DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO ATTENTION OF

Regional Planning and
Environment Division South
Environmental Planning Branch

Decision Record

Individual Environmental Report
Prepared to Supplement:
Programmatic Individual Environmental Report (PIER) 36
Bayou Sauvage, Turtle Bayou & New Zydeco Ridge Restoration Project
Saint Tammany & Orleans Parishes, Louisiana
PIER 36, Supplement 1 (SIER 1)

Description of Proposed Action

U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN) prepared SIER 1 to evaluate proposed changes to the recommended mitigation plan described in the PIER 36 titled "Lake Pontchartrain and Vicinity (LPV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist and St. Tammany Parishes, Louisiana" and its Decision Record approved by the CEMVN Commander on November 22, 2013. This SIER evaluated the potential impacts associated with implementation of the proposed mitigation projects that would mitigate LPV HSDRRS construction impacts to National Wildlife Refuge (NWR) lands and general impacts to brackish marsh that occurred off of NWR lands. The SIER 1 is attached hereto and incorporated by reference herein.

The proposed LPV mitigation plan provides compensatory mitigation for the following impacts to intermediate marsh, brackish marsh and bottomland hardwood wet (BLH-Wet) habitat types:

Habitat Type	Average Annual Habitat Units (AAHU) Impacted	Mitigation Project
Non-Refuge Brackish Marsh	118.06 AAHU	BSFBM & NZR-marsh component
Refuge Brackish Marsh	8.79 AAHU	
Refuge Intermediate Marsh	41.29 AAHU	TBPIM
Refuge Protected Side BLH-Wet	83.92 AAHU	NZR BLH-Wet
Refuge Flood Side BLH-Wet	8.91 AAHU	

Bayou Sauvage Floodside Brackish Marsh (BSFBM). The BSFBM restoration project is located in the far south-eastern lobe of Lake Pontchartrain, east of Interstate 10. The project plan consists of two areas of open water/broken marsh, which would be filled and/or restored to provide a healthy marsh platform. The most northern currently proposed marsh footprint is 58 acres (BSFS4) and is located immediately east of Hwy 11, fronting the community of Irish Bayou in Orleans Parish, Louisiana. The southern proposed marsh footprint is 280 (BSFS5) acres and is located approximate 2.5 miles south, south-east of the northern polygon on Bayou Sauvage NWR. The southern site is approximately 0.5 miles north of Chef Menteur Highway (Hwy 90).

Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. The dredge material would be obtained from a borrow site in east Lake Pontchartrain. Access impacts consist of .5 acres and .41 AAHUs of brackish marsh. Initial target elevation for dredge fill would be to approximate elevation +2.5-feet NAVD88, ultimately to hit a target marsh elevation ranging from +1.5 to +1.0-feet NAVD88. Both sites would require total perimeter retention to hold dredge material and allow for vertical accretion.

The eastern retention dike of BSFS4 paralleling the lake shoreline, is proposed to remain in place post marsh construction to enhance the existing shoreline along this reach of lakefront and provide additional protection to the newly created marsh. The remaining reaches of retention dike for both features would be gapped approximately a year after the final lift, upon settlement and dewatering of the created marsh platform. The marsh platform and the shoreline protection feature along Irish Bayou would also be planted at this time.

Cumulatively, the implementation of BSFS4 and BSFS5 would result in the creation of approximately 103.2 AAHUs of brackish marsh within the Bayou Sauvage National Wildlife Refuge (BSNWR). The brackish marsh mitigation requirement is 126.85 AAHUs (8.79 refuge, 118.06 general). This leaves an anticipated outstanding balance of 23.7 AAHUs of brackish marsh mitigation that would be mitigated adjacent to the NZR BLH-Wet project.

Turtle Bayou Protected-Side Intermediate Marsh (TBPIM). The TBPIM project is located on the Bayou Sauvage NWR in eastern Orleans Parish, Louisiana. The site is immediately west of LA Hwy 11, north of and adjacent to Turtle Bayou, and east of I-10. The project consists of creating approximately 126 acres of intermediate marsh within an open water area immediately north of Turtle Bayou.

Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. This work would be coupled with the restoration work proposed for BSFBM. The dredge material would be obtained from a borrow site in east Lake Pontchartrain. Access impacts consist of 10.13 acres and 3.36 AAHUs of intermediate marsh on the protected side of the levees and 2.11 acres and .77 AAHUs of brackish marsh on the flood side of the levees.

The dredge material would be placed confined to a maximum slurry elevation of +4-feet NAVD88. Spill box weirs may be constructed to control the pool level within the restoration

area and the earthen dikes and closures may be gapped and/or degraded as necessary to facilitate development of the restoration site. The dikes and closures shall be constructed to approximate elevation +5.5-feet NAVD88.

TBPIM has a mitigation potential of 0.39 AAHU per acre and provides mitigation for the 41.29 AAHU LPV HSDRRS refuge impacts and 3.36 AAHUs of TBPIM protected side access impacts to intermediate marsh through the creation of at least 120 acres of protected side intermediate marsh within the proposed 130-acre project area.

New Zydeco Ridge (NZR). BLH-Wet Component. The NZR BLH-Wet restoration project is located on the north shore of Lake Pontchartrain in the north east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, Louisiana on the Big Branch NWR. The project consists of creating approximately 159 acres of BLH-Wet within a designated shallow open water area immediately north of Salt Bayou.

Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. The dredge material would be obtained from a borrow site in east Lake Pontchartrain. Access impacts consist of 3.75 acres and 1.51 AAHUs of brackish marsh. For the BLH-Wet construction scenario, initial target elevation for dredge fill would be to approximate elevation +5.5 NAVD88, to ultimately hit a target elevation ranging from +3.0 to +3.5 NAVD88.

Total perimeter retention would be required to retain dredge material and allow for vertical accretion. The retention dikes would be constructed to elevation +7.0 feet NAVD88, with a 5 feet crown to assure dike integrity. Borrow for these retention dikes would come from within the BLH-Wet creation footprint. Spill boxes or weirs would be constructed at pre-determined locations within the retention dike to allow for effluent water release from within the marsh creation area.

With a mitigation potential of 0.6 AAHU per acre, the BLH-Wet restoration project provides more than the required 92.83 AAHU of Refuge BLH-Wet impacts through restoration of 159 acres of floodside BLH-Wet within the proposed project area. The estimated 93.94 AAHU provided by this BLH-Wet restoration project would fulfill the 83.92 AAHU of protected side BLH-Wet refuge impacts as well as the 8.91 AAHU of floodside BLH-Wet refuge impacts that resulted from LPV construction activities.

Intermediate/Brackish Marsh Component. To mitigate for the permanent impacts to approximately 159 acres of essential fish habitat (EFH) from construction of the NZR BLH-Wet project, a WVA was conducted to determine the habitat unit loss from conversion of open water and submerged aquatic vegetation (SAV) to non-tidally influenced BLH-Wetland habitat. The WVA assessed a loss of approximately 21.2 AAHUs of EFH, therefore, approximately 66.25 acres south of the proposed BLH-Wet restoration footprint would be restored to intermediate/brackish marsh habitat (mitigation potential of 0.32 AAHU/acre) on the refuge where the impacts occurred (first priority of the USFWS). The NZR marsh feature would fully compensate for the unavoidable impacts to EFH by converting relatively low quality shallow open water to emergent intermediate/brackish marsh habitat (also a type of EFH).

Additionally, to mitigate the 23.7 AAHUS of brackish marsh impacts the BSFSM project could not produce (see section BSFSM section above) and the 2.69 AAHUs of brackish marsh impacts that would be incurred from access to the mitigation projects during construction (.77 AAHUs flood side impacts at TBPIM, .41 AAHUS at BSFSM, and 1.51 AAHUS at NZR), approximately 82.3 acres of brackish marsh would be created at NZR. The total project footprint for the NZR intermediate/brackish project would therefore have to be at least 148.6 acres.

Dredge material would be placed confined within the restoration feature to a maximum slurry elevation of +3-feet NAVD88. Spill box weirs may be constructed to control the pool level within the restoration area and the earthen dikes and closures may be gapped and/or degraded as necessary to facilitate development of the restoration feature. The proposed construction of the NZR Marsh Creation project would result in approximately 160 acres of shallow open water being filled to elevations of approximately +3.0 feet NAVD88, to ultimately reach a target marsh elevation ranging from +1.0 feet to +1.2 feet NAVD88.

Approximately 10,165 linear feet of retention dike would be required, tying into the southern BLH-Wet retention dikes. Retention dikes would be constructed to elevation +4 NAVD88. Borrow for these retention dikes would come from within the NZR brackish marsh creation footprint. The dike would be degraded in year 1, upon settlement and dewatering of the created platform.

Borrow Sites

Bayou Sauvage/Turtle Bayou borrow site: The borrow source would be combined for the BSFBM and TBPIM projects. BSFBM creation would require borrow of approximately 4.2 million cubic yards of material and TBPIM creation would require borrow of approximately 900,000 cubic yards of material. The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 feet between the existing shoreline and the borrow area limit. Borrow excavation would not be allowed greater than 20-feet below the surface of the water.

Based on these criteria, the required borrow site would be approximately 335 acres. To assure adequate borrow, the proposed pit size would be enlarged to 459 acres to allow for avoidance of unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Three access corridors (one to each site) would be allowed from the lake to the proposed marsh creation site. The corridors leading to BSFS4 and BSFS5 would be restricted to 200-feet in width, and the corridor leading to Turtle Bayou Protected Side Intermediate Marsh would be restricted to 400 feet in width.

New Zydeco Ridge borrow site: The borrow site is approximately 289 acres and was broken into 2 primary and 2 secondary borrow areas due to differential lake bottom elevations. The primary and secondary borrow sites #1 are in deeper water (7 to 18 feet deep), thus a dredging depth of -20 feet NAVD88 is being used to obtain a suitable quantity of material. Primary and secondary borrow sites #2 are in shallower water (4 to

9 feet deep), thus primary borrow site # 2 has a dredge depth of -18' NAVD88 and secondary borrow site #2 has a dredge depth of -16' NAVD88. Borrow excavation would not be allowed greater than 20-feet below the surface of the water in all areas. The total anticipated amount of fill material being dredged from the borrow sites is 3,600,000 cubic yards.

The access corridor would be restricted as follows: 1) no wider than 500 feet in width in open water 2)no wider than 200 feet in width across the beach, 3) no wider than 100 feet paralleling Hwy 433, 4) restricted to the available right of way (ROW) alongside Hwy 90 (between the road shoulder and existing timber power poles), 5) restricted to 150 feet within the existing marsh reach, and 6) no wider than 200 feet in the open water leading to the marsh creation platform. A 30 feet wide board road would be utilized to minimize impacts to existing marsh.

Mitigation Banks and the State In Lieu Fee Program

Following guidelines established in the Water Resources Development Act (WRDA) of 2007 Section 2036(c)(1) in carrying out a water resources project involving wetlands mitigation and impacts that occur within the service area of a mitigation bank, USACE, where appropriate, would first consider the use of the mitigation bank if the bank contains sufficient available credits to offset the impact and the bank is approved in accordance with the Federal guidance for the establishment, use, and operation of mitigation banks. However, due to USFWS policy requiring that Refuge habitat impacts be mitigated on refuge property or within the authorized Refuge acquisition boundary on lands that would be transferred to Refuge ownership, mitigation bank credits may not be used to compensate for Refuge impacts.

If the USACE is unable to implement the expansion of the NZR marsh project to account for general brackish marsh impacts that cannot be mitigated at the BSFBM (23.7 AAHUs), then the purchase of mitigation bank or ILF credits would be an option the USACE may pursue to complete the mitigation of the LPV HSDRRS general brackish marsh impacts.

Factors Considered in Determination

CEMVN has evaluated the above described actions and the "no action" alternative. CEMVN has assessed the impacts of the action on
significant resources in the project area including wildlife, threatened and endangered species, fisheries, aquatic resources, water quality, essential fish habitat, cultural resources, and recreation, and for the potential of the project to encounter HTRW.

The proposed action would have the following impacts:

Permanent loss of approximately 706 acres of shallow open water habitat would occur through conversion to emergent marsh or BLH-Wet habitat for use by various species of wildlife.

The proposed action may affect, but is not likely to adversely affect the Gulf Sturgeon, West Indian manatee, and the green, Kemp's Ridley, and loggerhead sea turtles and may affect, but is not likely to adversely affect Gulf Sturgeon Critical Habitat and is not likely to destroy or adversely modify it. Temporary impacts to aquatic resource, fisheries and water quality are anticipated.

The adverse impacts to EFH that would result from the proposed actions may affect, but should not adversely affect, managed species considering the small acreage utilized for borrow activities relative to the size of Lake Pontchartrain, plus the project would provide long-term benefit to the managed species by providing intertidal wetlands, a valuable type of essential fish habitat. The New Zydeco Ridge project would convert approximately 159 acres of shallow open water habitat and SAVs to non-tidal BLH-Wet habitat. However, shallow open water is found in abundance throughout the LPV basin and this conversion would be offset by the creation of 66.25 acres of brackish marsh adjacent to the BLH-Wet creation area

No adverse effects on historic properties are anticipated. Recreational opportunities would be temporarily impacted during construction but are expected to improve in some areas once construction is complete. The overall habitat quality of the wetlands within the project area would be enhanced by the proposed creation of marsh and BLH habitat types. There would be a low probability of encountering HTRW in the proposed mitigation areas and borrow areas.

Environmental Design Commitments

The following commitments are an integral part of the proposed action:

1. To address CAR recommendation #7 and NMFS EFH Recommendation #8, water quality monitoring within the borrow areas would be conducted at least during March through November for a minimum of three years post dredging to verify the conductance, temperature, dissolved oxygen, and pH from the bottom to surface in five feet profiles. Samples should be collected at least monthly during March, April. September, October, November. During the hotter months of May, June, July and August, sampling should be conducted once every two weeks.

2. If the proposed action is changed significantly or is not implemented within one year, CEMVN will reinitiate coordination with the USFWS to ensure that the proposed action would not adversely affect any Federally listed threatened or endangered species, or their habitat.

3. If any unrecorded cultural resources are determined to exist within the proposed project site, then work will not proceed in the area containing these cultural

resources until a CEMVN staff archeologist has been notified and final coordination with the Louisiana State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer has been completed.

4. In order to minimize the potential for impacts to Gulf sturgeon during construction of retention dikes in flood side habitats, the bucket drop procedure, found in section 3.2.2 of final SIER 1, would be employed to encourage Gulf sturgeon in the vicinity of the construction activities to leave.

5. All contract personnel associated with the project should be informed of the potential presence of the West Indian manatees and the need to avoid collisions with manatees. Standard manatee protection measures, found in section 3.2.2 of final SIER 1, would be implemented when activities are proposed that would impact habitat where manatees could occur.

Based on CEMVN's evaluation of the final array of projects as set forth in the SIER to compensate for impacts to each respective habitat type, CEMVN determined that the above-described features are the environmentally preferable projects to compensate for LPV HSDRRS habitat losses.

Agency & Public Involvement

The draft SIER which evaluated the impacts of the proposed action, was released for 30 day public review on July 9, 2014. The comment period ended on Aug. 8, 2014. No comments from the public were received. Only the Federal and state agencies commented on the proposed action.

Along with CEMVN personnel, agency staff from USFWS, NMFS, US Environmental Protection Agency, US Geologic Survey, National Park Service, Louisiana Department of Natural Resources (LDNR), and Louisiana Department of Wildlife and Fisheries (LDWF) worked as part of an interagency team to develop the mitigation plan evaluated in SIER 1.

Draft SIER 1 Agency Comments and Coordination

1. Agency Comments and Responses

    a. USFWS- Comment letter dated July 30, 2014
        2 general comments and 6 specific comments
    b. NMFS - Comment letter dated Aug. 8, 2015
        3 general and 7 specific comments, 8 EFH Recommendations
    c. CPRAB – Comment letter dated Aug. 8, 2014
        72 specific comments

CEMVN responses to agency comments are included in Appendix F of the Final SIER 1.

2. Agency Coordination

a.	Endangered Species Act Section 7 concluded (USFWS):	Sept 28, 2015
b.	Endangered Species Act Section 7 concluded (NMFS):	Aug 19, 2015
c.	Coastal Zone Management Consistency Determination:	Oct 16, 2015
d.	Clean Water Act Section 401 Water Quality Certification:	Nov 12, 2014
e.	Clean Water Act Section 404(b)(1) signed:	July 30, 2014
f.	National Historic Preservation Act Sect. 106 (SHPO):	Oct 6, 2014
g.	USFWS Coordination Act Report:	Sept 2, 2015
h.	Magnuson Stevens Act EFH Recommendations:	Oct 14, 2015

US Fish and Wildlife Service (USFWS) comments and recommendations from the Sept. 2, 2015 Coordination Act Report (CAR) are addressed in the Final SIER 1 in Section 4.2.

Decision

The CEMVN Environmental Planning Branch has assessed the potential environmental impacts of the proposed action described in the Final SIER 1 and has reviewed the comments received during the public review period for Draft SIER 1.

In accordance with the environmental considerations discussed above, the public interest will be best served by implementing the proposed action mitigating LPV HSDRRS construction impacts as evaluated in SIER 1, namely the construction of: the BSFBM project mitigating NWR and general brackish marsh impacts, the TBPIM project mitigating NWR protected side intermediate marsh impacts, and the NZR projects mitigating NWR protected side and flood side BLH-Wet and intermediate/brackish impacts. The size of the TBPIM and NZR marsh projects have been increased to account for impacts to marsh and SAV that would occur during construction of the mitigation projects.

I have reviewed the LPV HSDRRS PIER 36, SIER 1 and have considered agency comments and recommendations. I find the proposed mitigation plan will allow CEMVN to fully offset the habitat losses caused by the construction of the LPV HSDRRS to NWR lands and to brackish marsh that was not on NWR lands as directed by the Water Resources Development Acts of 1986 and 2007 (Public Law 99-662 §906 and Public Law 110-114 §2036) and other laws.

The plan is justified and in accordance with environmental statutes. It is in the public interest to implement the recommended projects in PIER 36, SIER 1.

10/20/2015
Date

Richard L. Hansen
Colonel, U.S. Army
District Commander

FINAL
INDIVIDUAL ENVIRONMENTAL REPORT

PREPARED TO SUPPLEMENT:
PROGRAMMATIC INDIVIDUAL ENVIRONMENTAL REPORT 36

BAYOU SAUVAGE, TURTLE BAYOU & NEW ZYDECO RIDGE RESTORATION PROJECTS
SAINT TAMMANY & ORLEANS PARISHES, LOUISIANA

PIER 36, SUPPLEMENT 1 (SIER 36)

October 2015

US Army Corps of Engineers®

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1. INTRODUCTION AND BACKGROUND

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared this supplemental Individual Environmental Report (SIER) to present changes to the recommended mitigation plan described in the Programmatic Individual Environmental Report (PIER) 36 titled "Lake Pontchartrain and Vicinity (LPV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, Orleans, Plaquemines, St. Bernard, St. Charles, St. John the Baptist and St. Tammany Parishes, Louisiana" and its Decision Record approved by the CEMVN Commander on November 22, 2013. This supplemental IER evaluates the potential impacts associated with implementation of the proposed mitigation projects that would mitigate LPV HSDRRS construction impacts to National Wildlife Refuge (NWR) lands and portions of the general impacts that did not occur on NWR lands. These projects include measures to restore brackish marsh, fresh/intermediate marsh and bottom land hardwood wetlands (BLH-Wet) at the Bayou Sauvage, Turtle Bayou and New Zydeco Ridge features, respectively. Unlike the PIER 36, which presented a mitigation plan consisting of both programmatic and constructible features, all features presented in this supplement to the PIER 36 would be constructible. Both the PIER 36 and its decision record are hereby incorporated by reference

This document was prepared pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality's Regulations (40 CFR §1500-1508), and USACE Engineering Regulation (ER) 200-2-2, Procedures for Implementing NEPA. These regulations allow Federal agencies, in consultation with the Council on Environmental Quality (CEQ), to implement Alternative Arrangements to comply with NEPA in lieu of a traditional Environmental Assessment (EA) or Environmental Impact Statement (EIS) in certain emergency circumstances (40 CFR 1506.11). The CEMVN published the CEQ-approved Emergency Alternative Arrangements on March 13, 2007, in the Federal Register (72 FR 11337). This process was implemented to expeditiously complete the environmental analyses for the HSDRRS. The Alternative Arrangements may be found at www.nolaenvironmental.gov, and are incorporated by reference.

The approved LPV HSDRRS mitigation plan in the PIER 36 provides compensatory mitigation for the following habitat types:

Table 1: PIER 36 Previously Recommended Mitigation Plan

Habitat Type	Average Annual Habitat Units (AAHU)
Non-Refuge Bottomland Hardwood (BLH) - Wet/Dry	93.85 AAHU
Non-Refuge Swamp	108.01 AAHU
Non-Refuge Fresh/Intermediate Marsh	45.70 AAHU
Non-Refuge Brackish Marsh	118.06 AAHU
Refuge Brackish Marsh	8.79 AAHU
Refuge Protected Side BLH-Wet	83.92 AAHU
Refuge Intermediate Marsh	41.29 AAHU
Refuge Flood Side BLH-Wet	8.91 AAHU

A "habitat-based methodology" in the form of the WVA model was used to assess impacts from construction of the HSDRRS work and future benefits to 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 project and future without project (No Action) conditions. The difference is expressed as net AAHUs. The same version of the model was used to calculate both the impacts from construction the HSDRRS work and future benefits to be obtained through the implementation of the proposed mitigation.

The approved LPV HSDRRS mitigation plan set forth in the PIER 36 contained the following features:

Table 2: PIER 36 Mitigation Plan Features

Constructible Features	Mitigation Bank (BLH-Wet/Dry)
	Mitigation Bank (Swamp)
Programmatic Features	Milton Island Marsh Restoration (Non-Refuge Intermediate Marsh)
	Bayou Sauvage Marsh Restoration (Non-Refuge/Refuge Brackish Marsh)
	Bayou Sauvage Protected Side Refuge BLH-Wet/Intermediate Marsh Restoration
	Fritchie Flood Side Refuge BLH-Wet Enhancement

Subsequent investigations since the release of the PIER 36 revealed that a number of the projects previously selected as the programmatic mitigation features for general and refuge impacts are not feasible due to high construction costs and real estate issues. Specifically, the following projects are no longer considered feasible:

- Bayou Sauvage Protected Side Refuge BLH-Wet/Intermediate Marsh Restoration Project - Advanced engineering and design analysis produced significantly higher construction cost estimates than anticipated in earlier planning efforts.

- Bayou Sauvage Refuge Flood side Marsh Restoration Project - Portions of the site as originally planned had poor soils and deep water conditions that resulted in significantly higher estimated construction costs.

- Fritchie Flood side Bottomland Hardwood-Wet Project - This mitigation feature was intended to compensate for flood side BLH-wet impacts that occurred within the Bayou Sauvage NWR. The project would be located on private property and would require condemnation for use as a mitigation site. The U.S. Fish and Wildlife Service (USFWS), which operates the Bayou Sauvage NWR, has expressed an unwillingness to accept property into the Refuge that has been acquired by condemnation. As this mitigation feature would be incorporated into the Refuge, the Service's position renders this option non-viable.

When the above projects were deemed infeasible, the CEMVN, in coordination with the interagency team and NFS revised the design of some of the projects to move them to a

new location in the vicinity of the original project. The team also re-worked some of the earlier projects considered for those habitat types during alternatives analysis in the PIER 36 and developed a total of eight additional options to consider as alternatives to provide the required mitigation. Alternative formulation was constrained by USFWS policy requiring Refuge habitat impacts to be mitigated on Refuge property or within the authorized Refuge acquisition boundary and by the LPV HSDRRS mitigation screening criterion that required mitigation occur within the LPV Basin. The LPV HSDRRS Mitigation Basin boundaries coincide with the watershed boundaries as limited by the coastal zone to the north and excluding the barrier islands to the south.

Alternative projects were developed separately for each impacted habitat type. New alternative projects to meet mitigation requirements for both on-refuge and general impacts are presented in this document. The mitigation alternatives evaluated were developed in coordination with the U.S. Fish and Wildlife Service (USFWS) ecological office and Refuge staff to ensure satisfaction of their mitigation requirements. The non-federal sponsor (NFS), Louisiana Coastal Protection & Restoration Authority Board (CPRAB), was also consulted. The alternatives were evaluated using existing site information and data collected in field inspections. The table below and figures 5 through 11 in appendix A depict the eight additional options developed and the selection criteria used to determine the tentatively selected alternatives (TSP marked with an asterisk).

Table 3: LPV HSDRRS Mitigation Options Considered for SIER 36

		Refuge Priority	Soils	Essential Fish Habitat Impacts	Endangered Species Impacts	Relative Cost
Bottomland Hardwood	New Zydeco Ridge*	Medium	Best	Potential	Potential	Favorable
	Salt Bayou Private	High	Best	Potential	Potential	Favorable
Fresh/Intermediate Marsh	Blind Lagoon PS	High	Poor	None	Potential	Unfavorable
	Turtle Bayou North PS*	High	Best	None	Potential	Favorable
	Thomas Bayou PS	High	Poor	None	Potential	Unfavorable
	Salt Bayou	Medium	Best	Potential	Potential	Favorable
	Salmen	Low	Moderate	Potential	Potential	Favorable
Brackish Marsh	Bayou Sauvage Brackish Marsh (Relocated)*	High	Moderate	None	Potential	Favorable

The tentatively selected alternative projects are:

- New Zydeco Ridge BLH-Wet and Brackish Marsh - a 159 acre flood-side BLH restoration project with a 160 acre brackish marsh restoration component (to address SAV impacts from the BLH restoration and brackish marsh mitigation that can't be completed at Bayou Sauvage) in the Fritchie Marsh area of the Big Branch NWR;
- Turtle Bayou Protected Side Intermediate Marsh - a 126 acre protected-side intermediate marsh restoration project at Turtle Bayou, north of the Bayou Sauvage NWR; and
- Bayou Sauvage Brackish Marsh –a 338 acre brackish marsh restoration and nourishment project at Bayou Sauvage NWR.

The Turtle Bayou project is the tentatively selected alternative for intermediate marsh because it is significantly more cost-effective than the other potential alternatives.

The New Zydeco Ridge project is the tentatively selected alternative for BLH-Wet because it is slightly more cost-effective than the other potential alternative (Salt Bayou Private) and is on NWR land, thus avoiding potential future acquisition issues.

Bayou Sauvage was part of the recommended mitigation plan in PIER 36. During advanced design of that project extensive engineering features were found to be required to ensure success of the project due to its location next to Lake Pontchartrain. The features were extremely costly so, the restoration features were relocated away from the lake in the same area. This relocation brought the cost of the project back down such that the exploration of other options to mitigate the requirement was unnecessary.

Figure 1 shows the locations of the mitigation projects including the designated borrow sources in Lake Pontchartrain. Appendix A, figures 1 and 4 show a closer view of the proposed mitigation areas.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to compensate for impacts to both general and refuge brackish marsh habitats and for refuge intermediate marsh and BLH-wet habitats incurred during construction of the LPV HSDRRS (on the east bank of the Mississippi River). The proposed mitigation would replace the lost functions and services of the impacted habitats through restoration activities designed to create, increase, and/or improve the functions and services of the respective habitats at the planned mitigation sites.

1.2 AUTHORITY FOR THE PROPOSED ACTION

The Flood Control Act of 1965 (P.L. [Public Law] 89-298, Title II, Sec. 204) authorized the LPV project stating "project for hurricane protection on Lake Pontchartrain, Louisiana ... substantially in accordance with the recommendations of the Chief of Engineers in House

Document 231, Eighty-ninth Congress." The original authorization for the LPV Project was amended by the Water Resources Development Acts (WRDA) of 1974 (P.L. 93-251, Title I, Sec. 92), 1986 (P.L. 99-662, Title VIII, Sec. 805), 1990 (P.L. 101-640, Sec. 116); 1992 (P.L. 102-580, Sec. 102), 1996 (P.L. 104-303, Sec. 325), 1999 (P.L. 106-53, Sec. 324), and 2000 (P.L. 106-541, Sec. 432); and Energy and Water Development Appropriations Acts of 1992 (PL 102-104, Title I, Construction, General), 1993 (PL 102-377, Title I, Construction, General), and 1994 (PL 103-126, Title I, Construction, General).

The authority for the HSDRRS is provided as part of a number of hurricane and storm damage risk reduction supplemental appropriations after Hurricanes Katrina and Rita. These laws provide funds to modify and improve several existing USACE projects in southeastern Louisiana. These include the LPV project east of the Mississippi River in St. Charles, Jefferson, Orleans, and St. Bernard Parishes.

The Department of Defense, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic Influenza Act of 2006 (3rd Supplemental - PL 109-148, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorized accelerated completion of the LPV project and restoration of project features to design elevations at 100 percent Federal cost. The Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery of 2006 (4th Supplemental - PL 109-234, Title II, Chapter 3, Construction, and Flood Control and Coastal Emergencies) authorizes construction of a 100-year level of protection; replacement or reinforcement of floodwalls; and construction of levee armoring at critical locations.

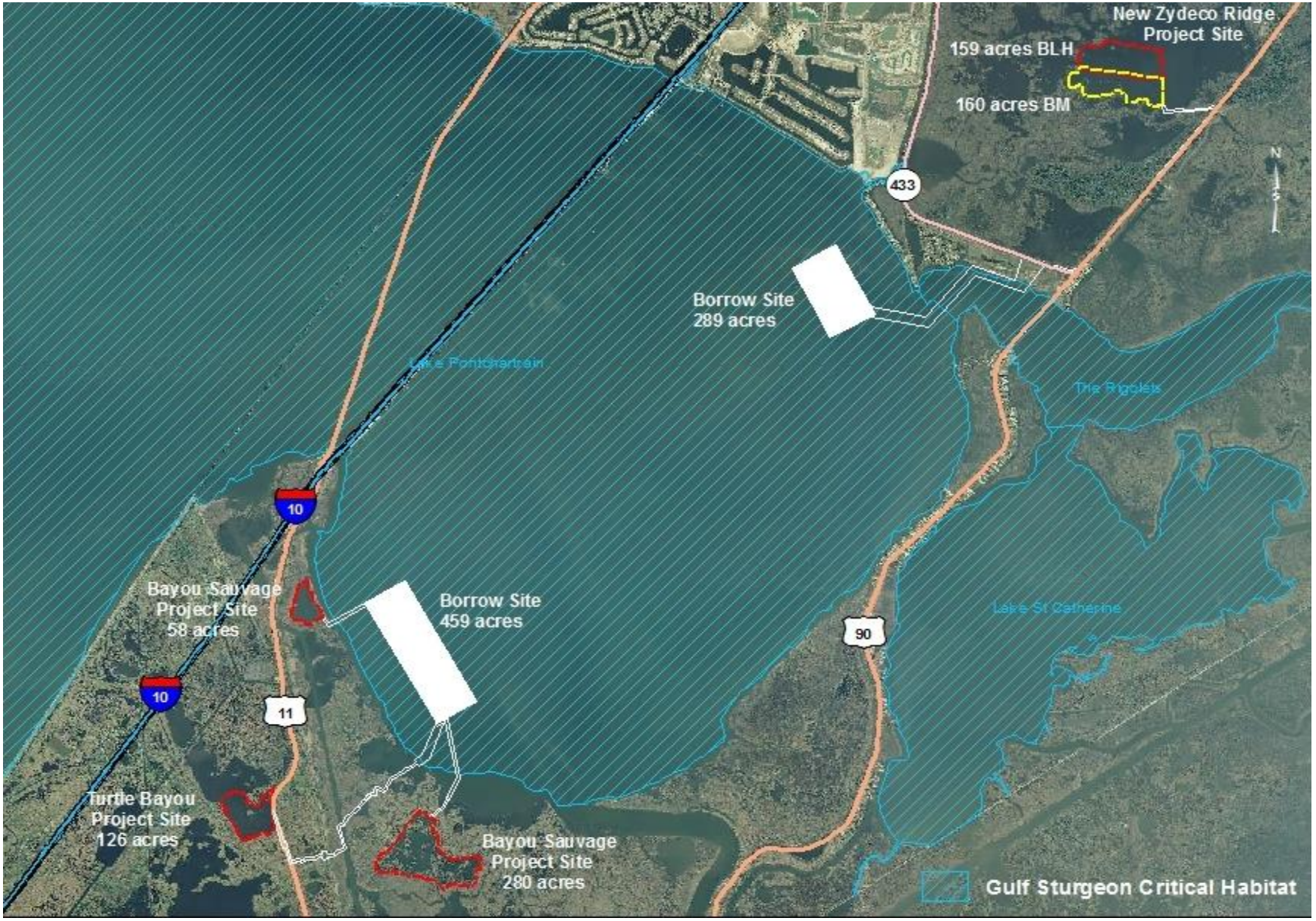

Figure 1 – Bayou Sauvage, Turtle Bayou, and New Zydeco Ridge Projects – All Features

The 6th Supplemental, PL 110-252, Title III, Chapter 3, authorized additional amounts for "Construction," for necessary expenses related to the consequences of Hurricane Katrina and other hurricanes of the 2005 season, to modify authorized projects in southeast Louisiana to provide hurricane, storm and flood damage reduction in the greater New Orleans and surrounding areas to the levels of protection necessary for participation in the National Flood Insurance Program under the base flood elevations current at the time of enactment of this Act, including funding for the Lake Pontchartrain and Vicinity project.

1.3 PRIOR REPORTS

A number of studies and reports on water resources development in the proposed project areas have been prepared by the USACE, other Federal, state, and local agencies, universities, research institutes, and individuals. The most relevant report to the proposed action is the PIER 36. It lists all pertinent previous reports and studies; that list is incorporated by reference.

1.4 PUBLIC CONCERNS

The foremost public concerns are reducing risk of hurricane and storm damage for businesses and residences, and enhancing public safety during major storm events in the New Orleans metropolitan area. In the Lake Pontchartrain basin, the public has expressed a desire for sufficient funding to be allocated for the HSDRRS mitigation efforts and that the mitigation be completed in a timely manner.

1.5 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 certain 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 their creation are a 'best guess' based on what we presently know about existing ecosystems and the results of already constructed restoration projects. Please see section 2.7of PIER 36 for more information on data gaps and uncertainties that have the potential to affect these projects.

2. ALTERNATIVES

2.1 ALTERNATIVES DEVELOPMENT AND SCREENING CRITERIA

NEPA requires that when analyzing alternatives to a proposed action, a Federal agency is to consider an alternative of "No Action" as well as the proposed action and reasonable alternatives to the proposed action. Multiple alternatives to meet the

mitigation requirements of Refuge and general brackish marsh impacts, and Refuge intermediate marsh and BLH-WET impacts were evaluated in the PIER 36. However, upon further design and investigation, none of the programmatic Refuge mitigation features identified in the PIER were deemed viable in their original form due to high costs and real estate issues. In response, the CEMVN and USFWS revised the Bayou Sauvage Flood Side Brackish Marsh feature and developed the Turtle Bayou Protected Side Intermediate Marsh, and New Zydeco Ridge features that perform more favorably under the Risk and Reliability, Cost Effectiveness, Time, and Other Cost Considerations criteria that were applied to evaluations of each potential mitigation project.

2.2 DESCRIPTION OF THE ALTERNATIVES

This supplemental IER discusses mitigation projects not previously included in the PIER 36 approved mitigation plan. Although these project locations were described generally and some of the new mitigation features may have been in close proximity to previously proposed mitigation features, the specific locations of these projects were not investigated in the PIER 36.

In order to ensure that HSDRSS impacts were adequately mitigated, a functional assessment model titled the Wetland Value Assessment Model (WVA) was utilized to predict the Average Annual Habitat Units (AAHUs) lost from the HSDRRS construction impact against the AAHUs generated by the proposed mitigation. Detailed descriptions of the Bayou Sauvage Flood Side Marsh, Turtle Bayou Protected Side Intermediate Marsh and New Zydeco Ridge BLH-Wet and New Zydeco Ridge Brackish Marsh restoration features are found below. Results from WVA calculations are incorporated within the project descriptions in Section 2.3. WVA model assumptions can be found in appendix B.

2.3 PROPOSED ACTIONS

2.3.1 Bayou Sauvage Flood Side Brackish Marsh

The Bayou Sauvage Flood Side Brackish Marsh restoration project is located in the far south-eastern lobe of Lake Pontchartrain, east of Interstate 10. The project plan consists of two areas of open water/broken marsh, which would be filled and/or restored to provide a healthy marsh platform. Both areas are within the existing marsh environment, at an adequate distance from the lake shoreline so that shoreline hardening for marsh protection is not necessary.

The most northern currently proposed marsh footprint is 58 acres (BSFS4) and is located east of Hwy 11 and the community of Irish Bayou in Orleans Parish, Louisiana. In addition to replacement of habitat impacts, completion of the marsh creation would provide some protection to U.S. Highway 90, U.S. Highway 11, Interstate 10, and the Irish Bayou Community. Survey data indicates fairly uniform bottom elevations ranging from approximately -2.0 to -2.5-feet NAVD88. Two soil borings reveal an approximate 4 foot organic peat layer underlain by very soft clays.

The southern proposed marsh footprint is 280 (BSFS5) acres and is located approximate 2.5 miles south, south-east of the northern polygon. The southern site is approximately 0.5 miles north of Chef Menteur Highway (Hwy 90). The site is a combination of 199 acres of open water and 81 acres broken marsh; however evaluation of historic photography reveals continued degradation of the broken marsh component. Survey data indicates a range of existing elevations within the site. The open water area bottom elevations are similar to the northern site, ranging from -1.5 to -2.5 feet NAVD88; getting slightly deeper in the northwestern corner where elevations increase to approximately -3.0-feet NAVD88. Three soil borings in the site reveal an approximate 6 foot organic peat layer underlain by very soft clays and silty sand layers.

For both sites, restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. The dredge material would be obtained from a borrow site in east Lake Pontchartrain with and would be piped from the lake to the restoration site following the access corridor depicted in figure 1. To minimize marsh impacts, the pipeline and equipment would follow open water and canals as much as possible. Access impacts consist of .5 acres and .41 AAHUs of brackish marsh. Initial target elevation for dredge fill would be to approximate elevation +2.5 feet NAVD88, ultimately to hit a target marsh elevation ranging from +1.5 to +1.0 feet NAVD88. Both sites would require total perimeter retention to hold dredge material and allow for vertical accretion. Site BSFS4 (58 acres) would require 7100 linear feet of earthen retention dike. Site BSFS5 (280 acres) would require a 18,000 linear feet of earthen retention dike. The retention dikes would be constructed to elevation +4.5 feet NAVD88, with a 5 foot crown. Due to poor soil conditions, 20 foot stability berms are required both interior and exterior to the dike alignment, resulting in an approximately 90 foot base width for the dike structure. For initial quantity estimates, the dikes were assumed to have 1 foot vertical on 4 foot horizontal side slopes. Retention dikes would be constructed, using marsh buggies for access and movement, to maintain a minimum of 1 foot of freeboard during dredging operations. The dike borrow ditch would be offset a minimum of 40 feet from the dike to assure dike stability. The allowable borrow ditch template would be an 80 foot bottom width, with excavation allowed to 15 feet below the existing ground elevation to capture potentially better deeper material. Earthen plugs would be left in the borrow canal at 1,000 foot intervals to minimize water flow during pumping operations.

The eastern retention dike of BSFS4 paralleling the lake shoreline, is proposed to remain in place post marsh construction to enhance the existing shoreline along this reach of lakefront and provide additional protection to the newly created marsh. The remaining reaches of the retention dike for both features would be gapped approximately a year after the final lift, upon settlement and dewatering of the created marsh platform. It is anticipated that the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform. The shoreline restoration feature along Irish Bayou would also be planted. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7 foot centers. See Appendix C for planting plan details.

The proposed brackish marsh restoration project would provide the required 8.79 AAHU of on- Refuge brackish marsh restoration and approximately 94.4 AAHU of general brackish marsh restoration, through restoration of 58 acres at BSFS4 and the restoration of 199 acres and the nourishment of 81 acres at BSFS5. Cumulatively, the implementation of BSFS4 and BSFS5 would result in the creation of approximately 103.2 AAHUs of brackish marsh within the BSNWR. The brackish marsh mitigation requirement is 126.85 AAHUs (8.79 refuge, 118.06 general) as stated in section 1. This leaves an outstanding balance of 23.7 AAHUs of brackish marsh mitigation that would be mitigated at the New Zydeco Ridge location (see section 2.3.3 intermediate/brackish marsh component).

2.3.2 Turtle Bayou Protected-Side Intermediate Marsh

The Turtle Bayou Protected Side Intermediate Marsh project is located on the Bayou Sauvage NWR and in eastern Orleans Parish, Louisiana. The site is immediately west of LA Hwy 11, north of and adjacent to Turtle Bayou, and east of I-10. As proposed, the project would consist of creating approximately 126 acres of intermediate marsh within an open water area immediately north of Turtle Bayou.

Multiple depth measurements taken by measuring rod during a site visit on January 22, 2014 showed that the average water depth within the restoration area was approximately -1.7 feet. Calibrating that measurement with the gage at the boat launch, located off of LA Hwy 11 and north of the restoration site, which read -0.6 feet placed the average elevation of water bottoms within the restoration area at approximately -2.3 feet NAVD88. This average elevation was verified by a controlled survey performed in July 2014 and used in developing required borrow and fill quantities, as well as dredge material fill elevations, in conjunction with Geotech designs based off of borings that were also taken and analyzed during the 65% design phase.

The proposed mitigation site is within the northeast portion of the Mississippi River deltaic plain. Depositional environments in the area are related to the St. Bernard Delta, which was active in this area approximately 3,000 years ago. Dominant physiographic features in the area include Bayou Sauvage and its associated natural levee, Chef Menteur Pass, Lake Pontchartrain, and marsh. Natural elevations are highest on the levees of Bayou Sauvage and decrease away from these levees to the marshes near Lake Pontchartrain.

Existing boring and map data in the vicinity of the proposed mitigation site indicated that the surface and shallow subsurface contains approximately 3 to 10 feet of marsh deposits characterized by very soft organic clays and peat with high water content. Interdistributary deposits underlie marsh deposits and are composed of very soft to medium clays and silty clay approximately 20 feet thick. Pleistocene deposits composed of very stiff clays, silt, and sand underlie interdistributary deposits. There are buried beach deposits at approximately elevation -15 feet immediately north and south of Bayou Chevee. Beach deposits are composed mainly of fine sand and shell.

Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. This work would be coupled with the restoration work proposed for Bayou Sauvage Flood Side Brackish Marsh, located just east of LA Hwy 11 and Irish Bayou. The dredge material would be obtained from a borrow site in east Lake Pontchartrain with access from the lake to the restoration site to follow the access corridor location depicted in figure 1. To minimize marsh impacts, the pipeline and equipment would follow open water and canals as much as possible. The pipeline would cross under LA Hwy 11 via one of three existing 36 inch culverts, which the Bayou Sauvage National Wildlife Refuge has indicated may be used for the dredge pipeline to access the site. For offloading pipeline and equipment to the restoration site, a 150 foot wide access corridor, commencing west of the centerline of LA Hwy 11, would be used. This corridor is existing marsh and a board road will be installed prior to offloading of equipment and dredge pipeline in order to minimize impacts. The area would be backfilled upon completion of work with 1 foot to 2 foot of material in order to restore the wetlands to pre-existing conditions. Access impacts consist of 10.13 acres and 3.36 AAHUs of intermediate marsh on the protected side of the levees and 2.11 acres and .77 AAHUs of brackish marsh on the flood side of the levees.

Disposal within the restoration site would be confined, with dredge effluent waters allowed to be returned to the adjacent open waters for nourishment of adjacent marsh and for enhancement of submerged aquatic habitat. The dredge material would be placed confined to obtain a target elevation of +0.5' feet NAVD88 (+/-0.25' feet). Spill box weirs may be constructed to control the pool level within the restoration area and the earthen dikes may be gapped and/or degraded as necessary to facilitate development of the restoration site.

The dikes for this project would be earthen and would be constructed from adjacent borrow obtained from within the marsh restoration site. Approximately 12,000 feet of earthen retention dikes shall be constructed prior to the placement of dredged material and maintained at all times during pumping operations. The earthen retention dikes shall be constructed to a minimum 5 foot crown width and slopes no steeper than 1V on 3H. The dikes shall be constructed to approximate elevation +3.5 feet NAVD88. Upon completion of the project, the dikes and weirs may either be left in place to naturally degrade, or be degraded at a later date, after the dredged material has had time to settle out within the restoration site. In the event the dikes are to be degraded, the degraded material shall be put back into the borrow pits that were used to construct these retention features. The degraded material would be placed either into the borrow pits, and /or adjacent open water areas at an elevation conducive to marsh creation. The planting of native intermediate marsh species would occur following the settling/dewatering necessary to meet the final target elevation of the mitigation feature. See Appendix C for planting plan details.

Turtle Bayou Protected Side Intermediate Marsh has a mitigation potential of 0.39 AAHU per acre and provides mitigation for the 41.29 AAHU LPV HSDRRS refuge intermediate marsh impacts and 3.36 AAHUs of Turtle Bayou Protected Side

Intermediate Marsh protected side access impacts to intermediate marsh through the creation of at least 120 acres of protected side intermediate marsh within the proposed 126-acre project area.

2.3.3 New Zydeco Ridge

The New Zydeco Ridge BLH-Wet restoration project is located on the north shore of Lake Pontchartrain in the north east quadrant of the lake, northwest of U.S. Highway 90, and approximately 5 miles east of Slidell, Louisiana. The project site is bounded on the east by U.S Highway 90, on the North by U.S. Highway 190, on the west by Interstate 10, and on the south by Lake Pontchartrain. As currently proposed, the project would consist of creating approximately 159 acres of BLH-Wet habitat and creating over 149 acres of brackish marsh habitat within a designated shallow open water area immediately north of Salt Bayou.

Based on a site visit on April 9, 2014, the area is very shallow open water. The water bottoms at the project site appeared to be fairly firm, after penetrating a foot or so of softer materials. Design surveys of the project site verified that the shallow bottom water elevations range from approximately -1.25 feet to -2.5 feet NAVD88.

The proposed mitigation site is located southeast of Slidell, between the Pleistocene terraces and Lake Pontchartrain. Depositional environments in the area include marshes bordering terrace deposits and dominant physiographic features in the area include Prevost Island, the Pleistocene terraces, marsh, Lake Pontchartrain, and the Rigolets.

Natural elevations of approximately +5 feet are found on the terraces bordering the northeastern edge of the site based on LIDAR data. Elevations reach approximately +7 feet on Prevost Island.

Based on boring and map data in the vicinity, it is estimated that the surface and shallow subsurface of the proposed site contains marsh deposits from 2 feet to 8 feet thick. Marsh deposits are characterized by very soft organic clays and clay with peat. Marsh deposits are thinner near the Pleistocene terraces and Prevost Island and thicken towards Lake Pontchartrain. Pleistocene deposits composed of stiff clays, silty clay, silt, and sands underlie the marsh deposits.

Project area wetlands within the terrace field transitioned from predominantly fresh marsh in 1956 and 1978 to brackish marsh in 1988. The 2000 data shows an almost even split within the terrace field between intermediate and brackish marsh. In the 2007 Operations, Maintenance, and Monitoring Report for the Fritchie Marsh Restoration Project (PO-06), salinity data was collected throughout the project area pre-construction, from 1997-2000, and from 2001-2005. The summary statistics showed that during the monitoring period, salinity averaged about 3 ppt post construction. This average was considerably higher pre-construction at about 6 ppt. Measurements taken during the WVA trip in June 2009 showed salinities around 3 ppt as well. The 2007 report discussion on vegetative composition indicated that portions of the vegetative

communities were trending brackish, with the predominant vegetation being Spartina patens and Schoenoplectus americanus; however, there are several areas that are trending intermediate. As such, the area is suitable for both intermediate and brackish marsh mitigation.

BLH-Wet Component

Establishment of bottomland hardwood forest habitat on a site that is currently open water would be accomplished through dedicated dredging of material to be borrowed from Lake Pontchartrain via hydraulic cutterhead dredge. The dredge material would be obtained from a borrow site in east Lake Pontchartrain with access from the lake to the restoration site to follow the location depicted in figure 1. Access impacts consist of 3.75 acres and 1.51 AAHUs of brackish marsh. For the BLH-Wet construction scenario, initial target elevation for dredge fill would be to approximate elevation +5.5 NAVD88, to ultimately hit a target elevation ranging from +3.5 to +3.0 NAVD88 after dewatering and settlement. Although this results in a 7.0 foot lift of fill material (+5.5-feet from -1.5-feet); a fairly firm bottom and anticipated partially sandy borrow source minimizes concerns for any significant settlement of the proposed platform. Geotechnical analysis indicated that approximately 1.6 feet of settlement and an additional 1.2 feet of shrinkage and consolidation is anticipated during and after completion of the pumping operation.

Total perimeter retention would be required to retain dredge material and allow for vertical accretion. Retention dikes would be constructed to maintain a minimum of 1 foot of freeboard during dredging operations. The retention dikes would be constructed using marsh buggies for access and movement to elevation +7.0 feet NAVD88, with a 5 foot crown to assure dike integrity. Borrow for these retention dikes would come from within the BLH-Wet creation footprint. The borrow ditch would be offset a minimum of 40 foot from the dike to assure dike stability. The allowable borrow ditch template would be a 50 foot bottom width, with excavation not to exceed 10 feet below the existing ground elevation. For initial quantity estimates, the dikes were assumed to have 1 vertical on 4 horizontal side slopes. Plugs would be left in the borrow canal at 1,000 foot intervals to minimize water flow during pumping operations. Spill boxes or weirs would be constructed at pre-determined locations within the retention dike to allow for effluent water release from within the marsh creation area.

Approximately 11,885 linear feet of retention dike would be required. Based on the layout provided, the entire boundary dikes are built in open water. The dike would be degraded approximately one year after construction is complete to the target BLH-W elevation, upon settlement and dewatering of the created platform. The degraded material could be disposed of in the original borrow canal if settlement allows, or cast into the open water immediately outside of the project footprint. The planting of native BLH-Wet canopy and midstory species would occur following the settling/dewatering necessary to meet the final target elevation of the mitigation feature. See Appendix C for planting plan details.

With a mitigation potential of 0.6 AAHU per acre, the BLH-Wet restoration project provides more than the required 92.83 AAHU of Refuge BLH-Wet impacts through restoration of 159 acres of flood side BLH-Wet within the proposed project area. The estimated 93.94 AAHU provided by this BLH-Wet restoration project would fulfill the 83.92 AAHU of protected side BLH-Wet refuge impacts as well as the 8.91 AAHU of flood side BLH-Wet refuge impacts that resulted from LPV construction activities.

Intermediate/Brackish Marsh Component

Efforts to implement refuge BLH-Wet mitigation in a location that would avoid impacts to essential fish habitat (EFH) were coordinated with NMFS and USFWS Refuge staff. However, due to policy requiring that refuge habitat impacts be mitigated on refuge property or within the authorized Refuge acquisition boundary and the Refuge's preference that lands used be acquired from landowners willing to sell their properties, options to locate BLH-Wet mitigation were extremely limited. After much deliberation, it was determined that the selected New Zydeco Ridge BLH-Wet mitigation feature would be the most appropriate location for refuge BLH-Wet mitigation. Therefore, impacts to shallow open water habitats were unavoidable.

To mitigate for the permanent impacts to approximately 159 acres of EFH from construction of the New Zydeco Ridge BLH-Wet project, a WVA was conducted to determine the habitat unit loss from conversion of open water and submerged aquatic vegetation (SAV) to non-tidally influenced BLH-Wet habitat. The WVA indicates there would be a loss of approximately 21.2 AAHUs of EFH, therefore approximately 66.25 acres south of the proposed BLH-Wet restoration footprint would be restored to intermediate/brackish marsh habitat (mitigation potential of 0.32 AAHU/acre) on the refuge where the impacts occurred (first priority based on USFWS policy). The New Zydeco Ridge Brackish Marsh feature would fully compensate for the unavoidable impacts to EFH by converting relatively low quality shallow open water to emergent intermediate/brackish marsh habitat (also a type of EFH).

Additionally, to mitigate the 23.7 AAHUS of brackish marsh impacts that could not be produced by the Bayou Sauvage Flood Side Marsh project (see section 2.3.1) and the 2.69 AAHUs of brackish marsh impacts that would be incurred from access to the mitigation projects during construction (.77 AAHUs flood side impacts at Turtle Bayou Protected Side Intermediate Marsh, .41 AAHUS at Bayou Sauvage Flood Side Marsh, and 1.51 AAHUS at New Zydeco Ridge), approximately 82.3 acres of brackish marsh would be created at the New Zydeco Ridge Brackish Marsh project. The total project footprint for the New Zydeco Ridge Brackish Marsh project would therefore have to be at least 148.6 acres.

To achieve a platform suitable for brackish marsh restoration, disposal within the restoration feature would be confined, with dredge effluent waters returned to the adjacent open waters for nourishment of adjacent marsh and for enhancement of submerged aquatic habitat. The dredge material would be placed to a maximum slurry elevation of +3 feet NAVD88. Spill box weirs would be constructed to control the pool

level within the restoration area and the earthen dikes and closures would be gapped and/or degraded as necessary to facilitate development of the restoration feature.

LIDAR data was used to evaluate existing marsh elevations in the proximity of the project site. In general, the data indicated a range of marsh elevations from approximately +0.5 to +1.5 feet NAVD88, with an average elevation of approximately +1.0 feet NAVD88. This coincides with Northshore CRMS data in the project vicinity which indicates existing marsh elevation of +0.9 feet. The lake shoreline fronting the potential project site has been developed with roads, camps, residences, etc.; thus, minimizing the potential for shoreline erosion at this site.

The proposed construction of the New Zydeco Ridge Brackish Marsh Creation project would result in approximately 160 acres of shallow open water being filled to an initial elevation of approximately +3.0 feet NAVD88, to ultimately reach a target marsh elevation ranging from +1.0 feet to +1.5 feet NAVD88.

Disposal within the restoration feature would be confined, with dredge effluent waters allowed to return to the adjacent open waters for nourishment of adjacent marsh and for enhancement of submerged aquatic habitat. Spill box weirs would be constructed to control the pool level within the restoration area and the earthen dikes and closures would be gapped and/or degraded as necessary to facilitate development of the restoration feature.

Total perimeter retention would be constructed to retain dredge material and allow for vertical accretion. The retention dikes would be constructed to elevation +4 feet NAVD88, with a 5 foot crown to assure dike integrity and maintain a minimum of 1 foot of freeboard during dredging operations. Borrow for these retention dikes would come from within the New Zydeco Ridge brackish marsh creation footprint. The borrow ditch would be offset a minimum of 40 foot from the dike to assure dike stability. The template for construction of the borrow ditch would have a 50 foot wide bottom width with excavation not to exceed 8 feet below the existing ground elevation. For initial quantity estimates, the dikes were assumed to have 1 foot vertical on 4 foot horizontal side slopes. Plugs would be left in the borrow canal at 1,000 feet intervals to minimize water flow during pumping operations. Spill boxes or weirs would be constructed at pre-determined locations within the retention dike to allow for effluent water release from within the marsh creation area.

Approximately 10,165 linear feet of retention dike would be required, tying into the southern BLH-Wet retention dikes. The entire western and southern boundaries would be built on the rim of existing marsh. The northern boundary would use the adjacent BLH-Wet retention dike. The dike would be degraded approximately year 1 after fill placement concludes, upon settlement and dewatering of the created platform. The degraded material would either be disposed of in the original borrow canal if settlement allows, or cast into the open water immediately outside of the project footprint. The planting of native intermediate/brackish marsh species would occur following the

settling/dewatering necessary to meet the final target elevation of the mitigation feature. See Appendix C for planting plan details.

2.3.4 Borrow Sites

Bayou Sauvage Flood Side Brackish Marsh & Turtle Bayou Protected Side Intermediate Marsh Components

Due to the location of these two projects, the borrow source would be combined to reduce mobilization impacts and increase efficiency. Bayou Sauvage Flood Side Brackish Marsh creation would require borrow of approximately 4.2 million cubic yards of material and Turtle Bayou Protected Side Intermediate Marsh creation would require borrow of approximately 900,000 cubic yards of material. The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 feet between the existing shoreline and the borrow area limit. Currently, the proposed borrow location exhibits relatively consistent depths of approximately 7-8 feet below water surface. Borrow excavation would not be allowed greater than 10 feet below the existing lake bottom, except that a tolerance of 1 foot below this target elevation would be provided for the contractor to account for inaccuracies in the dredging process. It is anticipated that final bottom depths at this borrow location would ultimately be approximately 17-19 feet. Based on these criteria, the required borrow site would be approximately 335 acres. To assure adequate borrow; the proposed size of the borrow pit would be enlarged for a total of 459 acres to allow for the avoidance of unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds.

Three access corridors (one to each site) would be constructed from the lake to the proposed marsh creation site. The corridors leading to BSFS4 and BSFS5 would be restricted to 200-feet in width, and the corridor leading to Turtle Bayou Protected Side Intermediate Marsh would be restricted to 400 feet in width. These corridors could also be used to stage and offload equipment as necessary, and to transport personnel to and from the worksite. The pipeline would be a submerged line without anchoring to reduce impacts. The pipeline location would require buoy markers and lights to notify mariners of its location. No excavation is anticipated within the access corridors. The pipeline access corridor(s) between the open waters of Lake Pontchartrain and the proposed marsh creation sites would be restricted to existing bayous and canals to minimize impacts to existing marsh. Water crossings that exist in the access corridors will be maintained or restored, to the extent possible, after the corridors on marsh are backfilled. Means to maintain or restore the water crossings will be developed through continued coordination with NMFS and other interested natural resource agencies during advanced engineering design and construction.

New Zydeco Ridge BLH-Wet and Brackish Marsh Component

The borrow site is approximately 289 acres and was broken into 2 primary and 2 secondary borrow areas due to differential lake bottom elevations. The primary and secondary borrow sites #1 are in deeper water (7 to 18 feet deep), thus a dredging

depth of -20 feet NAVD88 is being used to obtain a suitable quantity of material. Primary and secondary borrow sites #2 are in shallower water (4 to 9 feet deep), thus primary borrow site # 2 has a dredge depth of -18' NAVD88 and secondary borrow site #2 has a dredge depth of -16' NAVD88. The total anticipated amount of fill material being dredged from the borrow sites is 3,600,000 cubic yards.

An access corridor would be allowed from the lake to the proposed BLH-Wet creation site. The proposed corridor would remain in deeper water fronting the existing marina facilities along the lakefront, then hug the shallow water shoreline towards US Highway 90. The access corridor would not require any dredging and the pipeline would be a submerged line without anchoring to reduce impacts. The pipeline location would be marked with buoy markers and lights to notify mariners of its location. To stay out of the US-90 corridor, the pipeline access corridor must cross the beach and Hwy 433 well to west of the US-90. The access corridor would be 500 feet from the borrow site, through the open waters of Lake Pontchartrain, and 200 feet overland to Hwy 90. The overland portion of the corridor would allow for staging of pipe and equipment. The cost estimate for this project includes a jack-and-bore of the roadway to minimize local impacts. The pipeline access route from Hwy 433 to US 90 hugs the northern road shoulder to minimize impacts to private property. The access corridor then parallels the west side of US Highway 90 until it intersects the existing gravel parking lot, which would be utilized as a staging site. The access corridor would then extend westward into the proposed BLH-Wet creation site, 150 foot in width across open marsh, and 200 foot in width in the last open water leg prior to intersecting the marsh creation site. In the short reach of access corridor crossing existing marsh, the Contractor would be required to place a 30 foot wide board road to minimize impacts to existing marsh. Prior to placement of the board road, a 1 to 2 foot thick layer of sand would be placed within the board road footprint. Upon removal of the board road the area would be restored to pre-construction marsh elevations. In summary, the corridor would be restricted to 500 feet in width in open water and across the beach, restricted to 100 feet paralleling Hwy 433, restricted to the available right of way (ROW) alongside Hwy 90 (between the road shoulder and existing timber power poles), restricted to 150 feet within the existing marsh reach, and finally restricted to 200 feet in the open water leading to the marsh creation platform. The ROW would be used to establish a pipeline corridor, offload equipment as necessary, and transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the corridor, by using Hwy 90 and the proposed staging area for daily transportation of supplies and personnel where possible.

2.3.5 Mitigation Banks and the State In Lieu Fee Program

Following guidelines established in the Water Resources Development Act (WRDA) of 2007 Section 2036(c)(1) in carrying out a water resources project involving wetlands mitigation and impacts that occur within the service area of a mitigation bank, USACE, where appropriate, would first consider the use of the mitigation bank if the bank contains sufficient available credits to offset the impact and the bank is approved in accordance with the Federal guidance for the establishment, use, and operation of mitigation banks. However, due to USFWS policy requiring that Refuge habitat impacts

be mitigated on refuge property or within the authorized Refuge acquisition boundary on lands that would be transferred to Refuge ownership, mitigation bank credits may not be used to compensate for Refuge impacts.

Mitigation banking instruments and the ILF Program Instrument are binding agreements in which the mitigation bank or ILF is obligated to monitor ecological success, adaptively manage the site to ensure ecological success, and provide financial assurances for such actions. Purchase of mitigation credits can proceed considerably faster than the design, contract award, and construction of USACE-designed alternatives.

According to Implementation Guidance for WRDA 2007, Section 2036(c), Wetlands Mitigation, the purchase of mitigation credits for a water resources project relieves the Corps from responsibility of monitoring the mitigation measure and demonstrating that the mitigation measure is successful. Such activities would be conducted by the owner or operator of the mitigation bank or ILF Program.

If the USACE is unable to implement the expansion of the New Zydeco Ridge marsh project to account for brackish marsh impacts that cannot be mitigated at the Bayou Sauvage Flood Side Brackish Marsh restoration project (23.7 AAHUs), then the purchase of mitigation bank or ILF credits would be an option the USACE may pursue to complete the mitigation of the LPV HSDRRS general brackish marsh impacts. If that option is utilized, the same version of the WVA model as was used to assess the impacts from constructing the HSDRRS would be run on the mitigation bank/ILF project to ensure that the assessment of the functions and services provided by the mitigation bank/ILF project matches the assessment of the lost functions and services at the impacted site.

2.4 ALTERNATIVES TO THE PROPOSED ACTION

NEPA requires that in analyzing alternatives to a proposed action, a Federal agency consider an alternative of “No Action.” The No Action alternative represents the Future Without Project (FWOP) condition and provides a baseline for the comparison of action alternatives. In this case, the No Action alternative should be the mitigation plan as approved in the PIER 36. However, since only certain features in PIER 36 were constructible (the programmatic features required additional design and NEPA before they could be implemented), only a portion of the mitigation plan, the constructible features, could be considered in the FWOP condition. Currently, mitigation bank credits have been purchased for the general BLH and swamp features of the PIER 36 mitigation plan. Additionally, NEPA documentation for the once programmatic general intermediate marsh feature (Milton Island Intermediate Marsh Restoration Project) has been completed and that project is currently under construction. The remaining programmatic features of the mitigation plan that still need additional NEPA (addressed in this document) under the No Action alternative could not be implemented and therefore not mitigated. However, because compensatory mitigation for unavoidable impacts is required by law (e.g. Clean Water Act and the Water Resources Development Acts of 1986 and 2007), the No Action alternative to the proposed action is not considered a reasonable or legally viable alternative that could be selected.

2.4.1 No Action Alternative

It is anticipated that the Pontchartrain Basin would continue a trend of land loss caused by both natural factors such as subsidence, erosion, tropical storms and sea level rise, and human factors such as flood risk reduction projects, canal dredging, development, interruption of accretion processes, and oil and gas exploration. The No Action Alternative would not provide for the compensatory mitigation of unavoidable impacts to general and refuge brackish marsh, and refuge intermediate marsh and BLH-Wet from the construction of the HSDRRS.

The analysis for the no Action alternative considers previous, current, and reasonably foreseeable future projects, which could impact the resources evaluated in the SIER. A discussion of and the location of these projects can be found in PIER 36, section 2.9.1, and in PIER 36, appendix A, figure 33, and appendix B, tables 10-12.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

As discussed in Section 1.0 of this supplement, the mitigation features that were planned in the PIER 36 for the proposed on-refuge mitigation projects have been deemed infeasible in their original form. As such, proposed on-refuge replacement mitigation projects were developed and are discussed in Section 1.0 of this supplement. The following proposed alternative projects were eliminated from further consideration due to potential acquisition issues, site conditions, and relatively high costs to implement:

- Salt Bayou Private BLH
- Blind Lagoon Protected Side Fresh/Intermediate Marsh
- Thomas Bayou Protected Side Fresh/Intermediate Marsh
- Salt Bayou Fresh/Intermediate Marsh
- Salmen Fresh/Intermediate Marsh

The only alternatives that are continuing through alternative analysis are the proposed action and the No Action alternative.

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 ENVIRONMENTAL SETTING

The LPV HSDRRS mitigation planning basin is bounded to the north by Interstate 12 from the Louisiana/Mississippi state line to the Mississippi River at Baton Rouge. From Baton Rouge, the boundary then proceeds south utilizing the centerline of the Mississippi River. The southern boundary is situated to exclude the barrier islands since the HSDRRS work did not impact the barrier islands.

The three restoration areas are located in the Lake Pontchartrain Basin. Bayou Sauvage Brackish Marsh and Turtle Bayou Protected Side Intermediate Marsh are

located on the southern lobe and New Zydeco Ridge projects are located on the Northshore. The lake is slightly brackish, with a silty to sandy bottom, and approximately 15 feet deep. Historically, the shorelines of the lake were bordered by cypress/tupelo gum swamps, fresh to intermediate marshes, and bands of bottomland hardwood forests bordering natural drainages and the lake rim in some areas. Currently, much of the lake's southern and northeastern shoreline is composed of urban and suburban development. The lake shoreline near the project areas is a mixture of low-density residential development and undeveloped wetlands, including second-growth swamp and bottomland hardwood forest, scrub/shrub wetlands and intermediate to brackish marshes. The general project area supports a wide variety of fish and wildlife resources, many of which are important to recreational and commercial fishermen and hunters.

3.2. SIGNIFICANT RESOURCES

This section contains a list of the significant resources located in and near the proposed action, and describes in detail those resources that would be impacted, directly or indirectly. 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)). A cumulative impact is defined as the "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (40 CFR §1508.7).

The resources described in this section are those recognized as significant 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 4 shows those significant resources found in and near the project area, and notes whether they would be impacted by the proposed alternative.

Resources that would not be impacted, or only negligibly impacted are not discussed in this document. Aesthetics is not addressed since the project locations are only visible from a small number of residences, and because the undeveloped nature of the project area would be preserved. Air quality is not addressed since the only emissions would be from temporary construction equipment, and St. Tammany and Orleans Parishes are in attainment for all monitored air quality parameters. No construction emissions assessment to demonstrate conformity with any air quality program is required because of these parishes attainment status. Noise is not addressed due to the undeveloped nature of the project areas and the distances between the project areas and the closest sensitive receptors, which in the case of the Bayou Sauvage Flood side Brackish Marsh project, are the residences located approximately 1,000 feet to the west. The other projects are located even further from sensitive receptors.

The potential for impacts to socioeconomic resources including environmental justice were also considered. There are no anticipated impacts to population, housing, or

minority or low-income populated areas since the project areas and surrounding lands are uninhabited, remote, and to a large degree occur on Federally-owned property. Environmental justice concerns are not present due to the undeveloped nature of the area. Additionally, the only residences in the vicinity are indicative of high value and are not primarily occupied by minorities or low income groups. There are no commercial/industrial properties, or public facilities within the project boundaries or in adjacent areas, and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or property values are anticipated to occur with construction of this project. The proposed project does not require any agricultural or forestry land to be impacted or converted, therefore the requirements of the Farmland Protection Policy Act, Section 1541(b), do not apply. Most construction equipment and personnel would access the project areas via aquatic access resulting in no impacts to land-based transportation; although there would be minimal impact from the pipeline crossing for movement of dredge material from Lake Pontchartrain to the proposed project locations.

Table 4: Significant Resources In and Near the Project Area

Significant Resource	Impacted	Not Impacted
Wildlife	X	
Threatened & Endangered Species	X	
Aquatic Resources	X	
Water Quality	X	
Essential Fish Habitat	X	
Recreation	X	
Cultural Resources[1]		X
Air Quality		X
Noise		X
Aesthetics		X
Environmental Justice		X
Socioeconomic Resources		X
HTRW[2]		X
Wetlands	X	

[1]Although not impacted, cultural resources are addressed to comply with the National Historic Preservation Act.
[2]Hazardous, Toxic, and Radioactive Waste. Although the area has been determined to have a low probability of containing HTRW, it is assessed in this document to comply with USACE policy.

3.2.1 Wildlife

Existing Conditions. The coastal wetlands in the Pontchartrain Basin provide important and essential fish and wildlife habitats, especially transitional habitat between estuarine and marine environments, which are used for shelter, nesting, feeding, roosting, cover, nursery, and other life requirements. Emergent intermediate and brackish wetlands are typically used by many different wildlife species, including: seabirds; wading birds;

shorebirds; dabbling and diving ducks; raptors; rails; coots and gallinules; nutria; muskrat; mink; river otter; and raccoon; rabbit; white-tailed deer; and American alligator (LCWCRTF & WCRA 1999). All of these species are likely to be found in or near the projects areas.

Open water habitats such as Lake Pontchartrain provide wintering and multiple use functions for brown pelicans, various seabirds, and other open water residents such as laughing gulls and least terns, and migrants such as lesser scaup and double crested cormorants (LCWCRTF & WCRA, 1999). Open water in the project areas provide suitable habitat for many of these species, especially dabbling ducks, coots, and gallinules, which feed primarily on submerged aquatic vegetation.

Bottlenose dolphins are protected under the Marine Mammal Protection Act of 1972, and are found in temperate and tropical waters around the world including Lake Pontchartrain. The lake appears to have a semi-resident population of dolphins that generally are found in the eastern side of the lake which has the higher salinity level. They likely feed on various estuarine fish and shellfish. It is highly unlikely that dolphins venture into the area proposed for wetland mitigation due to existing very shallow water and submerged aquatic vegetation.

No Action: Without construction of an action alternative, there would be an overall loss of intermediate and brackish marsh and BLH within the system. Subsidence within the system would continue and emergent marsh habitat would continue to be lost resulting in the creation of more open water habitat. BLH habitat would continue to covert to swamp and marsh. Changes to plant communities and submerged aquatic vegetation would likely take place due to these factors, thus negatively impacting wildlife diversity and utilization in the basin. Land based animals would be the most directly affected, due to loss of the herbaceous and wooded wetlands around the project area. Because the habitat losses caused by the construction of the HSDRRS would not be compensated, wildlife species inhabiting BLH-wet, intermediate and brackish marsh habitats would sustain permanent habitat loss and population decrease within the watershed. CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied. This includes the specific obligation to mitigate NWR impacts.

Proposed Action: Direct impacts to wildlife would result from the conversion of approximately 702 acres of shallow open water to emergent marsh or BLH-Wet habitat and the nourishment of approximately 81 acres of existing emergent marsh. This conversion would reduce use and function of these areas for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules and other species that feed in the shallow open water in this location, but it is anticipated they would utilize adjacent areas of open water habitat that are abundant in close proximity to the proposed features. It is anticipated that the project areas would experience improved overall wetland habitat functions once construction and establishment of the proposed marsh and BLH-Wet restoration areas are achieved. The proposed mitigation projects would result in the establishment of approximately 126 acres of intermediate marsh at the Turtle Bayou

Protected Side Intermediate Marsh feature, the establishment of approximately 257 acres of brackish marsh in the Bayou Sauvage Flood Side Brackish Marsh feature, nourishment of approximately 81 acres of marsh at the Bayou Sauvage Flood Side Brackish Mars feature, and the establishment of approximately 160 acres of brackish marsh at the New Zydeco Ridge feature. These actions would create or enhance approximately 624 acres of emergent marsh habitat for terrestrial and semi-aquatic species such as nutria, muskrat, mink, river otter, and raccoon. Reptiles including the American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle are likely to utilize and populate the proposed marsh areas as well. Amphibians expected to colonize the area include the bullfrog, southern leopard frog, and Gulf coast toad. The edges and small areas of open water than would form over time would also provide feeding habitat for common wading bird species including great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis. The creation of about 159 acres of BLH-Wet habitat at the New Zydeco Ridge feature would provide habitat utilized by species such as songbirds, white-tailed deer, raccoons, squirrels, and rabbits.

Incidentally created mudflats and shallow-water areas would provide habitat for numerous species of shorebirds and seabirds. Shorebirds expected to use such areas include American avocet, willet, black-necked stilt, dowitchers, and various species of sandpipers. White pelican, brown pelican, black skimmer, herring gull, laughing gull, and several species of terns would be expected to forage in and near the project area. Migratory and resident non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, belted kingfisher, and marsh wrens, would also use the project areas. Game birds using the area would include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl. The project areas are not of sufficient depth to be used by bottlenose dolphins nor would sufficient access be available to anticipate the use of it by this species. As such, construction of the project should not result in entrapment of this species within the marsh or BLH-Wet creation features.

Indirectly, species that utilize shallow open water habitats would be displaced by the habitat conversion. However, these species would have the opportunity to utilize adjacent shallow open water areas. Many species utilizing the current habitat type would thrive with the additional foraging, cover, and resting habitat the project would create. A rise in turbidity at the borrow site could immediately reduce water quality in the area; however those effects would be temporary and would be reduced by movement of the tides. Any bottlenose dolphins or their prey in the borrow area would be free to relocate during construction since the borrow area encompasses only a small section of a 403,200 acre estuarine/brackish lake. This project would help to offset an overall loss in the basin of intermediate and brackish marsh and BLH-Wet habitat necessary for many wildlife species. These projects, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin, would prevent the net loss of intermediate, brackish and BLH wetland function and overall decline of wildlife species within the basin and would be beneficial

in both preserving the species bio-diversity and combating the current trend of conversion of coastal marsh to open water, which would be accelerated due to sea level rise.

3.2.2 Threatened and Endangered Species

Existing Conditions: Within St. Tammany and Orleans Parishes there are ten documented animal and one plant species under the jurisdiction of the USFWS and/or the National Marine Fisheries Service (NMFS), presently classified as endangered or threatened (table 5). Designated critical habitat for one of the animal species (Gulf sturgeon) is located within St. Tammany Parish. The USFWS and the NMFS share jurisdictional responsibility for sea turtles and Gulf sturgeon. Other species that were listed on the Endangered Species List, but have since then been de-listed because population levels have improved, are bald eagle and brown pelican. Currently, American alligators and shovelnose sturgeon 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 requirements.

Table 5: Threatened and Endangered Species in St. Tammany Parish

Species	Potentially in Project Areas	Status	Jurisdiction	
			USFWS	NFMS
West Indian Manatee (*Trichechus manatus*)	X	E	X	
Red Cockaded Woodpecker (*Picoides borealis*)		E	X	
Gopher Tortoise (*Gopherus polyphemus*)		T	X	
Ringed Map Turtle (*Graptemys oculifera*)		T	X	
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	X	E	X	X
Green Sea Turtle (*Chelonia mydas*)	X	T	X	X
Loggerhead Sea Turtle (*Caretta caretta*)	X	T	X	X
Pallid Sturgeon (*Scaphirhynchus albus*)		E	X	
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	X	T	X	X
Alabama Heelsplitter Mussel (*Potamilus inflatus*)		T	X	
Louisiana Quillwort (*Isoetes louisianensis*)		E	X	

Of the listed animal and plant species occurring in St. Tammany and Orleans Parishes, only the West Indian manatee; Gulf sturgeon; and Kemp's ridley, loggerhead, and green sea turtles are expected to potentially be found in the proposed borrow areas in Lake

Pontchartrain. It would be highly unlikely that any of the listed marine species would be found in the proposed marsh or BLH-Wet mitigation project areas due to very shallow water. All of these species are typically found in deeper water where they are able to maneuver and forage effectively.

West Indian Manatee

The West Indian manatee is Federally and state-listed as endangered and also is protected under the Marine Mammal Protection Act of 1972, under which it is considered depleted (USFWS 2001). Critical habitat for the manatee has been designated in Florida, but not in Louisiana (USFWS 1977). The manatee is a large gray or brown aquatic mammal that may reach a length of 13 feet and a weight of over 2,200 pounds. It occurs in both freshwater and saltwater habitats within tropical and subtropical regions. The manatee is not a year-round resident in Louisiana, but it may migrate there during warmer months. The primary human-related threats to the manatee include watercraft-related strikes (impacts and/or propeller strikes), crushing and/or entrapment in water control structures (flood gates, navigation locks), and entanglement in fishing gear, such as discarded fishing line or crab traps (USFWS 2007).

There have been 110 reported sightings of manatees in Louisiana since 1975 (LDWF 2005). Sightings in Louisiana, which have been uncommon and sporadic, have included occurrences in Lake Pontchartrain as well as the Amite, Blind, Tchefuncte, and Tickfaw Rivers. Between 1997 and 2000, there were approximately 16 sightings in the Lake Pontchartrain area and a general increase in the number of manatees per sighting (Abadie et al. 2000). Sightings of the manatee in the Lake Pontchartrain basin have increased in recent years, and in late July 2005, 20 to 30 manatees were observed in the lake from the air (Powell and Taylor 2005).

To minimize the potential for construction activities to cause adverse impacts to manatees, the following standard manatee protection measures, developed by the USFWS, Lafayette, Louisiana Field Office, would be implemented when activities are proposed that would impact habitat where manatees could occur: All contract personnel associated with the project would be informed of the potential presence of manatees and the need to avoid collisions with manatees. All construction personnel would be responsible for observing water-related activities for the presence of manatees. Temporary signs would be posted prior to and during all construction/dredging activities to remind personnel to be observant for manatees during active construction/dredging operations or within vessel movement zones (i.e., the work area), and at least one sign would be placed where it is visible to the vessel operator. If a manatee is sighted within 100 yards of the active work zone, special operating conditions would be implemented, including: moving equipment would not operate within 50 ft of a manatee; all vessels would operate at no wake/idle speeds within 100 yards of the work area; and siltation barriers, if used, would be re-secured and monitored. Once the manatee has left the 100-yard buffer zone around the work area of its own accord, special operating conditions would no longer be necessary, but careful observations would be resumed. Any manatee sighting would be immediately

reported to the USFWS (337/291-3100) and the Louisiana Department of Wildlife and Fisheries (LDWF), Natural Heritage Program (225/765-2821).

Gulf Sturgeon

The Gulf sturgeon was listed as threatened throughout its range on September 30, 1991. The Gulf sturgeon is an anadromous fish that migrates from salt water into coastal rivers to spawn and spend the warm summer months. Subadults and adults typically spend the three to four coolest months of the year in estuaries or Gulf of Mexico waters foraging before migrating into the rivers. This migration typically occurs from mid-February through April. Most adults arrive in the rivers when temperatures reach 70 degrees Fahrenheit and spend eight to nine months each year in the rivers before returning to estuaries or the Gulf of Mexico by the beginning of October.

Critical habitat identifies specific areas that have been designated as essential to the conservation of a listed species. Critical habitat units (areas) designated for the Gulf sturgeon in Louisiana include Lake Pontchartrain east of the Causeway, Lake Catherine, Lake Borgne, out into the Mississippi Sound (USACE 2006a). Studies by the LDWF have shown the presence of Gulf sturgeon in Lake Pontchartrain during the winter and during periods of migration between marine and riverine environments. Records indicate that Gulf sturgeon have been located in Lake Pontchartrain east of the Causeway, particularly on the eastern Northshore. Gulf sturgeon have been documented west of the causeway, typically near the mouths of small rivers (USFWS and NMFS 2003).

Kemp's Ridley, Loggerhead, and Green Sea Turtles

Sea turtles inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in U.S. waters, and all are listed as threatened or endangered. The three species potentially occurring in Lake Pontchartrain and Lake Borgne in the vicinity of the mitigation projects have a similar appearance, though they differ in maximum size and coloration. The Kemp's ridley is the smallest sea turtle – adults average about 100 pounds with a carapace length of 24 to 28 inches and a shell color that varies from gray in young individuals to olive green in adults. The loggerhead sea turtle is the next largest of these three species – adults average about 250 pounds with a carapace length of 36 inches and a reddish brown shell color. The green sea turtle is the largest of these three species – adults average 300 to 350 pounds with a length of more than 3 feet and a brown coloration (its name comes from its greenish colored fat). The Kemp's Ridley has a carnivorous diet that includes fish, jellyfish, and mollusks. The loggerhead has an omnivorous diet that includes fish, jellyfish, mollusks, crustaceans, and aquatic plants. The green sea turtle has an herbivorous diet of aquatic plants, mainly sea grasses and algae, which is unique among sea turtles. All three species nest on sandy beaches, which are not present near Lake Pontchartrain. The life stages that may occur in Lake Pontchartrain range from older juveniles to adults.

No Action: Without construction of the action alternative, there would be an overall loss of intermediate and brackish marsh, and BLH within the system. Subsidence within the

system would continue and emergent marsh habitat would continue to be lost resulting in the creation of more open water habitat. BLH habitat would continue to covert to swamp and marsh. The areas proposed for borrowing of fill material (Lake Pontchartrain), would not be impacted, although they would not likely provide feeding habitat for manatees and green sea turtles due to the lack of submerged aquatic vegetation, but they may pass through the area. This area of the lake could provide feeding habitat for Gulf sturgeon although the mud/silt substrate is not to their preference, which is sandy bottom. Kemp's ridley and loggerhead sea turtles may forage in the lake at the borrow site, although available evidence indicates that they very rarely are found in the lake. Because the habitat losses caused by the construction of the HSDRRS would not be compensated, habitat that once had the potential to provided cover, resting, nesting and foraging habitat for threatened and endangered species would be lost.

Proposed Action: No listed species are expected to be directly impacted within the proposed marsh and BLH-Wet mitigation areas since they would not be expected there due to shallow water depths (typically less than 2 feet) or access (on the protected side of the levees). Still, precautions would be taken during construction of retention dikes in flood side habitats to ensure no impacts to listed species. The construction contractor would be required to induce listed species to leave the immediate work area prior to any work regardless of water depth. A bucket (or similar equipment) would be dropped into the water and retrieved empty one time. After the bucket has been dropped and retrieved, a 1-minute no work period must be observed. During this no work period, personnel should carefully observe the work area in an effort to visually detect listed species. If species are sighted, no bucket dredging should be initiated until the listed species have left the work area. If the water turbidity makes such visual sighting impossible, work may proceed after the 1-minute no work period has elapsed. If more than 15 minutes elapses with no work, then the empty bucket drop/retrieval process shall be performed again prior to work commencing.

The borrow area could potentially be utilized by manatees and sea turtles. Direct impacts to these listed species in the proposed borrow area are unlikely as the site is located outside of designated critical habitat and the construction activities would be of a nature that are not known to directly injury the species. The indirect impacts resulting from the temporary loss of the area as foraging habitat would be insignificant given the small size of the borrow area compared to the overall area of Lake Pontchartrain. The presence of construction- related activity, machinery, and noise would be expected to cause these species to temporarily avoid the project area during the construction period. Dredging for borrow material would occur via hydraulic cutterhead dredge. Entrainment of sea turtles is not expected since hydraulic dredges are slow moving and their use is not known to impact these species. Manatees could potentially be affected by dredging operations, but adverse impacts to this species would be avoided through the implementation of standard manatee protection measures developed by the USFWS. These conditions are included in the construction contract specifications for nearly all USACE dredging contracts in coastal Louisiana.

Expected impacts to sturgeon foraging habitat could occur from borrow excavation in Lake Pontchartrain because the borrow locations are inside of designated critical habitat. Sturgeon primarily feed on sandy water bottoms. Preliminary borings show that the borrow locations have a high clay content especially at surface floor levels; the sandy substrates lie 10-11 feet below surface. Turbidity would increase at each location, but would remain localized and should be reduced by movement of the tides.

Although turbidity impacts would be localized and temporary, concern over borrow pit water quality impacts is justified. Improperly planned dredge pits can result in hypoxic/anoxic conditions. The development of these conditions has been linked to the inability of the water to be properly mixed and flushed within the pits, resulting in stagnation and stratification. Water quality impacts from borrow pits varies greatly due to geographic location, pit design, and environmental parameters.

Hypoxic and anoxic conditions have been linked to the tendency for a borrow pit to accumulate organic material. This accumulation can be reduced by: 1) limiting the depth of the pit; 2) increasing the pits surface area; and 3) decreasing side-slopes that transition from the pit to adjacent water bottoms. A shallow and broad “pan-shaped” borrow pit would facilitate circulation with adjacent waters, thereby decreasing the likelihood that organic material would become entrained, as well as allow for periodic flushing of the pit during storm events.

The proposed borrow plans have been developed with an emphasis of mimicking a natural depression in the lake bottom. A gradual side slope of 1V:3H has been designed for the borrow pits. This gradual slope would facilitate tidal flushing. Additionally, the New Zydeco Ridge borrow pit is located in an area of tremendous tidal flow and high current velocities that would ensure water exchange within the borrow pit. Borrow pits also have been consolidated together to increase their surface area, which would facilitate tidal mixing of the water column.

Flocks, J. and C. Franze. 2001 (L. Pontch Atlas) - generally characterized the DO issues within the multiple pits along the south shore of Lake Pontchartrain as being due to the salinity stratification introduced by the IHNC. In particular, the pit off of Lakefront Airport, shows hypoxic conditions seasonally beginning at 20 ft. Research conducted by Schurtz and Kerry (1984) in Lake Pontchartain also found anoxic conditions within Lake Pontchartrain. They concluded that the anoxic conditions resulted from non-mixing characteristics brought by pronounced salinity stratification during the summer months, particularly in years exhibiting normal or below normal rainfall. They further concluded that the cause of the seasonal salinity stratification was the intrusion of highly saline waters from the Gulf of Mexico via the Mississippi River Gulf Outlet (MRGO). Salinities at the mouths of the Rigolets and Chef Menteur Pass, also contributors of saltwater into Lake Pontchartrain, are not as high as at the mouth of the IHNC. They found salinity stratification at the Rigolets and Chef Menteur Pass was very slight. Data collected by Tarver and Savoie (1976) also showed a similar homogeneous water column at the Rigolets and Chef Menteur Pass and a more stratified condition at the IHNC. Sikora and Sikora (1982) found stratification to occur in Lake Pontchartrain

particularly near the IHNC and occasionally in eastern sections of the lake. Swenson (1980) reported that the IHNC was stratified and that the Rigolets and Chef Menteur Pass were homogenous. And that the IHNC/MRGO complex provided a connection of highly saline waters from the Gulf of Mexico to Lake Pontchartrain and thus was conducive to stratification. On the other hand, the Rigolets and Chef Menteur Pass allow inflows of waters containing salinities that are closer in concentration to those in Lake Pontchartrain and, therefore, have a much lesser tendency towards stratification.

The borrow pit depth would be approximately 10-11 feet deep from the lake bottom and not exceed a total depth of -20 feet from the surface of the water for the Bayou Sauvage Flood Side Marsh and Turtle Bayou Protected Side Intermediate Marsh borrow sites. The borrow pit depth for the New Zydeco Ridge projects could range from 2 to 14 feet deep depending on existing conditions at the time of dredging, but would also not exceed a total depth of -20 feet from the surface of the water. As such, the CEMVN does not anticipate hypoxic/anoxic conditions to result from the construction of the proposed action due to the borrow depths being utilized (no deeper than -20 feet from the surface of the water), the location of the borrow pits (adjacent to or in the vicinity of the Rigolets), and the fresher conditions being experienced in Lake Pontchartrain due to the closure of the MRGO in 2009.

Though a measurable change to the sediment composition of Lake Ponchartrain overall is not expected to occur, the removal of borrow material would result in the direct, indirect, temporary, and irretrievable impacts to the benthic communities within the lake at the borrow locations. This potential permanent loss of benthic resources is not anticipated to adversely affect Gulf Sturgeon due to the relatively small size of the borrow sites (459 acres and 289 acres respectively) compared either to the total area of designated critical habitat within Lake Pontchartrain (201,600 acres) or compared to the available forage area within the remaining 402,501 acres of lake bottom. Borings in the borrow areas show substrates with a high clay content down to depths of 10 feet with sandier substrates below. Once the borrow pits are excavated below 10-11 feet where sandier substrates are located, it would provide better foraging substrates than what's currently available. The resulting properly designed borrow areas with sandier composition could increase benthic community recovery and re-colonization. It is likely that the dredged areas will rapidly re-colonize. Relatively species-poor benthic assemblages associated with low salinity estuarine sediments can recover in periods of time ranging from a few months to approximately one year (Leathem et al. 1973; McCauley et al. 1976 and 1977; Van Dolah et al. 1979 and 1984; Clarke and Miller-Way 1992). Based on characteristics of the existing benthic community in the vicinity of the project area (Ray, 2007) it seems likely that the benthic community in the borrow areas will recover in one to two years. Due to the size of the anticipated impacts, these effects are considered insignificant.

The USACE has assessed the potential of the proposed action to affect listed species and has determined that the proposed action may affect, but is not likely to adversely affect the Gulf Sturgeon, West Indian manatee, and the green, Kemp's Ridley, and loggerhead sea turtles and may affect, but is not likely to adversely affect Gulf Sturgeon

Critical Habitat and is not likely to destroy or adversely modify it. In its August 19, 2015 letter, NMFS concurred that the proposed action was not likely to adversely affect listed speices and critical habitat under NMFS's purview. In its August 26, 2014 letter, USFWS concurred that the proposed action was not likely to adversely affect listed speices under USFWS's purview.

3.2.3 Fisheries, Aquatic Resources, and Water Quality

Existing Conditions: The NMFS oversees and manages our Nation's domestic fisheries through development and implementation of fishery management plans and actions. The Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), first enacted in 1976, amended in 1996, and reauthorized in 2006, is the primary law governing marine fisheries management in United States Federal waters to end overfishing, promote market-based management approaches, improve science, serve a larger role in decision-making, and enhance international cooperation.

The NMFS has determined that Lake Pontchartrain and adjacent wetlands provide nursery and foraging habitats which support varieties of economically important marine fishery species, including striped mullet, Atlantic croaker, Gulf menhaden, spotted and sand sea trout, southern flounder, black drum, and blue crab. Some of these species also serve as prey for other fish species managed under the MSFCMA by the Gulf of Mexico Fishery Management Council (e.g., mackerel, snapper, and grouper) and highly migratory species managed by NMFS (e.g., billfish and shark).

The existing submerged aquatic vegetation and shallow open water within the project area, and adjacent wetlands, provide important estuarine fisheries habitat, including transitional habitat between estuarine and marine environments used by migratory and resident fish, as well as other aquatic organisms for nursery, foraging, spawning, and other life requirements. Historically and currently, the area provides valuable recreational and commercial fishing opportunities that include a wide variety of finfish and shellfish (Rounsefell, 1964; Penland et al., 2002).

The assemblage of species in the proposed project area is largely dictated by salinity levels and season. During low-salinity periods, species such as Gulf menhaden, blue crab, white shrimp, blue catfish, largemouth bass and striped mullet are present in the project area. During high-salinity periods, more salt-tolerant species such as sand seatrout, spotted seatrout, black drum, red drum, Atlantic croaker, sheepshead, southern flounder, Spanish mackerel, and brown shrimp may move into the project area, especially the borrow area in Lake Pontchartrain. Wetlands throughout the project area also support small resident fishes and shellfish such as least killifish, sheepshead minnow, sailfin molly, grass shrimp, and others. Those species are typically found along marsh edges or among submerged aquatic vegetation, and provide forage for a variety of fish and wildlife.

The water quality in the hydrologic units in which these projects are located does not fully support two of their designated uses: (1) Primary Contact Recreation. The suspected source of this impairment, fecal coliform, is from on-site treatment systems,

such as septic systems and similar decentralized systems. (2) Fish and Wildlife Propagation. The suspected sources of this impairment, low dissolved oxygen, includes on-site treatment systems such as septic systems and similar decentralized systems, and permitted discharges in the area. Lake Pontchartrain, the project's borrow source, is considered to fully support its designated uses.

No Action: Without implementation of the proposed mitigation features, the areas would continue to naturally subside and the emergent marsh habitat would continue to decrease resulting in more open water habitat. Continued loss of submerged aquatic vegetation would lower habitat value for some resident species such as grass shrimp and killifishes that provide food for many species of birds. Increased salinity would allow estuarine species to extend their range within the basin. The proposed borrow sites within Lake Pontchartrain would not be impacted from the proposed action.

Proposed Action: Approximately 783 acres of open water, broken marsh, SAVs, and mud substrate would be replaced with intermediate and brackish marsh at Turtle Bayou Protected Side Intermediate Marsh, Bayou Sauvage Flood Side Brackish Marsh, and New Zydeco Ridge Brackish Marsh features, increasing spawning, nursery, forage and cover habitat for fisheries resources over the long term. For approximately 5 years after project construction the project area would be above daily tidal inundation and only partially vegetated, so maximum fisheries benefits would not be realized until after this 5-year period has elapsed. Turbidity during borrow excavation and fill placement would temporarily impair visual predators and would impact filter feeders, but these impacts are expected to cease after construction and benthic species would rebound once construction is complete. Temporary water quality impacts from turbidity are not anticipated to be substantial enough to cause impairment of the water body's designated uses as defined under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. Water quality impacts in the fill area would temporarily add to the water quality impairment of this sub-segment, but these impacts would be minimized through best management practices and would diminish to background levels after construction.

Fish access to this area would be extremely limited until the material consolidated and settled to an elevation conducive to natural emergent marsh habitats. It is expected this "lag" time would be approximately 5 years. Once the success criteria have been achieved, this area would once again serve its traditional functional role in the local ecosystem.

It is probable that crab fishermen sometimes place crab traps within the proposed borrow area as the practice is common throughout Lake Pontchartrain. Shrimp fishermen may venture into the area either pulling trawls or pushing "skimmer" nets. The fishermen and their gear would be temporarily displaced during project construction, and the borrow area may be less productive for up to a year after project construction due to loss of benthic animals from the dredging operation. The depth restriction on the borrow pit, preventing it from being more than 20 feet in total depth, would minimize the chance that the area would suffer from low oxygen conditions post

construction. The borrow pit should revert to productive habitat within a couple growing seasons after project construction. Overall, commercial fisheries in Lake Pontchartrain would not be disrupted by the proposed action.

At the New Zydeco Ridge project area there would be a conversion of approximately 159 acres of shallow open water habitat and SAVs to BLH-Wet habitat. However, shallow open water is found in abundance throughout the LPV basin and this conversion would be offset by the creation of 66.25 acres of brackish marsh adjacent to the BLH-Wet creation area. The resulting marsh would be cumulatively neutral in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin because the mitigation is off setting losses due to construction of the LPV HSDRRS. Implementation of the proposed action would prevent an overall loss in the basin of bottomland hardwoods, intermediate marsh, and brackish marsh habitat. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and combat the current trend of conversion of marsh to open water. There would be an overall loss of shallow open water habitat in the basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin. Direct impacts from the SAV loss were factored into the mitigation planning analysis and would be mitigated by the restoration of intermediate and brackish marsh in the proposed project areas.

3.2.4 Essential Fish Habitat

Existing Conditions: The MSFCMA (50 CFR 600) states that EFH is "those waters and substrate necessary for fish for spawning, breeding or growth to maturity" (16 United States Code [USC] 1802(10); 50 CFR 600.10). The 2005 amendments to the MSFCMA set forth a mandate for the NMFS, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fish. A provision of the MSFCMA requires that FMCs identify and protect EFH for every species managed by a Fishery Management Plan (FMP) 16 USC 1853. The public places a high value on seafood and recreational and commercial opportunities provided by EFH. Specific categories of EFH include all estuarine waters and substrates (mud, sand, shell, rock, and associated biological communities), subtidal vegetation (seagrasses and algae), and adjacent intertidal vegetation (marshes and mangroves). Table 6 shows the categories of EFH and the managed species that occur in the project area.

Table 6: EFH for the Managed Species Expected in Project Areas

Life Stage	Brown Shrimp	White Shrimp	Red Drum
Adults		R	R
Eggs			
Juveniles	C to HA	C to A	C
Larvae			
Spawners			
Relative Abundance:			

Blank - Not Present A – Abundant R – Rare HA - Highly Abundant C – Common (Variation in abundance due to seasonality) (NMFS, 1998)	
Life Stage	**Essential Fish Habitat**
Brown Shrimp - Adults	Silt, sand, muddy sand
Brown Shrimp - Juveniles	Marsh edge, submerged aquatic vegetation, tidal creeks, inner marsh
White Shrimp - Adults	Silt, soft mud
White Shrimp - Juveniles	Marsh edge, submerged aquatic vegetation, ponds, inner marsh, oyster reefs
Red Drum – Adults	Estuarine mud substrate
Red Drum - Juveniles	Submerged aquatic vegetation, estuarine mud substrate, marsh/water interface

The project is located within an area identified as essential fish habitat for postlarval/juvenile brown shrimp; postlarval/juvenile white shrimp; and postlarval/juvenile and adult red drum. The 2005 generic amendment of the FMP for the Gulf of Mexico, prepared by the Gulf of Mexico FMC, identifies EFH in the project area to be estuarine emergent wetlands, submerged aquatic vegetation, estuarine water column, and mud substrates.

No Action: Without implementation of the proposed mitigation features emergent marsh habitat in the basin would continue to be lost resulting in more open water habitat. Loss of estuarine emergent wetlands and submerged aquatic vegetation would not be mitigated thus adversely impacting these essential fish habitats. Because the habitat losses caused by the construction of the HSDRRS would not be compensated, EFH species inhabiting intermediate and brackish marshes would sustain permanent loss of habitat in the watershed.

Proposed Action: The existing essential fish habitat at the marsh restoration features includes estuarine water bottom, estuarine water column, and submerged aquatic vegetation. These habitats would be largely converted to another type of essential fish habitat – estuarine intertidal herbaceous wetlands (marsh). Benthic resources within the borrow site would be lost until they can re-colonize the borrow area. Relatively species-poor benthic assemblages associated with low salinity estuarine sediments can recover in periods of time ranging from a few months to approximately one year (Leathem et al. 1973; McCauley et al. 1976 and 1977; Van Dolah et al. 1979 and 1984; Clarke and Miller-Way 1992). Based on characteristics of the existing benthic community in the vicinity of the project area (Ray, 2007) it seems likely that the benthic community in the borrow areas will recover in one to two years. The borrow area would not be excavated more to more than 20 feet deep thereby minimizing the possibility of anoxic conditions. Fisheries access to the marsh mitigation area would be extremely limited during the initial 3-5 years of the project life while the pumped-in sediments are dewatering and subsiding. These areas were once a functional marsh system that

provided nursery and feeding habitat to local fisheries. Over time, the proposed actions would result in an increase of functional marsh and associated shallow water habitat thereby accomplishing the required level of mitigation and offsetting adverse impacts to certain categories of EFH. The adverse impacts to essential fish habitat that would result from the proposed actions may affect, but should not adversely affect, managed species considering the small acreage involved relative to Lake Pontchartrain, plus the project would provide long-term benefit to the managed species by providing intertidal wetlands, a valuable type of essential fish habitat.

Indirect impacts to managed species include increased turbidity and disturbance of Lake Pontchartrain in the vicinity of the borrow area. These species may be temporarily displaced. Cumulative impacts to fresh and intermediate marsh EFH resulting from construction of the LPV HSDRRS were considered and found to be adequately offset by the resulting increase in habitat quality from the proposed action. Implementation of the proposed action would result in sufficient EFH habitat improvement to offset adverse impacts to brackish and intermediate marsh EFH and open water designated as essential fish habitat from the LPV HSDRRS construction projects as well as the construction of this proposed mitigation project. The other LPV HSDRRS mitigation projects recommended in the PIER 36 were evaluated and found to have inconsequential cumulative impacts to EFH. No additional UCASE activities that would impact similar open water EFH were identified in the project vicinity.

At the New Zydeco Ridge project feature, there would be a conversion of approximately 159 acres of shallow open water habitat and SAVs to non-tidal BLH-Wet habitat. However, shallow open water is found in abundance throughout the LPV basin and this conversion would be offset by the creation of 66.25 acres of brackish marsh adjacent to the BLH-Wet creation area. The resulting marsh would be cumulatively neutral in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin because the mitigation is off setting losses due to construction of the LPV HSDRRS. Implementation of this project would offset the loss of brackish marsh habitat that occurred as a result of the HSDRRS construction. There would be an overall loss of open water habitat in the basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin. Direct impacts from the SAV loss were factored into the mitigation planning analysis and would be mitigated by the restoration of intermediate and brackish marsh in the proposed project areas.

3.2.5. Cultural Resources

Bayou Sauvage Flood Side Brackish Marsh and Turtle Bayou Protected Side Intermediate Marsh (project areas are in close proximity and share the same cultural and historic background): Several surveys for cultural resources have been carried out in the vicinity of the proposed Bayou Sauvage marsh restoration project. In 1970, surveys were carried out in the vicinity of the proposed project area for levee enlargement as part of the LPV Project (Neuman 1970). No sites were identified in the vicinity of the proposed project area as a result of this survey. In 1975, the Louisiana Department of Transportation performed a review and on-site inspection of five proposed bridge replacement sites along Highway 11 (Rivet 1975). This on-site

inspection identified the presence of one cultural resource site. The site is located within 1 mile of marsh restoration feature BSFS5 that is part of the currently proposed project, but the cultural resources site would not be impacted by activities associated with the project.

In the summer and early fall of 1982, New World Research, Inc. conducted a cultural resources investigation of specific areas within the proposed Lake Pontchartrain and Vicinity Hurricane Protection project (New World Research 1982). The surveys consisted of Phase I terrestrial surveys of the proposed levee enlargement and off-shore remote sensing survey of two proposed borrow sources in Lake Pontchartrain. During these surveys, no cultural resources were identified in the vicinity of the currently proposed marsh restoration project.

In 1985, the CEMVN conducted remote sensing surveys for seven flotation channels as part of the New Orleans East Lakefront Levee Enlargement and Foreshore Protection, a feature of the Lake Pontchartrain and Vicinity Hurricane Protection project (Stout 1985). No cultural resources were identified in the vicinity of the currently proposed project.

In 1994, Coastal Environments, Inc. conducted a Phase I cultural resources evaluation of the Bayou Sauvage National Wildlife Refuge for the USFWS. The survey indentified several cultural resources sites on the Refuge, three of which are located within one mile of the currently proposed marsh restoration project. The survey also proposed criteria for determining the potential for cultural resources on the Refuge. Patterns of pre-historic and historic settlement were most likely associated "with certain deltaic landform features, specifically elevated landforms such as sand ridges, beach ridges, and, most importantly, natural levees which developed along active deltaic distributary streams" (Pearson et al 1994).

In 2008, R. Christopher Goodwin and Associates, Inc. conducted a "*Phase I Cultural Resources Survey and Archeological Inventory, Nautical Remote Sensing Survey, and Phase II National Register Testing and Evaluation of Locus 07-02-E-01, Target 36_2, and Site 16OR453, Performed for Lake Pontchartrain and Vicinity Project, Individual Environmental Report Area 7 (IER #7), Orleans Parish,* Louisiana" (Heller et al. 2008). The Phase I surveys identified three new cultural resources sites, none of which were significant and no additional investigations were recommended. The remote sensing survey identified three targets that exhibited potential shipwreck characteristics. Additional evaluation of the three target locations determined that two of the targets were not significant and no additional work was recommended. The remaining target exhibited potential shipwreck characteristics and avoidance was recommended. None of the cultural resources identified during this survey effort are located within the currently proposed project area.

New Zydeco Ridge: A review of the Louisiana Division of Archaeology, Cultural Resources Map indicates that two surveys for cultural resources have been previously carried out in portions of the proposed project area. In 1983, Coastal Environments, Inc conducted a Level I survey of the Rigolets Estates Property for a proposed residential

development (Gagliano 1982). During this survey no sites were identified in the survey area. A portion of the proposed projects access corridor would extend through the area surveyed by Coastal in 1983. In 1999, Historic Preservation Associates conducted a survey to identify cultural resources along a proposed fiber optic line extending from New Orleans, Louisiana to Pensacola, Florida. A portion of this survey was located along Highway 90 adjacent to the currently proposed project area, and a single cultural resource was identified. The site was identified as a very thin scatter of Rangia shell and three flakes of unknown prehistoric affiliation. The site record indicates that the site is not eligible for listing to the National Register of Historic Places.

No Action: Without implementation of the proposed action wetlands within the basin would continue to naturally subside and the emergent marsh habitat would continue to be lost resulting in more open water habitat. Cultural resources that are present would continue to be impacted and eventually lost to erosion and conversion of existing land areas to open water.

Proposed Action: Existing and as yet undiscovered cultural resources could be adversely impacted by activities associated with the proposed projects such as retention dike construction, gapping along natural bayous, degrading of dikes, staging area location, access corridor use, and other activities. Implementation of the proposed action to restore vegetated marsh and BLH-WET could help to prevent or slow future erosion, which over time could contribute to the protection and preservation of cultural resources that may exist in the project area.

The draft report titled “Phase I Cultural Resources Investigations and Remote Sensing Survey of Lake Pontchartrain and Vicinity Refuge Mitigation Projects – National Wildlife Refuge Habitat Mitigation, Orleans and St. Tammany Parishes, Louisiana – Turtle Bayou, Bayou Sauvage Marsh, and New Zydeco Ridge” was received on July 7, 2014. The SHPO concurred in a letter dated Oct 6, 2014, that the project will have no adverse effects on historic properties. No comments were received from federally recognized Indian Tribes. Consultation pursuant to Section 106 of the National Historic Preservation Act has been concluded.

3.2.6 Recreational Resources

Existing Conditions: Recreation areas in the Pontchartrain Basin include two NWR, four LA Wildlife Management Areas, four state parks, and one state historic site, as well as other significant areas. These areas alone represent approximately 214,000 acres that are visited annually nearly 450,000 times for recreational purposes. The recreation areas include 46 miles of trails for hiking and biking, 38 boat ramps, 2 fishing piers, 4 classroom spaces, 3 visitor centers or museums, 4 picnic shelters, and 2 historic sites. The recreation areas provide opportunities for hunting, hiking, biking, boating, bird watching, fishing and crabbing, crawfishing, shrimping, education, camping, picnicking, and playing.

There are 2 NWR in the project areas including Bayou Sauvage and Big Branch. The BBNWR, located in St. Tammany Parish, encompasses about 18,000 acres offering

diverse habitats supporting a wide variety of wildlife species, attracting concentrations of waterfowl, wading birds, shorebirds, and neotropical migrants. In addition to providing habitat for a natural diversity of wildlife, the refuge seeks to provide a variety of opportunities for public outdoor recreation and education. Most of these opportunities are located on refuge lands west of Highway 11 and include hiking trails, public fishing, picnicking, interpretive tours, biking, canoeing, and hunting.

Waterfowl hunting is the most popular activity at the New Zydeco Ridge location. According to the BBNWR Manager, the Salt Bayou parking lot is full during waterfowl season as hunters launch pirogues and paddle to the nearest site, New Zydeco Ridge. About 5-10 hunters use the site per day during the season, according to the NWR Manager.

The BSNWR offers environmental education, birding, youth waterfowl hunting, fishing, hiking, wildlife observation, photography and canoeing attracting 50,000 visitors annually. Boating, hunting and fishing occur on the flood side lands of the refuge in the vicinity of the proposed restoration feature. The Bayou Sauvage Flood Side Brackish Marsh feature is used for youth waterfowl hunting and the area is accessible by boat.

Turtle Bayou, located in BSNWR on the protected side just west of Highway 11 and south of I-10, is used less often recreationally than the flood side site. Little recreation occurs at this site as it is hard to access and the area does not offer much opportunity for recreational fishing or hunting.

The BSFS4 feature, currently owned by the Audubon Nature Institute, is not currently being used for recreational purposes. Previous plans to build trails and allow canoeing and hiking have not been implemented.

Recreational boating does take place in BSNWR, particularly in Irish Bayou and Bayou Chevee. There are six boat launches providing access around the NWR including a canoe and a boat launch in the refuge. There is minimal recreational boating in the area of the New Zydeco Ridge restoration feature while hunters use pirogues to access the site.

No Action: Recreational resources in the project area that would be most affected in the Future Without Action are affected by loss of wetlands/marshes and habitat diversity. Many recreation activities are based on aquatic resources and are directly related to the habitat and species in an area. Habitat changes affect fish and wildlife populations, thereby affecting many recreational resources. Changes in habitat types can be a result of increased salinities and other factors affecting estuarine dependent fish. Loss of marshland and an increase in open water is expected to have impacts on recreational fishing and hunting over the next 50 years. Fishery habitats would decline as spawning places in the marsh are destroyed. Larger open water areas are forming resulting in less shallow waters available as nursery habitat for spawning areas of fish. A decline in the game fish population would also affect hunting opportunities. Populations of migratory birds and other animals directly dependent on the marsh and swamp would

decrease dramatically as would bird viewing, an impact that would be felt in much of North America, where some of these species spend part of their life cycle.

Another major impact of land loss is the possible loss of facilities and infrastructure that support or are supported by recreational activities. Land loss can literally result in the loss of boat launches, parking areas, access roads, as well as marinas and supply shops. The loss of access features, such as roads and boat launches, directly impacts the public's ability to recreate in particular areas. Marinas and other shops may lose business as access diminishes or may lose their facilities altogether. Alternatively, demand for goods and services may change. Habitat change and resulting changing recreation opportunities (i.e. fresh to marine) may for example severely impact a marina specializing in services to particularly types of recreation (i.e. loss of freshwater opportunities).

Under the no action plan, the land berm partially separating the proposed BSFS4 marsh mitigation area from Lake Pontchartrain would continue to erode exposing the interior area to increased wave energies and salinity changes. Changes to adjacent plant communities and submerged aquatic vegetation would likely take place reducing its utilization by waterfowl and the likelihood that hunters would try to hunt them. Fish usage would likely decrease as well with a related decrease in recreational fishing success.

Proposed Action: Recreational opportunities within the project area may increase with increased formulation of emergent marsh and other fish and wildlife habitats. An increase in habitat value would likely result in increased wildlife usage of the project area.

BSFS4 would be acquired in fee by the local sponsor to preserve the benefits of the proposed mitigation in perpetuity. The local sponsor would be responsible for managing the area and would determine how the land would be specifically used in the future. Bayou Sauvage Flood Side Brackish Marsh, Turtle Bayou Protected Side Intermediate Marsh, and New Zydeco Ridge mitigation features are all located within NWRs and would continue to be used recreationally.

Direct impacts from the restoration that are common to all of the restoration features include restricted boating, fishing and hunting during construction and for a period afterwards. Recreational use once the habitats are established would be at the discretion of the Refuge or the local sponsor. Earthen retention dikes would remain in place for a period to allow for material to settle out within the restoration feature. Once the restoration is complete and the site matures, direct benefits should accrue to recreational users in the restoration features due to improved habitat quality attracting wildlife or fish. Indirect benefits would also take place in areas surrounding the restoration features as some of the material placed would naturally migrate once the dikes are plugged and/or degrade, nourishing marsh cells and benefiting waterfowl and birds.

The Turtle Bayou feature may not see much change in use from existing conditions since this area is difficult to access. After restoration, it is anticipated that recreational use should remain similar to use today which is mainly hunting.

The proposed restoration at the Bayou Sauvage Flood Side feature may directly impact the youth waterfowl hunting program that takes place during waterfowl hunting season usually between November and January. Depending on when construction begins and the duration, hunting and all recreation use may be restricted during construction and for a period of time afterwards to allow for drainage, settling and consolidation of dredge material.

Positive long-term benefits would likely be realized from the deposition of dredged material into shallow open water areas and onto existing emergent marsh vegetation. The mitigation area would accept the dredge material in its highly turbid form and in time, become continuous, non-turbid, brackish, or saline marsh. Marsh plants consisting of emergent and/or submergent vegetation would become established, complementing the already existing fish and wildlife habitat and increasing future recreational activities in the area.

Hunting and all other recreational uses at the New Zydeco features would also be restricted during construction so as to enable the new material to settle and provide an adequate base for growth. Hunters likely would have to navigate around the site through private land to hunt on NWR lands while the site is closed. Once the site is opened, better habitat from the BLH-W restoration should improve conditions and opportunities for big and small game hunting or bird viewing.

Temporary direct impacts from dredging Lake Pontchartrain include an increase in water turbidity, which would affect fishing in the area of the activity. Dredging activities would disrupt most recreational activity occurring within the area of work; however, these adverse impacts would be temporary and short-lived. There are, however, many other locations in the lake to fish. Once construction activities are completed, the newly dug pits at the lake bottom should offer new habitat and fishing opportunities should return to the area.

Indirect impacts to boaters would be minor and result from placement of the pipeline needed to deliver the dredge material to the restoration features. In general, waterways would remain accessible and would not be totally shutoff from navigation. Where the pipeline crosses a navigable waterway, it would be submerged. In areas where the pipeline crosses a body of waterway, it would run along the waterway near its edge. Boaters may have to travel longer distances to arrive at their destination in areas where the floating pipeline blocks navigation. Indirect impacts would also accrue to areas surrounding the proposed restoration features as wildlife and fish in the vicinity would benefit from improved habitat nearby.

Recreational opportunities should improve in Lake Pontchartrain Basin once all of the LPV mitigation features are restored. These areas would provide valuable habitat to

both fisheries and wildlife using the Lake and surrounding marshes. Long-term cumulative impacts of proposed marsh and BLH creation in the Lake Pontchartrain Basin would have positive impacts on recreational fishing and hunting by increasing habitat nursery and feeding areas. Cumulative impacts of these types of actions normally are positive for recreational resources; however, the negative impacts that occur during construction activities may affect recreational use in the short-term. Since there are an abundant number of places to fish and hunt in the basin, these negative, temporary impacts are expected to only minimally, cumulatively impact recreational resources and are far outweighed by the long-term benefits.

3.2.7 Wetlands

Existing emergent wetlands and shallow open water within the project areas provide important habitat and EFH, including transitional habitat between estuarine and marine environments used by migratory and resident fish, as well as other aquatic organisms for nursery, foraging, spawning, and other life requirements. Emergent fresh, intermediate, and brackish wetlands are typically used by many different wildlife species, including: seabirds; wading birds; shorebirds; dabbling and diving ducks; raptors; rails; coots; and gallinules; nutria; muskrat; mink, river otter, and raccoon; rabbit; white-tailed deer; and American alligator. Emergent saline marshes are typically utilized by: seabirds; wading birds; shore birds; dabbling and diving ducks; rails, coots, and gallinules; other saline marsh residents and migrants; nutria; muskrat; mink, river otter, and raccoon; rabbits; deer; and American alligator.

Open water habitats such as Lake Pontchartrain provide wintering and multiple use functions for brown pelicans, seabirds, and other open water residents and migrants. Open water habitats in the project area provide wintering and multiple use functions for brown pelicans, seabirds, dabbling and diving ducks, coots, and gallinules as well as other open water residents and migrants.

No Action: Without construction of the action alternative, there would be an overall loss of intermediate and brackish marsh and BLH within the system. Subsidence within the system would continue and emergent marsh habitat would continue to be lost resulting in the creation of more open water habitat. BLH habitat would continue to covert to swamp and marsh.

Proposed Action: A cumulative total of approximately 783 acres of existing emergent wetlands and shallow open water would be replaced with approximately 126 acres of intermediate marsh restoration at the Turtle Bayou Protected Side Intermediate Marsh feature, approximately 257 acres brackish marsh restoration and approximately 81 acres of brackish marsh nourishment at the Bayou Sauvage Flood Side Brackish Marsh feature, and the creation of approximately 159 acres of BLH-Wet and the creation of approximately 160 acres of brackish marsh at the New Zydeco Ridge feature. The locations selected for mitigation features were coordinated with USACE and FWS staff to select wetlands areas that provided relatively low habitat quality and improve the habitat through the creation and enhancement of higher quality wetland habitat such as emergent marsh and BLH-Wetland. Although the proposed projects would take place in

existing shallow open water habitats, the overall habitat quality of the project area would be enhanced by the proposed creation of marsh and BLH habitat types that are currently being lost in coastal Louisiana.

3.3 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)

In accordance with Engineering Regulation 1165-2-132, the potential to encounter HTRW in the project area was investigated.

The proposed mitigation features were surveyed via aerial photographs, topographic maps, field investigation, and database searches. The proposed features have not been developed in recent historic times based on a time-series of aerial photography. No recognized environmental concerns were found or identified within or near the proposed mitigation areas. The database searches failed to identify any pipelines crossing the proposed mitigation area or borrow area. Likewise, no oil or gas well or waste pits have been identified. In conclusion, there would be a low probability of encountering HTRW in the proposed mitigation area and borrow area.

3.4 CUMULATIVE IMPACTS

NEPA requires Federal agencies to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action. A cumulative impact is defined as the "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR §1508.7)." Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time.

Cumulative impacts of the proposed action relative to specific resources were discussed in the evaluation of effects to individual resources in Section 3. Those impacts were determined to be individually and cumulatively insignificant. The proposed action is one part of a larger mitigation plan addressed in the PIER 36. The PIER 36 and the Final Comprehensive Environmental Document (CED), Phase I, Greater New Orleans Hurricane and Storm Damage Risk Reduction System (USACE 2013) both included detailed cumulative impact analysis and are incorporated herein by reference. Cumulative impacts of these and other HSDRRS projects will also be evaluated in the CED, Phase II, expected to be released in 2016.

4. COORDINATION AND CONSULTATION

4.1. PUBLIC INVOLVEMENT

Public involvement has been sought in planning the mitigation for HSDRRS impacts beginning with a public notice of the NEPA Alternative Arrangements published in the Federal Register on March 13, 2007, (Federal Register Volume 72, No. 48) which included a commitment to analyze alternatives to determine appropriate mitigation. The notice is available at www.nolaenvironmental.gov.

Mitigation-specific public involvement was sought in preparing the PIER 36, which is supplemented by this document. The details of specific coordination can be found in section 8.1 of the PIER 36.

The draft supplement was distributed for a 30-day public review and comment period on July 9, 2014 and closed Aug 8, 2014. Three comment letters were received from USFWS, NMFS, and the NFS (CPRAB). The USFWS provided comments on SIER 1 by letter dated July 30, 2014. The USFWS letter included a variety of comments related to the design of the mitigation projects and the monitoring and adaptive management plans. The CPRAB provided comments on SIER 1 by letter dated Aug 8, 2014. The CPRAB letter included a variety of comments related to the design of the mitigation projects, the monitoring and adaptive management plans, and the responsibilities of the NFS for future management of the mitigation projects. The NMFS provided comments on SIER 1 by letter dated September 24, 2013. The NMFS letter included a variety of comments related to potential impacts to essential fish habitats and final design of the mitigation projects. Responses to the agency's comment letters can be found in appendix F.

4.2. AGENCY COORDINATION

Preparation of this supplemental has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. An interagency environmental team was established in which Federal and state agency staff played an integral part in the project planning and alternative analysis phases of the HSDRRS mitigation planning (members of this team are listed in appendix O of PIER 36). This interagency environmental team was integrated with the CEMVN project delivery team. A subset of the interagency environmental team participated in the more detailed development and analysis of the refuge mitigation projects and during preparation of this document.

The following agencies and Tribes, as well as other interested parties, received copies of the draft supplement:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, NOAA National Marine Fisheries Service
U.S. Natural Resources Conservation Service
Louisiana Coastal Protection and Restoration Authority Board
Louisiana Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality
Louisiana State Historic Preservation Officer
Alabama Coushatta Tribe of Texas
Caddo Nation of Oklahoma

Chitimacha Tribe of Louisiana
Choctaw Nation of Oklahoma
Coushatta Tribe of Louisiana
Jena Band of Choctaw Indians
Mississippi Band of Choctaw Indians
Seminole Nation of Oklahoma
Seminole Tribe of Florida
Tunica-Biloxi Tribe of Louisiana

USFWS concurred with the CEMVN's determination that the proposed action was not likely to adversely affect Federally-listed threatened or endangered species, or their critical habitat, under the jurisdiction of USFWS. Concurrence received Sept 28, 2015.

NMFS concurred with the CEMVN's determination that the proposed action was not likely to adversely affect Federally-listed threatened or endangered species, or their critical habitat, under the jurisdiction of NMFS. Letter of concurrence received Aug 19, 2015.

NMFS submitted comments on the proposed action that included the following EFH Recommendations in their Aug 8, 2014 letter.

1) The Decision Record should not be signed until acceptable mitigation is developed through coordination with NMFS and other interested natural resource agencies. Revised mitigation details (e.g., amount, location, design, timing, and the 12 items required by mitigation regulations) should be made available for public and agency review and comment prior to signage of the Decision Record. Specific mitigation details we recommend be included in the final SIER prior to signage of the Decision Record include:

a. use of mitigation banks or the ILF are not viable parts of a mitigation plan unless credits are available;
b. revised sizing of mitigation area (New Zydeco brackish marsh) to ensure all impacts to floodside water, submerged aquatic vegetation and marsh are offset.

CEVMN Response: Detailed PED information (including settlement curves, refined project schedules, and other pertinent information) has been provided to the PDT as they were developed. In February 2015, the interagency team reviewed and commented on the 65% DDRs and P&S, and since that time those comments and recommendations have been incorporated where applicable. It is the opinion of CEMVN that the conceptual mitigation plans provided in the draft SIER are sufficiently detailed to inform the public of the plans at each mitigation location. Final WVAs were completed in July 2015 at 95% design which allowed for agency input into final design and O&M plans.

Currently, to mitigate the 23.7 AAHUS of outstanding brackish marsh impacts that can't be mitigated at the BSFSM project and the 2.69 AAHUs of brackish marsh impacts that

would be incurred from access to the mitigation projects during construction (.77 AAHUs protected side impacts at TBPIM, .41 AAHUS at BSFSM, and 1.51 AAHUS at NZR), the construction of approximately 82.3 acres of brackish marsh south of the New Zydeco Ridge BLH-Wet (NZR BLH-Wet) project is proposed. This additional 82.3 acres would be added on to the 66.25 acre New Zydeco Ridge Brackish Marsh (NZR BM) project mitigating for EFH impacts from the NZR BLH-Wet project.

Although we anticipate mitigating the brackish marsh shortfall through the expansion of the NZR BM project, the utilization of released credits from approved mitigation banks or the State of Louisiana's In-Lieu Fee (ILF) program is an alternative to the proposed action. If, for some reason, implementation of an expansion to the NZR BM project became infeasible, the CEMVN may choose, upon further analysis and coordination with the agencies, to mitigate the shortfall using mitigation banks or the ILF program.

2) Alternatively, a supplemental NEPA document should be prepared and advertised for review if sufficient credits do become available through a mitigation bank or the ILF Program.

CEVMN Response: The currently proposed plan only provides for the purchase of mitigation bank/ILF credits if the expansion of the New Zydeco marsh project cannot accommodate the amount of brackish marsh mitigation unable to be completed at Bayou Sauvage.

3) If the mitigation project is not constructed as scheduled during 2016, the USACE should commit to reassessing additive temporal losses and offsetting such losses with additional mitigation.

CEVMN Response: It is the goal of the CEMVN to begin construction of the mitigation projects outlined in this SIER in 2016, as scheduled.

4) The USACE should commit to continued coordination with NMFS and other interested natural resource agencies during PED and construction to ensure adequate mitigation is achieved. This should include review of advanced designs (including settlement curves), plans, and specifications. Mitigation for marsh and open water impacts may need to be rescaled based on revised impact analyses to be conducted on final designs (i.e., 100 percent Design Documentation Reports).

CEVMN Response: Detailed PED information (including settlement curves, refined project schedules, and other pertinent information) has been provided to the PDT as they were developed. In February 2015, the interagency team reviewed and commented on the 65% DDRs and P&S, and since that time those comments and recommendations have been incorporated where applicable. It is the opinion of CEMVN that the conceptual mitigation plans provided in the draft SIER are sufficiently detailed to inform the public of the plans at each mitigation location. Final WVAs were completed in July 2015 at 95% design which allowed for agency input into final design and O&M plans. Final design of the mitigation projects has been adjusted to reflect the

final WVA outputs.

5) Unless addressed separately or differently herein, all NMFS recommendations by letter dated September 24, 2013, on the draft PIER are incorporated by reference (letter enclosed).

CEVMN Response: The CEMVN has received the recommendations in a letter dated 24 September, 2013 and also on 19 August, 2015, and has incorporated them into the planning for the proposed action.

6) To the extent practicable, the final bottom depths of the proposed borrow sites in Lakes Pontchartrain and Borgne should be revised to not exceed 15 to 20 feet below the water surface depending on continued consultation with NMFS.

CEVMN Response: The design of the proposed borrow sites in Lake Ponchartrain would not exceed 17-18 feet in deep upon the completion of project construction.

7) A containment dike gapping plan should be revised through further coordination with NMFS and other interested natural resource agencies and implemented no later than three years after construction. Containment dikes may be gapped, notched, or degraded prior to construction demobilization at the discretion of the USACE. Additional gapping, notching, or degrading may be necessary to achieve tidal connection between the created marsh and adjacent waters. An interagency on-site investigation and use of available survey information is encouraged to assess and field fit needs after fill placement and dewatering.

CEVMN Response: The current containment dike degrading/gapping plan has been coordinated with the resource agencies during advanced design. The proposed mitigation areas will be monitored by the interagency PDT following the completion of placement of dredged material to assure that the material has settled and to document local conditions. These field visits will be used to adjust the gapping plans and to ensure that tidal connection is achieved.

8) As part of the Adaptive Management Plan, water quality monitoring should be conducted at least during March through November for a minimum of three years post dredging to verify the conductance, temperature, dissolved oxygen, and pH from the bottom to surface in five feet profiles. Samples should be collected at least monthly during March, April, September, October and November. During the hotter months of May, June, July, and August, sampling should be conducted once every two weeks. Benthos should be sampled immediately prior to construction and thereafter annually for three years post- dredging to evaluate potential recovery or changes in the community structure.

CEVMN Response: The CEMVN is unclear as to what would trigger implementation of this action as part of the Adaptive Management Plan. Monitoring of the borrow sites would occur as part of the mitigation plan to augment statements made in the SIER.

The Louisiana Department of Natural Resources (LDNR) concurred with the CEMVN's determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; Consistency (C20120046). Concurrence letter received Oct xx, 2015.

CEMVN received a State Water Quality Certificate from the Louisiana Department of Environmental Quality on Nov 12, 2014.

Public notice for the Section 404(b)(l) evaluation was released for a 30 public comment period on Aug 1, 2014. The Section 404(b)(l) evaluation was signed on July 31, 2014.

The Louisiana State Historic Preservation Officer (SHPO) concurred with the CEMVN's recommendation of no adverse effect on historic properties. Concurrence letter received Oct 6, 2014. No comments on the proposed action were received from federally recognized Indian Tribes.

A final Fish and Wildlife Coordination Act Report (CAR) for SIER 1 was provided by the USFWS on Sept. 2, 2015. The final CAR concluded that the USFWS supports the proposed action to mitigate impacts to fish and wildlife resources associated with HSDRRS, specifically the Bayou Sauvage Flood-side Brackish Marsh Restoration, the New Zydeco BLH Habitat Creation, and the Turtle Bayou North Protected-side Intermediate Marsh Restoration projects, and stated that the recommendations provided in the October 28, 2013, FWCA Report addressing the PIER 36 remain valid and should be incorporated into future project planning and implementation (see section 8.2 and appendix Q of PIER 36). A copy of the final report is provided in appendix E. The USFWS project-specific recommendations for the SIER 1 proposed action are listed below:

1) Constructing bottomland hardwood habitat within estuarine open water areas comes with an inherent risk. Salt water intrusion and storm induced salinity impacts will likely be more prevalent in the future. To reduce risk and construction shortfalls, we recommend considering higher target elevations (e.g. +3.0 to +3.5 feet NAVD88) and planting vegetation that has tolerance for low salinity water.

CEVMN Response: Concur, project designs have been modified to reflect these elevations.

2) While "General Mitigation Guidelines" for monitoring, success criteria, and reporting requirements were developed by the Corps in coordination with the Interagency Team, project-specific mitigation guidelines will also need to be reviewed and agreed upon by the Interagency Team including the Non-Federal Sponsor. Please provide project specific monitoring plans and success criteria for agency review and continue to coordinate with the agencies to finalize those plans.

CEVMN Response: Concur, project specific monitoring plans and success criteria are being developed and will be shared with the Interagency Team and Non-Federal Sponsor.

3) Comments provided by the Service and NMFS on the "General Mitigation Guidelines" provided in the PIER 36 and in the Milton Island Marsh Restoration TIER 1, and comments provided by the Service in response to the draft SIER 1 NEPA document are applicable and should be incorporated in the Mitigation Guidelines addressed in SIER 1.

CEVMN Response: Concur, the General Mitigation Guidelines have been updated in coordination with the resource agencies.

4) Newly developed mitigation guidelines are being approved by the Corps' Regulatory Division and the Interagency Review Team. Mitigation guidelines, including monitoring and survey requirements, for this project, as well as future LPV mitigation features, should coincide with those Regulatory guidelines as much as possible and should continue to be conducted in coordination with the Interagency team. Once the Corps revises the project specific mitigation guidelines based on comments received on the SIER, please provide the revised plan to the agencies for review.

CEVMN Response: Concur. The guidelines will be provided to the agencies for review.

5) Areas of marsh outside of the mitigation sites are expected to be nourished by dredge effluent during construction. Should the Corps decide to include those areas in the mitigation plan, pre-construction surveys, as-build surveys, and additional monitoring requirements will be necessary.

CEVMN Response: Concur.

6) A fully defined mitigation plan should be included in the authorizing report and Decision Record. The mitigation plan should be developed including locations and AAHUs vetted through the natural resource agencies. Only existing mitigation banks and existing credits released by Corps Regulatory Branch may be considered.

CEVMN Response: Concur.

7) Water quality monitoring within the borrow areas is recommended, and should be conducted at least during March through November for a minimum of three years post dredging to verify the conductance, temperature, dissolved oxygen, and pH from the bottom to surface in five feet profiles. Samples should be collected at least monthly during March, April. September, October, November. During the hotter months of May, June, July and August, sampling should be conducted once every two weeks. Benthos should be sampled immediately prior to construction and thereafter annually for three years post-dredging to evaluate potential recovery or changes in the community structure.

CEVMN Response: Concur on the water quality monitoring. Benthic community structure and predicted response to dredging in the vicinity of the project areas was addressed in Ray 2007.

4.3. COMPLIANCE WITH ENVIRONMENTAL LAWS, REGULATIONS, AND GUIDANCE

Environmental compliance for the proposed action has been achieved. The correspondence documenting compliance is included in Appendix E. Other specific environmental requirements were addressed in the PIER 36 and require no further consideration is this SIER. A Section 404 (b)(1) public notice was distributed for 30-day public review and no comments were received. A section 404 evaluation was developed and signed. The public notice and evaluation are included as Appendix E.

5. MITIGATION SUCCESS CRITERIA, MITIGATION MONITORING AND REPORTING, AND ADAPTIVE MANAGEMENT

An effective monitoring program is required by the Water Resources Development Act of 2007, Section 2036, to determine if the project outcomes are consistent with the identified success criteria. A monitoring plan including success criteria, monitoring requirements, and planting guidelines for the proposed mitigation projects has been developed and is included in Appendix C.

The purpose of adaptive management activities in the life-cycle of the project is to address ecological and other uncertainties that could prevent successful implementation of a project. Adaptive management also establishes a framework for decision making that utilizes monitoring results and other information, as it becomes available, to update project knowledge and adjust management/mitigation actions. Hence, early implementation of adaptive management and monitoring allows for a project that can succeed under a wide range of conditions and can be adjusted as necessary. Furthermore, careful monitoring of project outcomes both advances scientific understanding and helps adjust operations changes as part of an iterative learning process. An adaptive management plan has been developed and is included as Appendix D.

6. CONCLUSION

The proposed action has been assessed for its potential impacts to wildlife, threatened and endangered species, fisheries, aquatic resources, water quality, essential fish habitat, cultural resources, and recreation, and for the potential of the project to encounter HTRW. The proposed action would provide the 126.85 AAHU of mitigation required for general and refuge brackish marsh impacts, 41.29 AAHU of mitigation for refuge intermediate marsh impacts, and 92.83 AAHU of mitigation for refuge BLH-Wet impacts from construction of the Lake Pontchartrain and Vicinity HSDDRS. These

benefits would be realized through restoration and nourishment of 338 acres of brackish marsh at the Bayou Sauvage Flood Side Brackish Marsh feature, restoration of 126 acres of intermediate marsh at the Turtle Bayou Protected Side Intermediate Marsh feature, and the restoration of 159 acres of BLH-Wet at the New Zydeco Ridge-BLH feature.

The conversion of approximately 159 acres of EFH from shallow open water to non-tidal BLH-Wet habitat at the New Zydeco Ridge site would be offset by the construction of approximately 66.25 acres of brackish marsh adjacent to the New Zydeco Ridge-BLH feature at the New Zydeco Ridge Brackish Marsh feature. Also, to address the portion of the brackish marsh mitigation that cannot be completed at the Bayou Sauvage Flood Side Brackish Marsh Restoration project (23.7 AAHUs) as well as access impacts that would occur from construction of the mitigation projects, approximately 82.3 additional acres of emergent brackish marsh would also be created within the New Zydeco Ridge Brackish Marsh feature, resulting in restoration of approximately 160 acres of intermediate/brackish marsh at the New Zydeco Ridge site. Construction of the proposed action is recommended to satisfy the general/refuge brackish marsh, PS/FS refuge BLH-Wet, and PS refuge intermediate marsh impacts from construction of the LPV HSDRRS.

7. PREPARERS

This SIER 1 was prepared by the following:

Name	Discipline
Elizabeth Behrens	Biologist
Daniel Sumerall	Biologist
Patrick Erwin	Project Manager
Mathew Mallard	Plan Formulator
Sean Mickal	Plan Formulator
Andrew Perez	Outdoor Recreation Planner
Eric Williams	Archaeologist
Sandra Stiles	Chief, Coastal Env Planning Section

7. LITERATURE CITED

Abadie, S.W., C.G. Brantley, S. Mickal, and S. Shively. 2000. "Distribution of the Manatee, (*Trichechus manatus*), in the Lake Pontchartrain Estuarine System." Basics of the Basin Research Symposium, Lake Pontchartrain Basin Foundation.

Clarke, D. G. and T. Miller-Way. 1992. An environmental assessment of the effects of open-water disposal of maintenance dredged material on benthic resources in Mobile Bay, Alabama. U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS, Miscellaneous Paper D-92-1, 40 p.

Flocks, J. and C. Franze. 2001. Dredge pit characterization, in S. Penland, A. Beall and J. Waters, (eds.), Environmental Atlas of the Lake Pontchartrain Basin. Lake Pontchartrain Basin Foundation, New Orleans, LA, pp. 153.

Gagliano, Sherwood M.1983. Level I Cultural Resources Evaluation of the Rigolets Estates Property, St. Tammany Parish, Louisiana. Report #22-0655.

Heller, Nathanael, Troy J. Nowak, Kathryn A. Ryberg, Lindsay Hannah, Ginny Jones, and Emily Crowe 2004. Management Summary: Phase I Cultural Resources Survey and Archaeological Inventory, Nautical Remote Sensing Survey, and Phase II National Register Testing and Evaluation of Locus 07-02-E-01, Target 36_2, and Site 16OR453, Performed for Lake Pontchartrain and Vicinity Project, Individual Environmental Report Area 7 (IER # 7), Orleans Parish, Louisiana. Report #22-3216.

Klinger, Timothy C. and John L. Gray IV 2000. PF.NET, LLC New Orleans-Pensacola Louisiana Documentation, Historic properties review of a proposed fiber optics corridor within Louisiana Management Units IV and V, Mississippi River Drainage Basin, Orleans and St. Tammany parishes, Louisiana. Report #22-2267.

Kowalski, Jessica A., Richard A. Weinstein, Sara A. Hahn, Sally A. Morehead, Anne Marie M. Blank and Richard S. Fuller 2011. Terrestrial Cultural Resources Investigations for the MRGO Ecosystem Restoration Project, Southeast Louisiana. Report #22-4057.

Leathem, W., P. Kinner, D. Maurer, R. Briggs and W. Treasure. 1973. Effect of spoil disposal on benthic invertebrates. Marine Pollution Bulletin 4: 122-125.

Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTF) & Wetlands Conservation and Restoration Authority (WCRA). 1999. Coast 2050: Toward a Sustainable Coastal Louisiana. Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority.

Louisiana Department of Wildlife and Fisheries (LDWF). 2005. Louisiana Department of Wildlife and Fisheries (LDWF) 2004-2005 Annual Report. Louisiana Department of Wildlife and Fisheries, Baton Rouge, Louisiana. 58 p.

McCauley, J. E., D. R. Hancock and R. A. Parr. 1976. Maintenance dredging and four polychaete worms. p. 673-683 in Proceedings of the Specialty Conference on Dredging and Its Environmental Effects, Mobile, AL. American Society of Civil Engineers.

McCauley, J. E., R. A. Parr and D. R. Hancock. 1977. Benthic infauna and maintenance dredging: a case study. Water Research 11: 233-242.

National Marine Fisheries Service (NMFS) Galveston Lab. 1998. EFH Mapping. Accessed at http://galveston.ssp.nmfs.gov/efh.

Neuman, Robert W.1970. Archaeological Survey of the Lake Pontchartrain Hurricane Project Area, Southeast Louisiana. Report #22-0226.

New World Research, Inc.1983. Cultural Resources Survey of Terrestrial and Offshore Locations, Lake Pontchartrain and Vicinity Hurricane Protection Project, Louisiana. Report #22-0811.

Penland, S., A. Beall and J Kindinger (eds.). 2002. Environmental Atlas of the Lake Pontchartrain Basin. Prepared for Lake Pontchartrain Basin Foundation, University of New Orleans, U.S. Geological Survey and U.S. Environmental Protection Agency. U.S. Geological Survey Open-File Report 02-206. New Orleans, Louisiana 194 p.

Pearson, Charles E., Wouldiam D. Reeves, David B. Kelley, and Richard A. Weinstein 1994 A Phase I Cultural Resources Evaluation of the Bayou Sauvage National Wildlife Refuge, Orleans Parish, Louisiana. Report #22-1730.

Pearson, Charles E., and Kelsey Lowe 2010. Phase I Cultural Resources Investigations, Remote-Sensing Survey, MRGO Ecosystem Restoration Shoreline Protection Louisiana. Management Summary on file at the U.S. Army Corps of Engineers, New Orleans District.

Powell, J.A. and C.R. Taylor, eds. 2005. Sirenews: Newsletter of the IUCN/SSC Sirenia Specialist Group. Number 44. October.

Ray, Gary L 2007. Characterization of Benthic Habitats Associated with Potential Borrow Sites and Access Channels in Lake Borgne, Louisiana. A Report to the U.S. Army Engineer District, New Orleans. U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi 23 p.

Rivet, Philip G.1975. Archaeological Survey of Five Bridge Replacements, Micheaud - Lake Pontchartrain, Route LA U.S. 11, Orleans Parish, Louisiana. Report #22-0254.

Rounsefell, G. 1964. Preconstruction Study of the Fisheries of the Estuarine Areas Traversed by the Mississippi River-Gulf Outlet Project. Bureau of Commercial Fisheries, U.S. Fish and Wildlife Service, Fisheries Bulletin, 63 (2): 373-393.

Schurtz, M.H., and K.M. St. Pe'. 1984. Report on Interim Findings, Water Quality Investigation of Environmental Conditions in Lake Pontchartrain. Louisiana Department of Environmental Quality, Water Pollution Control Division. 248 p.

Sikora, W.B., and J.P. Sikora. 1982. Ecological characterization of the benthic community of Lake Pontchartrain, Louisiana. Coastal Ecology Lab, Center for Wetland Resources, La. St. Univ. Baton Rouge. Publication No. LSU-CEL - 82-05. 214 p.

Swenson, F.M. 1980. General hydrography of tidal passes of Lake Pontchartrain, Louisiana. pp. 157-215. In: J.H. Stone, ed. Environmental analysis of Lake Pontchartrain, Louisiana, its surrounding wetlands, and selected land uses. CEL, CWR, LSU, BR, LA. Prepared for U.S. Army Engineer District, New Orleans. Contract No. DAC W29-77-C-0253. Two Volumes. 1219 p.

Tarver, J.W., and L.B. Savoie. 1976. An inventory and study of the Lake Pontchartrain-Lake Maurepas estuarine complex, Phase III-hydrology and water chemistry. La. Wildlife and Fisheries Comm. Technical Bulletin No. 19. 159 p.

Stout, Michael E. 1985. Remote Sensing Investigation of the New Orleans East Lakefront Levee Flotation Access Channels, Lake Pontchartrain and Vicinity Hurricane Protection Project, Orleans Parish, Louisiana. Report #22-1080.

U.S. Army Corps of Engineers. 2013. Final Comprehensive Environmental Document, Phase I, Greater New Orleans Hurricane and Storm Damage Risk Reduction System, New Orleans, Louisiana. 676 p.

U.S. Fish and Wildlife Service (USFWS). 1977. Endangered and Threatened Wildlife and Plants; Final Rule, Correction and Augmentation of Published Rulemaking on Critical Habitats. Federal Register 50 CFR Part 17, Volume 42, No. 184, pp. 44840 - 47845.

U.S. Fish and Wildlife Service (USFWS). 2001. Florida Manatee Recovery Plan (*Trichechus manatus latirostris),* third revision. USFWS Southeast Region. October 30, 2001.

U.S. Fish and Wildlife Service (USFWS). 2007. West Indian Manatee *(Trichechus manatus)* 5-Year Review: Summary and Evaluation. USFWS Southeast Region. April 2007.

U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). 2003. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Gulf Sturgeon. Federal Register. Vol. 68, No. 53, pp. 13370-13418. Washington, D.C. March 19, 2003.

Van Dolah, R. F., D. R. Calder, D. M. Knott and M. S. Maclin. 1979. Effects of dredging and unconfined disposal of dredged material on macrobenthic communities in Sewee

Bay, South Carolina. South Carolina Marine Resources Center Technical Report No. 39, April 1979. 54 p.

Van Dolah, R. F., D. R. Calder and D. M. Knott. 1984. Effects of dredging and open-water disposal on benthic macroinvertebrates in a South Carolina estuary. Estuaries 7:28-37.