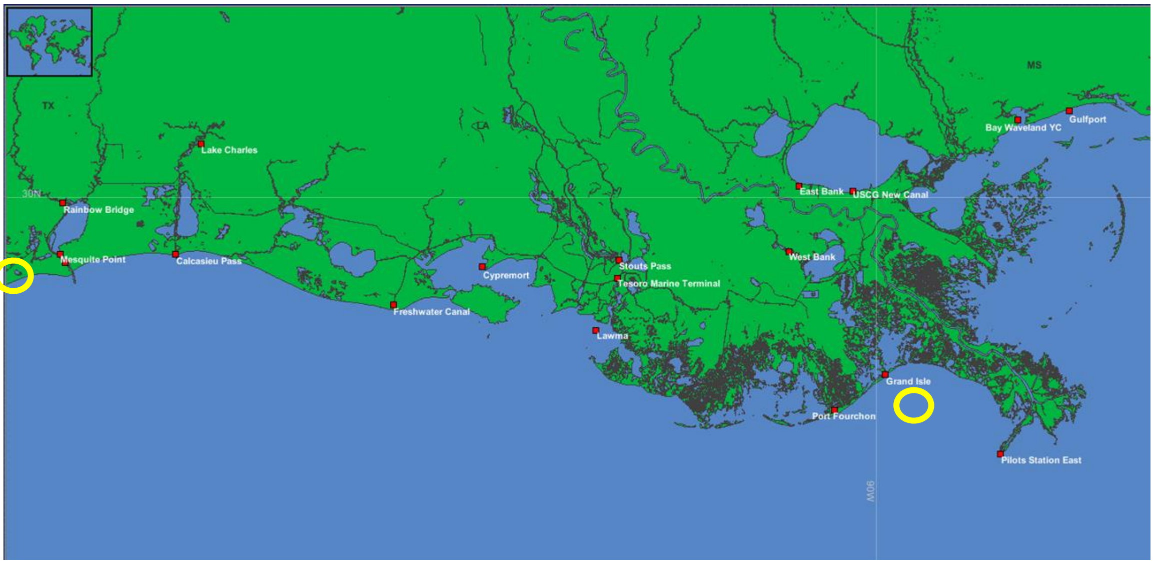

Figure 2-16 NOAA's tide gauge network in Louisiana

Figure 2-16. NOAA's tide gauge network in Louisiana covers multiple geomorphic settings within the State's coastal zone. The two NOAA Co-ops stations with a 40-year record are highlighted by the yellow circles, highlighting the paucity of NOAA stations in coastal Louisiana that meet that benchmark. Note that three NOAA stations are not shown on this map: Carrollton, Crescent City

Air Gap, and Huey Long Bridge Air Gap. http://egisws01.nos.noaa.gov/website/co-ops/stations/viewer.htm.

Sea Level Rise

Global sea level change (GSLR), also called eustatic sea level change, is the global change of the oceanic water level. Data indicate that concentrations of greenhouse gases (e.g., carbon dioxide), and global temperatures have increased during the 20th century. As a result, eustatic sea levels are expected to rise in the future at a higher rate than observed during the 20th century. EPA (1995) estimated that climate change is likely to raise global sea levels 5.9 inches (15 cm) by the year 2050 and 13.4 inches by the year 2100 (34 cm). Other experts predict that the level of the world's oceans could rise over 8 inches (20 cm) over the next 50 years.

Relative sea level is defined as the sea level related to the level of the continental crust. Relative sea level changes can thus be caused by absolute changes of the sea level and/or by absolute movements of the continental crust. Potential impacts brought about by various projected rates of relative sea level change must be considered in every USACE coastal activity as far inland as the extent of estimated tidal influence, in the case in the vicinity of New Orleans, La. (ER-1100-2-8162 and ETL 1100-2-1). This will be consider during feasibility level design of the TSP. Fluvial studies that include backwater profiling should also include potential relative sea level change in the starting water surface elevation for such profiles, where appropriate. Planning studies and engineering designs over the project life cycle, for both existing and proposed projects, will consider alternatives that are formulated and evaluated for the entire range of possible future rates of sea level change represented here by three scenarios of "low," "intermediate," and "high" sea level change. The historic rate of sea level change represents the "low" rate.

For this navigation study, USACE assumes a historical 1.7 mm/yr linear rate of GSLR based on data reported in the International Panel on Climate Change 2007 Working Group I report (Bindoff et al. 2007). The State's Master Plan sea level rise technical team utilized a historical value of global sea level rise of 3.1 mm/yr, based on a 1993-2003 satellite altimetry dataset cited in IPCC 2007, and DeMarco et al. (2012) outlines the use of 2.4 mm/yr as an estimate for the historical linear trend, based on data through 2011 and on the weight of evidence of both tide gauge and satellite altimetry data.

USACE (2011, 2014) instructs its personnel to model three distinct future scenarios for GSLR: 1) an extension of the linear historical rate at the relevant local tide gauge; 2) NRC (1987) Curve I modified as described in USACE (2011), which equates to 0.5-meters GSLR by 2100, and 3) modified NRC (1987) Curve III, which equates to 1.5-meters GSLR by 2100 (Figure 2-17).

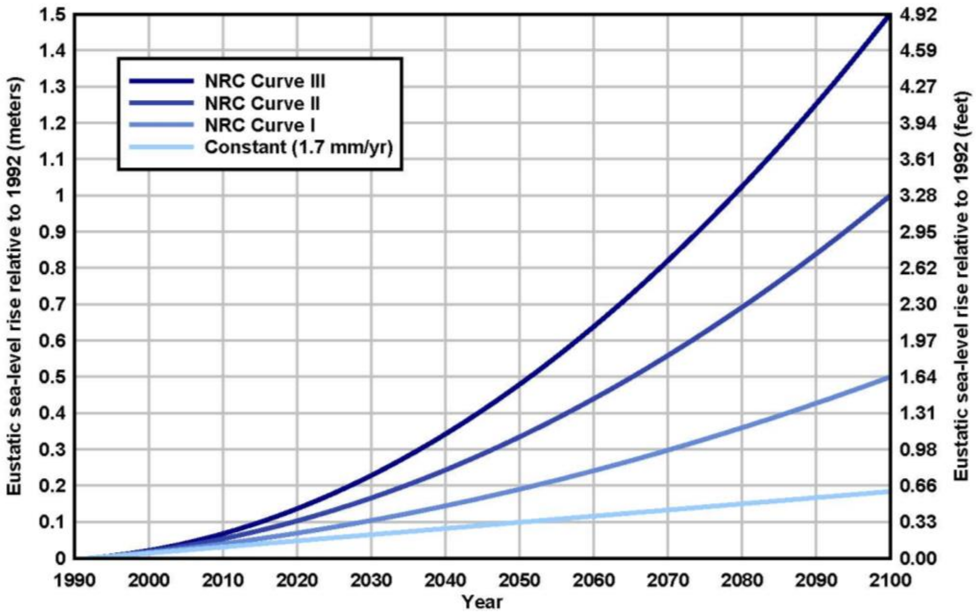

Figure 2-17 Sea level rise scenarios

Environmental Disasters

On April 20, 2010, the Deepwater Horizon mobile drilling unit exploded, caught fire, and eventually sank, resulting in a massive release of oil and other substances from BP's Macondo well (located approximately 50 miles southeast of Head of Passes). Approximately 3.19 million barrels (134 million gallons) of oil were released into the ocean, by far the largest offshore marine oil spill in U.S. history (NOAA 2016). Aquatic and vegetative habitats contained toxic levels of oil which resulted in extensive injuries across the northern Gulf of Mexico ecosystem. Toxicity levels have decreased substantially since 2010 though lingering effects to aquatic resources may be felt for many years.

Large oil slicks also resulted in impacts to aquatic and vegetative resources in and near the Mississippi River Delta. To help prevent surface oil from reaching vegetated areas, large volumes of sand were dredged from the Mississippi River delta and transported to nearby areas for berm construction. The berms served as a barrier between surface oil in Gulf and the vegetated shoreline along the deltaic coast. Dredging for the berms occurred in Pass A Loutre at Head of Passes and in a Mississippi River offshore disposal site.

In February 2016, NOAA and its Federal and state natural resource trustee agencies released the Final Programmatic Damage Assessment and Restoration Plan and Final Programmatic Environmental Impact Statement (Final PDARP/PEIS) as part of the Natural Resources Damage

Assessment. Due to the severity of oil spill impacts across such a broad array of ecosystem resources (i.e. habitats, species, and functions), the Final PDARP/PEIS recommends a comprehensive, integrated ecosystem restoration approach to help offset the ecosystem injuries and impacts. These injuries affected corals, fish and shellfish, wetlands, beaches, birds, sea turtles, mammals, and protected marine life due to three months of oil flow that resulted in an oil slick covering 43,300 square miles (an area roughly equivalent to the size of Virginia) which oiled more than 1,300 miles of shoreline (NOAA 2016). Key findings of the Final PDARP/PEIS include: injuries occurred at all trophic levels; injuries occurred to virtually all marine and estuarine habitats that came in contact with oil, from the deep sea to the shoreline; injuries occurred to species, communities, and ecosystem functions; lost recreation use value is estimated at $693 million dollars.

The preferred restoration alternative primarily focuses on restoring Louisiana coastal marshes. However, a variety of restoration approaches shall be implemented including water quality, nearshore habitats, specific species, and recreation, among others. The preferred alternative is an integrated restoration portfolio that emphasizes the broad ecosystem benefits that can be realized through coastal habitat restoration in combination with resource-specific restoration in the ecologically interconnected northern Gulf of Mexico ecosystem. Restoration will occur over the next several decades (http://www.gulfspillrestoration.noaa.gov/restoration-planning/gulf-plan).

<u>Future Without-Project Conditions (No Action / Alternative 1)</u>

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no action alternative. The area would be subjected to increases in RSLR which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area, could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominant species to those species that can tolerate higher salinity. O&M, including beneficial use within the federal standard, within the study area would continue as described above. The marshes of Plaquemines parish are anticipated to continue to decline and convert to marsh and open water. However, CEMVN O&M would continue to use material beneficially for coastal habitat creation to the extent authorized under the federal standard. There would be no direct impacts under the no action alternative.

The effects of human activities will continue to exacerbate land loss rates in the Plaquemines-Balize delta. Channel stabilization and levee maintenance along the Mississippi River will continue to restrict seasonal sediment-laden overbank flows that once nourished adjacent wetland areas. The Mississippi River levees to the north, and associated erosion control and channel stabilization measures extending to its mouth, will continue to preclude the possibility of a naturally occurring crevasses or natural changes in the river's course. The river will continue to be maintained at its current navigational dimensions. As such, crossings would continue to require a combined annual average of approximately 16,403,283 cubic yards of dredging and have minimal effect on the delta since the material is contained within the system. Southwest Pass would continue to require approximately 15,091,427 cubic yards of dredging annually. Approximately 528 acres of coastal marsh habitat is expected to establish each year via beneficial use, however, due to subsidence, erosion, and sea level rise, most of these areas are not expected to exist beyond the 50-year period of analysis4. Continued relative sea level rise could also impact the entire area resulting in vast areas of shallow open water as vertical accretion rates fail to keep pace with rising sea levels.

O&M dredging of the project area would continue at an average of 35,318,498 cy per year. Flow and water level trends described above are expected to continue. The gradual trend of shoaling upriver of Head of Passes between RM 6-13.4 is anticipated to continue. This is based on observations of the project indicating the migration of dredge requirements up river of this reach and porptionally fewer demands for dredging down river. Overall increase in dredging quantities in the lower river is not anticipated, Without the proposed project, the area would continue to be affected by the following:

- Federal and state water quality programs – may address land use practices in the Mississippi River basin and could impact the area water quality (Broussard 2008).
- Coastal processes – the marshes of Plaquemines Parish are anticipated to continue to decline and convert to marsh and open water, in turn affecting local water quality conditions. However, CEMVN O&M would continue to use material beneficially for coastal habitat creation to the extent possible under the federal standard as described previously.
- Climate change, relative sea-level rise and hurricane/tropical storm surge.

2.2.3 Water Quality

Regulatory Overview

The Clean Water Act (CWA) established a process for states to assess water quality. Section 305(b) requires states to develop a surface water quality monitoring program, and a report describing the water quality status of state waterbodies with respect to support of designated uses. Section 303(d) requires states to develop and list Total Maximum Daily Loads (TMDLs) for impaired waterbodies (waterbodies with water quality unsupportive of one or more designated uses). A TMDL is the maximum amount of the pollutant(s) contributing to impairment that can enter a waterbody from all sources (including nonpoint sources) and still meet water quality criteria. The Louisiana Department of Environmental Quality (LDEQ) implements a watershed-based approach to reduce pollutant loads in the waterbodies where TMDLs have been established, through the Louisiana Pollutant Discharge Elimination System (LPDES) and Louisiana Nonpoint Source (NPS) programs. For the purpose of state water quality assessment, Louisiana is divided into 12 major basins, which are further divided into waterbodies known as sub segments. The *2014 Louisiana Water Quality Inventory: Integrated Report* is the most recent in the biennial publication prepared by LDEQ on the status of Louisiana waters in accordance with Sections 305(b) and 303(d) (LDEQ 2014).

Historic and Existing Conditions

Groundwater is near the surface throughout most of the Louisiana coastal zone (USACE 2004). The silt and sand rich depositional environments such as point bar, intradelta, natural levee, beach, and nearshore gulf are generally connected hydraulically to the adjacent water body (i.e. river, lake, distributary channel) and the groundwater level in these deposits reflects the level/stage of the adjacent water body (USACE 2004). This is especially true in deposits adjacent to the Mississippi and Atchafalaya Rivers. Any potential connectivity should be investigated to determine its influence on uplift pressures, design of dewatering systems, and groundwater migration (USACE 2004). In addition, it has been proposed that submarine groundwater discharge is an important contributor to geochemical and hydrological fluxes within the deltaic plain (Kolker et al. 2012.

Numerous deep regional aquifers exist in South Louisiana (USGS 2015a). The coastal lowlands aquifer system of Louisiana consists of alternating beds of sand, gravel, silt, and clay deposited under fluvial, deltaic, and marine conditions (USGS 2015a). The aquifer system is comprised of sediment from the late Oligocene age to Holocene that thicken and dip toward the Gulf Coast. The sediments are highly heterogeneous with sand beds that are not traceable for more than a few miles (USGS 2015a). The Chicot aquifer underlies most of southwestern Louisiana and extends from central southwestern Louisiana to the Gulf of Mexico and from Sabine Lake to St. Mary Parish. The Chicot aquifer is up to 800 ft thick at its most northern extent and extends to an unknown depth beneath the Gulf of Mexico. The Southeastern Louisiana aquifer system, also known as the Southern Hills aquifer system, consists of about 30 named aquifers (USACE 2004). The Southeastern aquifer extends approximately from the Mississippi River to the Pearl River in Louisiana. The aquifers range in thickness from 50 to 1,100 ft with thickness increasing toward the south (USGS 2015a).

Mississippi River

River water quality varies due to factors such as seasonality, changing farming practices, and rainfall patterns. As this relates to agricultural runoff and suspended sediment, fertilizer and pesticide concentrations in the river are dependent on their physiochemical properties, timing of application and subsequent rainfall, crop selection, and Federal farm policy, while suspended sediment concentration, load, and grain size distribution are dependent on factors such as river discharge, time between flood events, and water depth (Meade 1995, Allison et al. 2010, Rosen and Xu 2014).

Anthropogenically-induced changes in Mississippi River water quality are primarily related to population increases within the river's watershed and development practices, including the adoption of agricultural soil conservation practices beginning in the 1930s; the construction of major river engineering works during the 20th century; increasing use of fertilizers and pesticides, particularly for industrial farming; and insufficient regulation of point source pollution prior to effective enforcement of the CWA. Table 2-4, adapted from Garrison (1998), includes a water quality summary for three long-term (periods of record ranging from 1905-1995) monitoring stations in the Mississippi River.

Table 2-4 Mississippi River water quality summary, from Garrison (1998) (BDL = Below Detection Limit)

Group	Parameter	Units	Mississippi River at New Orleans, Louisiana (8)			Mississippi River at Violet, Louisiana (9)			Mississippi River at Belle Chasse, Louisiana (10)		
			Percentile			Percentile			Percentile		
			25th	50th (Median)	75th	25th	50th (Median)	75th	25th	50th (Median)	75th
Physical properties	Specific Conductance	µmhos/cm	346	406	462	324	358	450	332	402	461
	pH	SU	7.3	7.6	7.9	7.4	7.6	7.8	7.3	7.6	7.8
	Water Temperature	°C	11.5	19	28	10.5	17.5	26.2	11	19.2	26.5
	Dissolved Oxygen	mg/L	6.5	8	9.5	7.1	8.1	9.6	6.8	7.9	10.2
	Dissolved Solids	mg/L	208	245	275	201	220	254	214	249	286
Major cations	Calcium (Dissolved)	mg/L	36	41	45	35	38	44	35	39	43
	Magnesium (Dissolved)	mg/L	9.7	12	13	9.6	11	13	9.8	12	14
	Sodium (Dissolved)	mg/L	16	22	28	15	18	26	15	20	28
	Potassium (Dissolved)	mg/L	2.8	3.3	3.5	2.5	2.9	3.3	2.8	3.3	3.6
Major Anions	Alkalinity (Total, as $CaCO_3$)	mg/L	90	106	118	89	98	115	88	105	120
	Sulfate (Dissolved)	mg/L	44	53	62	40	46	57	38	48	59
	Chloride (Dissolved)	mg/L	19	25	30	18	22	29	20	26	32
Nutrients	Ammonia + Organic Nitrogen (Total, as N)	mg/L	0.5	0.7	0.9				0.5	0.7	1
	Nitrate + Nitrite (Total, as N)	mg/L	0.88	1.2	1.6	0.85	1.2	1.4	1.1	1.4	1.7
	Phosphorus (Total, as P)	mg/L	0.18	0.24	0.31	0.2	0.24	0.3	0.14	0.2	0.27
Biological Constituents	Fecal coliform	Col/100 mL	170	280	460	2,000	3,100	3,600	140	310	800
	Fecal streptococcus	Col/100 mL	200	440	880				120	280	750
	Phytoplankton	Cells/mL	760	1,400	2,800				880	1,800	4,100
Metals	Iron (Dissolved)	µg/L	*BDL*	20	40	*BDL*	*BDL*	30	*BDL*	20	29
	Zinc (Dissolved)	µg/L	*BDL*	*BDL*	20	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*	*BDL*
Organic Compounds	2,4-D (Total)	µg/L	*BDL*	*BDL*	0.2	*BDL*	*BDL*	*BDL*			
	Phenols (Total)	µg/L				*BDL*	1	2			
	Oil and Grease (Total Recoverable)	mg/L				*BDL*	*BDL*	1			
	Organic Carbon (Total)	mg/L	3.6	5.6	7.7	6	6.2	8.5	5.2	6.7	8.9

Louisiana Water Quality Inventory

The 2014 Louisiana Water Quality Inventory: Integrated Report (IR) reports the most recent assessment of waterbody subsegments as required by Sections 303(d) and 305(b) of the CWA. For the Mississippi River, there are three applicable subsegments for the study area including:

1. LA070301 (Mississippi River from Monte Sano Bayou [Baton Rouge] to Head of Passes),
2. LA070401 (Mississippi River Passes – Head of Passes to Mouth of Passes [includes all passes in the birdfoot delta]), and
3. LA070601 (Mississippi River Basin Coastal Bays and Gulf Waters to the State 3 mile limit)

Table 2-5 provides the 2014 IR's summary information for the applicable waterbody subsegments. The upper reaches of the river within the study limits are fully supporting the assigned designated uses. However, the lower reach (coastal/Gulf waters) are listed as impaired due to the reasons shown below. LDEQ has developed a TMDL for mercury in fish tissue impairment while the dissolved oxygen and fecal coliform impairments are listed on the 303(d) list and require TMDL development.

Table 2-5. Mississippi River Waterbody Subsegments

Table 2-5 Mississippi River Waterbody Subsegments

Subsegment Number	Designated Uses					Impaired Use	Suspected Causes of Impairment	Suspected Sources of Impairment
	PCR[1]	SCR[2]	FWP[3]	DWS[4]	OYS[5]			
LA070301	F[6]	F	F	F				
LA070401	F	F	F		F			
LA070601	F	F	**N**[7]		**N**	FWP	Mercury in fish tissue	Atmospheric deposition of toxics and unknown source
	F	F	**N**		**N**	FWP	Dissolved oxygen	Upstream source
	F	F	**N**		**N**	OYS	Fecal coliform	On-site treatment systems, waterfowl, and other wildlife

[1] Primary Contact Recreation (swimming),[2] Secondary Contact Recreation (boating),[3] Fish and Wildlife Propagation (fishing),[4] Drinking Water Supply,[5] Oyster Propagation,[6] Fully supporting, and [7] Not supporting

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct or indirect impacts from implementing the No Action Alternative.Without the proposed project, study area water quality would likely continue current trends. For example, surface water quality has improved significantly with the implementation of the Clean Water Act and industrial and municipal discharge programs such as NPDES. These programs continue to advance with new or improved technologies to treat wastewater discharges. The causes of impairment listed in Table 2-5 above will continue to degrade water quality until TMDL development and execution, and the suspected sources are addressed. In addition, contaminants of emerging concern such as pharmaceuticals and personal care products, microplastics, etc. continue to present uncertainty for surface water quality and potential concerns for human health and the environment.

2.2.4 Salinity

Historic and Existing Conditions

Due to the sheer volume of freshwater discharge from the river and its outlets, the coastal area of the delta can be classified as a mixing zone for fresh and salt water. The mixing zone is dynamic and depends on such variable factors as river discharge, tides, and wind. Saltwater intrusion occurs when freshwater flows decrease in volume, allowing saltwater from the gulf, which is heavier than freshwater, to move inland or “upstream”. Saltwater can then infiltrate fresh groundwater and surface water supplies, and damage freshwater ecosystems. The rate of saltwater intrusion depends on the amount of freshwater flows traveling downstream and the water depth in the wetlands, channels, and/or canals. Generally, high-inflow/low-salinity periods occur from late winter to late spring and low-inflow/high-salinity periods from late spring to fall. Saltwater intrusion is a principle factor in the conversion of freshwater habitats to saline habitats.

The salt water in the Gulf of Mexico is denser than the fresh water flowing in the Mississippi. Therefore, at low river flows, the Gulf’s salt water migrates upstream along the bottom of the River underneath less dense river fresh water. This wedge is blocked under extreme low water conditions by construction of the aforementioned temporary saltwater barrier/sill at RM 64. Figure 2-18 demonstrates the buoyancy of fresh water above denser saline water.

Based on monitoring data from beneficial use sites, over 95% of the area is classified as intermediate marsh. Chabrek (1972) defined the typical range of intermediate salinity as 2-5 ppt.

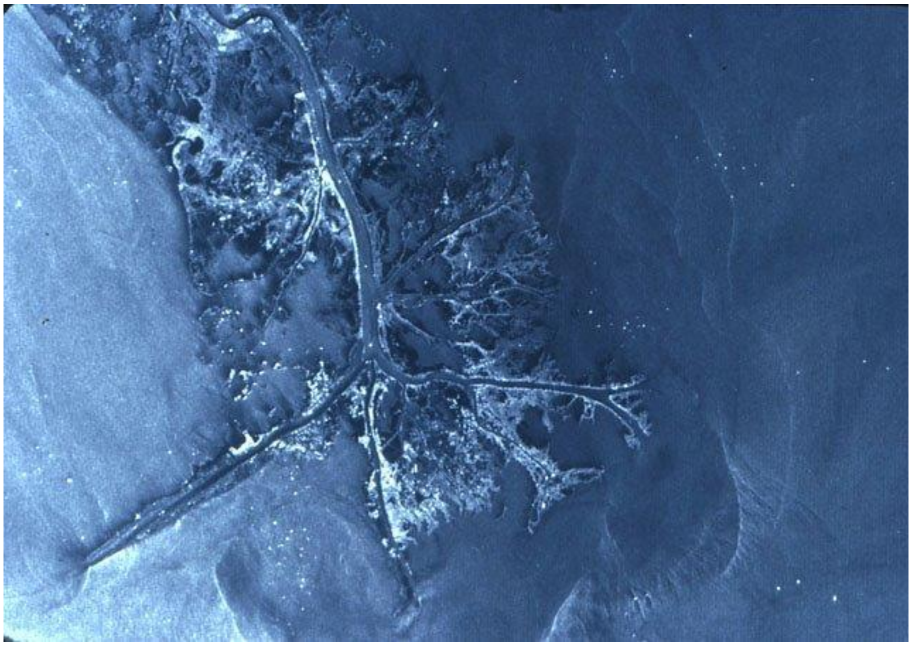

Figure 2-18 Mississippi River Delta, Salinity Front

In the black-and-white synthetic aperture radar (SAR) image of the Mississippi Delta, seen in Figure 2-18, several long, narrow, curving features can be seen in the waters to the east of the delta (at the right of the frame). These are surface waves resulting from the interaction between the outflowing fresh waters of the Mississippi River and the ambient saline waters of the Gulf of Mexico. The less-saline river water is less dense than the Gulf waters, and therefore flows out across the salty sea water at the river mouth. Fresh water can be seen discharging to a distance of about 5 kilometers out to sea where it blends with Gulf water.
(http://www.lpi.usra.edu/publications/slidesets/oceans/oceanviews/slide_28.html)

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no action alternative. Salinity gradient trends are expected to continue. Without the proposed project, the area would still be affected by the following:

• Coastal processes – the marshes of Plaquemines parish are anticipated to continue to decline and convert to marsh and open water, in turn affecting local water quality conditions.

• Saltwater wedge migration-the saltwater wedge (Section 2.2.1) would continue to migrate upstream during low water conditions. The saltwater barrier sill would continue to be constructed as a mitigation measure for the project.

• Climate change, relative sea-level rise and hurricane/tropical storm surge- each of these processes would speed the process of saltwater intrusion in the area of the lower river.

2.3 Human Environment

2.3.1 Population and Housing

Historic and Existing Conditions

Population

Across the 11 affected parishes, a 6 percent population growth from 1.55 million to 1.64 million persons, was observed between the 1990 and 2000. This is significantly lower than the observed national growth of 29% over the same historical period. Six of the parishes within the immediate economic region of the study area have seen a growth in population from 1990, while 5 parishes have seen a decrease in population. The Ascension Parish experienced the highest increase in population from 1990 to 2015 (+75%), while the St. Bernard Parish experienced the greatest decrease in population (-32%) over the same time period (Table 2-6).

Currently (from year 1990 to 2015), the US Census Bureau estimates the population of the study area to be approximately 1.56 million people. East Baton Rouge, Jefferson, and Orleans Parishes are the most populous. These three parishes contain approximately 79% of the total population of the 11 study area.[1]\

Table 2-6 Population Trends for Selected Louisiana Parishes

Parish	Population				Percentage Change			
	1990[2]	2000[3]	2010	2015[4]	1990 to 2000	2000 to 2010	2010 to 2015	1990 to 2015
Ascension	68,214	76,627	107,215	119,455	12%	40%	11%	75%
East Baton Rouge	285,167	412,852	440,171	446,753	45%	7%	1%	57%
Iberville	31,049	33,320	33,387	33,095	7%	0%	-1%	7%
Jefferson	448,306	455,466	432,552	436,275	2%	-5%	1%	-3%
Orleans	496,938	484,674	343,829	389,617	-2%	-29%	13%	-22%
Plaquemines	25,575	26,757	23,042	23,495	5%	-14%	2%	-8%
St. Bernard	66,631	67,229	35,897	45,408	1%	-47%	26%	-32%
St. Charles	42,437	48,072	52,780	52,812	13%	10%	0%	24%
St. James	25,575	21,216	22,102	21,567	-17%	4%	-2%	-16%
St. John the Baptist	39,996	43,044	45,924	43,626	8%	7%	-5%	9%

[1] http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?fpt=table
[2] Bureau of the Census, http://www.census.gov/population/www/censusdata/cencounts/files/la190090.txt
[3] Bureau of the Census, http://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t
[4] Bureau of the Census, American Community Survey, Quick Facts

Parish	Population				Percentage Change			
	1990[2]	2000[3]	2010	2015[4]	1990 to 2000	2000 to 2010	2010 to 2015	1990 to 2015
West Baton Rouge	19,419	21,601	23,788	25,490	11%	10%	7%	31%
Louisiana	4,219,973	4,468,976	4,533,372	4,670,724	6%	1%	3%	11%
United States	248,709,873	281,421,906	308,745,538	321,418,820	13%	10%	4%	29%

Housing

The 11 parishes have estimated occupancy rates ranging from 75% in Orleans Parish to 93% in both Ascension Parish and St. Charles Parish. An estimated 61% of all residents in the eleven counties own their home. Orleans Parish has the lowest ownership rate at an estimated 47% and St. Charles Parish has the highest with an estimated 81% of residents owning their home (Table 2-7).

Table 2-7 Estimated Occupancy in Selected Louisiana Parishes

Parish	Owner-Occupied	Renter-Occupied	Vacancy Rate
Ascension	80%	20%	7%
East Baton Rouge	60%	40%	8%
Iberville	76%	24%	13%
Jefferson	63%	53%	10%
Orleans	47%	53%	25%
Plaquemines	71%	29%	16%
St. Bernard	70%	30%	21%
St. Charles	81%	19%	7%
St. James	80%	20%	9%
St. John the Baptist	77%	23%	9%
West Baton Rouge	70%	30%	14%

<u>Future without Project Conditions (No Action / Alternative 1)</u>

Direct and Indirect Impacts: Population and housing would continue to grow as projected. Moody's Economy projected the populations of all but one of the eleven parishes to increase in all but three parishes: East Baton Rouge Parish, Iberville Parish, and West Baton Rouge Parish (Table 2-8).

Table 2-8 Population Projections for Select Louisiana Counties – 2015 to 2035

Parish	2015	2020	2025	2030	2035	Projected Percentage Change

						2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035
Ascension Parish	120,261	133,212	145,076	155,967	166,192	10.8%	8.9%	7.5%	6.6%
East Baton Rouge Parish	430,202	428,749	423,971	416,921	409,210	-0.3%	-1.1%	-1.7%	-1.8%
Iberville Parish	30,860	30,736	30,554	30,430	30,368	-0.4%	-0.6%	-0.4%	-0.2%
Jefferson Parish	451,766	459,592	466,229	471,364	476,624	1.7%	1.4%	1.1%	1.1%
Orleans Parish	233,959	238,011	241,448	244,108	246,832	1.7%	1.4%	1.1%	1.1%
Plaquemines Parish	23,577	23,986	24,332	24,600	24,875	1.7%	1.4%	1.1%	1.1%
St. Bernard Parish	16,248	16,529	16,768	16,952	17,142	1.7%	1.4%	1.1%	1.1%
St. Charles Parish	55,257	56,214	57,026	57,654	58,297	1.7%	1.4%	1.1%	1.1%
St. James Parish	22,008	22,300	22,626	22,926	23,242	1.3%	1.5%	1.3%	1.4%
St. John the Baptist Parish	50,835	51,716	52,463	53,041	53,633	1.7%	1.4%	1.1%	1.1%
West Baton Rouge Parish	22,766	22,805	22,676	22,405	22,065	0.2%	-0.6%	-1.2%	-1.5%
Louisiana	4,423,850	4,495,380	4,556,410	4,604,250	4,650,210	1.6%	1.4%	1.0%	1.0%
United States	321,369,000	334,503,000	347,335,000	359,402,000	370,338,000	4.1%	3.8%	3.5%	3.0%

2.3.2 Employment and Industrial Activity

Historic and Existing Conditions

Louisiana employment in 2014 totaled 2 million. Of the major industry sectors within the state, the health care and social assistance sector employs the most persons (283,000). This industry is followed by retail trade (234,000), educational services (184,000), construction (161,000), manufacturing (160,000), and accommodation and food services (156,000). The parishes in the study region yield fairly similar proportions of workers per sector (all within 5 percent) compared to what was observed at the state level. The one industry exception was manufacturing in St. James Parish and West Baton Rouge Parish. Respectively, 23 percent and 16 percent of workers participated in the manufacturing industry compared to 8 percent at the state level.

According to the United States Bureau of Labor Statistics (BLS), the unemployment rate[5] in the 11 affected parishes ranged from 6% to 8.7%, as of June 2016. Statewide, the unemployment rate in June 2016 was 7%, higher than the national rate of 4.9%. Only Iberville Parish with 7.7% unemployment and St. James Parish with 8.7% unemployment had rates higher than the state average. Unemployment in all eleven parishes has been declining steadily, between .2 and .95 percentage points, since 2011.

Future without Project Conditions (No Action / Alternative 1)

Direct and Indirect Impacts: Direct and Indirect Impacts: Industry and business would continue to grow or shrink depending on market forces. Inefficiencies due to shallow water depth along navigation channels would inhibit the ability of shipping-related business to grow and expand. Unemployment is predicted to decline in all parishes by the year 2035. All parishes, with the exception of St. James parish, are forecasted to see a rise in unemployment between 2015 and 2025 before seeing an increase in employment (Table 2-9).

Table 2-9 Projected Change in Unemployment for Select Louisiana Counties – 2015 to 2035

	2015	2020	2025	2030	2035	Projected Change			
						2015 to 2020	2020 to 2025	2025 to 2030	2030 to 2035
Ascension Parish	3.4%	3.5%	3.7%	3.7%	3.5%	1.7%	5.9%	-0.7%	-3.9%
East Baton Rouge Parish	3.5%	3.6%	3.8%	3.7%	3.6%	1.7%	5.9%	-0.7%	-3.9%
Iberville Parish	5.0%	5.1%	5.4%	5.3%	5.1%	1.7%	5.9%	-0.7%	-3.9%
Jefferson Parish	3.7%	3.8%	4.1%	4.1%	4.0%	3.7%	6.9%	0.2%	-2.7%
Orleans Parish	5.2%	5.4%	5.8%	5.8%	5.7%	3.7%	6.9%	0.2%	-2.7%
Ouachita Parish	4.0%	4.1%	4.4%	4.4%	4.3%	2.9%	7.1%	0.4%	-3.7%
St. Bernard Parish	4.8%	5.0%	5.3%	5.3%	5.2%	3.7%	6.9%	0.2%	-2.7%
St. Charles Parish	3.9%	4.0%	4.3%	4.3%	4.2%	3.7%	6.9%	0.2%	-2.7%
St. James Parish	5.5%	5.3%	5.1%	4.8%	4.5%	-5.1%	-2.7%	-5.8%	-6.0%
St. John the Baptist Parish	5.1%	5.3%	5.7%	5.7%	5.5%	3.7%	6.9%	0.2%	-2.7%
West Baton Rouge Parish	3.5%	3.6%	3.8%	3.8%	3.6%	1.7%	5.9%	-0.7%	-3.9%

2.3.3 Public Facilities and Services

Historic and Existing Conditions

The eleven parishes in the study area contain public facilities and services typical of other American Communities. Public schools, fire and police departments, and public health services

[5] Not seasonally adjusted

are among the services provided by the parishes. Ascension Parish has a public boat ramp operated by the Louisiana Fish and Wildlife services. Iberville Parish, Plaquemines Parish and Orleans Parish have both State and Parish operated Ferry services.

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Increases in population could increase demand for public services such as police, school and public health services. Other public services, such as boat rams and ferry services, may also see an increase in usage as a result of population growth.

2.3.4 Transportation

Historic and Existing Conditions

The eleven parishes contain five ferry terminals.[6] Three are state-operated and two are parish-operated. A study conducted in 2009 noted the average ridership for ferries in the Jefferson, Orleans, Plaquemines, St. Bernard and St. Tammany Parishes have experienced an average decline of about 1% per year. The decline was attributed, in part, to the effects of Hurricane Katrina on the region's population. In addition to water transportation, the area also has an extensive network of state, county and municipal roads to accommodate vehicle traffic.[7]

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: The volume of goods transported by ship would remain similar to current levels, due to constraints imposed by water depth. Increased population numbers would put more demand on roadways and public transportation.

2.3.5 Community and Regional Growth

Historic and Existing Conditions

Presently, population numbers have remained largely stable in 8 of the 11 affected parishes. Orleans Parish saw a sharp decline in residents from 2005 to 2010, due to Hurricane Katrina. West Baton Rouge Parish also saw a sharp decline during the same time frame. Ascension Parish has seen a steady increase in residents from 1995 until the present.

Future without Project Conditions (Alternative 1)

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[6] http://wwwapps.dotd.la.gov/operations/ferrystatus/fmbs_map.aspx?PID=F_ALL
[7] http://wwwsp.dotd.la.gov/Inside_LaDOTD/Divisions/Multimodal/Data_Collection/Mapping/Wall%20Map/Official%20Highway%20Map%20(side%201).pdf

Direct and Indirect Impacts: Communities would continue to grow and expand along with their populations. Community growth could fuel business development, as well as expand the physical community borders.

2.3.6 Cultural and Historic Resources

Historic and Existing Conditions

The Mississippi River is integral to the history of the United States. In both prehistoric and historic times, the Mississippi River has been a means of transit and an area of rich resources conducive to settlement along its banks. During the growth of the United States and during the Civil War, control of the Mississippi River warranted fortifications. In the industrial age, numerous efforts to control the Mississippi River began and continue with engineered features such as levees, dikes, channel training and similar features. The current project involves deepening of select crossings, and increasing the availability of designated disposal areas for beneficial use of dredged material in the constant battle to stem land loss occurring in the Delta of the Mississippi River. Channel depths have been examined and coordinated for impacts to natural resources, via documents of the National Environmental Policy Act (NEPA). Not all of these areas were subject to cultural resources survey, but studies that have been completed and that discuss these areas, present large agreement that resources are not preserved at the depths in question, both because of the continued dredging that has occurred during the age of navigation, and because of the high velocity and large energy of the Mississippi River at these depths.

Consideration of the disposal areas support a similar conclusion. The vast majority of the currently proposed disposal area has already been discussed in previous NEPA documents including those assessing the disposal of material acquired by dredging the Venice Harbor, and those assessing the expansion of disposal areas associated with South Pass and Southwest Pass by 51,000 acres. Not all of the prior NEPA documents on the lower river contain a cultural resources survey (Appendix A-1) but they do discuss the natural forces at work that make the existence of intact historic properties unlikely. The proposed project's proposed disposal areas are underlain by several hundred ft of alluvial material which is slowly compressing and causing surface sediments to subside. Large land areas develop and disappear over several centuries. The current proposal would add approximately 24,000 acres of new disposal areas to the approximately 143,207 acres of existing and previously cleared disposal areas in the vicinity of the lower Mississippi River.

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: There would be no direct impacts. Indirect impacts at Channel Crossings are unknown but could involve unknown steps taken by private shipping interests to allow deeper draft shipping to navigate the Mississippi River. Indirect impacts of no action would involve increased land loss and potential impacts to existing unknown cultural resources by lack of effort to provide sediments to prevent subsidence and erosion.

2.3.7 Aesthetics and Visual Resources

Historic and Existing Conditions

The project area is large and water resources are abundant. Water resources include a large stretch of the Mississippi River and associated tributaries and passes located at the river delta going out into the Gulf of Mexico. There are a plethora of bays and other similar water bodies as well. There are no scenic streams, either state or federally recognized, anywhere near the vicinity of the disposal areas.

There are two wildlife management areas in the vicinity of the disposal areas. These include Delta National Wildlife Refuge and Pass a Loutre Preserve Wildlife Management Area. There are other recreational, public and institutionally significant lands along the Mississippi River corridor but those will be removed from any potential work associated with this project.

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Under the no action alternative, there would no direct impacts to visual resources within the study area. Visual resources would most likely evolve from existing conditions in a natural process, or change as dictated by future land use maintenance practices and policies.

Any future changes or alterations to the study area would evolve in a natural process over the course of time, or by local land use patterns and maintenance practices. These incremental direct and indirect impacts would be in addition to the direct and indirect impacts of visual resources in the region, Louisiana and the Nation.

2.3.8 Noise

Historic and Existing Conditions

Generally, noise is a localized phenomenon throughout the study area. There are many different noise sources throughout the area including commercial and recreational boats, and other recreational vehicles; automobiles and trucks, and all-terrain vehicles; aircraft; machinery and motors; and industry-related noise. Noise levels vary depending on the time of day and climatic conditions. Automobile, navigation traffic, train traffic, all-terrain vehicle traffic, industry and to a lesser extent air traffic, contribute to the background noise levels.

Pass a Loutre WMAs and the Delta National Wildlife Refuge are located in the vicinity of the lower river and existing disposal areas. These public lands are sensitive noise receptors where serenity and quiet are an important public resource. Residential homes, apartments, schools, churches, and businesses are also in proximity. Noise levels around the project area are variable depending on the time of day and climatic conditions. Near developed areas, automobile and train traffic, and to a lesser extent air traffic, contribute to the background noise levels.

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no action alternative. Localized and temporary noise impacts would likely continue to affect animals and the relatively few people in the remote coastal wetland areas. Potential noise impacts concerns may be expected for those workers at oil and gas extraction sites, recreationists, and construction activities. Additional noise impacts would be associated with the villages, towns, and clusters of human habitations. Institutional recognition of noise, such as provided by the regulations for Occupational Noise Exposure (29 CFR Part 1910.95) under the Occupational Safety and Health Act of 1970, as amended, would continue.

It is anticipated that, in some instances, noise impacts may be an important issue for their potential effects on wildlife, such as disruption of normal breeding patterns and abandonment of nesting colonies. However, tolerance of unnatural disturbance varies among wildlife. Therefore, these issues shall be addressed by identifying the key species of concern and following feasible administrative and or engineering controls, determining and implementing appropriate buffer zones, and implementing construction "activity windows" (i.e., project construction initiation and completion dates to minimize disturbance to nesting birds).

Terrestrial wildlife generally will not be impacted, as construction activities will occur mainly over open water. There is the potential for noise or wave action generated by construction activities to displace terrestrial wildlife in the area; however, this would be a temporary disturbance, with wildlife likely to return following the completion of disposal activities. Migratory waterfowl and other avian species, if present, would likely be only temporarily displaced from the project area. Overall populations would not likely be adversely affected because these species would move to existing adjacent habitat areas during construction activities.

2.3.9 Recreation Resources

Historic and Existing Conditions

Primary recreational activities in the Study Area have been consumptive in nature, including fishing and hunting. Saltwater recreational activities have revolved primarily around saltwater fishing and to a lesser degree recreational shrimping and crabbing. Freshwater-based recreational opportunities have primarily been waterfowl hunting and freshwater fishing.

All proposed disposal areas presented in this Supplemental Report are within the active delta of the Mississippi River. Boating and fishing (fresh and saltwater) occur within all proposed disposal areas. The study area contains two state- and federally-managed parks typically used for active and consumptive recreational activities (Table 2-10). The value the public places on recreational resources in the study area, such as boating, fishing, and hunting, can be directly measured by the large number of fishing and hunting licenses sold in the study area, and the large number of recreational boat registrations per capita (Table 2-11). Numerous water bodies in the study area provide boating and fishing opportunities.

Pass a Loutre Wildlife Management Area (WMA): The Pass a Loutre WMA, owned by the Louisiana Department of Wildlife and Fisheries is located in southern Plaquemines Parish, Louisiana, at the mouth of the Mississippi River approximately 10 miles south of Venice and is accessible only by boat. Approximately 115,000 acres in size, this WMA is characterized by river channels, channel banks, bayous, man-made canals, and intermediate and freshwater marshes. Hurricane damage and subsidence have formed large ponds within the marsh complex. Waterfowl and other migratory game bird hunting, rabbit hunting, and archery hunting for deer as well as recreational fishing are permitted on the Pass a Loutre WMA. (LDWF 2014). Several camps, five campgrounds and Port Eads Marina are located in the WMA

Approximately 64,000 acres of existing disposal site area is located within the Pass a Loutre WMA. The nearest public boat launches are in Venice. Consumptive recreation uses include hunting for waterfowl, birds, rabbits, and deer; trapping for surplus furbearing animals and alligators; fishing for freshwater and salt water species; and crabbing. Other recreational activities include boating, picnicking, nature study, bird watching, and camping. The WMA has 5 designated tent-camping areas, Port Eads Marina and 3 areas have been designated to allow the mooring of recreational houseboats.

Table 2-10 Recreational Features within the Study Area

Recreational Area	Location	Land Management Agency	Size (acres)	Key Recreational Features
Delta NWR	Plaquemines Parish, LA	USFWS	49,000	• Boat access only • Hunting and fishing
Pass-a-Loutre WMA	Plaquemines Parish, LA	LDWF	115,000	• Boat access only • Hunting and fishing

Delta National Wildlife Refuge (NWR): The Delta NWR established in 1935 and located on the east side of the Mississippi River in Plaquemines Parish 10 miles south of Venice, Louisiana, is under the jurisdiction of the U.S. Fish and Wildlife Service and is contiguous with the Pass-a-Loutre WMA. The Delta NWR serves as a breeding ground for migratory birds and other wildlife, and as a migratory waterfowl refuge. The refuge lands are accessible only by boat. Despite this limitation, the area has a long record of public use. The majority of this public use has been in the form of consumptive uses such as hunting and fishing (fresh and saltwater). Other public use includes wildlife observation, bird watching, boating, canoeing and kayaking, and photography. Camping is not allowed on the refuge. About 8,534 acres of existing disposal site area is located within the Delta.

2-11 Boater Registrations, Fishing/Hunting License in the Study Area

Parish or County	Fishing License				Hunting License		Boater Registrations
	Resident - Freshwater	Resident - Saltwater	Non-Resident - Fresh water	Non-Resident - Saltwater	Resident	Non-Resident	
Jefferson	40,145	38,650	1,151	1,237	14,244	60	18,627
Lafourche	19,656	18,605	290	298	8,742	25	11,878
Orleans	17,145	16,014	637	638	5,899	49	4,171
Plaquemines	4,605	4,488	228	231	2,304	31	4,649
St. Charles	8,230	7,796	83	82	3,725	11	4,343
East Baton Rouge	35,334	27,562	640	593	19,648	77	16,145
Iberville	4,967	3,453	78	52	3,445	8	3,320
Ascension	17,830	14,939	239	215	9,142	30	8,530
St. James	3,852	3,405	36	29	2,221	5	2,135
St. John the Baptist	5,291	4,926	92	92	2,443	4	2,269
Total	157,055	139,838	3,474	3,467	71,813	300	76,067

Source: LDWF 2015

Future without Project Conditions (No Action / Alternative 1)

Direct and Indirect Impacts: Without implementation of the proposed action, the conditions within the recreational environment would continue as they have in the past and would be dictated by the natural land use patterns and processes. Direct impacts to recreation from dredging of the Mississippi River will be minimal and relate mostly to those impacts related to the dredge material placement in open water and marshes. During dredging of the river, bank fishing opportunities may diminish but this affect will be temporary. Indirect impacts would include the continued loss of wetlands/marshes and habitat diversity that affects recreational opportunities. Storm surge and saltwater could have a negative impact on freshwater forests and habitats and could reduce recreational resources (e.g., fishing, hunting, bird watching, and other). In general, further degradation of area marshes will continue and its associated negative impacts including lower quality fishery spawning, nursery, and foraging habitat would likely translate to a decline in recreational fishing, shrimping, and crabbing catch rates in the future. As existing freshwater wetland/marsh areas convert to saltwater marsh, then to open water, the recreational opportunities will change accordingly. For example, fresh water fishing opportunities may be expected to become saltwater opportunities. If the expected peak and then decline of fishery production occurs in these open waters, then the associated marine-fishery recreational opportunities will also decline. As populations of migratory birds and other animals dependent on marsh and swamp decrease, associated recreational opportunities, such as hunting and wildlife viewing, will decrease.

2.3.10 Vegetation Resources

Historic and Existing Conditions

Vegetation varies considerably between the 254 River Mile corridor between Baton Rouge, Louisiana and that of the lower delta. Plant assemblages in the study area provide primary productivity and structural stability to terrestrial (supratidal) and aquatic (inter- and subtidal) substrates thereby creating diverse habitats for a variety of estuarine and coastal fauna (Hester et al. 2005). Plants that tolerate salty Gulf waters form a narrow band along the study area coast line. Inland of this salt marsh are the brackish water species which grade inland into freshwater species (Chabreck 1998).

Based on monitoring of salinity and beneficial use placement site vegetation, it is estimated that over 95% of the study area marshes classify as intermediate marsh, with the remaining areas classifying as fresh marsh (mostly occurring around the Coastal Wetland Planning Protection and Restoration Act (CWPPRA) West Bay Sediment Diversion). Penfound and Hathaway (1938) conducted what many consider the seminal research in describing the plant communities of southeastern Louisiana; their findings are still applicable today. Vegetation zonal communities or plant associations in coastal Louisiana are determined by four major factors: elevation. salinity of soil water and surface water, water level with respect to soil surface including soil water content, and soil organic matter. Vegetation resources in the study area include five main wetland types: fresh, intermediate, brackish, and saline marsh; and swamp forest. These wetlands are distributed not only within the study area, but also within the entire coastal Louisiana area, based on the salinity tolerance of the various plant species (Table 2-12, Chabreck 1988).

Table 2-12 Salinity ranges for the four coastal wetland types

Wetland Type	Range (ppt)	Mean (ppt)	Typical Range (ppt)
Fresh	0.1 – 6.7	<3.0	0 – 3
Intermediate	0.4 – 9.9	3.3	2 – 5
Brackish	0.4 – 28.1	8.0	4 – 15
Saline	0.6 – 51.9	16.0	12 +

(Source: Chabreck, 1972; Louisiana Coastal Wetlands Conservation and Restoration Task Force; and the Wetlands Conservation and Restoration Authority 1998) ppt – parts per thousand

More recently Dahl and Stedman (2013) indicate that saltwater inundation of freshwater wetlands along the coast of Louisiana has resulted in the continued conversion of freshwater wetlands into saltwater wetlands. Sasser et al. (2014) indicate the approximate size of wetland areas in Louisiana’s coastal zone: 956,617 acres of fresh marsh, 940,592 acres of intermediate marsh, 997,437 acres of brackish marsh, 729,942 acres of saline marsh, and 464,805 acres of swamp.

Batture Vegetation

The batture community is a pioneer community which is first to appear on newly formed sand bars and river margins. The area receives sands and silts with each flood and the soils are semi-permanently inundated or saturated. Soil inundation or saturation by surface water or groundwater occurs periodically for a major portion of the growing season, and such conditions typically prevail during spring and summer months with a frequency ranging from 51 to 100 years per 100 years. The total duration of time for the seasonal event(s) normally exceeds 25 % of the growing season (LNHP 2009).

Tidal Intermediate, Brackish, and Salt Marshes

Tidal salt marsh vegetation zonation is strongly influenced by small differences in elevation above the mean high water level. The intertidal zone or low marsh next to the estuary, bay, or tidal creek is dominated by the tall form of smooth cordgrass (Spartina alterniflora). In the high marsh, smooth cordgrass gives way to stands of saltmeadow cordgrass (Spartina patens) (saltmeadow cordgrass; dominant species in the northern Gulf Coast) mixed with saltgrass (Distichlis spicata) and occasional patches of the shrub marsh elder (Iva frutescens) and other shrubs. Beyond the saltmeadow cordgrass zone and at normal high tide, black rush (Juncus roemerianus) forms pure stands (Mitsch et al. 2009).

Submerged Aquatic Vegetation (SAV)

Fresh and intermediate marshes often support diverse communities of submerged aquatic plants that provide important food and cover to a wide variety of fish and wildlife species. Fresh and intermediate marshes often support more diverse communities of submerged aquatic vegetation (SAV) than brackish marshes. However, in lower salinity marshes, widgeon-grass provides important food and cover for many species of fish and wildlife. Saline marshes typically do not contain an abundance of SAVs. Submerged aquatic vegetation (SAV) persists in shallower, protected areas of the disposal area. It is estimated that less than 10 % of the open water portions of disposal area contains SAV’s.

Invasive Plant Species

Invasive plants play a large part in the loss of wetland and coastal habitats. These plants have been introduced into the local environment either purposefully or accidentally. Invasive aquatic plant species often increase and spread rapidly because the new habitat into which they are introduced is often free of insects and diseases that are natural controls in their native habitats (USGS 2000).

The following species are classified in coastal Louisiana as Extensively Established Species (Tulane and Xavier 2013: Wild Taro (*Colocasia esculenta*), Brazilian Waterweed (*Egeria densa*), Water Hyacinth (*Eichhornia crassipes*), Hydrilla (*Hydrilla verticillata*), Parrot Feather (*Myriophyllum aquaticum*), Eurasian Watermilfoil (*Myriophyllum spicatum*), Water Lettuce (*Pistia stratiotes*), Common Salvinia (*Salvinia minima*), and Chinese Tallow (*Sapium sebiferum*). Locally Established Species are: Giant Salvinia (*Salvinia molesta*), and Cogongrass (*Imperata cylindrica*) (Tulane and Xavier 2013).

<u>Future without Project Conditions (Alternative 1)</u>

Direct and Indirect Impacts: There would be no direct impacts to the project area except for the placement of beneficial use of dredge material in the lower river delta during ongoing river maintenance (under the no action alternative). It is estimated that annual O&M dredging of the project area could establish approximately 528 acres of intermediate marsh annually on average. Existing conditions and trajectories of ecological change to area vegetation would persist. Undeveloped vegetated lands, including wetlands, would continue to be lost to subsidence and erosion. Emergent and upland habitats and associated sub-canopy species would continue to be subjected to saltwater intrusion and subsidence. These areas would convert to marsh and eventually open water (USACE 2010a and 2010b).

Much of the lower study area could be permanently inundated under the intermediate and high RSLR scenarios further speeding conversion of existing habitats. The area would continue to be subjected to increases in RSLR which could increase the geographic extent of saltwater intrusion, potentially convert vast areas of existing forested wetlands and swamp habitats to marsh and eventually open water. There could also be a shift from fresh water dominant species to species that can tolerate higher salinity.

2.3.11 Air Quality

<u>Historic and Existing Conditions</u>

The U.S. Environmental Protection Agency (USEPA) Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called “criteria” pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (03) are combined by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air. The Clean Air Act General Conformity Rule (58 FR 63214, November 30, 1993, Final Rule, Determining Conformity of General Federal Actions to State or Federal Implementation Plans) dictates that a conformity review be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. A conformity assessment would require quantifying the direct and indirect emissions of criteria pollutants caused by the Federal action to determine whether the proposed action conforms to Clean Air Act requirements and any State Implementation Plan (SIP).

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved SIP for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the SIPs; (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the NAAQS.

St. James Parish, St. Charles, and Plaquemines Parishes are currently in attainment of all National Ambient Air Quality Standards, and operating under attainment status. This classification is the result of area-wide air quality modeling studies.

East Baton Rouge, West Baton Rouge, Iberville, and Ascension Parishes are four of the five Baton Rouge area parishes that were designated by the Environmental Protection Agency as ozone non-attainment areas under the 8-hour standard effective June 15, 2004. Currently none of the five parishes are in attainment of NAAQS. The five parish area has been classified as marginal, which is the least severe classification. This classification is the result of area-wide air quality modeling studies, and the information is readily available from Louisiana Department of Environmental Quality, Office of Environmental Assessment and Environmental Services.

Federal activities proposed in East Baton Rouge, West Baton Rouge, Iberville, and Ascension Parishes may be subject to the State's general conformity regulations as promulgated under LAC 33:III.14.A, Determining Conformity of General Federal Actions to State or Federal Implementation Plans. A general conformity applicability determination is made by estimating the total of direct and indirect volatile organic compound (VOC) and nitrogen oxide (NOX) emissions caused by the construction of the project. Prescribed de minimis levels of 100 tons per year per pollutant are applicable in the four parishes. Projects that would result in discharges below the de minimis level are exempt from further consultation and development of mitigation plans for reducing emissions.

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no action alternative. Without implementation of the proposed project the status of attainment of air quality for East Baton Rouge, West Baton Rouge, Iberville, and Ascension Parishes would not change from current conditions, and there would be no direct, indirect, or cumulative impacts.

2.4 Natural Environment

2.4.1 Soils and Water Bottoms

Historic and Existing Conditions

The project study area consists of a winding river corridor of 254 river miles between Baton Rouge, Louisiana and the Gulf of Mexico via Southwest Pass. Approximately 35% of this corridor requires at least some maintenance dredging to maintain the current channel dimensions. Specifically 28 miles from Venice, LA, to the Gulf of Mexico are dredged at less than an annual occurrence, and 61 combined miles of 14 deep draft crossings between Baton Rouge, LA, and New Orleans, LA, require some level of maintenance dredging. On an average annual basis, a combined 3.7 miles between Venice, LA, and the Gulf of Mexico (via Southwest Pass) are maintained. Since 1986, Crossings have required an average of 16,403,283 cubic yards of dredging. By comparison, since 1986 Southwest Pass has required 15,091,427 cubic yards of dredging. Dredged material from the Mississippi River would be placed in approximately 167,318-acres of new and existing disposal areas in the Mississippi River Delta for the purpose of creating coastal habitat such as emergent and high marsh, bird islands, and deltaic ridges.

There are three soil types identified in the proposed disposal areas and include Aquents, Balize and Larose, and Carver/Cancienne/Schriever soils. Aquents are poorly to very poorly drained soils typically formed by human transport such as dredging or on excavated landscapes. Approximately 37% of the soils in the proposed disposal areas is Aquent likely resulting from previous dredging and disposal activities occurring in the vicinity. Balize and Larose soils are very poorly drained and frequently flooded soils that are commonly associated with marsh landforms. Balize soils are typically associated with a parent material originating from fluid loamy backswamp deposits of silt loam and silty clay loam. Larose soils form from the decay of thin herbaceous organic material over fluid clayey alluvium, developing into muck and mucky clay. Carville, Cancienne, and Schriever soils are somewhat poorly to poorly drained and associated with natural levees, depressions, and backswamps. Profiles typically consist of silt loam, fine sandy loam, and silty clay. None of these soils are identified as prime and/or unique farmlands. More detailed information and descriptions of the soil types is provided in Table 2-13.

Table 2-13 Soil types and descriptions in the proposed disposal areas

Soil Symbol	Soil Type and Description	Approximate Acres in Disposal Areas	Percentage in Disposal Areas
AT	Aquents, dredged, frequently flooded, poorly to very poorly drained	14,789	37%
BA	Balize and Larose soils, frequently flooded, very poorly drained	22,661	57%
CV	Carville, Cancienne, and Schriever soils, somewhat poorly to poorly drained	2,426	6%
	Total	39,876	100%

Water Bottoms

Water bottoms in the study area (Table 2-14) include large shallow estuaries of the Mississippi River Delta and the deep-draft navigation channel of the Mississippi River from Baton Rouge to the Gulf of Mexico. Many water bottoms in the study area are a result of degraded and collapsing marshes or transgressing and subsiding barrier islands, and areas that were previously wetlands or upland ridges are now subsided below the water surface. The sediments of most of the water bottoms in the study area are composed of fine grain material with a high organic content and a low sand content. Organic content in the soils increases in areas that were formerly coastal marsh and swamp and now form shallow water bottoms.

Table 2-14 Area of water bottoms in the study area

Water Bottom	Approximate Acres
Mississippi River Delta	123,923
Mississippi River	68,033
Total acres	191,956

Future without Project Conditions (No Action / Alternative 1)

Without the proposed action, operation and maintenance of the 45-foot Mississippi River deep-draft navigation channel from Baton Rouge to the Gulf of Mexico would continue as it has in the past. Direct and indirect impacts to soils and water bottoms in the Mississippi River and the Mississippi River Delta would remain the same under current operation and maintenance dredging of the river and placement of dredged material. Dredging in the Mississippi River would continue at current levels, resulting in direct impacts to approximately 2,500-acres of water bottoms. The placement of dredged material into existing disposal areas in the Mississippi River Delta would continue, resulting in direct impacts to approximately 38,000-acres of soils and 100,000-acres of shallow open water bottoms. Annual O&M dredging of the project area would continue at an average 35,318,498 cy per year and would establish approximately 528 acres of intermediate marsh annually.

Soil erosion and land loss in the Mississippi River Delta would continue into the future. Natural and man-made levees would continue to subside and organic soils would not be able to maintain their elevations due to subsidence, decreased plant productivity, changes in existing land cover, and wave erosion. Soils in the study area would continue to degrade and be converted to open shallow water bottoms. Deltaic formation processes would continue at the mouth of the Mississippi River. Many water bottoms in the study area are a result of degraded and collapsing marshes, and areas that were previously wetlands or upland ridges are now subsided below the water surface. In the future without project conditions, organic content in the soils would continue to increase in areas that were formerly coastal marsh and swamp, and these areas would continue to be converted to shallow water bottoms. Water bodies would grow larger increasing the acreage of water bottoms in the study disposal areas. Wave erosion would accelerate causing further land loss, thus making coastal communities more vulnerable to tropical storms.

2.4.2 Wildlife

Historic and Existing Conditions

Important wildlife species utilizing coastal wetlands in Louisiana (Nyman et al. 2013) include: American alligator (*Alligator mississippiensis*), nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), waterfowl (Anser spp., Anas spp., Aythya spp., Mergus spp., etc.), woodcock (*Scolopax minor*), river otter *Lutra Canadensis*), white-tailed deer (*Odocoileus virginianus*), mink (*Mustela vison*), rabbit (Sivilagus spp.), squirrel (Sciurus spp.), and snapping turtle (*Macroclemys temmincki*) (Nyman et al. 2013.

The project area is also home to federally and state managed wildlife areas (Figure 2-19). Pass-a-Loutre Wildlife Management Area is located in southern Plaquemines Parish at the mouth of the Mississippi River. This area is owned by the Louisiana Department of Wildlife and Fisheries and encompasses some 115,000 acres. The area is characterized by river channels with attendant channel banks, natural bayous, and man-made canals which are interspersed with intermediate and fresh marshes. Hurricane damage and subsidence have contributed to a major demise of vegetated marsh areas resulting in formation of large ponds. Habitat development is primarily directed toward diverting sediment-laden waters into open bay systems (i.e., creating delta crevasses), which promotes delta growth.

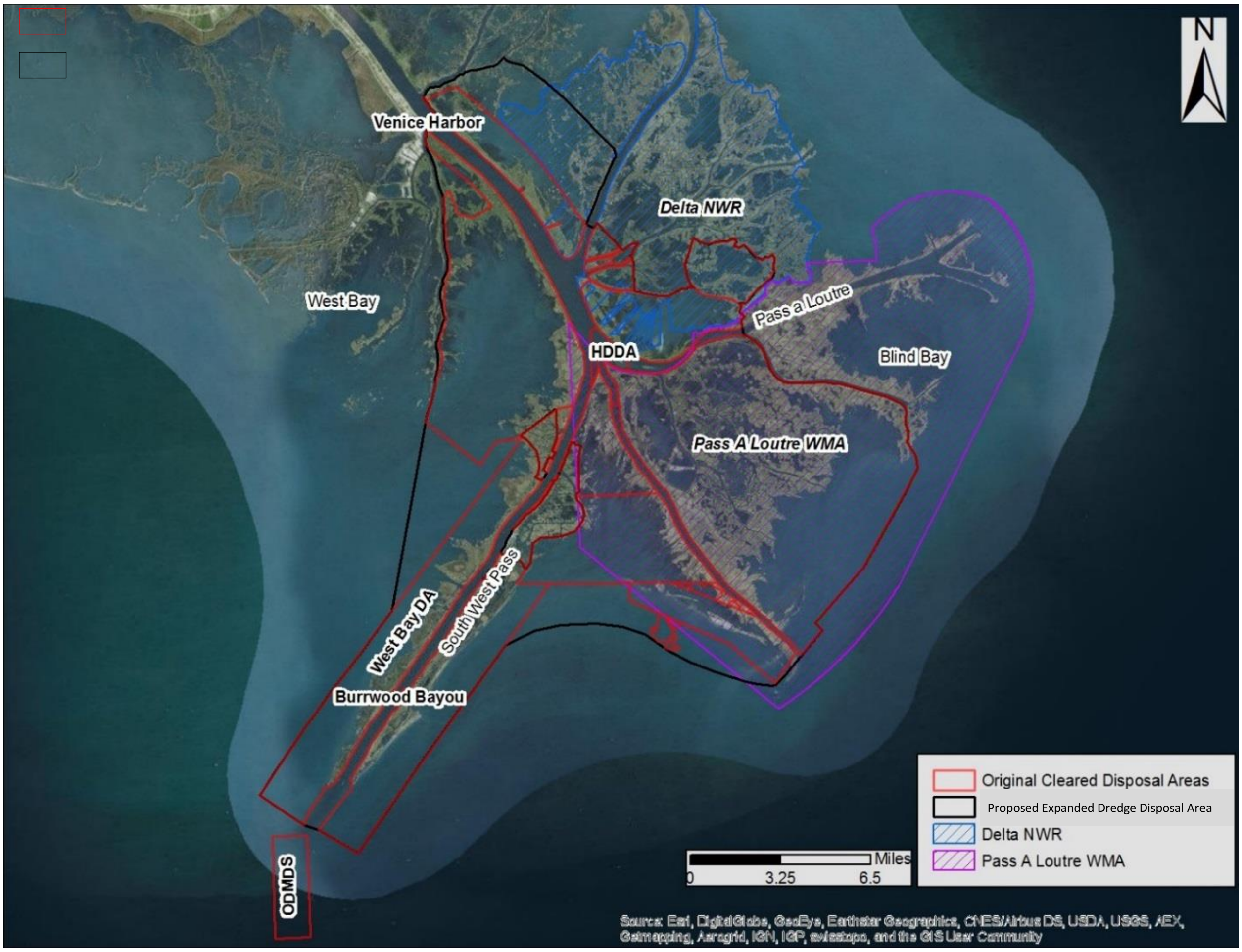

Figure 2-19 Location of Delta NWR and Pass A Loutre WMA in relation to beneficial use disposal activities in the lower river

Delta National Wildlife Refuge was established in 1935. Its 49,000 acres were formed by the deposition of sediment carried by the Mississippi River. This area combines the warmth of the Gulf and the wealth of the river. Its lush vegetation is the food source for a multitude of fish, waterfowl and animals. Delta is the winter home for hundreds of thousands of snow geese, coots and ducks.

Invasive Wildlife

Invasive animals have been recognized as playing a large part in the loss of wetland and coastal habitats (USGS 2015c). Nutria and feral swine are the only mammals identified as invasive in

Louisiana. Although nutria are not distributed throughout all of Louisiana, their numbers and environmental impact in coastal Louisiana are so great that they warrant consideration as extensively established and extremely problematic. Feral hogs are established sporadically throughout the state. The problems caused by feral hogs in Louisiana, however, are dwarfed by those caused by nutria. Feral hogs also provide some social and economic benefit for local hunters and trappers, whereas nutria no longer offer any benefit to Louisiana residents (Tulane and Xavier 2005).

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct or indirect impacts under the no action alternative. Existing conditions and trajectories of ecological change to wildlife in the area would persist. Continued human encroachment and development would result in loss of existing wildlife wetland habitats. The area would be subjected to increases in RSLR which could increase saltwater intrusion and exacerbate ongoing conversion of existing forested wetland and swamp habitats to marsh and open water (USACE 2010a, USACE 2010b). Migratory neotropic avian species currently utilize the area as stopover habitat. As forested wetlands and emergent wetland habitats are lost, there would be a corresponding reduction in overall species diversity and abundance. Most mammal, amphibian and reptile species would be required to relocate to more suitable swamp habitats. There could be an increase in the population and distribution of nutria due to the conversion of swamp into open water and marsh which are the preferred habitats by nutria.

2.4.3 Aquatic and Fisheries Resources

Historic and Existing Conditions:

Mississippi River

The Mississippi River plays an important role in the distribution of fishes across the state because it provides suitable habitat for many species and it also divides the state into ecologically different areas (Douglas 1974). Douglas (1974) is one of the first most comprehensive studies on the diversity of freshwater fishes in Louisiana with at least 148 freshwater species in Louisiana's waters. Douglas (1974) attributes the large number of species to the diverse freshwater habitats found in Louisiana (from placid bayous and oxbows of the eastern Mississippi River floodplain to the swift flowing streams of the north, central, and western parishes).

La Roe et al. (1985) study of fish species within the Mississippi River found the river supports one of the most diverse fisheries in the world with at least 183 species of freshwater fish in the Mississippi River Delta. There are three species of mussels, and 13 species of crawfish found within the Mississippi Basin in Louisiana. Minnow, darter, perch, sturgeon, and paddlefish species are the most common fish species in the river (NPS 2014b). Native fish stocks have been declining in number; approximately 6 % of the native fish species in the Delta are found on the endangered, threatened, or special concern lists of the U.S. Fish and Wildlife Service (NPS 2014b).

Delta Fishery Resources

Brackish and saltwater species include spotted seatrout, red drum, flounder, sheepshead, pinfish, and croaker. Shellfish in the study area include blue crab, white shrimp, brown shrimp, Gulf stone crab, grass shrimp, mysid shrimp, and mud crab (O'Connell et al. 2005). Commercially and recreationally important species include blue crab, white and brown shrimp, American oyster, and the gulf stone crab (NMFS 2012).

Three species of crustaceans — brown shrimp, white shrimp, and blue crab — are of major commercial and recreational importance in the coastal waters of Louisiana (Caffey and Schexnayder 2002). Each of these species follows a circular migration, which encompasses a broad range of estuarine salinities. Because commercial harvesting targets the late juvenile and adult stages, productivity is often incorrectly equated with higher salinities. Although higher salinities tend to favor harvestability, Caffey and Schexnayder (2002) indicate they are not directly linked to absolute productivity.

The project area is not considered productive oyster habitat. There is currently one oyster lease that overlaps the far western boundary of the existing western disposal area along Southwest Pass (http://gis.wlf.la.gov/oystermap/map.html). This lease would not be impacted by the project.

O'Connell et al. (2005) identify the most common commercially and recreationally important aquatic species found in coastal Louisiana that are estuarine dependent (see Table 2-15).

Table 2-15 Common commercially and recreationally important aquatic species found in coastal Louisiana that are estuarine dependent (from O'Connell et al. 2005)

Group Common Name (Scientific Name)	Commercial Significance	Description of Estuarine Dependence
Invertebrates		
brown shrimp (*Farfantepenaeus aztecus*)	Most productive shrimp fishery species in Gulf of Mexico; LA leads Gulf states	Postlarvae and juveniles require inshore nursery habitats, preferably with vegetation
white shrimp (*Litopenaeus setiferus*)	Second most productive shrimp fishery species in	Postlarvae and juveniles require inshore nursery habitats, preferably with vegetation

Group Common Name (Scientific Name)	Commercial Significance	Description of Estuarine Dependence
	Gulf of Mexico; La leads Gulf states	
blue crab (*Callinectes sapidus*)	Most productive commercial crab species in US; LA leads US in landings (31 % of US total)	Juveniles require inshore nursery habits, adults spawn in estuaries
pink shrimp (*Fafante duorarum*)	Third most productive shrimp fishery species in Gulf of Mexico; LA leads Gulf states	Postlarvae require inshore nursery habitats, preferably with vegetation
Vertebrates		
Gulf menhaden (*Brevoortia patronus*)	Most productive finfish fishery in US (all menhaden species); LA leads Gulf States	Larvae and juveniles use inshore nursery habitats
Atlantic croaker (*Micropogonias undulatus*)	Only US finfish in top 10 most abundant species both commercially and recreationally	Larvae and juveniles use inshore nursery habitats
spotted seatrout (*Cynoscion nebulosus*)	Most popular recreational food fish in LA	Larvae and juveniles use inshore nursery habitats; adults spawn in deep passes
spot (*Leiostomus xanthurus*)	Fourth most numerous finfish collected in long term fishery-independent sampling	Larvae and juveniles use inshore nursery habitats
red drum (*Sciaenops ocellatus*)	Species has widespread recreational and culinary interest within LA	Juveniles and adults use shallow barrier island habitats

Group Common Name (Scientific Name)	Commercial Significance	Description of Estuarine Dependence
striped mullet (*Mugil cephalus*)	Small Louisiana commercial fishery; importation prey species	Juveniles use inshore nursery habitats
sand seatrout (*Cynosican arenarius*)	Valuable recreational fishery species	Juveniles use inshore nursery habitats
black drum (*Pogonias cromis*)	Valuable commercial and recreational species throughout Gulf of Mexico	Juveniles use inshore nursery habitats (though tolerant to wide salinity range)
sheepshead (*Achosargus probatocephalus*)	Valuable recreational fishery species	Adults feed in bay and estuaries
southern flounder (*Paralichthys lethostigma*)	Valuable commercial and recreational species throughout Gulf of Mexico	Juveniles use estuaries, brackish water, and freshwater creeks

Invasive Aquatic and Fisheries Species

The State Management Plan for Aquatic Invasive Species in Louisiana (2005) identifies several established finfish and mollusks within the state (Tulane and Xavier 2005). The management plan focuses not on all invasive species in Louisiana, but on those inhabiting aquatic environments and those spread via aquatic pathways. Established finfish include Rio Grande cichlid (*Cichlasoma cyanoguttatum*), common carp (*Cyprinus carpio*), grass carp (*Ctenopharyngodon idella*), silver carp (*Hypophthalmichthys molitrix*), and bighead carp (*Hypophthalmichthys nobilis*). The network of interconnected waterways within the state makes it easy for fish to relocate, constantly changing their ranges. Two mollusks are known as invasive in Louisiana, the zebra mussel (*Dreissena polymorpha*) and the Asian clam (*Corbicula fluminea*). These species are predominantly freshwater mollusks, and, in general, are confined to river drainages. Zebra mussels and Asian clams are established in the three largest rivers in Louisiana (Mississippi, Red, and Atchafalaya) and, therefore, are considered extensively established. (Tulane and Xavier 2005).

Federally Managed Essential Fish Habitat

Submerged aquatic vegetation (SAV) persists in shallower, protected areas of the disposal areas. It is estimated that less than 10 % of the open water disposal areas contain SAV's. In 1996 Congress amended the Magnuson-Stevens Fishery Conservation and Management Act with the Sustainable Fisheries Act (SFA). Through the SFA, and its "essential fish habitat" (EFH) provisions, Congress sought to increase the attention fisheries managers and other federal coastal zone stakeholders pay to habitat (Fletcher and Shea 2000). Congress defined EFH as *those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity* (16 U.S.C. 1802(10). Specific categories of EFH in the basin include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), including the sub-tidal vegetation (sea grasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves). Louisiana has historically been an important contributor to the Nation's domestic fish and shellfish production, and one of the primary contributors to the Nation's food supply for protein (NMFS 2014b).

The following federally-managed species utilize EFH in some areas of the study area: brown shrimp (*Penaeus aztecus*), white shrimp (*Penaeus setiferus*), red drum (*Sciaenops ocellatus*), lane snapper (*Lutjanus synagris*), dog snapper (*Lutjanus jocu*), blacktip shark (*Carcharhinus limbatus*), bonnethead shark (*Sphyrna tiburo*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), and blacknose shark (*Carcharhinus acronotus*). Each of these species, their life stages, the aquatic systems where they may be found, and EFH are described in detail in Table 2-17. Other economically important marine fishery species in the study area (according to the April 25, 2012 NMFS scoping letter): striped mullet (*Mugil cephalus*), Atlantic croaker (*Micropogonias undulatus*), Gulf menhaden (*Brevoortia patronus*), spotted and sand seatrout (*Cynoscion nebulosus* and *Cynoscion arenarius*, respectively), southern flounder (*Paralichthys lethostigma*), black drum (*Pogonias cromis*), and blue crab (*Callinectes sapidus*). Some of these species also serve as prey for other fish species managed under the Magnuson-Stevens Act by the Gulf of Mexico Fishery Management Council (GMFMC) (e.g., mackerels, snappers, and groupers) and highly migratory species managed by NMFS (e.g., billfishes and sharks). Text Descriptions and GIS Data Inventory website provides spatial representations of aquatic species, their life stages, and important habitats that, for certain species, span the entire northern portion of the Gulf of Mexico (NMFS 2014a). GIS data were downloaded to determine NMFS designated EFH areas and (their associated species) that overlay the study area. These designated EFH areas and the species associated with these areas are provided in Table 2-16 below (NMFS 2014a).

Table 2-16 NMFS designated EFH areas for various species in the study area

NMFS Designated EFH Area	Species
Coastal Migratory Pelagics of the Gulf of Mexico and South Atlantic	cobia (*Rachycentron canadum*)
	king mackerel (*Scomberomorus cavalla*)
	Spanish mackerel (*Scomberomorus maculatus*)

NMFS Designated EFH Area	Species
Coral and Coral Reefs of the Gulf of Mexico	black corals (Order Antipatharia)
	fire corals (Order Milleporina)
	hydrocorals (Order Stylasterina)
	stony corals (Order Scleractinia)
Gulf of Mexico Red Drum	red drum (*Sciaenops ocellatus*)
Gulf of Mexico Shrimp	brown shrimp (*Penaeus aztecus*)
	pink shrimp (*Penaeus duorarum*)
	rock shrimp (*Sicyonia brevirostris*)
	royal red shrimp (*Pleoticus robustus*)
	seabob shrimp (*Xiphopenaeus kroyeri*)
	white shrimp (*Penaeus setiferus*)
Reef Fish Resources of the Gulf of Mexico	almaco jack (*Seriola rivoliana*)
	banded rudderfish (*Seriola zonata*)
	blackfin snapper (*Lutjanus buccanella*)
	black grouper (*Mycteroperca bonaci*)
	blueline tilefish (*Caulolatilus microps*)
	Cubera snapper (*Lutjanus cyanopterus*)
	gag (*Mycteroperca microlepis*)
	goldface tilefish (*Caulolatilus chrysops*)
	gray (mangrove) snapper (*Lutjanus griseus*)
	gray triggerfish (*Balistes capriscus*)
	greater amberjack (*Seriola dumerili*)
	hogfish (*Lachnolaimus maximus*)
	lane snapper (*Lutjanus synagris*)
	lesser amberjack (*Seriola fasciata*)
	mutton snapper (*Lutjanus analis*)
	Nassau grouper (*Epinephelus striatus*)
	queen snapper (*Etelis oculatus*)
	red grouper (*Epinephelus morio*)
	red snapper (*Lutjanus campechanus*)
	scamp (*Mycteroperca phenax*)
	silk snapper (*Lutjanus vivanus*)
	snowy grouper (*Epinephelus niveatus*)
	speckled hind (*Epinephelus drummondhayi*)
	tilefish (*Lopholatilus chamaeleonticeps*)
	Vermillion snapper (*Rhomboplites aurorubens*)

NMFS Designated EFH Area	Species
	Warsaw grouper (*Epinephelus nigritus*)
	wenchman (*Pristipomoides aquilonaris*)
	yellowedge grouper (*Epinephelus flavolimbatus*)
	yellowfin grouper (*Mycteroperca venenosa*)
	yellowmouth grouper (*Mycteroperca interstitialis*)
South Atlantic Snapper-Grouper and Reef Fish Resources of the Gulf of Mexico	goliath grouper (*Epinephelus itajara*)
	yellowtail snapper (*Ocyurus chrysurus*)

The tables below provide supplemental info on Highly Migratory Species with EFH in the study area that are species managed by the NMFS (Tables 2-17 through 2-18).

Table 2-17 Highly Migratory Species with EFH in the study area (species managed by NMFS,

Species Common Name	Species Scientific Name
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*
Atlantic yellowfin tuna	*Thunnus albacres*
bignose shark	*Carcharhinus altimus*
blacknose shark	*Carcharhinus acronotus*
blacktip shark	*Carcharhinus limbatus*
bonnethead Shark	*Sphyrna tiburo*
bull shark	*Carcharhinus leucas*
dusky shark	*Carcharhinus obscurus*
finetooth shark	*Carcharhinus isodon*
great hammerhead	*Sphyrna mokarran*
lemon shark	*Negaprion brevirostris*
sailfish	*Istiophorus platypterus*
scalloped hammerhead	*Sphyrna lewini*
silky shark	*Carcharhinus falciformis*
spinner shark	*Carcharhinus brevipinna*
swordfish	*Xiphias gladius*
tiger shark	*Galeocerdo cuvier*
whale shark	*Rhincodon typus*

Table 2-18 EFH for fishery species within the study area (species managed by the GMFMC)

Species Habitat	Species Common Name	Species Scientific Name
Emergent Marsh	red drum	*Sciaenops ocellatus*
	gray (mangrove) snapper	*Lutjanus griseus*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*
Mangrove	gray triggerfish	*Balistes capriscus*
	lane snapper	*Lutjanus synagris*
SAV	red drum	*Sciaenops ocellatus*
	lane snapper	*Lutjanus synagris*
	brown shrimp	*Penaues aztecus*
	pink shrimp	*Penaues duorarum*
Oyster Reefs	brown shrimp	*Penaues aztecus*
Hard Bottom	red drum	*Sciaenops ocellatus*
	gag	*Mycteroperca microlepis*
	gray (mangrove) snapper	*Lutjanus griseus*
	lesser amberjack	*Seriola fasciata*
	red snapper	*Lutjanus campechanus*
	Vermilion snapper	*Rhomboplites aurorubens*
Soft Bottom	red drum	*Sciaenops ocellatus*
	gray (mangrove) snapper	*Lutjanus griseus*
	lane snapper	*Lutjanus synagris*
	red snapper	*Lutjanus campechanus*
	brown shrimp	*Penaues aztecus*
	white shrimp	*Penaues setiferus*
Sand Shell	red drum	*Sciaenops ocellatus*
	gray snapper	*Lutjanus griseus*
	gray triggerfish	*Balistes capriscus*
	lane snapper	*Lutjanus synagris*
	red snapper	*Lutjanus campechanus*
	brown shrimp	*Penaues aztecus*
	pink shrimp	*Penaues duorarum*

Species Habitat	Species Common Name	Species Scientific Name
	white shrimp	*Penaues setiferus*
Reefs	gag	*Mycteroperca microlepis*
	gray snapper	*Lutjanus griseus*
	gray triggerfish	*Balistes capriscus*
	greater amberjack	*Seriola dumerili*
	lane snapper	*Lutjanus synagris*
	red snapper	*Lutjanus campechanus*
	Vermilion snapper	*Rhomboplites aurorubens*
Pelagic	cobia	*Rachycentron canadum*
	king mackerel	*Scomberomorus cavalla*
	Spanish mackerel	*Scomberomorus maculatus*
	red drum	*Sciaenops ocellatus*
	greater amberjack	*Seriola dumerili*
	lane snapper	*Lutjanus synagris*
	red snapper	*Lutjanus campechanus*
	brown shrimp	*Penaues aztecus*
	pink shrimp	*Penaues duorarum*
	white shrimp	*Penaues setiferus*
	spiny lobster	*Panulirus argus*
Shoal-Banks	gray (mangrove) snapper	*Lutjanus griseus*
	lane snapper	*Lutjanus synagris*
Shelf Edge –Slope	lane snapper	*Lutjanus synagris*

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: O&M activities within the river would continue, however, there would be no direct impacts under the no action alternative. Annual O&M dredging of the project area would continue at an average 35,318,498 cy per year and would establish approximately 528 acres of intermediate marsh annually, and would remain compliant with the Magnuson-Stevens Fishery Act. Existing conditions and trajectories of ecological change to aquatic and fisheries resources, as described in previous Sections, would persist. The area would be subjected to increases in RSLR which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of forested wetlands and swamp habitats to marsh and open water. Much of the area, could be permanently inundated under both the intermediate and high

RSLR scenarios. There could be a shift from fresh water dominate species to those species that can tolerate higher salinity.

2.4.4 Threatened and Endangered Species

Historic and Existing Conditions

Based on discussions with USFWS and the NMFS, the animals presented in Table 2-19 are known to occur or occasionally enter the the study area.

Table 2-19 Federally protected species and critical habitat potentially impacted by the proposed project

Species	Critical habitat	Status
West Indian Manatee		Endangered
piping plover	X	Threatened
rufa red knot		Threatened
Green Sea Turtle		Threatened
Hawksbill Sea Turtel		Endangered
Kemps Ridley Sea Turtle		Endangered
Leatherback Sea Turtle		Endangered
Loggerhead Sea Turtle	X	Threatened
pallid sturgeon		Endangered
gulf sturgeon	X	Threatened

Piping Plover: The piping plover, as well as its designated critical habitat, occurs along the Louisiana coast (habitat.fws.gov/crithab). Piping plovers winter in Louisiana and may be present eight to ten months of the year (LDWF 2011), however, critically habitat is not present in the study area. They depart for the wintering grounds from mid-July through late October and remain until late March or April. Piping plovers forage on intertidal beaches, mudflats, sand flats, algal flats, and wash-over passes with no or very sparse vegetation. They roost in unvegetated or sparsely vegetated areas, which may have debris, detritus, or micro-topographic relief offering refuge from high winds and cold weather. They also forage and roost in wrack deposited on beaches. Piping plovers could occur along the shoreline and in the intertidal areas of the project vicinity during winter migration, but are not permanent residents of the area. Critical habitat (Critical Habitat Unit LA-6) has been designated south of Pass a Loutre—mainly near the mouth of South Pass and in portions of East Bay between South and Southwest passes. Dredging and disposal areas associated with the proposed work do not lie within these critical habitat areas. Construction activities associated with the proposed project may cause piping plovers occurring near the project area to be temporarily displaced to nearby areas containing foraging and loafing habitat.

Red knot: The red knot (*Calidris canutus rufa*) was federally listed as a threatened species on December 11, 2014, as announced in the Federal Register Vol. 79, No. 238. The red knot is a medium-sized shorebird about 9 to 11 inches (23 to 28 centimeters) in length with a proportionately small head, small eyes, short neck, and short legs. The black bill tapers steadily from a relatively thick base to a relatively fine tip; bill length is not much longer than head length. Legs are typically dark gray to black, but sometimes greenish in juveniles or older birds in non-breeding plumage. Non-breeding plumage is dusky gray above and whitish below. The red knot breeds in the central Canadian arctic but is found in Louisiana during spring and fall migrations and the winter months (generally September through March).

Pallid Sturgeon: The pallid sturgeon is an endangered fish found in Louisiana, in both the Mississippi and Atchafalaya Rivers (with known concentrations in the vicinity of the Old River Control Structure Complex); it is possibly found in the Red River as well. The pallid sturgeon is adapted to large, free-flowing, turbid rivers with a diverse assemblage of physical characteristics that are in a constant state of change. Detailed habitat requirements of this fish are not known, but it is believed to spawn in Louisiana. Habitat loss through river channelization and dams has adversely affected this species throughout its range. Entrainment issues associated with dredging operations in the Mississippi and Atchafalaya Rivers and through diversion structures off the Mississippi River are two potential effects that should be addressed in future planning studies and/or in analyzing current project effects. Juvenile pallid sturgeon appear to be at risk for entrainment in hydraulic dredges, because of their benthic holding behavior and their relatively low burst swimming speed (Hoover et al. 2005). The density of pallid sturgeon in the lower Mississippi River Delta is thought to be low; however, sampling efforts in that area have not been extensive so population estimates in these areas are uncertain (USFWS 2010). Because pallid sturgeon are believed to be a strictly freshwater fish, they are probably absent from the Mississippi River Delta during low river flows when salt water from the Gulf of Mexico intrudes upriver along the bottom of the channel (salt water wedge). If project construction is planned during these events, impacts to pallid sturgeon due to dredging activities in the Mississippi River Delta are unlikely.

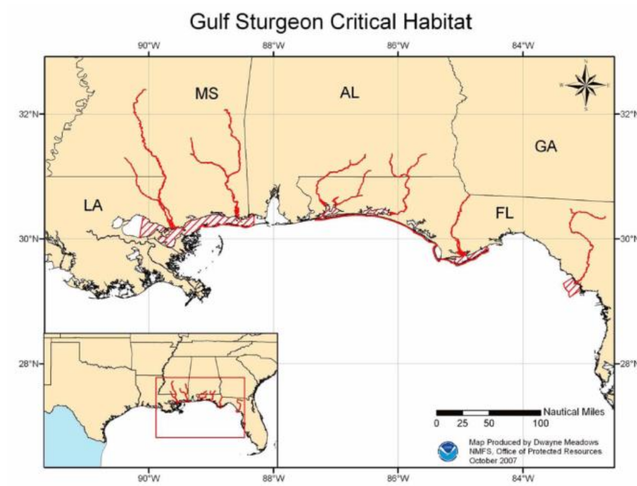

Figure 2-20 Gulf Sturgeon Critical Habitat

Gulf Sturgeon: The threatened Gulf sturgeon (*Acipenser oxyrhynchus desotoi*) is found in river systems from Louisiana to Florida, in nearshore bays and estuaries, and in the Gulf of Mexico. Gulf sturgeons are primitive, anadromous fish that annually migrate from the Gulf of Mexico into freshwater streams to spawn. Subadults and adults spend eight to nine months each year in rivers. Although Gulf sturgeon activity is not well documented, the species has been found in the upper reaches of the Pearl River and Lake Pontchartrain tributaries. The Gulf sturgeon is documented as occurring within parishes comprising the Mississippi Delta, Mississippi Sound, Breton Sound, Barataria, and Pontchartrain Basins (LDWF 2014a). Critical habitat has been designated along Louisiana river systems, nearshore bays and estuaries, and in the Gulf of Mexico (Figure 2-20; NOAA 2015). The areas impacted by project activities are not critical habitat for the Gulf sturgeon. However, it is possible that Gulf sturgeon may wander outside of areas where they are generally found to the north of the project area into the mud and sand-bottomed area where the navigation channel is located during cooler months when they are feeding in the estuaries. Even if they do occur in the area, Gulf sturgeon have the mobility necessary to avoid being adversely affected by dredging operations. Larval and small juvenile sturgeon, which are more susceptible to entrainment are not be expected in this area due the distance from spawning habitat.

Sturgeon entrainment or "takes" from dredging activities with observer programs are summarized in the USACE, Sea Turtle Data Warehouse available at http://el.erdc.usace.army.mil/seaturtles/index.cfm. From 1995 through January 2013, a total of 42 sturgeon takes (3 Gulf sturgeon, 11 shortnose sturgeon, 34 Atlantic sturgeon) have been recorded from the Atlantic and Gulf Coasts. Of these, 3 Atlantic and 2 shortnose sturgeon were released alive and the remainder were mortalities. Of the 34 observed Atlantic sturgeon mortalities, the majority were associated with hopper dredging (n=22) and mechanical clamshell dredging (n=3), operations. During this period a single Atlantic sturgeon was entrained by a hydraulic pipeline (i.e. cutterhead) dredge. Of the 11 shortnose sturgeon entrained, 5 each were taken by hopper and cutterhead dredge, while only 1 was entrained by a mechanical bucket dredge. All three Gulf sturgeon were entrained by hopper dredge, and all were reported from areas within the boundaries of the Corps of Engineers, Mobile District, Alabama. Two other takes in which the species was not reported was taken by hopper dredge. It is important to note that observers are more commonly required for hopper dredging operations compared to mechanical and cutterhead dredging operations, so the relative numbers of sturgeon taken by each dredge type are not necessarily an indication of how likely each dredge type is to take the species.

A technical report prepared by the Corps of Engineers, Engineer Research and Development Center (ERDC/EL TR-14-12) contains the results of a study on tagged Atlantic sturgeon responses to cutterhead dredges. Tagged fish were actively tracked throughout a section of the James River during dredging operations, and their movements included passage both upstream and downstream in the vicinity of the dredge. Atlantic sturgeon behavior did not show either attraction or avoidance responses to any stimuli likely associated with the dredging operation (i.e., the physical presence of the dredge plant itself, noise generated during the dredging operation, or disturbance of sediment, either from increase turbidity or re-suspending potential food resources in the water column). This study and other reviewed reports and studies suggest that sturgeon encounters with cutterhead dredges are coincidental, and extremely rare unless the dredge is operating in areas where sturgeon are known to congregate. In areas where sturgeon are very uncommon to rare, cutterhead dredge encounters with sturgeon are highly unlikely.

The areas impacted by project activities are not critical habitat for the Gulf sturgeon. However, it is possible that Gulf sturgeon may wander outside of areas where they are generally found to the north of the project area into the mud and sand-bottomed area where the navigation channel is located during cooler months when they are feeding in the estuaries. Even if they do occur in the area, Gulf sturgeon have the mobility necessary to avoid being adversely affected by dredging operations. Larval and small juvenile sturgeon, which are more susceptible to entrainment are not be expected in this area due the distance from spawning habitat.

West Indian Manatee: Substantial food sources (submerged or floating aquatic vegetation) have not been observed in the area. Given the extensive areas of relatively undisturbed wetlands in the region and the paucity of food sources in the project area, it is considered unlikely for the manatee to frequent and utilize the inshore waters of Lake Maurepas and Pontchartrain as habitat, although manatees could pass through this area while transiting the lake.

Green and Loggerhead Sea Turtles: Two species of threatened sea turtles inhabit Gulf of Mexico waters along the Louisiana coast; these include the green (*Chelonia mydas*) and loggerhead (*Caretta caretta*) sea turtles. Although sea turtles are predominantly marine animals, they come ashore to nest on barrier islands and mainland beaches of parishes comprising the Mississippi Delta, Mississippi Sound, Breton Sound, Barataria, and Pontchartrain Basins (LDWF 2014a). Loggerhead Critical Habitat, Sargassum (brown macroalgae) habitat, exists in the southern (offshore) portion of the study area (see Figure 2-21**;** NOAA 2015).

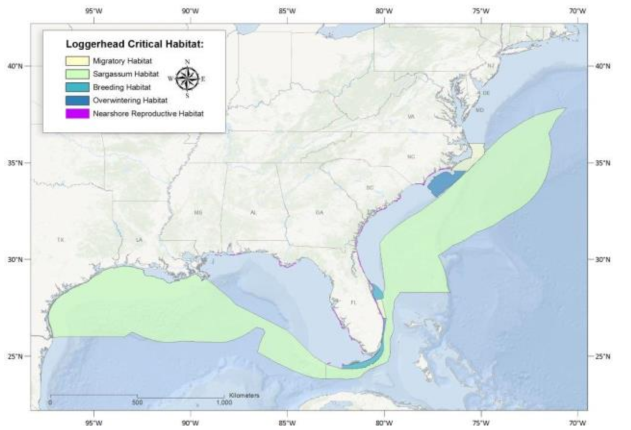

Figure 2-21 Loggerhead Critical Habitats including: migratory, sargassum, breeding, overwintering, and nearshore reproductive

http://www.nmfs.noaa.gov/pr/species/turtles/images/loggerhead_critical_habitat_map.jpg; accessed March 14, 2016).

Kemp's Ridley Sea Turtle: The most seriously endangered of the sea turtles, Kemp's Ridley turtles (*Lepidochelys kempii*) occur mainly in bays and coastal waters of the Atlantic Ocean and Gulf of Mexico (NMFS/USFWS 1992a). Nesting occurs on the northeastern coast of Mexico and occasionally on Texas Gulf Coast beaches from April to July. No Kemp's Ridley sea turtle nesting habitat occurs near the project site, and nesting has not been known to occur in the area. Along the Louisiana coast, turtles are generally found in shallow nearshore and inshore areas, and especially in salt marsh habitats, from May through October.

Hawksbill Sea Turtle: The hawksbill (*Eretmochelys imbricate*) is a small sea turtle, generally spending most of its life in tropical waters such as the warmer portions of the Atlantic Ocean, Gulf of Mexico, and Caribbean Sea (NMFS/USFWS 1993). Hawksbills frequent rocky areas, coral reefs, shallow coastal areas, lagoons, narrow creeks, and passes. Nesting may occur on almost any undisturbed deep-sand beach in the tropics—in North America, the Caribbean coast of Mexico is a major nesting area. In the continental United States, nesting sites are restricted to Florida where nesting is sporadic at best (NMFS/USFWS, 1993). Due to the lack of suitable foraging and nesting habitats, there is a low probability of this species occurring within the project area.

Leatherback Sea Turtle: The leatherback sea turtle (*Dermochelys coriacea*) is the largest, deepest diving, and most migratory and wide ranging of all the sea turtles (NMFS/USFWS 1992). Leatherbacks are mainly pelagic, inhabiting the open ocean and seldom entering coastal waters except for nesting purposes. Nesting in the United States is mainly confined to the Florida coast, and no nesting has been reported from Louisiana (Gunter 1981).

Future without Project Conditions (Alternative 1)

Direct and Indirect Impacts: Adverse impacts on threatened or endangered species, designated critical habitats, and other species of concern would not be likely. The species identified above would continue to occasionally enter the project area, and the potential for harassment or a take would remain during regular dredging operations. All takes would be documented and reported to the appropriate management agency. Routine dredging operations would continue to be coordinated with the USFWS and NMFS on at least an annual basis under the Endangered Species Act.

2.5 Cumulative Impacts of No Action (Alternative 1)

Cumulative impacts resulting from the No Action Alternative (i.e., current O&M practices) would be the result of all past, present, and reasonably foreseeable future actions in the study area. Cumulatively, 1,765,924,900 cubic yards of material over the course of 50 years would be dredged in the project area to maintain the river at its current state. As such, approximately 23,209 acres (6,161 AAHUs) of intermediate marsh habitat is anticipated to be constructed via beneficial use over the 50 year project life as part of the no-action alternative (Appendix A-7). Without the proposed action, study area water quality would still be affected by industrial activity along the corridor, by other coastal environmental projects, Federal and state water quality management programs, coastal deltaic processes, land development, flood protection, and climate:

- O&M of the River— In order to maintain the river at it's current navigational capacity, the project area would continue to require a comibined annual average of approximately 35,318,498 cubic yards of dredging. Approximately 528 acres of coastal marsh habitat (target eleveation of 2ft) is expected to establish each year via beneficial usea. However, due to tropical storms, subsidence, erosion, and sea level rise, approximately 57% of these areas are not expected to exist 50 years after construction. Ongoing maintenance activities identified under the No Action alternative would complement any future marsh creation projects, including those associated with the BP oil spill.

- Other coastal environmental projects—Existing diversions would continue to affect study area water quality, salinity, aquatic vegetation and phytoplankton community dynamics, and bioaccumulation rates. Long-term river water inflows from diversions may in some cases accelerate wetland loss (Swarzenski et al. 2005, Kearny et al. 2012). Other coastal projects affecting study area water quality include wetlands creation and nourishment, ridge rehabilitation, shoreline protection, oyster reef creation, and other types of hydrologic modification.

- To date, a total of 80 acres of wetlands were created by placing HDDA dredged material in shallow open water areas of West Bay under the Louisiana Coastal Authority (LCA) Beneficial Use of Dredged Material (BUDMAT program in FY 2015. At least for some unidentified period of time, LCA BUDMAT will potentially utilize dredge material from this project beneficially beyond the federal standard. Presently the LCA BUDMAT authorization is limited to federal expenditure of $100,000,000. The 2012 State Master Plan indicates little opportunity in partnering on beneficial use south of Venice, LA.

- Federal and state water quality management programs—State and federal water quality management programs are expected to improve study area water quality. There are currently no anticipated changes in nonpoint source pollution management and regulation that would significantly reduce Mississippi River nutrient and pesticide loads.

- Coastal deltaic processes—The study area would continue to be impacted by coastal deltaic processes associated with a transgressive delta. The continued subsidence and erosion of estuary wetlands would reduce their water quality benefits. Changes in barrier island morphology may lead to increased tidal prism volumes, which may provide some water quality benefits in regions of the study area where salinities may increase, such as decreased harmful algal blooms and removal of inorganic and organic materials. Additional foreseeable changes in water quality may occur due to redistribution of river discharge between the Mississippi and Atchafalaya rivers.

- Existing conditions are anticipated to change in Plaquemines Parish as trajectories of ecological change to aquatic resources would persist. The area would be subjected to increases in RSLR, which could increase saltwater intrusion and lead to increases in and the potential conversion of vast areas of adjacent marsh to open water. Much of the area could be permanently inundated under both the intermediate and high RSLR scenarios. There could be a shift from fresh water dominate species to those species that can tolerate higher salinity.

- Development— Population growth could increase traffic circulation, creating need for expanded roadways and bridges. Land use patterns in the Mississippi River and delta are expected to continue, along with industrial activities affecting the study area. In general, it appears that river water quality as impacted by basin agriculture will not change significantly (e.g., see Murphy et al. 2013, Thelin and Stone 2013). Recent (2008-2013) study area watershed land use data was evaluated using the Annual Kendall test to determine land use trends in the study area (USDA-NASS 2014). Results suggest decreasing shrubland area, increasing forest area, increasing or decreasing land use for several crops, and increasing high intensity development, all of which may affect water quality (e.g., see Demcheck et al. 2004, Southwick et al. 2002). Industrial activities, including accidental spills, would continue to affect study area water quality. Although unanticipated, environmental catastrophes such as the 2011 BP oil spill can have widespread impacts on study area water quality.

- Flood Risk Reduction—Diversion of Mississippi River water into Lake Pontchartrain during river floods would continue during flood events in order to maintain the river at 17.5 ft' at the Carrollton Gage in New Orleans.

- Climate—Increasing surface water temperatures could affect water quality by increasing primary productivity, rates of waterbourne disease, and frequency of harmful algal blooms, and decreasing dissolved oxygen levels (Milello et al. 2014). Increasing sea-level and severity of hurricanes could aid in accelerating wetland loss rates, as well as increases in the flooding of study area infrastructure, impacting water quality by removing habitat capable of ameliorating water quality and increasing the frequency of introduction of infrastructure floodwaters into study area estuaries. Increasing severity of droughts in the study area may impact water quality by facilitating stagnation of estuary waters during the warm summer months, leading to changes in phytoplankton community and decreases in pH and dissolved oxygen levels. Increasing severity of droughts may also foster dieback of some marsh communities and saltwater intrusion of upper estuary swamps, with both temporary and permanent impacts to these wetlands communities, affecting water quality. More severe rainfall events in the study area and Mississippi River watersheds could affect water quality by altering the transport of runoff constituents, particularly nutrients. Changes in Mississippi River discharge in response to climate change could alter the timing and extent of the Gulf of Mexico dead zone.

- Without the proposed project, study area water quality would likely continue current trends. For example, surface water quality has improved significantly with the implementation of the Clean Water Act and industrial and municipal discharge programs such as NPDES. These programs continue to advance with new or improved technologies to treat wastewater discharges.

- The causes of impairment will continue to degrade water quality until TMDL development and execution, and the sources are addressed. In addition, contaminants of emerging concern such as pharmaceuticals and personal care products, microplastics, etc. continue to present uncertainty for surface water quality and potential concerns for human health and the environment.

- With no action, processes affecting known or unknown cultural resources will continue as they are. Dredging within the channel is a regular maintenance activity that will likely have no additional effect on any resources that may have been within its area of effect. Within disposal areas, natural process will continue to erode and degrade remaining lands and will likely submerge any cultural resource that has not already been destroyed.

- The continued beneficial use of dredged material in existing disposal areas in the Mississippi River Delta would not result in overall adverse direct, indirect, or cumulative impacts to soils or water bottoms in or near the project area. The direct, indirect, and cumulative impacts to soils and water bottoms would remain consistent with current impacts to those resources from existing operation and maintenance dredging in the Mississippi River from Baton Rouge to the Gulf of Mexico. Cumulatively, approximately 26,400 acres are of intermediate marsh habitat is anticipated to be constructed within the Federal Standard limitations, via beneficial use over the 50 year period of analysis via annual O&M actions. Overall, the cumulative impacts of the proposed action would be positive, with long-term benefits to navigation, recreation, coastal habitat, and other resources in the study area. During the final feasibility design phase of the study USACE will consider whether additional dredge material placement and access lands are needed for the construction and OMRR&R of the project for the period of analysis.

- The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act (RESTORE Act) represents a portion of the Congressional response to the Deepwater Horizon oil spill. The Act dedicates 80 percent of all Clean Water Act administrative and civil penalties related to the Deepwater Horizon oil spill to the Gulf Coast Restoration Trust Fund (Trust Fund). RESTORE Act funds are allocated between five buckets: the Direct Component (35%), the Council-Selected Restoration Component (30%), the Spill Impact Component (30%), the Gulf Coast Ecosystem Restoration Science Program (2.5%); and Centers of Excellence Research Grants Program (2.5%). In early 2013, Transocean entered into a plea agreement to pay $1 billion to resolve federal Clean Water Act civil penalty claims, of which $800 million will be made available under the RESTORE Act to fund Gulf Coast recovery projects. The process of selecting projects for implementation under the RESTORE Act is anticipated to continue through the period of analysis, until the allocated funds are exhausted. Some projects have been selected and funded for implementation and will be discussed as a part of the reasonably foreseeable actions section below. In November of 2016, the Louisiana Coastal Protection and Restoration Authority (CPRA) has been awarded two grants totaling approximately $7.5 million from the Gulf Coast Ecosystem Restoration Council (RESTORE Council) for engineering and design of the Golden Triangle Marsh Creation ($3.2M) project and the Biloxi Marsh Living Shoreline ($4.3M) project under the

Resources and Ecosystems Sustainability, Tourist Opportunities and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act). These projects represent two out of seven total projects that were selected for funding by the RESTORE Council under its Initial Funded Priorities List that will directly benefit Louisiana. One additional grant in the amount of $7.3 million was funded by the RESTORE Council in September for the engineering and design of the West Grand Terre Beach Nourishment and Stabilization Project.

- Economic activity related to shipping would be held back by low water depth along the river. Economic activity related to wetland resources would be adversely affected by the depletion of these resources along the coastline. Industry development would contribute to the degradation of wetlands. Businesses may relocate to areas with less risk of storm damage.

- There are no foreseen cumulative impacts to visual resources in the study area from the no action alternative. Cumulative impacts would be the incremental direct and indirect impacts of not implementing the proposed action and the continued loss of wetland and habitats due to human development and conversion of existing forested wetlands and swamp habitats to marsh and open water.