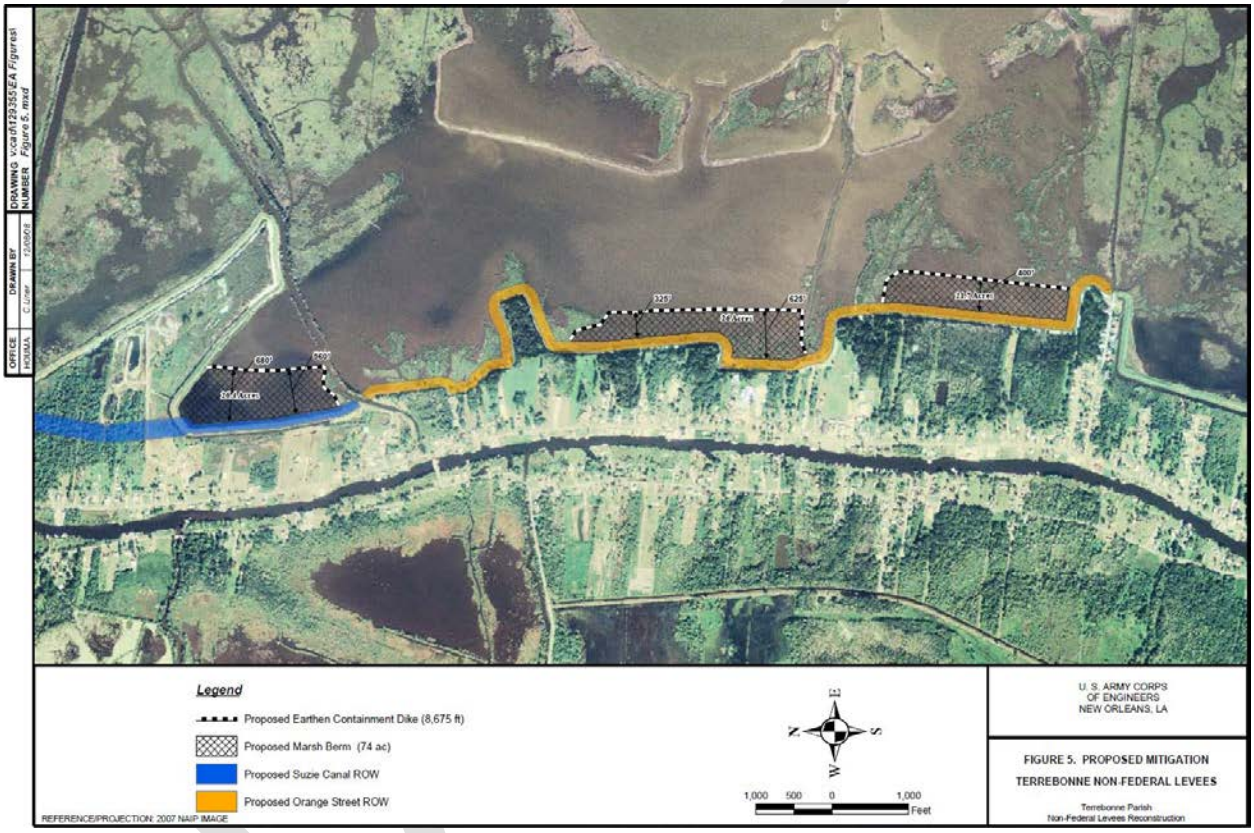
SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT #555

TERREBONNE NON-FEDERAL LEVEE MITIGATION

TERREBONNE PARISH, LOUISIANA



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U.S. Army Corps of Engineers
Mississippi Valley Division
Regional Planning and Environment Division South
New Orleans District

Contents

1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, Regional Planning and Environment Division South, has prepared this Supplemental Environmental Assessment (SEA) for New Orleans District (CEMVN) to evaluate the effectiveness of the mitigation plan implemented for impacts incurred during improvement to non-Federal levees in Terrebonne Parish, LA, described in EA #450 titled "Terrebonne Parish Non-Federal Levee System Repairs, Replacements, Modifications, and Improvements Terrebonne Parish, Louisiana" and to explore corrective actions to ensure full satisfaction of the mitigation requirement. The Finding of No Significant Impact (FONSI) for EA #450 was approved by the CEMVN Commander on 14 January 2009. The project area is located approximately 8.5 miles south of Houma, LA and 2 miles north of Dulac, LA on the west shore of Lake Boudreaux.

In 2006, through Public Law (PL) 109-234 (4th Supplemental), Congress authorized the repair, replacement, modification, and improvement of non-Federal levees and associated protection measures in Terrebonne Parish at full Federal expense. In response, the USACE, in coordination with Terrebonne Parish, raised 6 miles of levees to an elevation of +8.5 feet North American Vertical Datum of 1988 (NAVD88). These improvements resulted in environmental impacts that required mitigation.

A "habitat-based methodology" in the form of the wetland value assessment (WVA) model was used to assess both the environmental impacts incurred during construction of the Terrebonne Non-Federal Levee (NFL) improvements and the future benefits that would be obtained through the compensatory mitigation projects. The WVA model computes the difference in the habitat value over the period of analysis between the future with and future without project conditions. The difference is expressed as net average annual habitat units (AAHUs). For example, if the net change between the future without project condition (FWOP) and future with project (FWP) over the 50-year period of evaluation is a +0.2 over 100 acres, then that project would produce 20 AAHUs of ecological benefit. The same version of the model was used to calculate both the impacts from Terrebonne NFL work and future benefits to be obtained through the implementation of the mitigation. For further information regarding WVA models see Section 1.9.

Improvements to the NFL project impacted 12.1 acres (8.01 AAHUs) of bottomland hardwoods (BLH) and 25.7 acres (17.21 AAHUs) of brackish marsh. The mitigation plan for these impacts was presented in EA #450 and involves the purchase of BLH mitigation bank credits and the construction of a brackish marsh creation project (see EA #450 for details).

To satisfy the BLH mitigation requirement, approximately 13.2 BLH-Wet credits were purchased from Upper Bayou Folse and Ponderosa mitigation banks in March of 2017.

To satisfy the brackish marsh mitigation requirement, a 74 acre marsh creation project was planned. However, following construction, the 74 acres included retention dikes without plans for future dike degrade. This resulted in only approximately 71 acres of actual marsh creation. Additionally, upon review of the project's final surveys, it was discovered that portions of the marsh creation site never achieved elevations conducive to brackish marsh establishment (some too high, some too low). A site inspection conducted by the USACE and the Interagency Environmental Team (IET) in the fall 2013 verified the results of these surveys. In coordination with the IET, the project modeling (WVA) was re-run to assess the benefits of the created project, which showed the site fell short of satisfying the brackish marsh mitigation requirement by 6.73 AAHUs. During the fall 2013 inspection, the IET also discovered damage to the mitigation project from all-terrain vehicles (ATVs) traversing the site, which incurred an additional 2.48 AAHUs of damage to the site.

SEA #555 presents the remedial actions evaluated to ensure full satisfaction of the outstanding brackish marsh mitigation requirement, taking into account the shortfall at the created site and the damages to the marsh creation project from ATVs. Additionally, SEA #555 presents the final monitoring requirements for the functional portions of the marsh creation project as anticipated in EA #450's FONSI.

This SEA has been prepared in accordance with the National Environmental Policy Act (NEPA) and the Council on Environmental Quality's Regulations (40 Code of Federal Regulations [CFR] §1500-1508), as reflected in the USACE Engineering Regulation (ER) 200-2-2. In accordance with the Procedures for Implementing NEPA, 40 CFR Section 1501.4, SEA #555 provides sufficient information on the potential adverse and beneficial environmental effects to allow the District Commander, USACE-MVN, to make an informed decision on the need to prepare an Environmental Impact Statement (EIS) or make a FONSI.

1.1 PROPOSED ACTION

The proposed action consists of purchasing brackish marsh credits from the Louisiana Department of Natural Resources (LDNR) In Lieu Fee (ILF) Program and/or mitigation banks to offset the outstanding 6.73 AAHUs brackish marsh mitigation requirement not satisfied through construction of the marsh creation project. Additionally, brackish marsh ILF program and/or mitigation bank credits would be purchased to mitigate the 2.48 AAHUs of damage to the marsh creation project incurred from ATV use of the site with the assumption that the non-Federal sponsor will not allow further damage to the project.

In addition, EA #450's FONSI has the following specific environmental design commitments that would be completed as part of the proposed action.

> 6. The local sponsors, Terrebonne Levees Conservation District (TLCD) and Terrebonne Parish Consolidated Government (TPCG) would monitor and

maintain the marsh berm. A Conservation Easement would be purchased by TPCG over the marsh berm to prevent any development.

7. The Corps will work with US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Environmental Protection Agency (EPA), and other interested agencies to develop a final mitigation plan that is fully consistent with the Clean Water Act Section 404(b)(1) Guidelines, particularly with respect to the April 10, 2008, mitigation rule. The Corps will issue a special public notice describing the details of this mitigation plan."

Environmental Design Commitment number 6 is also found in EA #450's USFWS Coordination Act Report (CAR) recommendations. TPCG has not acquired the conservation easement from this commitment. CEMVN's response to USFWS's recommendation is provided below the recommendation.

USFWS Recommendation 4:
4. Fee title or an equivalent easement should be acquired for any mitigation lands to preclude incompatible development and to ensure that the recommended mitigation values are maintained over the project life; costs for development, maintenance, and monitoring of mitigation lands should be allocated as a project first cost in future project funding estimates and requests.

CEMVN Response 4: The TPCG will be required to purchase a conservation easement on the marsh mitigation site. TPCG and TLCD, will be required to implement the Monitoring Plan agreed to by the IMP. The Final Mitigation Plan will indicate actions that must be taken if Success Criteria are not met. Construction of the project is authorized and fully funded by the Emergency Supplemental Appropriations Act for Defense and the Hurricane Recovery of 2006 (Public Law 109-234, Title II, Chapter 3, Flood Control and Coastal Emergencies).

To satisfy EA #450's Environmental Design Commitment number 6 and USFWS Recommendation number 4, in a letter dated 24 October 2017, the TPCG committed to fully undertaking the monitoring, operation, and maintenance responsibilities for the mitigation project (See Appendix B). Additionally, the letter states that they have the necessary right, title, and real estate interests required to perform such responsibilities.

In order to satisfy EA #450's Environmental Design Commitment number 7, SEA #555 presents the final monitoring requirements for the functional portions of the constructed brackish marsh creation project.

1.2 PROJECT AUTHORITY

The proposed project is authorized under the Emergency Supplemental Appropriations Act for Defense and the Hurricane Recovery of 2006 (PL 109-234, Title II, Chapter 3, Flood Control and Coastal Emergencies). Generally, PL 109-234 provides funding

"…for the necessary expenses relating to the consequences of Hurricane Katrina and other hurricanes." The public law included provisions for Terrebonne Parish, specifically $30 million in funding "…for repairs, replacements, modifications and improvements of non-Federal levees and associated protection measures in Terrebonne Parish at full Federal expense."

1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to fully satisfy the mitigation requirement incurred during improvements to the Terrebonne NFL. Although the BLH mitigation requirement has been satisfied (in-kind mitigation bank credits have been purchased), the mitigation project built to satisfy the brackish marsh mitigation requirement did not fully achieve marsh elevations and has been damaged by ATVs. As such, the project, in its current condition, cannot fully satisfy the brackish marsh mitigation requirement to offset habitat lost due to the USACE's construction of 6 miles of non-Federal levee. Additionally, as per EA #450's FONSI, the final monitoring plan for the portion of the constructed brackish marsh creation that is functioning as intended needs to be completed.

1.4 DATA GAPS AND UNCERTAINTIES

Because natural systems are complex and consist of an intricate web of variables that influence the existence and condition of other variables within the system, all restoration projects contain inherent uncertainties. The effects of tropical storms, increased sea level rise, and climate change on each project's performance are uncertain and are addressed through future projections based on existing information. All models used for this study rely on mathematical representations of current and future conditions to quantify and predict the future success and benefits of these mitigation projects. No model can account for all relevant variables in an evolving coastal system. Additionally, there is inherent risk in reducing complex natural systems to mathematic expressions driven by simplified interactions of key variables. As such, how the proposed projects will actually perform and the benefits that will result from the proposed projects' creation are a 'best guess' based on what we presently know about existing ecosystems and the results of already constructed restoration projects.

1.5 PRIOR NEPA DOCUMENTS

Information and data on previous and existing NFL conditions associated with the proposed action were derived from the following reports, which are incorporated herein by reference:

- 2002, *Final Programmatic Environmental Impact Statement, Mississippi River & Tributaries – Morganza, Louisiana to the Gulf of Mexico Hurricane Protection*. This document discusses impacts associated with upgrading existing forced drainage system levees in southern Terrebonne and Lafourche parishes, constructing new levees and water control structures, and operating the water control structures and floodgates in a coordinated

manner during tropical storm or hurricane tidal surges. The record of decision (ROD) was signed on March 2002.

- 2005, *EA #406, Mississippi River and Tributaries, Morganza, Louisiana to the Gulf of Mexico, Hurricane Protection Levee, Reach J, Segment 1, Terrebonne Parish, Louisiana*. This document describes the impacts associated with the proposed construction of a hurricane levee (Reach J1) that connects with the existing TLCD's 4-1 and 4-3B levees. The Reach J1 levee is described as a 2.7 mile reach consisting of a segmented flood side borrow canal, a dual purpose marsh platform and levee berm, a consolidated fill levee, a T-wall at the pipeline crossing, a protected side berm, a protected side fishery access trenasse, a temporary construction access road, and improvements including culverts to the old board road to make it a permanent access road. The FONSI was signed on 29 July 2005.

- *2009, EA #450, Final Environmental Assessment, Terrebonne Parish Non-Federal Levee System Repairs, Replacements, Modifications, and Improvements, Terrebonne Parish, Louisiana*. This document discusses the impact of raising and repairing around 32,500 linear feet (6.1 miles) of existing levee near Dulac, Terrebonne Parish, LA. Six alternatives were assessed in the initial screening including structural and non-structural flood protection measures. The recommended plan is to raise the Suzie Canal and Orange Street levees to an elevation of +9.5 feet NAVD88 with an approximately 10-foot wide crown and side slopes of 1-foot vertical on 3-feet horizontal. Borrow material was obtained from a 100-acre site ("J-1 borrow area") owned by TLCS. The FONSI was signed on 14 January 2009.

- 2013, *Final Revised Programmatic Environmental Impact Statement, Morganza to the Gulf of Mexico, Louisiana*. This Revised Programattic EIS is a revision to the 2002 Final Programmatic EIS for the project. The 2002 Programattic EIS was not finalized with the signing of a Record of Decision. A revision was required because project alternatives have been modified as a result of new hurricane and storm damage risk reduction design guidelines issued after hurricanes Katrina and Rita. Four structural alternatives were assessed consisting of levee sections and structures including culverts. The ROD was signed on May 2013.

1.6 PUBLIC CONCERNS

Because of the recreational value of wetlands, the public is concerned about wetland loss, shoreline erosion, and water quality impacts to Lake Boudreaux and other areas in the vicinity of the project. The public realizes the importance of the area's wetlands, and there are non-governmental organizations (NGO) set up solely in concern over their fate (e.g., America's Wetland Foundation, and National Audubon Society). Louisiana

has approximately 40 percent of the nation's coastal wetlands, and 80 percent of the nation's annual wetland loss (Turner 1997). Coastal Louisiana is losing marsh faster than any other place in the US. According to current estimates, around one football field of marsh becomes water about every 34 minutes (Couvillion et al. 2017). Wetland restoration and conservation, as well as public awareness of issues pertaining to these topics, are the goals of interested NGOs.

1.7 TERREBONNE MITIGATION COMPLETED TO DATE

Compensatory mitigation bank credits were acquired in 2017 for 12.3 acres (8.08 AAHUs) of BLH impacts resulting from construction of the Terrebonne NFL improvements. Impacts resulting from that construction were assessed in EA #450 with a signed FONSI dated January 14, 2009.

1.8 OUTSTANDING TERREBONNE NFL MITIGATION

Approximately, 9.21 AAHUs of brackish marsh impacts remain to be mitigated for the construction of the NFL project assessed in EA #450. From the USFWS Coordination Act Report dated 20 August 2018 (Appendix B; page 11/13):

> "In coordination with the [interagency environmental team (IET)], the acreage of USACE created marsh within an acceptable elevation range was re-evaluated using the WVA. That re-evaluation (i.e., removal of acreage below the acceptable elevation range from the WVA's total project area) determined that the mitigation site failed to mitigate all impacts; leaving approximately 6.73 Average Annual Habitat Units (AHHUs) of brackish marsh unmitigated. The WVA calculations for the IFL program determined the mitigation potential for brackish and intermediate marshes would be 0.31. Based upon that potential USACE would need to purchase from the LDNR In-Lieu Fee program 6.73 credits to mitigate impacts to brackish marshes."
>
> "To determine ATV impacts, the acreage of areas that had persistent loss of vegetation were determined and that acreage was removed from the total mitigation project area in the WVA. That re-evaluation determined that ATV impacts resulted in the loss of 2.48 AAHUs from the projects benefits, therefore an additional 2.48 AAHUs of brackish marsh should be purchased form the LDNR In-Lieu Fee program or a mitigation bank."

1.9 WETLAND VALUE ASSESSMENT

The WVA methodology operates under the assumption that optimal conditions for general fish and wildlife habitat within a given coastal wetland type can be characterized and that existing or predicted conditions can be compared to that optimum level to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland type. Each model consists of: 1) a list of variables that are considered important in characterizing fish and wildlife habitat; 2) a Suitability Index graph for each variable, which defines the

assumed relationship between habitat quality (Suitability Index) and different variable values; and 3) a mathematical formula that combines the Suitability Index for each variable into a single value for wetland habitat quality. That single value is referred to as the Habitat Suitability Index, or HSI.

The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources. The coastal marsh WVA models consists of six variables: 1) percent of wetland area covered by emergent vegetation; 2) percent of open water area covered by aquatic vegetation; 3) marsh edge and interspersion; 4) percent of open water area $\leq$ 1.5 feet deep in relation to marsh surface; 5) salinity; and 6) aquatic organism access.

Values for variables used in the models are derived from existing conditions and are estimated for conditions projected into the future if no mitigation efforts are applied (i.e., future without project conditions, or "FWOP"), and for conditions projected into the future if the proposed mitigation project is implemented (i.e., future with project, or "FWP"), providing an index of habitat quality, or habitat suitability, for the period of analysis. The HSI is combined with the acres of habitat to generate a number that is referred to as "habitat units." Expected project impacts/benefits are estimated as the difference in habitat units between the FWP scenario and the FWOP scenario. To allow comparison of WVA benefits to costs for overall project evaluation, total benefits are averaged over a 50-year period, with the result reported as AAHUs. Assumptions applied to determine the values used in the ILF WVA can be found in Appendix A.

Sea Level Rise Analysis

Wetland Acreage Predictions Under Increased Sea Level Rise Rates

Potential increases in Sea Level Rise (SLR) could affect the performance and therefore ability of a mitigation project to achieve replacement of the services and functions of the impacted habitat types. The Brackish Marsh ILF WVAs were run using the intermediate SLR scenario to account for potential uncertainties in future SLR impacts. WVAs for the mitigation banks in the Deltaic Plain would also be run using the intermediate SLR scenario to account for these uncertainties. As such, the risk of the proposed ILF and/or Mitigation Bank Purchase not successfully meeting the mitigation requirement due to SLR has been minimized.

2.0 ALTERNATIVES INCLUDING THE PROPOSED ACTION

The following are the alternatives that were considered to fully satisfy the outstanding brackish marsh mitigation requirement (9.21 AAHUs).

2.1 ALTERNATIVE 1: NO ACTION ALTERNATIVE

In compliance with NEPA, Federal agencies must consider an alternative of "No Action" to the proposed action. The analysis for the No Action alternative considers previous, current, and reasonably foreseeable future projects. The No Action alternative evaluates not implementing any of the alternatives and represents the FWOP, the baseline environmental conditions against which alternatives considered in detail are compared. This alternative would not satisfy the mitigation required by law (e.g. Clean Water Act, WRDAs of 1986 and 2007).

2.2 ALTERNATIVE 2: EXISTING PROJECT COMPLETION AND AUGMENTATION

Alternative 2 consists of adding 3+ acres of brackish marsh creation to and rectifying the existing mitigation project to satisfy the outstanding Terrebonne NFL brackish marsh mitigation requirement. The project delivery team (PDT) determined that construction methods associated with rectifying the existing project would incur additional impacts to the already existing brackish marsh within the project area that could not be avoided. These additional impacts would also require mitigation, which would necessitate construction of more marsh acreage. Increased cost and time to complete the design and construction of this alternative compared to the proposed action resulted in the PDT eliminating this alternative from further consideration.

2.3 ALTERNATIVE 3: COASTAL WETLANDS PLANNING PROTECTION AND RESTORATION ACT PROJECT AUGMENTATION

Alternative 3 consists of expanding a Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) project within the Terrebonne Basin watershed to satisfy the outstanding Terrebonne NFL brackish marsh mitigation requirement. Since there are no CWPPRA projects scheduled to be completed in the watershed for brackish marsh in the near future and considering the need to comply with WRDA 1986 Section 906 and complete the mitigation as soon as possible as well as the additional cost involved with designing an expansion compared to other alternatives, this alternative was eliminated from further consideration by the PDT.

2.4 ALTERNATIVE 4: IN LIEU FEE AND/OR MITIGATION BANK CREDIT PURCHASE (PROPOSED ACTION)

USACE approved ILF program/mitigation banks with perpetual conservation servitudes currently in compliance with their authorizing instrument (ILF agreement or mitigation bank instrument) and able to mitigate brackish marsh Coastal Zone impacts were considered as a potential alternative. Alternative 4 assumes that the outstanding brackish marsh mitigation requirement could be satisfied through the purchase of brackish/saline marsh ILF and/or mitigation bank credits.

The ILF is similar to mitigation banks in that the program sells mitigation credits to permittees, whose obligation to provide compensatory mitigation is then transferred to the ILF program sponsor (LDNR). LDNR then builds a marsh project with those funds

in the geographic area impacted (Chenier Plain or Deltaic Plain), within the Louisiana Coastal Zone. Consistent with how USACE 404 Mitigation Bank Program mitigates marsh impacts, credits mitigate either fresh/intermediate impacts or brackish/saline impacts. When ILF credits are purchased, there is no certainty which project will actually be built by the program with those funds. As such, impacts may end up being mitigated outside of the impacted watershed.

There are no mitigation banks in the affected watershed (Terrebonne Basin watershed) with available brackish/saline marsh credits for purchase. The WIIN Act of 2016 (PL 114-322) states that all potential credits from mitigation banks and ILF programs with service areas that include the impacted areas should be considered as reasonable alternatives. Tidal marsh mitigation banks in Louisiana have a service area made up of either the Deltaic or Chenier Plain. Terrebonne Basin watershed is within the Deltaic Plain. There are brackish/saline marsh credits available in the Deltaic Plain (the plain). As such, if mitigation bank credits were purchased to satisfy all or part of the remaining brackish marsh requirement, mitigation for impacts incurred in the watershed would occur outside of the watershed.

In coordination with the resource agencies, the same version of the WVA model used to assess the brackish marsh mitigation shortfall would be used for the mitigation alternatives to ensure that the assessment of the functions and services provided by the ILF program and/or mitigation bank(s) match the assessment of the functions and services that would have been provided at the mitigation site. The WVAs would also be adjusted to account for the potential delay in restoring brackish marsh in the watershed. At this time, to fully mitigate the outstanding brackish marsh mitigation requirement, the CEMVN would purchase sufficient ILF and/or mitigation bank credits within the plain to satisfy 9.21 AAHUs of brackish marsh impacts.

3.0 AFFECTED ENVIRONMENT

This section describes the natural and human environment as well as the relevant resources of the watershed. A description of the affected environment of the complete Terrebonne NFL project area is presented in EA #450.

3.1 DESCRIPTION OF THE WATERSHED

ILF and/or mitigation bank credits would be purchased in the Deltaic Plain in southeastern Louisiana. The credits would be approved for mitigating Coastal Zone impacts.

The currently constructed brackish marsh creation project is located in the watershed approximately 8.5 miles south of Houma, LA and 2 miles north of Dulac, LA on the west shore of Lake Boudreaux (Figure 1).

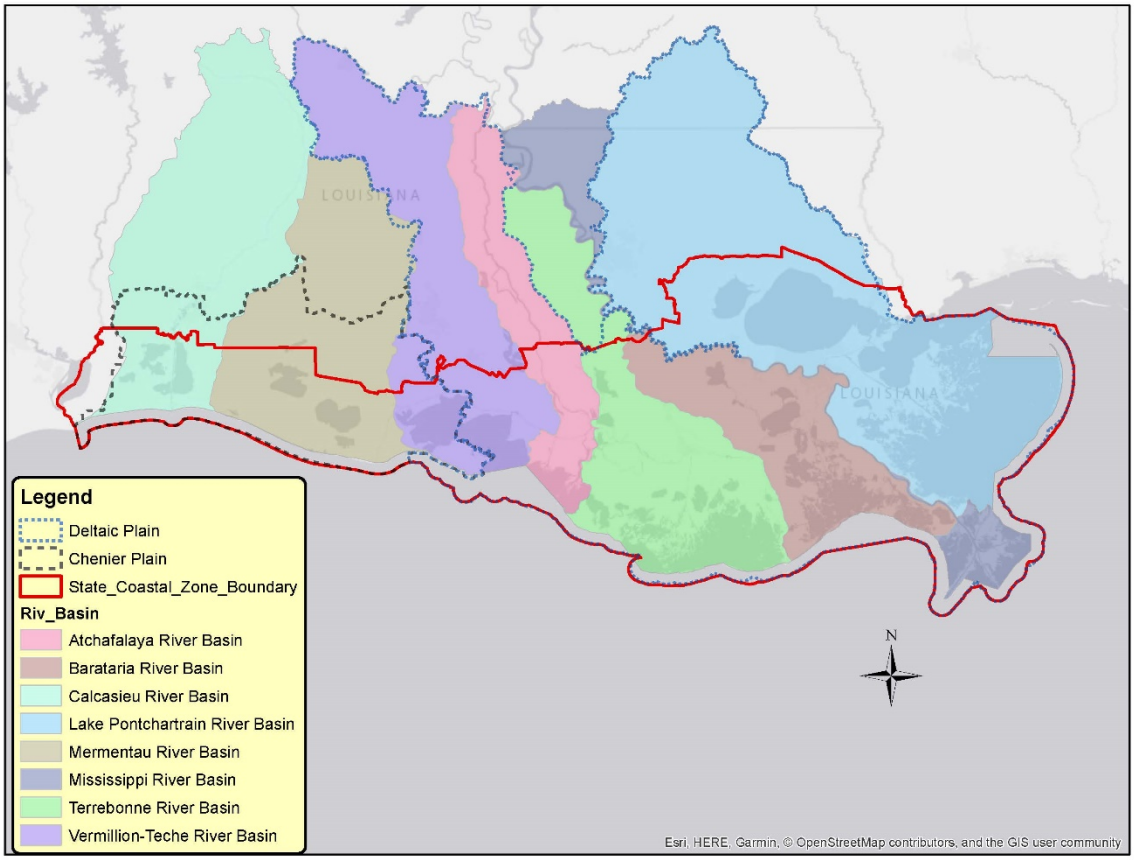

Figure 1: Terrebonne Basin Watershed Location Map

The watershed covers approximately 1,712,500 acres in south-central Louisiana (LCWRCTF 1993), bordered by Bayou Lafourche to the east, the Atchafalaya Basin floodway to the west, the Mississippi River to the north, and the Gulf of Mexico to the south. It includes all of Terrebonne Parish and parts of Lafourche, Assumption, St. Martin, St. Mary, Iberville, and Ascension Parishes. The watershed is an abandoned delta complex, characterized by a thick section of unconsolidated sediments that are undergoing dewatering and compaction, contributing to high subsidence, and a network of old distributary ridges extending southward from Houma (CWPPRA 2017). The southern end of the watershed is defined by a series of narrow, low-lying barrier islands (the Isles Dernieres and Timbalier chains), separated from the mainland marshes by a series of wide, shallow lakes and bays (e.g., Lake Pelto, Terrebonne Bay, Timbalier Bay).

The Mississippi River Delta complex was formed by river deposits between 700 and 7,400 years ago. The Natural Resources Conservation Service (NRCS) classifies soils within the Terrebonne Basin watershed as typically peat, mucks, and clays mixed with organic matter, and silts derived from river deposits. The soil composition is subject to

change as floodwaters and storm surges deposit new sediments. They are composed predominantly by Balize and Larose soil types. These soils are classified as continuously flooded deep, poorly drained and permeable mineral clays and mucky clays. Marsh and swamp deposits are found in the vicinity of the river from New Orleans to the Heads of Passes at the Gulf of Mexico. Marsh deposits are primarily organic, consisting of 60 percent or more by volume of peat and other organic material with the remainder being a composition of various types of clays. Total organic thickness is normally 10 feet, with variances less than one foot. Inland swamp deposits are composed of approximately 70 percent clay and 30 percent peat and organic materials. The percentage of sand and sandy silts increases with proximity to the open waters of the Gulf of Mexico (USACE 1974).

3.2 RELEVANT RESOURCES

Table 1 presents relevant resources recognized by laws, executive orders, regulations, and other standards of National, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public.

Table 1: Relevant Resources and Their Institutional, Technical, and Public Importance

Resource	Institutionally Important	Technically Important	Publicly Important
Wetlands	Clean Water Act of 1977, as amended; Executive Order 11990 of 1977, Protection of Wetlands; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968., EO 11988, and Fish and Wildlife Coordination Act.	They provide necessary habitat for various species of plants, fish, and wildlife; they serve as ground water recharge areas; they provide storage areas for storm and flood waters; they serve as natural water filtration areas; they provide protection from wave action, erosion, and storm damage; and they provide various consumptive and non-consumptive recreational opportunities.	The high value the public places on the functions and values that wetlands provide. Environmental organizations and the public support the preservation of marshes.
Wildlife	Fish and Wildlife Coordination Act of 1958, as amended and the Migratory Bird Treaty Act of 1918	They are a critical element of many valuable aquatic and terrestrial habitats; they are an indicator of the health of various aquatic and terrestrial habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Threatened and Endangered Species	The Endangered Species Act of 1973, as amended; the Marine Mammal Protection Act of 1972; and the Bald Eagle Protection Act of 1940.	USACE, USFWS, NMFS, NRCS, EPA, LDWF, and LDNR cooperate to protect these species. The status of such species provides an indication of the overall health of an ecosystem.	The public supports the preservation of rare or declining species and their habitats.
Aquatic Resources/ Fisheries	Fish and Wildlife Coordination Act of 1958, as amended; Clean Water Act of 1977, as amended; Coastal Zone Management Act of 1972, as amended; and the Estuary Protection Act of 1968.	They are a critical element of many valuable freshwater and marine habitats; they are an indicator of the health of the various freshwater and marine habitats; and many species are important commercial resources.	The high priority that the public places on their esthetic, recreational, and commercial value.
Water Quality	Clean Water Act of 1977, Fish and Wildlife Coordination Act, Coastal Zone Mgt Act of 1972, and Louisiana State & Local Coastal Resources Act of 1978.	USACE, USFWS, NMFS, NRCS, EPA, and State DNR and wildlife/fishery offices recognize value of fisheries and good water quality and the national and state standards established to assess water quality.	Environmental organizations and the public support the preservation of water quality and fishery resources and the desire for clean drinking water.
Essential Fish Habitat (EFH)	Magnuson-Stevens Fishery Conservation and Management Act of 1996, Public Law 104-297	Federal and state agencies recognize the value of EFH. The Act states, EFH is "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity."	Public places a high value on seafood and the recreational and commercial opportunities EFH provides.
Recreation Resources	Federal Water Project Recreation Act of 1965 as amended and Land and Water Conservation Fund Act of 1965 as amended	Provide high economic value of the local, state, and national economies.	Public makes high demands on recreational areas. There is a high value that the public places on fishing, hunting, and boating, as measured by the large number of fishing and hunting licenses sold in Louisiana; and the large per-capita number of recreational boat registrations in Louisiana.
Aesthetic (Visual) Resources	USACE ER 1105-2-100, and National Environmental Policy Act of 1969, the Coastal Barrier Resources Act of 1990, Louisiana's National and Scenic Rivers Act of 1988, and the National and Local Scenic Byway Program.	Visual accessibility to unique combinations of geological, botanical, and cultural features that may be an asset to a study area. State and Federal agencies recognize the value of beaches and shore dunes.	Environmental organizations and the public support the preservation of natural pleasing vistas.

Of these relevant resources, the ones that could be impacted from implementation of the proposed action are: wetlands; wildlife; threatened, endangered, and protected species; fisheries, aquatic resources, and water quality; essential fish habitat; aesthetic and recreational resources.

3.2.1 Wetlands

Marshes in the watershed are being lost at the rate of 2.3 percent per year according to data (1987-2000) gathered for the West Lake Boudreaux Shoreline Protection and Marsh Creation project (USFWS 2006). This loss is due to subsidence, sea level

change, salinity intrusion caused by navigation channels and oilfield canals, shoreline erosion, ponding of water, etc.

Other wetland habitat types found within the watershed include bottomland hardwoods and swamp. However, since the outstanding mitigation requirement only involves marsh, these wetland resources are not discussed further in this document. Marsh habitat definitions are presented in the following paragraphs.

Freshwater marsh is found in low-lying frequently flooded areas, with the water level remaining on or near the surface for extended periods of time during growing season. It contains emergent herbaceous (non-woody) vegetation adapted to predominantly non-tidal freshwater conditions (Salinity less than 5 parts per thousand (ppt) during the growing season: March-November).

Intermediate marsh is found between brackish marsh and freshwater marsh and has an irregular tidal regime. This marsh is characterized by a diversity of species, many of which are found in freshwater marsh and some of which are found in brackish marsh (e.g. *Cyperus spp*., wire grass). Intermediate marsh experiences a mean salinity equal to or less than 7 ppt during the growing season. Intermediate marsh is normally found between fresh marsh and brackish marsh.

Brackish marsh is found in low-lying frequently flooded tidally influenced areas, with the water level remaining on or near the surface for extended periods during growing season. It contains emergent herbaceous vegetation adapted to tidal conditions. In the watershed, species found in brackish marsh (salinity 4-18 ppt) are a combination of saltmeadow cordgrass, chairmaker's bulrush (*Schoenoplectus americanus*), saltmarsh bulrush (*Bolboschoenus robustus*), and dwarf spikerush (*Eleocharis parvula*) (Visser et al., 1998). Figure 2 shows the loss of brackish marsh habitat from 1985-2016 (USFWS 2018, personal coordination).

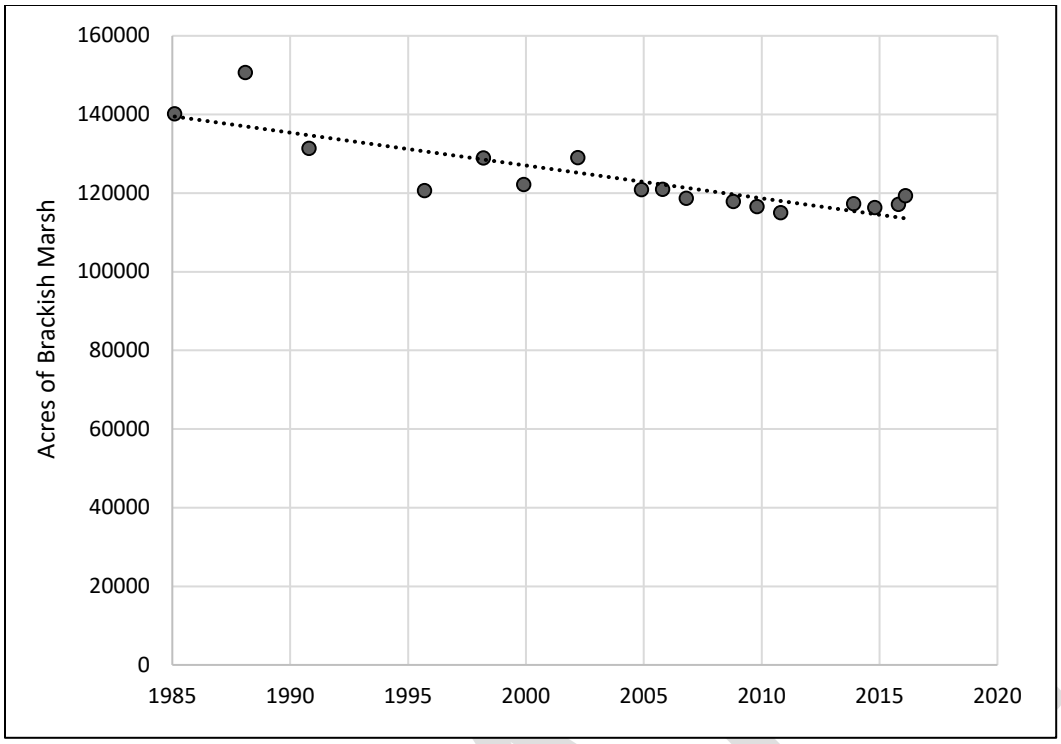

Figure 2. Brackish Marsh Habitat in Terrebonne Basin (1985-2016)

Saline marsh is similar habitat to brackish marsh, but at a lower elevation and more tidally influenced. In the watershed, species found in saline marsh (salinity 8-29 ppt) are a combination of smooth cordgrass (*Spartina alterniflora*), needlegrass rush (*Juncus roemerianus*), turtleweed (*Batis maritima*), black mangrove (*Avicennia germinans*), and *Distichlis spicata* (saltgrass) (Visser et al., 1998).

3.2.2 Wildlife

Existing Conditions

The watershed provides habitat for numerous species of wildlife, including waterfowl, wading birds, shorebirds, mammals, reptiles and amphibians. The coastal marshes provide wintering habitat for migratory ducks and geese. The resident Mottled Duck (*Anas fulvigula*), which nests in fresh to brackish marshes along the coast, is found throughout the year within watershed marshes. Besides migratory waterfowl, other game birds which occur within the area include rails, coots, and snipe. Several species of wading birds including of herons, egrets, and ibis utilize the marsh, mud flats, and shallow water habitats within the watershed. The mudflats and shallow-water areas also attract a wide variety of shorebirds (killdeer, avocet, stilt, dowitchers, snipe, and sandpipers), while seabirds such as pelicans, gulls, and terns are found more often in deeper water areas. Other common bird species that can be found within the watersheds include songbirds, raptors, kingfishers, and numerous seasonal neo-tropical migrants. Commercially and economically important wildlife species that occur or may occur within the watershed include nutria, muskrat, mink, raccoon, and the American

alligator. Other wildlife species known to have occurred within the watershed include white-tailed deer, feral hogs, and rabbits.

The watershed contains a variety of birds, mammals, and other wildlife. Both migratory and resident birds occur in or near the watershed. Common birds include ibis *(Plegadis spp.; Eudocimus albus),* egrets *(Ardea alba; Egretta thula),* cormorants *(Phalacrocorax spp.), terns (Sterna spp.),* gulls *(Larus spp.),* skimmers *(Rynchops niger),* sandpipers *(Calidris spp.),* pelicans *(Pelecanus spp.),* osprey *(Pandion haliaetus),* herons *(Ardea herodias; Egretta spp.; Nycticorax spp.),* hawks *(Accipiter spp.; Buteo spp.),* kestrels *(Falco sparverius),* vultures *(Coragyps atratus; Cathartes aura),* frigatebirds *(Fregata magnificens),* grackles *(Quiscalus spp.),* blackbirds *(Agelais phoeniceus),* and several species of swallows, flycatchers, wrens, warblers, and sparrows.

Mammals using the marshes and scrub-shrub habitat include numerous furbearers, such as nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), swamp rabbit (*Sylvilagus aquaticus*), mink *(Mustela vison),* river otter *(Lontra canadensis),* raccoons (*Procyon lotor*), and white-tailed deer (*Odocoileus virginianus*). Scrub-shrub provides habitat for salamanders, toads, frogs, turtles, and several species of poisonous and nonpoisonous snakes. The American alligator *(Alligator mississippiensis)* is abundant in fresh to intermediate marsh and is caught commercially for its hide and meat.

3.2.3 Threatened and Endangered Species

Within the State of Louisiana there are 30 animal and 3 plant species (some with critical habitat) under the jurisdiction of the USFWS and/or the NMFS, presently classified as endangered or threatened. Other species that were listed on the Endangered Species List, but have since then been de-listed because population levels have improved are the Bald Eagle (*Haliaeetus leucocephalus*) and the Brown Pelican (*Pelecanus occidentalis*). Currently, American alligators (*Alligator mississippiensis*) and shovelnose sturgeon (*Scaphirhynchus platorynchus*) are listed as threatened under the Similarity of Appearance clause in the Endangered Species Act (ESA) of 1973, as amended but are not subject to ESA Section 7 consultation. The listed species found in the parishes within the watershed can be found in Table 2.

Table 2: LA Threatened and Endangered Species in the Watershed

Species	Parish	Critical Habitat	Status	Jurisdiction		Impact
				USFWS	NFMS	
Animal						
West Indian Manatee (*Trichechus manatus*)	Ascension, Lafourche, Saint Martin, Saint Mary, Terrebonne		T	X		
Gulf sturgeon (*Acipenser oxyrinchus desotoi*)	Ascension		T	X	X	
Pallid sturgeon (*Scaphirhynchus albus*)	Ascension, Iberville, Saint Martin, Saint Mary, Terrebonne		E	X		
Piping plover (*Charadrius melodus)*	Saint Mary, Lafourche	X	T	X		
Red knot *(Calidris canutus)*	Lafourche, Saint Mary		T	X		
Green Sea Turtle (*Chelonia mydas*)	Saint Mary, Lafourche, Terrebonne		T	X	X	
Hawksbill Sea Turtle (*Eretomchelys imbricata*)	Saint Mary, Lafourche, Terrebonne		E	X	X	
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	Saint Mary, Lafourche, Terrebonne		E	X	X	
Leatherback Sea Turtle (*Dermochelys coriacea*)	Saint Mary, Lafourche, Terrebonne		E	X	X	
Loggerhead Sea Turtle (*Caretta caretta*)	Saint Mary, Lafourche, Terrebonne		T	X	X	
Inflated Heelsplitter Mussel (*Potamilus inflatus*)	Ascension		T		X	
Interior Least Tern (*Sterna antillarum athalassos*)	Iberville		E	X		

The Louisiana Natural Heritage Program (LNHP) of Louisiana Department of Wildlife and Fisheries (LDWF) has developed its own lists and monitors the status of rare, threatened and endangered species, and natural communities for each parish of the state. The species and habitats listed by the State of Louisiana may be found at http://www.wlf.louisiana.gov/wildlife/species-parish-list. Below are the state listed species that have the potential to be found in the watershed.

- Bald Eagle (E): Ascension, Iberville, Lafourche, St. Martin, St. Mary, Terrebonne
- Brown Pelican (E): LaFourche, Terrebonne
- Interior Least Stern (E): Iberville
- Louisiana Black Bear (T): Iberville, St. Martin, St. Mary

3.2.4 Aquatic Resources/Fisheries, and Water Quality

Major water bodies within the watershed include Lake Boudreaux and Bayou Butler. Several unnamed pipeline canals and other interconnecting waterways are found throughout the floodside marsh. The marsh and aquatic habitats found in the watershed contain emergent vegetation and submerged aquatic vegetation, which serve as nursery, feeding, and cover habitat for several species of fishes and shellfishes. Resident fishes include the striped mullet and several species of killifish. These habitats also support many commercially and recreationally important species including red drum, black drum, sheepshead, Atlantic croaker, southern flounder, Gulf menhaden, sand and spotted trout, blue crab, white shrimp, and brown shrimp.

Salinity and turbidity are important factors that can influence submerged and emergent plant communities in a given area. The floodside marshes and open water portions of the project area have intermediate and brackish salinities and non-turbid waters, while the open waters of Lake Boudreaux normally have brackish salinities and turbid waters.

As part of its surface water quality monitoring program, the Louisiana Department of Environmental Quality (LDEQ) routinely monitors a number of sites on larger water bodies throughout the state, including Terrebonne Bay and Lake Boudreaux. Based upon this data and the use of less-continuous information, such as fish tissue contaminants data, complaint investigations, and spill reports, the LDEQ has assessed water quality fitness in Lake Boudreaux to be supportive of swimming, boating, and fishing, but not supportive of fish and wildlife propagation or oyster production (LDEQ 2006). Suspected causes are low dissolved oxygen, high nutrient load (nitrate/nitrite and phosphorus) and total fecal coliform bacteria, while the suspected sources were retention of domestic sewage, on-site treatment systems, and package plant or other permitted small flow discharges (LDEQ 2006).

3.2.5 Essential Fish Habitat

All of the marine and estuarine waters of the northern Gulf of Mexico have been designated as Essential Fish Habitat (EFH) through regulations promulgated by NMFS

and the Gulf of Mexico Fishery Management Council as required by the Magnuson-Stevens Fishery Conservation and Management Act. EFH is described as waters and substrates necessary for Federally-managed species to spawn, breed, feed, and grow to maturity. In the northern Gulf of Mexico, EFH has generally been defined as areas where individual life-stages of specific Federally-managed species are common, abundant or highly abundant. In estuarine areas, EFH is defined as all estuarine waters and substrates (mud, sand, shell, rock and associated biological communities), including the sub-tidal vegetation (seagrasses and algae) and adjacent inter-tidal vegetation (marshes and mangroves). The open waters, waterbottom substrates, and inter-tidal marshes of the watershed are considered EFH under the estuarine component.

The estuarine waters in the watershed include EFH for several Federally-managed species. These species use the area for foraging and nursery habitat, as well as a migration route to other areas considered to be EFH. Specific categories of EFH in the watershed include estuarine emergent wetlands, mud/sand substrates, and estuarine water column. Table 3 shows the EFH for the managed species expected in those areas.

Table 3. Essential Fish Habitat for Life Stages

Species	Life Stage	Essential Fish Habitat
Brown Shrimp	Adults	Gulf of Mexico <110 m, silt sand, muddy sand
	Juvenile	Marsh edge, SAV, tidal creeks, inner marsh
Pink Shrimp	Adults	Gulf of Mexico 11 to 110 m, calcareous mud, sand shell
	Juvenile	Marsh edge, SAV, marsh ponds, inner marsh, oyster Reefs, sand-shell substrate
White Shrimp	Adults	Gulf of Mexico <33 m, silt, soft mud
	Juvenile	Marsh edge, SAV, marsh ponds, inner marsh, oyster Reefs
Red Drum	Adults	Gulf of Mexico & estuarine mud bottoms, oyster reef
	Juvenile	SAV, estuarine mud bottoms, marsh/water interface
Gray Snapper*	Adult	Emergent marshes, hard bottoms, reefs, sand/bottoms, soft bottoms
	Juvenile	Mangroves, emergent marshes, seagrass, SAV
Lane Snapper*	Adult	Offshore, sand bottom, natural channels, banks, and man-made reefs and structures
	Juvenile	grass flats, reefs, and soft bottom, GOM <20 m

3.2.6 Recreational Resources

The watershed contains many recreational opportunities for boating and wildlife viewing. Major bodies of water located in the watershed include Lake Boudreaux, Lake Felicity, Bayou Terrebonne, Bayou Pointe au Chenes, Bayou du Large, and many others

including numerous oil field canals. The Pointe aux Chenes Wildlife Management Area (WMA), the Mandalay National Wildlife Refuge (NWR), the Atchafalaya Delta WMA, the Isles Dernieres Barrier Islands Refuge, and the Elm Hall WMA are located within the watershed. The Wisner Wildlife Management Area is also located in the vicinity. Recreational facilities include camps, marinas, boat launch ramps, and small neighborhood parks.

These extensive wetland resources, comprised of swamp and marsh habitat, have traditionally supported substantial consumptive and non-consumptive recreational use. Primary consumptive recreational uses have included both freshwater and saltwater based activities. Freshwater based consumptive uses include freshwater fishing, crawfishing, hunting for waterfowl, as well as hunting for deer or small game along natural ridges and in wooded swamp lands. Primary saltwater based activities have included saltwater fishing, recreational shrimping, and crabbing. Non-consumptive activities have included recreational boating, water skiing, bird watching, hiking, and camping.

Like much of coastal southeast Louisiana, much of the study area has experienced substantial coastal erosion, loss of wetlands, and increasing salinity levels. These conditions are due to numerous factors, such as extensive oil and gas exploration via a maze of canals and pipelines, subsidence, and coastal storm surges. Although the study area has traditionally provided excellent saltwater fishing, in recent years, because of the increased salinity levels, anglers have been able to catch saltwater species much farther inland than in the past. As fresh and intermediate marshes, cypress trees, and submerged aquatic vegetation in the area have disappeared, waterfowl habitat has become less abundant, and, consequently, duck hunting opportunities have decreased.

Unlike most of coastal Louisiana, the far western portion of the study area, due to the influence of the Atchafalaya River, has been relatively stable or experiencing some limited accretion of deltaic lands. Salinity levels are relatively stable in this area and freshwater fishing opportunities in the area are excellent. The floating marshes traditionally have provided quality habitat for waterfowl and waterfowl hunting.

The Terrebonne non-Federal levee project is in close proximity to two refuges, including the 4,212-acre Mandalay NWR and the 35,000-acre Pointe aux Chenes WMA. Mandalay NWR is located approximately 6 miles southwest of Houma, LA, which is approximately 55 miles southwest of New Orleans. The refuge, established in 1996 in Terrebonne Parish, LA, is accessible only by boat and has a beautiful fresh-water marsh with ponds, levees and man-made canals. The Mandalay NWR alone is visited annually more than two thousand times. The most prominent recreational activities within the study area are consumptive uses: fishing and waterfowl hunting. Limited consumptive recreation uses include recreational crabbing, shrimping, and crawfishing. Natural ridges are also utilized for deer and small game hunting. Non-consumptive recreational activities attract far fewer participants and include birdwatching, hiking, wildlife observation, boating, and photography.

Pointe-aux-Chenes WMA, located just to the east of Lake Boudreaux, is located in Terrebonne and Lafourche Parishes approximately 15 miles southeast of Houma. The WMA, which is owned by the Louisiana Department of Wildlife and Fisheries, includes about 35,000 acres. Table 4 provides a listing of the refuges and wildlife management areas in the basin.

Table 4. Recreation Resources within Terrebonne Basin

Agency	Recreational Resource	Description
US Fish and Wildlife Service National Wildlife Refuge (NWR)	Mandalay NWR	4,212 acres with estimated annual visitation of 2,000. Refuge offers public use opportunities for fishing, wildlife observation, photography, environmental education and boating.
Louisiana Wildlife and Fisheries Wildlife Management Area (WMA) and State Wildlife Refuge	Point-au-Chenes WMA	33,488 acres, offers fishing, hunting, boating and wildlife viewing
Louisiana Wildlife and Fisheries Wildlife Management Areas (WMA)	Atchafalaya Delta WMA	137,000 acres, offers fishing, hunting and boating.
	Terrebonne Barrier Islands Refuge	Consists of three barrier islands in the Isles Dernieres Chain. Wine Island, Whiskey Island, and Raccoon Island comprising a total of approximately 630 acres. Raccoon Island is one of the most important waterbird nesting areas on the coast.
	Elm Hall WMA	2,839 acres located in Assumption Parish. Access is via water from Lake Verret. The entire acreage consists of cypress-tupelo swamp. Pipe canals and natural drainages bisect the area. Deer, squirrels, and waterfowl hunting are allowed as is trapping for furbearers. The area is known for good fishing, particularly chinquapin and white perch. Numerous bald eagles have been spotted in the vicinity and nests have been located nearby. The area offers opportunities for bird watchers, as well as aesthetic values with respect to unique cypress and tupelo stands.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section describes the direct, indirect, and cumulative effects of the alternatives.

Direct impacts are those that are caused by the action taken and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR §1508.8(b)). Cumulative impacts are the effects on the environment that results from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future action, regardless of what agency or person undertakes such actions.

The proposed action is to purchase ILF and/or mitigation bank credits to compensate for NFL construction impacts within the Terrebonne watershed. Since no in-kind mitigation bank credits are available in the watershed, if in-kind mitigation bank credits are purchased, habitat represented by those credits would be located outside of the watershed affected by construction of the Terrebonne NFL levees. Resources within the impacted watershed would be affected as follows. If ILF credits were purchased, it is uncertain where a future ILF project would be constructed and whether that project would be located within the impacted watershed. If funds used to purchase ILF credits are not utilized to construct a project within the watershed, then impacts to the watershed would be the same as those stated for the purchase of in-kind mitigation bank credits.

4.1 WETLANDS

4.1.1 Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts

Under the No Action alternative, there would be a permanent loss of brackish marsh habitat. The marsh creation project constructed to offset the Terrebonne NFL brackish marsh losses did not fully offset those losses. Damage done to the mitigation site after construction caused additional habitat losses. As such, the current condition of this constructed marsh creation project does not fully offset the brackish marsh habitat losses caused by USACE's construction of the NFL. With no action, these acres would be permanently lost.

There would be an overall loss of brackish marsh within the watershed that once provided cover, resting, nesting and foraging habitat for wildlife, fisheries, and aquatic species, which would indirectly impact these other resources. The loss of brackish marsh in the watershed, and the effect such losses would have on wildlife and fish species, could cause recreational opportunities in the basin to also suffer loss. The loss of wetlands and the detritus and filtering function they provide would indirectly impact fisheries productivity and water quality.

Cumulatively, the no action alternative would contribute to the ongoing trend of overall loss of wetlands from natural and man-made influences in the watershed and in Louisiana.

4.1.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

Direct, Indirect, and Cumulative Impacts

No brackish marsh mitigation bank credits are available in the watershed. In-kind credits purchased outside of the watershed would offset habitat losses in the plain, but would result in a permanent loss of brackish marsh habitat in the watershed. Wetlands provide refuge habitat for numerous wildlife species. The recipient basin of ILF and/or mitigation bank credits for brackish marsh outside the watershed would in return receive the positive benefits of additional created brackish marsh. However, due to the uncertainty of what projects LDNR would build with ILF credits, the brackish marsh could potentially stay within the watershed.

Cumulatively, completing the outstanding mitigation requirement outside the watershed when combined with other past, present, and reasonably foreseeable ecosystem and mitigation projects in the recipient basin would prevent the loss of AAHUs for brackish marsh in the plain, while in return reducing the restoration of brackish marsh in the watershed.

4.2 WILDLIFE

4.2.1 Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts

The permanent loss of brackish marsh within the watershed would reduce the habitat available to wildlife for breeding, nesting, and foraging. However, because there is an abundance of brackish marsh habitat in the watershed, this small loss of AAHUs will have a minimal impact on wildlife populations.

Cumulatively, the no action alternative would contribute to the overall loss of wetlands from natural and man-made influences in the watershed and in Louisiana, which could minimally, but permanently reduce wildlife populations.

4.2.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

Direct, Indirect, and Cumulative Impacts

In-kind credits purchased outside of the watershed would offset habitat losses in the plain, but would result in a permanent loss of brackish marsh habitat in the watershed thereby reducing wildlife populations in the watershed.

The loss of wetlands in the watershed would reduce wildlife habitat for resident and migratory bird species and other wildlife species. The recipient basin of ILF and/or mitigation bank credits for brackish marsh outside the watershed would in return receive the positive benefits of additional wildlife associated with brackish marsh habitat. However, due to the uncertainty of what projects LDNR would build with ILF credits, the brackish marsh could potentially stay within the watershed and continue to support wildlife populations.

Accounting for other ongoing projects in the plain, this alternative would prevent an overall loss of wetland habitat necessary for many wildlife species. Cumulatively, this alternative, when added to other past, present, and reasonably foreseeable future ecosystem restoration and mitigation projects in the plain, would help reduce the loss of wetlands and overall decline of wildlife species within the plain and would be beneficial to preserving species biodiversity.

4.3 THREATENED AND ENDANGERED SPECIES

4.3.1 Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts

The permanent loss of brackish marsh within the watershed would reduce the habitat available to T&E species for breeding, nesting, and foraging. However, because there is

an abundance of brackish marsh habitat in the watershed, this small loss of AAHUs would have no overall impact on T&E populations.

Cumulatively, the No Action alternative would contribute to the overall loss of wetlands from natural and man-made influences in the watershed and in Louisiana which could minimally, but permanently reduce some T&E populations.

4.3.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

Direct, Indirect, and Cumulative Impacts

This alternative is not likely to adversely affect any listed T&E species. In-kind credits purchased outside of the watershed would offset habitat losses in the plain, but would result in a permanent loss of brackish marsh habitat in the watershed thereby reducing the habitat available to T&E species in the watershed. None of the T&E species listed in the watershed are watershed specific, as such replacement of brackish marsh habitat in the plain is not anticipated to effect the overall populations of T&E species. Replacement of brackish marsh habitat within the plain would restore potential breeding habitat for T&E species. Although several of the listed T&E species within the watershed prey on aquatic species whose life cycles depend on brackish marsh, the replacement of brackish marsh outside of the watershed is only expected to have minimal impacts to aquatic species within the watershed and not affect the overall populations of T&E species within the plain. Due to the uncertainty of what projects LDNR would build with ILF credits, if ILF credits are purchased the brackish marsh could potentially stay within the watershed and continue to support T&E populations.

Cumulatively, when added to other past, present, and reasonably foreseeable future ecosystem restoration and mitigation projects in the plain, this alternative would help reduce the loss of T&E species within the plain.

4.4 AQUATIC RESOURCES/FISHERIES, AND WATER QUALITY

4.4.1 Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts

The permanent loss of brackish marsh within the watershed would reduce the habitat available to fish species for breeding, nesting, and foraging. However, because there is an abundance of brackish marsh habitat in the watershed, this small loss of AAHUs will have a minimal impact on fisheries populations. The permanent loss of brackish marsh and the detritus and filtering function that these wetlands provide would indirectly impact fisheries productivity and water quality.

Cumulatively, the No Action alternative would contribute to the overall loss of wetlands from natural and man-made influences in the watershed and in Louisiana which could minimally, but permanently reduce fisheries populations and water quality.

4.4.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

In-kind credits purchased outside of the watershed would offset habitat losses for fisheries in the Deltaic Plain, but would result in a permanent loss of brackish marsh habitat in the watershed thereby reducing the habitat available to fish species in that watershed. However, because there is an abundance of brackish marsh habitat in the watershed, this small loss of AAHUs will have a minimal, but permanent impact on fisheries populations in the watershed. Furthermore, since fish species are highly mobile throughout the coast of Louisiana, this impact would not affect the overall population of fish species.

Due to the uncertainty of what projects LDNR would build with ILF credits, the brackish marsh could potentially stay within the watershed and continue to support fish populations there. If purchased outside the watershed, any loss of brackish marsh and the detritus and filtering function these wetlands provide would indirectly impact fisheries productivity and water quality.

Cumulatively, when added to other past, present, and reasonably foreseeable future ecosystem restoration and mitigation projects in the plain, this alternative would help counter the overall trend of loss of marsh habitat and the loss of fish species within the plain.

4.5 ESSENTIAL FISH HABITAT

4.5.1 Alternative 1: No Action Alternative

Direct, Indirect, and Cumulative Impacts

The permanent loss of brackish marsh would permanently reduce the habitat available to EFH species that use this habitat for breeding, nesting, and foraging. However, because there is an abundance of brackish marsh habitat in the watershed, this small loss of AAHUs will have a minimal impact on EFH populations.

Cumulatively, the No Action alternative would contribute to the overall loss of wetlands from natural and man-made influences in the watershed and in Louisiana which could minimally, but permanently reduce EFH populations.

4.5.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

Direct, Indirect, and Cumulative Impacts

In-kind credits purchased outside of the watershed would offset habitat losses in the Deltaic Plain, but would result in a permanent loss of brackish marsh habitat in the watershed thereby reducing the habitat available to EFH species in the watershed.

Since EFH species are highly mobile throughout the coast of Louisiana, this impact would not affect the overall population of EFH species within the plain.

4.6 RECREATIONAL RESOURCES

4.6.1 Alternative 1: No Action Alternative

The permanent loss of brackish marsh habitat in the watershed would have an impact to the fish and wildlife community that use these areas for breeding and foraging. The habitat loss and impacts to wildlife and fisheries then indirectly impacts the recreational opportunities associated with these species. However, because there is an abundance of brackish marsh habitat in the watershed, this small loss of marsh will have a minimal indirect impact on recreational fishing and hunting.

Cumulatively, the No Action alternative adds to the impacts of all currently authorized projects in the watershed as well as ongoing coastal marsh loss due to natural processes (such as storm erosion, subsidence, and sea level rise) that might directly or indirectly impact recreational resources, either by temporarily impacting access to recreational sites or by permanently changing the landscape and increasing or decreasing recreation opportunities.

4.6.2 Alternative 4: ILF and/or Mitigation Bank Credit Purchase (Proposed Action)

Direct, Indirect, and Cumulative Impacts

Because of recreational value of wetlands, the public is concerned about wetland loss, shoreline erosion, and water quality impacts to Lake Boudreaux and other areas in the vicinity of the existing mitigation project. The public realizes the importance of the area's wetlands and their influence on recreational fishing and hunting opportunities, and there are non-governmental organizations (NGO) set up solely in concern over their fate (e.g., America's Wetland Foundation, and National Audubon Society). Louisiana has approximately 40 percent of the nation's coastal wetlands, and 80 percent of the nation's annual wetland loss (Turner 1997). Coastal Louisiana is losing marsh faster than any other place in the US.

The habitat loss and impacts to wildlife and fisheries minimally, indirectly impact the recreational opportunities associated with these species in the watershed. Because there is an abundance of other recreational opportunities in the watershed, the small loss of marsh would have a minimal impact to recreational resources if credits are purchased outside the watershed. Due to the uncertainty of what projects LDNR would build with ILF funds, the brackish marsh could potentially stay within the watershed and continue to support recreational resources if ILF credits were purchased.

The new marsh created in the plain would attract many of the same species that already exist in Terrebonne Basin. Thus, moving the recreational opportunities associated with

that marsh from one watershed to another would have no overall effect to recreational resources within the plain.

If credits were purchased outside the watershed, cumulative impacts to the watershed, through the permanent loss of marsh, would be in addition to other potentially negative impacts caused by other local and regional construction projects that may impact habitat and recreational opportunities.

5.0 MITIGATION

In response to environmental design commitment #7 in EA #450's FONSI, the following is the final mitigation plan for the constructed brackish marsh project created in coordination with the USFWS, National Marine Fisheries Service (NMFS), and Environmental Protection Agency (EPA), that addresses the 12 components of a mitigation plan (Table 5) as presented in 40 CFR Part 230.

Table 5: Twelve Components of a Compensatory Mitigation Plan

Components	Sections
1. Objectives	See purpose and need pg. 6.
2. Site Selection	See purpose and need pg. 6.
3. Site Protection Instrument	In an effort to satisfy this component as well as satisfy EA 450's Environmental Design Commitment #6 and US Fish and Wildlife Recommendation #4, in letter dated 24 October 2017, the Terrebonne Parish Consolidated Government committed to fully undertaking the monitoring, operation, and maintenance responsibilities for the mitigation project (See Appendix B). Additionally, this letter stated that the Government has the necessary right, title, and real estate interests required to perform such responsibilities. A conservation easement that prohibits all human uses of the site that may result in adverse effects to the constructed marsh habitat should be obtained.
4. Baseline Information	See Relevant Resources pg. 10.
5. Determination of Credits	See proposed action pg. 4-5 and purpose and need pg. 6.
6. Mitigation Work Plan	See proposed action pg. 4-5 and Appendix C. Refer back to the original EA and the 12 components.
7. Maintenance Plan	Sponsor responsibilities for the as-built maintenance include a write-up of construction event(s), planting event(s), a summary of elevation data collection, and a summary of photographic documentation. The initial success criteria follow-up report has the same responsibilities with an additional analysis of the vegetative community (i.e. survivorship of plants of each species planted) and a summary of visual qualitative observations (including plant colonization, wildlife utilization, conditions of interspersion features, potential problems with the Bank). Access to the mitigation site must be restricted to avoid further damage to the site.

8. Performance Standards	Since success criteria presented in EA 450's FONSI were not achieved, a re-evaluation of the site was conducted in coordination with the resource agencies 3 years after construction and the following criterion established. The local sponsors, TLCD and TPCG, must insure that the following performance standards are met: <u>Five-year Success Criteria (2017)</u> 1. Five years after construction, at least 65% of the marsh creation sites remain within the target elevation range (1 to 2 ft NAVD88). 2. Demonstrated use of bank area by estuarine-dependent marine fishery species (not just forage species) as shown by sampling in 2017 using cast nets and/or seines in open water within the project area. 3. Observed use of created marsh by wildlife species typically found in natural marsh habitats of similar salinity regime. 4. At least 100 percent of the area meeting the target elevation range must contain emergent vegetation. See the yellow, light green, dark green and light blue areas on figure 5. 5. The marsh creation sites must contain less than 3% invasive/exotic species.
9. Monitoring Requirements	Restrict Public Access: The non-Federal Sponsor must restrict public access to the mitigation area. Use of ATVs or public access in general will jeopardize the success of the mitigation. A conservation easement that prohibits all human uses of the site that may result in adverse effects to the constructed marsh habitat should be obtained. Monitoring Reports: In accordance with the EA, monitoring shall be conducted in the following years: 2017, 2022, and 2032. Linear transects should have been established at the time of planting. One-hundredth acre plots should have been established along these transects so as to cover 2 percent of the planted area. Those plots should have been identified with an 8-foot polyvinyl chloride pipe anchored with a metal T post at plot center and GPS coordinates should have been recorded. A current map depicting the location of the survey plots and a listing of the coordinates for each survey plot shall be prepared for each monitoring report. In years 2017, 2022, and 2032, elevations along the transect lines, species present and percent cover within the plots, presence or absence of invasive species, ground level photographs and the general narrative describing the overall condition of the mitigation area, including wildlife noted shall be provided. The following reports presenting the results of the monitoring effort shall be provided to MVN after each monitoring survey and distributed to the IMT by the CEMVN. A monitoring report was prepared for TPCG in 2017, however Success Criteria #4 and #5 were not documented in the report. The Sponsor shall provide a Success Criteria Report within 60 days following the interim success criteria monitoring event and within 60 days following the long-term success criteria monitoring event.

10. Long-term Management Plan	The NFS shall prevent damage to the mitigation site. The commitment of the NFS include: The local sponsor would be responsible for maintaining the mitigation site in perpetuity.
11. Adaptive Management Plan	In the event reports in Component 9 submitted to CEMVN reveal that any success criteria have not been met during OMRR&R phase, the non-Federal sponsor will take all necessary measures to modify management practices in order to achieve these criteria in the future. If damages are observed in the mitigation cells from allowing access/damage to the marsh project, the Parish may be required to purchase additional credits to mitigate these impacts.
12. Financial Assurances	Financial assurances are required to ensure that the compensatory mitigation project would be successful. In this case, the Cooperation Agreement between the non-Federal sponsors (i.e. TPCG and TLCD) and the Federal Government provides the required financial assurance for this mitigation project. Under the CA, the NFS must operate and maintain the mitigation project at no cost to the Government.

Figure 5. Mitigation Site Elevations in Existing Project (from Appendix C; pgs 8-10) from north to south

6.0 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Environmental compliance for the proposed action in EA #555 is achieved through coordination with appropriate agencies and organizations, and release of the Draft EA to the public for its review and comment. Resolution of all Fish and Wildlife Coordination Act (FWCA) recommendations and LDNR concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program will be the final steps to achieve environmental compliance.

If the purchase of ILF and/or mitigation bank credits were determined not appropriate, not cost effective, or for other reasons not feasible, then the CEMVN would prepare another supplemental document exploring other options to fully satisfy the Terrebonne NFL brackish marsh requirement in compliance with all relevant laws and policies.

Coastal Zone Management Act of 1972
The Coastal Zone Management Act ("CZMA") requires that "each federal agency conducting or supporting activities directly affecting the coastal zone shall conduct or support those activities in a manner which is, to the maximum extent practicable, consistent with approved state management programs." In accordance with Section 307, a Consistency Determination was prepared for the proposed project and was coordinated with the LDNR in a letter dated 14 June 2018. LDNR concurred by letter dated 5 July 2018 with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; Consistency (C20070273 Mod 01; See Appendix B).

Fish and Wildlife Coordination Act of 1934
The Fish and Wildlife Coordination Act (FWCA) provides authority for the USFWS involvement in evaluating impacts to fish and wildlife from proposed water resource development projects. It requires that fish and wildlife resources receive equal consideration to other project features. It requires Federal agencies that construct, license or permit water resource development projects to first consult with the USFWS, NMFS and state resource agencies regarding the impacts on fish and wildlife resources and measures to mitigate these impacts. Section 2(b) requires the USFWS to produce a Coordination Act Report (CAR) that details existing fish and wildlife resources in a watershed, potential impacts due to a proposed project and recommendations for a project. The USFWS reviewed the proposed changes to the previously approved NFL realignment and mitigation project described in EA #450 and provided a draft CAR with project specific recommendations on 12 January 2009. The Draft CAR can be found in Appendix B.

7.0 CONCLUSION

CEMVN has assessed the environmental impacts of the no action alternative and the proposed action on relevant resources in SEA #555. The proposed action would have no direct impacts and only minimal adverse impacts on the amount of brackish marsh in

the watershed. It would complete the mitigation required to fully offset the brackish marsh impacts from construction of the Terrebonne NFL project. Potential loss of brackish marsh habitat from the watershed would have minimal impacts on the wildlife populations within this watershed resulting in insignificant reductions in recreational opportunities in the watershed. The proposed action will replace the marsh damaged by construction of the NFL within the Deltaic Plain, which is environmentally preferable to allowing permanent loss of that habitat. All practicable means to avoid and minimize environmental harm have been adopted.

Implementing the proposed action would consist of the purchase of ILF and/or mitigation bank credits that would offset the loss of 9.21 AAHUs of brackish marsh impacts.

8.0 PREPARED BY

EA 555 and the associated FONSI were prepared by Daniel Meden with relevant sections and review conducted by the following:

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9.0 REFERENCES

EA #450 entitled “Terrebonne Parish Non-Federal Levee System Repairs, Replacements, Modifications, and Improvements, Terrebonne Parish, Louisiana” with a signed FONSI dated January 14, 2009.

EA entitled “West Lake Boudreaux Shoreline Protection and Marsh Creation, TE-46.” Prepared by Robert Dubois.

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