DRAFT PROGRAMMATIC INDIVIDUAL ENVIRONMENTAL REPORT #36

LAKE PONTCHARTRAIN AND VICINITY HURRICANE STORM DAMAGE AND RISK REDUCTION MITIGATION

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1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared this Programmatic Individual Environmental Report # 36 (PIER # 36) to evaluate alternatives for mitigating the impacts associated with the construction of the Lake Pontchartrain and Vicinity (LPV) 100-year Hurricane and Storm Damage Risk Reduction System (HSDRRS). The term "100-year level of risk reduction," as it is used throughout this document, refers to a level of risk reduction that reduces the risk of hurricane surge and wave driven flooding that the New Orleans Metropolitan Area has a 1 percent chance of experiencing each year. The HSDRRS work consists of upgrading the existing system of levees, floodwalls and gates around the New Orleans Metropolitan Area to provide the 100-year level of risk reduction. The LPV portion of the HSDRRS is the work that is occurring on the east bank of the Mississippi River. A list of the abbreviations used in the PIER is provided in appendix P.

This PIER provides an assessment of the compensatory mitigation plan for the LPV HSDRRS impacts known to date and identifies the tentatively selected mitigation plan alternative (TSMPA). Sufficient detail and impact analysis is presented for certain features (projects) in the LPV HSDRRS mitigation plan such that parts of the overall plan are recommended for implementation at this time (referred to as 'constructible projects within the PIER). Additional National Environmental Policy Act (NEPA) document(s) providing greater detail and full impact assessment on the other projects in the plan currently assessed at a programmatic level (referred to as 'programmatic projects within the PIER) would follow (tier off) this PIER once the plans and specifications for those projects are complete. Those future tiered IERs are referred to as "TIERs" within the PIER.

Impacts from construction of the LPV HSDRRS are described in IERs 1-11, 18, 19, 22, 23, 25-32, 35, and their associated Supplemental IERs (IERS). The LPV HSDRRS IERs are available on www.nolaenvironmental.gov. The CEMVN has made and continues to make a concerted effort to avoid and minimize environmental impacts to the maximum extent practicable while designing and constructing the HSDRRS. However, unavoidable impacts have occurred and continue to occur to fresh marsh, intermediate marsh, brackish marsh, bottomland hardwoods dry (BLH-Dry), bottomland hardwoods wet (BLH-Wet), and swamp. When unavoidable impacts occur, the CEMVN is required to offset those impacts through compensatory mitigation by replacing the lost habitat's functions and services equally and in-kind within the same hydrologic basin as the impacts occurred. Compensatory mitigation is required by the Water Resources Development Acts (WRDA) of 1986 and 2007 and by the Clean Water Act Section 404(b)(1) Guidelines. It is an integral feature of the HSDRRS work.

PIER # 36 has been prepared in accordance with the NEPA and the Council on Environmental Quality's (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] §1500-1508), as reflected in the USACE ER 200-2-2 (33 CFR §230). This PIER has been prepared in lieu of a traditional environmental assessment (EA) or Environmental Impact Statement (EIS) pursuant to the CEQ approved NEPA Emergency Alternative Arrangements (40 CFR §1506.11). The Alternative Arrangements can be found at www.nolaenvironmental.gov, and are herein incorporated by reference.

The CEMVN published the Alternative Arrangements in the Federal Register on 13 March 2007. This process was implemented to expeditiously complete environmental analysis for the 100-year level of the HSDRRS, formerly known as the Hurricane Protection System (HPS). The proposed actions are located

in southeastern Louisiana (LA) and are part of the Federal effort to construct the HSDRRS in the New Orleans Metropolitan area after the destruction caused by Hurricanes Katrina and Rita.

This draft PIER will be distributed for a 30-day public review and comment period. A public meeting specific to the proposed action would be held if requested by a stakeholder during the review period. Any comments received during that public meeting would be considered part of the official record. After the 30-day comment period, and public meeting if requested, the CEMVN Commander would review all comments received during the review period and make a determination on whether they rise to the level of being substantive. If no substantive comments are received the CEMVN Commander would make a decision on the proposed action. This decision would be documented in a Decision Record (DR) for the PIER. If a comment(s) is determined to be substantive, an Addendum to the IER responding to the comment(s) would be prepared and published for an additional 30-day public review and comment period. After the expiration of the public comment period the CEMVN Commander would then make a decision on the proposed action that would be documented in a DR for the PIER.

Unless otherwise indicated, all figures cited within this PIER can be found in appendix A and all tables in appendix B.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

The purpose of the proposed action is to compensate for habitat losses incurred during construction of the LPV HSDRRS to six specific types of habitat: fresh marsh, intermediate marsh, brackish marsh, swamp, BLH-Dry and BLH-Wet. These habitat types are described in section 2.1. The proposed mitigation would replace the lost functions and services of the impacted habitat through restoration or enhancement activities designed to create/increase/improve the habitat functions and services at specific mitigation sites. Impacts to a National Wildlife Refuge (NWR) would be mitigated in kind on the refuge impacted as per the Department of Interior (DOI) Policy (FR Vol. 64, No. 175, 10 Sep 1999). If sufficient opportunity to mitigate refuge impacts on the NWR impacted does not exist then mitigation on another refuge in the same complex would be allowed as per U.S. Fish and Wildlife Services' (USFWS) HSDRRS compensatory mitigation planning aid letter (14 May 2013). CEMVN agreed to adhere to the DOI Policy during consultations with the USFWS in compliance with the Fish and Wildlife Coordination Act (FWCA) for HSDRRS work impacting the Bayou Sauvage NWR.

1.2 AUTHORITY FOR THE PROPOSED ACTION

The authority for the proposed action was provided as part of a number of hurricane and storm damage risk reduction projects spanning southeastern LA, including the LPV project and the West Bank and Vicinity (WBV) project. Congress passed a series of supplemental appropriations acts following Hurricanes Katrina and Rita to repair and upgrade the projects damaged by these storms.

The LPV project was authorized under the Flood Control Act of 1965 (PL [Public Law] 89-298, Title II, Sec. 204) which authorized a "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 statutory authorization for the LPV Project was amended by the WRDA of 1974 (PL 93-251, Title I, Sec. 92), 1986 (PL 99-662, Title VIII, Sec. 805), 1990 (PL 101-640, Sec. 116); 1992 (PL 102-580, Sec. 102), 1996 (PL 104-303, Sec. 325), 1999 (PL 106-53, Sec. 324),

and 2000 (PL 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 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 full Federal expense. 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 modification to LPV to provide the level of protection necessary to achieve the certification required for participation in the National Flood Insurance Program; the replacement or reinforcement of floodwalls; and the construction of levee armoring at critical locations.

1.3 PUBLIC CONCERNS

Throughout the LPV basin, the public has expressed concern that sufficient funding be allocated for the HSDRRS mitigation efforts and that the HSDRRS mitigation is completed in a timely manner. Concern has also been expressed that mitigation banks are given the opportunity to sell credits to satisfy the HSDRRS mitigation requirement.

1.4 PRIOR REPORTS

1.4.1 INTRODUCTION

A number of studies and reports on water resources development in the proposed project area have been prepared by CEMVN, other Federal, state, and local agencies, research institutes, and individuals. Pertinent studies, reports, and projects are discussed in the following sections.

1.4.2 NEPA DOCUMENTS

- In July 2006, the CEMVN Commander signed a Finding of No Significant Impact (FONSI) on an EA # 433 entitled, “USACE Response to Hurricanes Katrina & Rita in Louisiana.” The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of impacts incurred to the system from Hurricanes Katrina and Rita.

- On 30 October 1998, the CEMVN Commander signed a FONSI on EA # 279 entitled “Lake Pontchartrain Lakefront, Breakwaters, Pump Stations 2 and 3.” The report evaluates the impacts associated with providing fronting protection for outfall canals and pump stations. It was determined that the action would not significantly impact resources in the immediate area.

- On 2 October 1998, the CEMVN Commander signed a FONSI on EA # 282 entitled “LPV, Jefferson Parish Lakefront Levee, Landside Runoff Control: Alternate Borrow.” The report investigates the impacts of obtaining borrow material from an urban area in Jefferson Parish. No significant impacts to resources in the immediate area were expected.

- On 2 July 1992, the CEMVN Commander signed a FONSI on EA # 169 entitled "LPV, Hurricane Protection Project, East Jefferson Parish Levee System, Jefferson Parish, Louisiana, Gap Closure." The report addresses the construction of a floodwall in Jefferson Parish to close a "gap" in the levee system. The area was previously leveed and under forced drainage, and it was determined that the action would not significantly impact the already disturbed area.

- On 22 February 1991, the CEMVN Commander signed a FONSI on EA # 164 entitled "LPV Hurricane Protection – Alternate Borrow Area for the St. Charles Parish Reach." The report addresses the impacts associated with the use of borrow material from the Mississippi River on the left descending back in front of the Bonnet Carré Spillway Forebay for LPV construction.

- On 30 August 1990, the CEMVN Commander signed a FONSI on EA # 163 entitled "LPV Hurricane Protection – Alternate Borrow Area for Jefferson Parish Lakefront Levee, Reach III." The report addresses the impacts associated with the use of a borrow area in Jefferson Parish for LPV construction.

- On 2 July 1991, the CEMVN Commander signed a FONSI on EA # 133 entitled "LPV Hurricane Protection – Alternate Borrow at Highway 433, Slidell, Louisiana." The report addresses the impacts associated with the excavation of a borrow area in Slidell, LA, for LPV construction.

- On 12 September 1990, the CEMVN Commander signed a FONSI on EA # 105 entitled "LPV Hurricane Protection – South Point to Gulf Intracoastal Waterway, A. V. Keeler and Company Alternative Borrow Site." The report addresses the impacts associated with the excavation of a borrow area in Slidell, LA, for LPV construction.

- On 12 March 1990, the CEMVN Commander signed a FONSI on EA # 102 entitled "LPV Hurricane Protection – 17th Street Canal Hurricane Protection." The report addresses the use alternative methods of providing flood damage risk reduction for the 17th Street Outfall Canal in association with LPV activity. Impacts to resources were found to be minimal.

- On 4 August 1989, the CEMVN Commander signed a FONSI on EA # 89 entitled "LPV Hurricane Protection, High Level Plan - Alternate Borrow Site 1C-2B." The report addresses the impacts associated with the excavation of a borrow area along Chef Menteur Highway, Orleans Parish for LPV construction. The material was used in the construction of a levee west of the Inner Harbor Navigation Canal (IHNC).

- On 27 October 1988, the CEMVN Commander signed a FONSI on EA # 79 entitled "LPV Hurricane Protection – London Avenue Outfall Canal." The report investigates the impacts of strengthening hurricane and storm damage risk reduction at an existing the London Avenue Outfall Canal.

- On 21 July 1988, the CEMVN Commander signed a FONSI on EA # 76 entitled "LPV Hurricane Protection – Orleans Avenue Outfall Canal." The report investigates the impacts of strengthening hurricane and storm damage risk reduction at an existing the Orleans Avenue Outfall Canal.

- On 26 February 1986, the CEMVN Commander signed a FONSI on EA # 52 entitled "LPV Hurricane Protection – Geohegan Canal." The report addresses the impacts associated with the excavation of borrow material from an extension of the Geohegan Canal for LPV construction.

- On 12 June 1987, the CEMVN Commander signed Supplemental Information Report (SIR) # 25 entitled "LPV Hurricane Protection – Chalmette Area Plan, Alternate Borrow Area 1C-2A." The report addresses the used of an alternate CF borrow area for LPV construction.

- On 12 June 1987, the CEMVN Commander signed SIR # 27 entitled "LPV Hurricane Protection – Alternate Borrow Site for Chalmette Area Plan." The report addresses the used of an alternate CF borrow area for LPV construction.

- On 12 June 1987, the CEMVN Commander signed SIR # 28 entitled "LPV Hurricane Protection – Alternate Borrow Site, Mayfield Pit." The report addresses the use of an alternate CF borrow area for LPV construction.

- On 12 June 1987, the CEMVN Commander signed SIR # 29 entitled "LPV Hurricane Protection – South Point to Gulf Intercoastal Waterway (GIWW) Levee Enlargement." The report discusses the impacts associated with the enlargement of the GIWW.

- On 7 October 1987, the CEMVN Commander signed SIR # 30 entitled "LPV Hurricane Protection Project, Jefferson Lakefront Levee." The report investigates impacts associated with changes in Jefferson Parish LPV levee design.

- On 30 April, 1986, the CEMVN Commander signed SIR # 17 entitled "LPV Hurricane Protection – New Orleans East Alternative Borrow, North of Chef Menteur Highway." The report addresses the use of an alternate CF borrow area for LPV construction.

- On 5 August 1986, the CEMVN Commander signed SIR # 22 entitled "LPV Hurricane Protection – Use of 17th Street Pumping Station Material for LPHP Levee." The report investigates the impacts of moving suitable borrow material from a levee at the 17th Street Canal in the construction of a stretch of levee from the IHNC to the London Avenue Canal.

- On 3 September 1985, the CEMVN Commander signed SIR # 10 entitled "LPV Hurricane Protection, Bonnet Carré Spillway Borrow." The report evaluates the impacts associated with using the Bonnet Carré Spillway as a borrow source for LPV construction, and found that "no significant adverse effect on the human environment."

- In December 1984, an SIR to complement the Supplement to final EIS on the LPV Hurricane Protection Project was filed with the U.S. Environmental Protection Agency (USEPA).

- In August 1974 the EIS for the LPV Hurricane Protection Project was finalized. On 2 December 1974, the CEMVN Commander signed A Statement of Findings. Final Supplement I to the EIS, dated July 1984, was followed by a Record of Decision (ROD), signed by the CEMVN

Commander on 7 February1985. Final Supplement II to the EIS, dated August 1994, was followed by a ROD signed by the CEMVN Commander on 3 November 1994.

- On 18 December 1927 a report was submitted entitled "Flood Control, Mississippi River and Tributaries," published as House Document No. 90, 70th Congress, 1st Session that resulted in authorization of a project by the Flood Control Act of 1928. The project provided comprehensive flood control for the lower Mississippi Valley below Cairo, Illinois. The Flood Control Act of 1944 authorized the USACE to construct, operate, and maintain water resources development projects. The Flood Control Acts have had an important impact on water and land resources in the proposed project area.

1.4.3 LPV NEPA DOCUMENTS COMPLETED UNDER ALTERNATIVE ARRANGEMENTS

1.4.3.1 LPV HSDRRS IERs and Impacts

Impacts to the human and natural environment caused by construction of the LPV HSDRRS work (appendix A, figure 1) were analyzed in numerous IERs. Impacts to wetlands and non-jurisdictional bottomland hardwoods or BLH-Dry require mitigation by the USACE to reduce the level of impacts and ensure no net loss of these habitat's functions and services. Jurisdictional wetlands and non-jurisdictional bottomland hardwoods forest impacts were assessed in cooperation with an interagency mitigation team in accordance with the NEPA, the Fish and Wildlife Coordination Act, and Section 906(b) WRDA 1986 requirements. Because some discrepancies were found in the impacts documented in the IERs verses the Coordination Act Reports (CARs) and/or in the DRs for the IERs, verification/reconciliation of the correct impact numbers was necessary. In coordination with USFWS and National Marine Fisheries Service (NMFS), the project delivery team (PDT) documented these discrepancies in a memorandum (appendix C). The verified final impact numbers can be found in this memo as well as appendix B, table 1.

A "habitat-based methodology" in the form of the wetland value assessment (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 and future without project conditions. The difference is expressed as net average annual habitat units (AAHUs). For example, if the net change between the future without project condition (FWOP) and future with project (FWP) over the 50-year period of evaluation is a +0.2 over 100 acres, then that project would produce 20 AAHUs of ecological benefit. The same version of the model was used to calculate both the impacts from construction the HSDRRS work and future benefits to be obtained through the implementation of the mitigation. For further information regarding WVA models please see section 2.6.

IER 1

IER1, DR signed by the CEMVN Commander on 9 June 2008, entitled "Lake Pontchartrain and Vicinity, La Branche Wetlands Levee, St. Charles Parish, Louisiana." The proposed action included raising approximately 9 miles of earthen levees, replacing over 3,000 feet of floodwalls, rebuilding or modifying four drainage structures, closing one drainage structure, and modifying one railroad gate in St. Charles Parish, LA.

IERS1 - Supplement to IER1, DR signed by the CEMVN Commander on 29 June 2009, entitled "Lake Pontchartrain and Vicinity, La Branche Wetlands Levee, St. Charles Parish, Louisiana." This supplement proposed modifications to actions approved in IER 1 in order to incorporate a levee flood side shift, replacement of a floodwall with a levee segment, the use of high strength geotextile fabric, construction of drainage structures in proposed locations, construction of new access roads and temporary bridges, use of cofferdams, and use of existing access roads along the La Branche Wetlands in St. Charles Parish, LA.

IERS 1.b - Supplement to IER1 and IERS1, DR signed by the CEMVN Commander on 6 July 2011, entitled "La Branche Wetland Levee, LPV 04.2B Access Road and Ditch Relocation, St. Charles Parish, Louisiana." IERS 1.b addressed the relocation of a drainage ditch and portions of the Fox Lane access road outside of the Pontchartrain Levee District easement onto Pontchartrain Levee District property and providing proper access to the levee reach.

Total IER1 impact discussion
The total impacts of the proposed actions from IER1 and supplements IER1 and IER1.b were 143.6 acres (110.97 AAHUs) of flood side (FS) swamp, 137.05 acres (73.99 AAHUs) of protected side (PS) swamp, and 11.33 acres (8.09 AAHUs) of FS BLH-Wet, and 1.5 acres (0.19 AAHUs) of PS BLH-Wet totaling 293.5 acres (193.2 AAHUs). In addition, the temporary and permanent losses of 19.41 acres of open water were anticipated.

IER 2
IER 2, DR signed by the CEMVN Commander on 18 July 2008, entitled "Lake Pontchartrain and Vicinity, West Return Floodwall, Jefferson and St. Charles Parishes, Louisiana." The document was prepared to evaluate potential impacts associated with replacing the existing floodwall with a new T-wall along the east embankment of the Parish Line Canal on the border of Jefferson and St. Charles Parishes.

IERS2 - Supplement to IER2, DR signed by the CEMVN Commander on 29 October 2009, entitled "Lake Pontchartrain and Vicinity, West Return Flood Wall, Jefferson and St. Charles Parish, Louisiana." The supplemental document evaluated modifications to the action approved in IER2 to remove the sharp angle from the system alignment near the Louis Armstrong International Airport in Jefferson Parish, LA; to widen the flood side base slab along the entire stretch of floodwall to create an inspection road; to convert pedestrian gates to vehicular gates and turn-arounds to accommodate flood side inspections; to construct certain floodwall reaches 20-25 ft flood side of the existing location versus the approved 35 ft shift flood side; and to remove a gate near the Recurve I-Wall.

IERS 2.a - Supplement to IER2 and IERS2, DR signed by the CEMVN Commander on 9 February 2012, entitled "Lake Pontchartrain and Vicinity, West Return Floodwall, Jefferson and St. Charles Parish, Louisiana." The document evaluates the installation of a rainwater drainline and transfer lines for conveying runoff from the West Return Floodwall to the existing City of Kenner drainage system.

Total IER2 impact discussion
The total impacts of the proposed actions from IER2 and supplements IER2 and IER2.a were noted as 2 acres (1.55 AAHUs) of FS swamp and 31.5 acres (20.45 AAHUs) of FS brackish marsh including 16 acres of open water from IER2 to be mitigated as marsh and for a total habitat impact of 33.5 acres (22

AAHUs). In addition, the permanent loss of 3 acres of open water and the temporary loss of 75 acres of water bottom were anticipated.

IER 3

IER3, DR signed by the CEMVN Commander on 25 July 2008, entitled "Lake Pontchartrain and Vicinity, Lakefront Levee, Jefferson Parish, Louisiana." The proposed action included the rebuilding earthen levees, upgrading of foreshore protection, replacement of two floodgates, and construction of fronting protection and construction or modification of breakwaters at four pumping stations along the lakefront in Jefferson Parish, LA.

IERS 3.a - Supplement to IER3, DR signed by the CEMVN Commander on 18 December 2009, "Jefferson East Bank, Jefferson Parish, Louisiana." The document was prepared to evaluate the impacts associated with modifications to the approved actions in IER3 including the construction of wave attenuation berms and foreshore protection along the Jefferson Parish lakefront and a T-wall, overpass bridge, and traffic detour lane bridge spans at the Causeway Bridge abutment, additional rock armoring of a breakwater along the Lake Pontchartrain lakeshore, movement of a breakwater access bridge, and an earthen ramp in lieu of a gate within the recurve I-Wall.

Total IER3 impact discussion

The total impacts of the proposed actions from IER3 and supplement IER3.a were to lake habitat, 326.5 acres of temporary impact and 90.5 acres of permanent impact. However, the 90.5 acres of permanent lake habitat impacts would be mitigated for in coordination with the Federal and state resource agencies (see appendix O for a list of resource agencies).

IER 4

IER4, DR signed by the CEMVN Commander on 13 March 2009, entitled "Lake Pontchartrain and Vicinity, Orleans East Bank, New Orleans Lakefront Levee, West of Inner Harbor Navigation Canal to East Bank of 17th Street Canal, Orleans Parish, Louisiana." The document was prepared to evaluate the potential impacts associated with improving the Orleans lakefront hurricane risk reduction features including rebuilding and/or modifying earthen levees and floodwalls, replacing or adding new floodgates, modifying the Bayou St. John gate structure, and rebuilding roadway ramps.

Total IER4 impact discussion

The IER4, DR and draft CAR provided by the USFWS on 6 March 2009 concluded that there would be no significant fish and wildlife resources impacted as a result of the proposed action.

IER 5

IER5, DR signed by the CEMVN Commander on 30 June 2009, entitled "Lake Pontchartrain and Vicinity, Permanent Protection System for the Outfall Canals Project on 17th Street, Orleans Avenue, and London Avenue Canals, Jefferson and Orleans Parishes, Louisiana." The document evaluated the potential effects associated with the construction and maintenance of a permanent protection system for the 17th Street, Orleans Avenue, and London Avenue Canals.

Total IER5 impact discussion

Approximately 3.59 acres of waters of the U.S. were anticipated to be permanently filled through construction of the pump stations and approximately 3.3 acres of open water/mud bottom habitat in Lake

Pontchartrain was expected to be lost if breakwaters were built at the mouth of the 17th Street and Orleans Avenue Canals. The IER5, DR, and draft CAR provided by the USFWS on 6 June 2009 stated that no impacts had been identified that would require compensatory mitigation.

IER 6

IER6, DR signed by the CEMVN Commander on 25 June 2009, entitled "Lake Pontchartrain and Vicinity, New Orleans East Citrus Lakefront Levee, Orleans Parish, Louisiana." The document evaluated the potential effects associated with proposed improvements to three reaches of the East Orleans Hurricane Risk Reduction Levee that were originally constructed as part of the LPV project.

IERS6 - Supplement to IER6, DR signed by the CEMVN Commander on 8 February 2010, entitled "Lake Pontchartrain and Vicinity, East Citrus Lakefront Levee, Orleans Parish, Louisiana." The document was prepared to evaluate the potential impacts associated with the addition of a floodwall in lieu of raising the existing levee, which was evaluated in IER 6.

Total IER6 impact discussion

The total impacts of the proposed actions from IER6 and supplement were 4 acres of FS emergent/fringe brackish marsh, which had been assessed as impacts under the original LPV authorization but had not been impacted until the HSDRRS work. As such, those impacts were mitigated with the impacts assessed under the original authorization at the LPV Manchac mitigation site. The 6.9 acres of permanent impact to open water, and 61.1 acres of temporary impact to open water from construction of the breakwaters has not occurred to date since the existing condition of the breakwater is functioning sufficiently to achieve its intended purpose. If in the future, construction of the breakwaters becomes necessary, then mitigation for those impacts would be completed as part of the HSDRRS.

IER 7

IER7, DR signed by the CEMVN Commander on 19 June 2009, entitled "Lake Pontchartrain and Vicinity, New Orleans East Lakefront to Michoud Canal, Orleans Parish, Louisiana." The document evaluated the potential effects associated with proposed improvements to three reaches of the East Orleans Hurricane Risk Reduction Levee that were originally constructed as part of the LPV project.

IERS7 - Supplement to IER7, DR signed by the CEMVN Commander on 3 May 2010, entitled "Lake Pontchartrain and Vicinity, New Orleans East Lakefront to Michoud Canal, Orleans Parish, Louisiana." The document was prepared to evaluate the impacts associated with construction changes to the IER 7 project area, including expansion of construction limits, construction of a T-wall along portions of reach LPV 111, and raising and relocation of USFWS pump stations on two levee reaches.

Total IER7 impact discussion

The total impacts of the proposed actions from IER7 and supplement were anticipated to result in both the temporary and permanent loss of 447 acres (212 AAHUs), some of which included impacts on the Bayou Sauvage NWR mainly in reaches LPV-109 and LPV-111. Protected side impacts included169 acres (89.2 AAHUs) of BLH-Wet and 119 acres (42.9 AAHUs) of fresh/intermediate marsh. Flood side impacts included32.8 acres (12.2 AAHUs) of BLH-Wet and 126 acres (67.4 AAHUs) of brackish marsh. In addition, 6.76 acres of open water were anticipated to be temporarily impacted.

IER 8
IER8, DR signed by the CEMVN Commander on 23 June 2009, entitled "Lake Pontchartrain and Vicinity, Bayou Dupre Control Structure, St. Bernard Parish, Louisiana." The proposed action for Bayou Dupre consisted of the construction of a new flood control structure comprised of a steel sector gate and floodwall tie-ins to the existing levees, which was anticipated to be constructed adjacent to the existing structure on the flood side, and a pontoon bridge that was anticipated for construction on the protected side.

The proposed action was anticipated to have no direct impact on wetlands as stated in the DR, IER, and final CAR dated 28 May 2009. Up to 2 acres of aquatic habitat in Bayou Dupre would be temporarily disturbed during construction, and up to 0.3 acre of essential fish habitat (EFH) (estuarine mud bottom and water column) would be permanently occupied by the control structure.

IER 9
IER9, DR signed by the CEMVN Commander on 8 February 2010, entitled "Lake Pontchartrain and Vicinity, Caernarvon Floodwall, St. Bernard Parish, Louisiana." The document was prepared to evaluate the potential impacts associated with realignment of the Caernarvon Floodwall to the west of the existing alignment to replace the existing Caernarvon Floodwall complex on the east side of the canal.

It was anticipated that approximately 13 acres (6.5 AAHUs) of flood side habitat would be lost due to the construction of the new T-wall. This included a loss of approximately 1.9 acres (1.2 AAHUs) of freshwater marsh, 1.2 acres (0.66 AAHUs) of BLH-Wet, and 10 acres (4.65 AAHUs) of BLH-Dry as stated in the final CAR dated 25 January 2010. In addition, approximately 0.3 acre of the Caernarvon Canal water bottom was anticipated to be permanently occupied by the new control structure and an additional 1.5 acres of open water would be temporarily impacted. Although the CAR, IER, and DR did not state the location of the impacts, it was assumed that the impacts were located on the flood side.

IER 10
IER10, DR signed by the CEMVN Commander on 26 May 2009, entitled "Lake Pontchartrain and Vicinity, Chalmette Loop Levee, St. Bernard Parish, Louisiana." The document evaluated the potential impacts associated with the proposed construction of a T-wall floodwall on top of the existing Chalmette Loop levee.

The construction of this proposed project was anticipated to result in a total impact of 503.22 acres (298.9 AAHUs) including protected side impacts to 46.45 acres (23.76 AAHUs) of fresh marsh, 60.02 acres (33.5 AAHUs) of intermediate marsh, 0.08 acres (0.05 AAHUs) of brackish marsh, and 38.32 acres (16.44 AAHUs) of BLH-Wet. Flood side impacts were comprised of 53.2 acres (31.26 AAHUs) of intermediate marsh, 269.84 acres (178.68 AAHUs) of brackish marsh, and 35.31 acres (15.22 AAHUs) of BLH-Wet as stated in final CAR dated 19 May 2009. In addition, 50 acres of open water habitat was anticipated to be permanently impacted by the construction of the proposed action.

IER 11
<u>Tier One</u>
IER11 (Tier 1), DR signed by the CEMVN Commander on 14 March 2008, entitled "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana." The

document evaluated potential impacts associated with building navigable and structural barriers to prevent storm surge from entering the IHNC from Lake Pontchartrain and/or the GIWW-Mississippi River Gulf Outlet-Lake Borgne complex. The proposed actions selected in this initial Tier 1 document were location ranges within which further analysis, under Tier 2 documents (one for Lake Borgne area and another for Lake Pontchartrain area), were discussed for alignment alternatives and designs of the navigable and structural barriers, and the impacts associated with each footprint.

For the purpose of impacts analysis as stated in the IER and DR, the Tier 1 document considered the greatest conceptual footprint within each alternative location range. Any future structures analyzed in the Tier 2 documents were expected to have adverse impacts equal to or less than the impacts described for the proposed action in Tier 1.

<u>Tier Two - Lake Borgne</u>
IER11 (Tier 2-Borgne), DR signed by the CEMVN Commander on 21 October 2008, entitled "Improved Protection on the Inner Harbor Navigation Canal, Tier 2 Borgne, Orleans and St. Bernard Parishes, Louisiana." The document was prepared to evaluate potential impacts associated with the construction of a new floodwall/gated system extending from the Michoud Canal floodwall north of the GIWW to the HSDRRS levee on the west side of the deauthorized MRGO.

IERS11 - Supplement to IER11 (Tier 2-Borgne), DR signed by the CEMVN Commander on 10 December 2009, entitled "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana, IERS11 Tier 2 Borgne." The document was prepared to evaluate the potential impacts associated with construction of a vertical lift gate in lieu of the previously approved sector gate on Bayou Bienvenue within the Lake Borgne Barrier.

IERS 11.b - Supplement to IER11 and IERS11 (Tier 2-Borgne), DR signed by the CEMVN Commander on 29 November 2010, entitled "Improved Protection on the Inner Harbor Navigation Canal (IHNC), Orleans and St. Bernard Parishes, Louisiana IERS 11.b – Tier 2 Borgne – IHNC." The document evaluates the potential effects associated with restoring and reinforcing levees and floodwalls along the IHNC to meet current HSDRRS design guidelines for seepage and stability.

IERS 11.c - Supplement to IER11, IERS11, and IERS 11.b (Tier 2-Borgne), DR signed by the CEMVN Commander on 22 March 2011, entitled, "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana IERS 11.c – Tier 2 Borgne – IHNC." IERS 11.c addresses the construction of approximately 13,000 feet (2.5 miles) of shoreline protection along the flood and protected side of an expanded construction access channel. The expanded footprint included approximately 75 feet of additional right-of-way on the protected side and 150 feet of additional right-of-way on the flood side.

Total IER 11 Tier 2 Borgne impact discussion
Total wetland impacts from the proposed actions within IER11 Tier 2 Borgne and supplements was 92.78 acres (36.71 AAHUs) including 80.84 acres (34.7 AAHUs) of floodside brackish marsh and interspersed water within the marsh and 11.94 acres (2 AAHUs) of BLH as stated in the Final CAR dated 11 March 2011. Although not specifically stated in the Final CAR the BLH impact was assumed to include 2.46 acres of PS BLH-Dry and 9.48 acres of FS BLH-Dry based on review of the 100 percent design impacts. In addition, 45 acres of open water were anticipated to be impacted. Impacts originally

expected to occur on the Bayou Sauvage NWR, as mentioned in prior CAR reports, were no longer anticipated.

Tier Two - Lake Pontchartrain
IER11 (Tier 2-Pontchartrain), DR signed by the CEMVN Commander on 1 April 2010, entitled "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the proposed construction of a storm surge risk reduction structure on the IHNC where it meets Lake Pontchartrain at Seabrook.

IER11S 11.d - Supplement to IER11 (Tier 2-Pontchartrain), DR signed by the CEMVN Commander on 30 May 2012, entitled "Improved Protection on the Inner Harbor Navigation Canal, Orleans and St. Bernard Parishes, Louisiana, IERS 11.d – Tier 2 Pontchartrain." The proposed action consisted of extending the construction end date for those actions approved in IER11 Tier 2 Pontchartrain to approximately September 2012 by constructing a storm surge risk reduction structure on the IHNC near its connection to Lake Pontchartrain. Specifically, the extension was necessary to complete construction of a steel sector gate and two vertical lift gates south of the Senator Ted Hickey Bridge (also referred to as the Seabrook Bridge) in the IHNC. The extension also included construction of T-wall floodwall tie-ins and a roadway gate.

Total IER 11 Tier 2 Pontchatrain impact discussion
Total impacts as a result of proposed actions from IER 11 Tier 2 Pontchartrain and supplement 11.d included permanent impacts to 7 acres of open water.

IER 27
IER 27, DR signed by the CEMVN Commander on 7 October 2010, entitled, "Outfall Canal Remediation on the 17th Street, Orleans Avenue and London Avenue Canals, Jefferson and Orleans Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with strengthening of floodwalls along the 17th Street, Orleans Avenue and London Avenue outfall canals.

IERS 27.a - Supplement to IER27, DR signed by the CEMVN Commander on 15 April 2011, entitled "Outfall Canal Remediation on the 17th Street, Orleans Avenue and London Avenue Canals, Jefferson and Orleans Parishes, Louisiana." The proposed action included the temporary use of additional staging and access areas for the construction activities described for London Avenue Canal in IER27.

Total IER 27 impact discussion
No impacts as described in IER27 and supplement would require compensatory mitigation.

1.4.3.2 Government Furnished Borrow IERs and Impacts

In order to raise the level of risk reduction for the HSDRRS system, large quantities of earthen material (borrow) were required. In 2007, CEMVN began an unprecedented search for suitable material to rebuild and reinforce the HSDRRS in the Greater New Orleans Metropolitan Area. Approximately 93 million cubic yards of material was estimated to be required for the HSDRRS construction borrow program. To date, no wetlands have been impacted in the acquisition of borrow for the HSDRRS. Thus far, the only impacted habitat type requiring mitigation for the HSDRRS borrow is BLH-Dry.

The first stages of borrow procurement for the HSDRRS work utilized identification of sites with appropriate material for acquisition by the Federal Government (Government). Once the sites were either acquired or an easement over them obtained, they were then provided to the HSDRRS construction contractors as potential sources of borrow material. Because the government is providing these sites for borrow excavation in connection with a Federal action, mitigation for habitat impacts if these sites are utilized is the responsibility of the Government. Below are the IERs that assessed the borrow sites located in the LPV basin and the potential habitat impacts that would occur if they are fully utilized.

IER 18

IER18, DR signed by the CEMVN Commander on 21 February 2008, entitled "Government Furnished Borrow Material, Jefferson, Orleans, Plaquemines, St. Charles, and St. Bernard Parishes, Louisiana." The document evaluates the potential impacts associated with approving 12 government furnished borrow areas throughout the New Orleans Metropolitan area for use in construction of the HSDRRS.

Eight of the 12 potential borrow sites evaluated in IER18 fall within the LPV mitigation basin; however, only 5 would require mitigation for impacts if selected for use in the HSDRRS construction. See table 1-1.

Table 1-1: Impacts to Non-Jurisdictional BLH

Proposed Borrow Area	Parish	BLH Impacted (acres)	AAHUs Needed
1418/1420 Bayou Rd	St. Bernard	13.0	6.20
1572 Bayou Rd.	St. Bernard	3.7	1.79
Dockville	St. Bernard	98.7	61.24
Maynard	Orleans	44.0	14.65
Cummings North	Orleans	182.0	54.14
Total		*341.4*	*138.02*

IER 22

IER22, DR signed by the CEMVN Commander on 30 May 2008, entitled "Government Furnished Borrow Material, Plaquemines and Jefferson Parishes, Louisiana." The document evaluates the potential impacts associated with approving 5 Government furnished borrow areas located in Jefferson and Plaquemines Parishes for use in construction of the HSDRRS.

One of the five potential borrow sites evaluated in IER 22 falls within the LPV mitigation basin. The Tabony borrow site, located on the east side of LA Highway 15 in Plaquemines Parish, would require mitigation for 86.93 acres (28.9 AAHUs) of PS BLH-Dry as noted in the DR, IER, and final 15 November 2010 CAR if selected for use in HSDRRS construction.

IER 25

IER25 DR signed by the CEMVN Commander on 3 February 2009, entitled "Government Furnished Borrow Material #3, Orleans, Jefferson, and Plaquemines Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the possible excavation of four government furnished borrow areas.

One of the four potential borrow sites evaluated in IER25 falls within the LPV mitigation basin. The Stumpf site, located in Orleans Parish, would require mitigation for PS BLH-Dry impacts if selected for use in the construction of the HSDRRS. The impacts would include 318 acres (88 AAHUs) in Stumpf Phase 1 and 519 acres (143 AAHUs) in Stumpf Phase 2 for a total of 837 acres (231 AAHUs) as noted in the DR, IER Mitigation Section, and the Final CAR dated 15 November 2010.

IERS 25.a DR signed by the CEMVN Commander on 13 January 2012, entitled "Government Furnished Borrow Material #3, Orleans Parish, Louisiana." The document evaluates the "after the fact" modifications to IER25, impacting 22.41 acres (6.19 AAHUs) of non-jurisdictional BLH. Compensatory mitigation for these impacts was completed on 20 September 2011 by the purchase of 12.2 acres of BLH from Paradis Mitigation Bank, located in St. Charles Parish, LA.

IER 28

IER28, DR signed by the CEMVN Commander on 31 July 2009, entitled "Government Furnished Borrow material # 4 Plaquemines, St Bernard and Jefferson Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the possible excavation of three government furnished borrow areas and the construction of a separate borrow access road.

Two proposed borrow area sites, Bazile Site and Johnson/Crovetto Site, are located within the LPV mitigation basin in upper Plaquemines Parish. The proposed action at these sites would impact 11.6 acres (3.93 AAHUs) and 8.05 acres (4.35 AAHUs) of non-jurisdictional BLH respectively.

Mitigation for Government Furnished Borrow Sites

Of the government furnished borrow sites approved for use in HSDRRS construction, only the Maynard site discussed in IER18 has been utilized to date. The total impact for that site is 40 acres (14.65 AAHUs) of PS BLH-Dry, which would be mitigated with the other LPV HSDRRS impacts. The Bonnet Carré Spillway was also utilized as a borrow source for the LPV HSDRRS work. However, no habitats in Bonnet Carré were impacted for HSDRRS borrow that require compensatory mitigation.

1.4.3.3 Contractor Furnished Borrow IERs and Impacts

To meet the extremely large need for borrow for the HSDRRS improvements, utilization of Contractor Furnished (CF) borrow was also employed by the CEMVN. Under the CF borrow program, land owners made their land available for use as a borrow source to contractors needing borrow for the HSDRRS work by obtaining certain clearances for the land in question. These clearances included proof of mitigation for any habitat type impacted that the Government is required to mitigate under WRDAs of 1986 and 2007.

To date, no wetlands have been impacted by the excavation of borrow for the HSDRRS program. Mitigation for BLH-Dry impacts under the CF program must be completed by either the land owner or the contractor(s) utilizing the site before the site is excavated. Mitigation for habitats impacted under the CF borrow program is not addressed in this PIER since mitigation for those impacts is the responsibility of the land owner or the contractor utilizing the site. The CF borrow IERs that addressed utilization of borrow pits found in the LPV basin are IERs 19, 23, 26, 29, 30, 31, 32, and 35. Of the CF borrow sites approved for use in the HSDRRS construction, only the following sites in the LPV basin have been utilized to date (table 1-2):

Table 1-2: CF Borrow Sites

IER	CF Borrow Site
19	Eastover Phase I
29	Eastover Phase 2*
29	Tammany Holding
30	Big Shake
30	Contreras- Cell Z*
31	Lilly Bayou*
31	Port Bienville*

* use required mitigation

Detailed information on all HSDRRS CF borrow impacts can be found in the CF borrow IERs at http://www.nolaenvironmental.gov/.

1.4.3.4 Revised Impacts

Because the IERs evaluating the HSDRRS risk reduction features were completed at the 35 percent level of design, the footprints stated in those IERs were, in many cases, a worst-case scenario footprint. Through advanced engineering and design, the CEMVN has made a concerted effort to avoid and minimize impacts to the environment to the maximum extent possible. As such, in many cases, the predicted impacts anticipated in the HSDRRS IERs were significantly reduced as the projects proceeded to 100 percent design. Consequently, to accurately capture the impacts caused by construction of the HSDRRS, the mitigation PDT, in cooperation with the resource agencies, revised the original impacts estimates utilizing the 95-100 percent design plans. Additionally, following identification of TSMPA, the revised impacts estimates were revisited and verified by the USFWS, which resulted in further adjustment to the estimated impacts. The results of this effort are presented in table 1-3.

Table 1-3: LPV Impacts Based on 100percent Design Plans

	Protected Side										Flood Side												
IER+	Fresh and Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Fresh and Intermediate Marsh		Brackish Marsh		Swamp		BLH wet		BLH dry		Open Water*	**TOTAL****	
	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	AAHUs	Acres	**Acres**	**AAHUs**
1	0	0	0	0	104.02	49.99	0	0	0	0	0	0	0	0	82.68	52.66	0	0	0	0	22.72	**186.70**	**102.65**
2	0	0	0	0	0	0	0	0	0	0	0	0	19.60	8.58	10.65	5.36	0	0	0	0	12	**30.25**	**13.94**
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	**0**	**0**
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	**0**	**0**
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**	**0**
7	89.50	42.50	0	0	0	0	167.43	85.17	0	0	0	0	52.27	18.95	0	0	32.65	13.36	0	0	0*	**341.85**	**159.98**
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	**0**	**0**
9	0	0	0	0	0	0	0	0	0	0	2.05	0.33	0	0	0	0	1.21	0.69	8.75	2.3	0	**12.01**	**3.32**
10	89.02	40.92	0	0	0	0	32.76	14.06	0	0	5.93	3.24	98.45	64.62	0	0	26.56	11.66	0	0	0*	**252.72**	**134.50**
11	0	0	0	0	0	0	0	0	2.46	0.41	0	0	80.74	34.7	0	0	0	0	9.48	1.59	119.02	**92.68**	**36.70**
18	0	0	0	0	0	0	0	0	44.74	14.65	0	0	0	0	0	0	0	0	0	0	0	**44.74**	**14.65**
27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0.00**	**0.00**
Total	**178.52**	**83.42**	**0.00**	**0.00**	**104.02**	**49.99**	**200.19**	**99.23**	**47.20**	**15.06**	**7.98**	**3.57**	**251.06**	**126.85**	**93.33**	**58.02**	**60.42**	**25.71**	**18.23**	**3.89**	**153.74**	**960.95**	**465.74**

+Includes IERs and supplements

*Mitigation for open water impacts for IERs 3, 5, 7, 8 and 10 would be quantified from the as-built drawings and mitigated for at a later date.

**Total does not include impacts to open water as stated in this table.

Final Accounting
Once As-Builts (final plans documenting the structures actually built) for all HSDRRS contracts are complete, the mitigation PDT, along with the resource agencies, will revisit the impacts to all habitat types from the HSDRRS construction (including open water). This effort will result in a final computation of impacts and could result in the identification of additional impacts requiring mitigation.

At this time, impacts to open water from construction of bottomland hardwoods and swamp mitigation projects have not been quantified. If there are open water impacts requiring mitigation, those impacts would be mitigated as the marsh type closest to the impacts and would be disclosed in the TIER in which mitigation for that marsh type is a constructible feature. See appendix D for the draft guidelines for when impacts to open water would require mitigation. These guidelines would be finalized before the release of the first TIER.

1.4.4 TASK FORCE GUARDIAN

The USACE established Task Force Guardian (TFG) immediately after Hurricane Katrina hit the Lousiana and Mississippi coasts. TFG's main mission was to repair and restore the levees and floodwalls in the greater New Orleans area to pre-Katrina conditions. With the emergency declaration by the President, NEPA compliance for emergency repairs was documented in EA #433. The habitat impacts as a result of TFG construction occurred prior to but within similar reaches as the LPV HSDRSS construction. During review of the LPV HSDRRS habitat impacts based on the 95-100 percent design, additional TFG impacts were identified within reaches LPV-108, LPV-145, and LPV-146 that require mitigation. Table 1-4 presents the acres and AAHUs by habitat type and reach that were impacted. The impacts to reach LPV-146 have been documented in EA #433 appendix E, *Environmental Coordination Report Post-Katrina Emergency Operations, Borrow Pit Evaluation Bayou Dupre to Verret, Proposed Borrow Site for St. Bernard Levee Restoration.* The impacts to LPV-108 and LPV-145 will be documented in the supplemental to EA #433 entitled "U.S. Army Corps of Engineers Response to Hurricanes Katrina and Rita in Louisiana" that is currently being completed. All of these impacts will be mitigated along with the HSDRRS impacts at the LPV HSDRRS mitigation sites.

Table 1-4: Additional TFG Impacts

	Protected Side	
TFG/LPV Reach	BLH Dry	
	Acres	AAHUs
108	16.65	8.96
145	122.00	30.85
146	79.92	2.98
Total	**218.57**	**42.79**

1.5 INTEGRATION WITH OTHER INDIVIDUAL ENVIRONMENTAL REPORTS

In addition to this IER, the CEMVN has prepared a Comprehensive Environmental Document (CED) that will present a cumulative effect's assessment of the HSDRRS work on a system-wide scale. The first phase of the CED, and any subsequent phases, describe/will describe the integration of all individual IERs into a systematic planning effort. Overall cumulative impacts and future operations and

maintenance requirements will also be included. Additionally, the CED(S) will contain updated information for any IER that had incomplete or unavailable data at the time it was posted for public review.

Public review of the first phase of the CED closed 28 June 2013. The next phase of the CED is under development. A decision record will be executed following review of the final phase of the CED.

2. ALTERNATIVE FORMULATION

2.1 MITIGATION MEASURE DEVELOPMENT AND SCREENING CRITERIA

The CEMVN is required to mitigate for LPV HSDRRS impacts to six specific types of habitat: swamp, fresh marsh, intermediate marsh, brackish marsh, BLH-Dry, BLH-Wet and swamp.

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

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

Brackish marsh has an irregular tidal regime, experiences a mean salinity less than 10 ppt, and is dominated by narrow-leaved, persistent species such as wire grass.

Bottomland hardwoods are broadleaf deciduous forested wetlands. They are generally found along the edges of lakes and rivers and in sinkholes. Bottomland forests represent a transition between drier upland hardwood forest and swamp. While trees and plants in this ecosystem cannot tolerate long periods of flooding (as in a swamp), they are flooded periodically when water levels rise. Species common to bottomland hardwoods include oaks, hickories, American elm, cedar elm, green ash, sweetgum, sugarberry, boxelder, common persimmon, honey locust, red mulberry, eastern cottonwood, black willow, American sycamore, etc. The designation of ‘wet or dry’ (e.g. BLH-Wet or BLH-Dry) refers to the amount of flooding experienced by the stand in question. Dry bottomland hardwoods seldom or never experience inundation by flood waters.

Swamps are broadleaf and needleleaf deciduous forested wetlands that experience inundation either permanently or seasonally throughout the year. They are generally found along the edges of lakes and rivers. A swamp is defined as an area supporting or capable of supporting a canopy of woody vegetation that covers at least 33 percent of the area's surface, and with at least 60 percent of that canopy consisting of any combination of baldcypress, tupelogum, red maple, buttonbush, and/or planertree.

The proposed compensatory mitigation would replace the lost functions and values of the impacted areas through restoration or enhancement activities that increase/improve the habitat functions and services within a particular mitigation site. Enhancement would involve implementing actions to improve already existing low quality habitat. Restoration would involve creating a habitat type from open water or agricultural fields where none currently exists but which historically occurred in the vicinity of the project area.

Mitigation Formulation Requirements:

In accordance with the USACE Implementation Guidance for Section 2036 of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, and the standards and policies set forth in 33 CFR Part 332, compensatory mitigation was formulated to occur within the same watershed or hydrologic basin as the impacts and to replace the functions and services of each habitat type with functions and services of the same habitat type. The LPV HSDRRS Mitigation Basin boundaries coincide with the watershed boundaries as limited by the coastal zone to the north except for the southern boundary. The southern boundary for the LPV HSDRRS Mitigation Basin excludes the barrier islands because the HSDRRS construction did not impact barrier island habitats (appendix A, figure 2).

To be considered, mitigation measures were required to either restore or enhance the same habitat types that were impacted (e.g. "habitat type for habitat type") from the HSDRRS construction. The phrase "mitigation measures" refers to potential actions at a given site that could provide mitigation for the HSDRRS impacts.

Design of the mitigation measures was completed in cooperation with the PDT which included CEMVN staff, the Non-Federal Sponsor, and the resource agencies. In the case of impacts to BLH-Dry habitats, the PDT determined that the potential mitigation measures could involve restoring or enhancing BLH-Wet habitat instead of BLH-Dry habitat. This is possible because BLH-Wet habitat has an added hydrologic component that allows a greater diversity of species to thrive while still supporting the species that utilize BLH-Dry habitat. The result is an increase in habitat functions and services for BLH-Wet over and above what BLH-Dry would provide. The reverse would not be possible because using BLH-Dry to mitigate BLH-Wet would result in the loss of wetland related functions and services essential to that system. Similarly, impacts to fresh marsh habitats could involve restoring or enhancing intermediate marsh as intermediate marsh provides similar functions and services for many of the same species utilizing fresh marsh.

The PDT also decided to mitigate all protected side impacts on the flood side of the levees in an effort to consolidate impacts and create large mitigation projects that would provide greater ecological benefits. Since protected side habitats are within an impounded system, cut off from tidal influences and subject to internal drainage and pumping, they do not provide the same access for aquatic organisms. In addition, the future success of protected side habitats can be difficult to ensure as they may be directly influenced by internal drainage regimes. Greater ecological benefits are derived from mitigating protected and flood side impacts together on the flood side of the levees.

In addition to mitigating each habitat type in-kind; per the DOI Policy (FR Vol. 64, No. 175, 10 Sep 1999) when impacts occur on a NWR, they must be mitigated within the boundaries of the affected NWR. USFWS has indicated that lands transferred to the NWR are considered within the NWR boundaries if those lands are within the approved acquisition boundary of the refuge. If sufficient opportunity to mitigate refuge impacts on or within the acquisition boundary of the NWR impacted does not exist, then mitigation on another NWR within the same complex would be allowed as per USFWS HSDRRS compensatory mitigation planning aid letter (14 May 2013). However, as required by the LPV HSDRRS mitigation screening criteria, that NWR would also need to be within the LPV Basin (all potential measures must be within the LPV basin). CEMVN agreed to adhere to DOI Policy during FWCA consultations for HSDRRS work impacting the Bayou Sauvage NWR.

NEPA Scoping

Scoping is a critical component of the overall public involvement process to solicit input from affected Federal, state, and local agencies, Indian Tribes, the public, and interested stakeholders. The NEPA scoping process is designed to provide an early and open means for determining the scope of issues (problems, needs, and opportunities) to be identified and addressed in the NEPA document. As part of the scoping process, public meetings were held at multiple locations within the LPV basin in an effort to obtain potential compensatory mitigation measures from the general public. Suggestions for mitigation measures were received from the general public; non-governmental organizations; the non-Federal sponsor, Coastal Protection and Restoration Authority Board (CPRAB); and state and Federal resource agencies. In addition, the PDT also examined (within the basin) existing watershed plans, searched for measures beyond what was already submitted, and developed implementation alternatives during the value engineering study that could produce sufficient credits to meet the mitigation requirement.

In total, the scoping process resulted in the identification of over 400 possible mitigation measures. Appendix A, figure 3 shows the location of all mitigation measures suggested to or developed by the PDT. USACE approved mitigation banks with perpetual conservation servitudes within the LPV basin currently in compliance with their mitigation banking instrument (MBI) and able to service the habitat types impacted by the HSDRRS work were also considered as potential mitigation measures.

Initial Screening

Screening criteria were developed by the PDT in accordance with the Implementation Guidance derived from video teleconference factsheets and the CEMVN Commander's Intent to pare down the 400 proposed mitigation measures to a manageable list of measures for further analysis (USACE, 2010). For detailed information on the screening criteria, see appendix E.

The screening criteria were developed to achieve large contiguous tracts of land for the purposes of obtaining greater ecological output within the watershed and to produce cost efficiencies that would be experienced during construction and OMRR&R phases. The screening criteria encouraged the grouping of measures of one habitat type with measures of a different habitat type or with other resource managed areas in the same geographical area to form large contiguous tracts of resource managed land. Proposed measures had to meet the following criteria and those that did not meet all of the criteria were eliminated from further consideration.

- Proposed measures could not convert existing wetlands to uplands
- Proposed measures had to be compliant with applicable laws and policies
- Proposed measures had to be located within LPV Mitigation Basin
- Proposed measures had to be free of known Hazardous, Toxic, or Radioactive Waste (HTRW)
- Proposed measures had to provide for in-kind replacement of impact AAHUs by habitat type (exception: BLH-Dry can be mitigated as BLH-Wet)
- Proposed measures had to be technically viable (e.g. salinity suitable for target habitat type)
- Proposed mitigation measures could not be measures already considered in the Future Without Project Condition
- Proposed measure had to have independent utility (not dependent on implementation of or modification to other projects)
- Proposed measures had to be easily scaled to meet changing mitigation acreage requirements

- Proposed measures could not be a stand-alone BLH-Dry habitat type (requirements allowed for BLH-Dry to be mitigated contiguous with mitigation for other habitat types, and mitigated on flood side or protected side of levee)
- Proposed mitigation measures could not be stand alone un-confined marsh nourishment measures
- Proposed mitigation measures could not be preservation of an existing habitat type.
- Proposed mitigation measures for BLH-Wet and swamp had to be contiguous with (or within) an existing resource-managed area or with the project area of another proposed mitigation measure
- Proposed mitigation measures for BLH-Dry, BLH-Wet, and swamp habitat types had to be part of proposed mitigation measures that consist of at least 100 contiguous acres of forested habitat unless contiguous with the project area of a proposed marsh mitigation measure or contiguous with or within another resource-managed area
- Proposed mitigation measures that address mitigation requirements for impacts to the Bayou Sauvage NWR had to be located within the boundary or acquisition boundary of a NWR.
- Proposed mitigation measures had to meet 100 percent (%) of the mitigation requirement by habitat type according to the following groupings unless contiguous with the project area of other proposed mitigation measures:
    - 100% non-refuge BLH-Wet FS + PS (mitigate FS)
    - 100% non-refuge Swamp FS + PS (mitigate FS)
    - 100% non-refuge Brackish Marsh FS + PS and 100% refuge Brackish Marsh FS (mitigate FS)
    - 100% non-refuge Fresh/Intermediate Marsh FS + PS (mitigate FS)
    - 100% refuge BLH-Wet PS (mitigate PS)
    - 100% refuge BLH-Wet FS (mitigate FS)100% refuge Fresh/Intermediate Marsh PS (mitigate PS)

Table 2-1 lists the impacts based on the first review of the 95-100 percent HSDRRS design plans identified at the time of screening in September 2010.

Table 2-1. Impacts from LPV HSDRRS Projects Based on 95-100 % Design Plans

Habitat Type	AAHUs Impacted
Non-Refuge BLH-Wet/Dry	67.54 AAHUs
Non-Refuge Swamp	97.72 AAHUs
Non-Refuge Fr/Int. Marsh	107.87 AAHUs
Non-Refuge Brackish Marsh	96.13 AAHUs
Refuge Brackish Marsh	9.21 AAHUs
Refuge PS BLH-Wet	134.38 AAHUs
Refuge Int. Marsh	27.99 AAHUs
Refuge FS BLH-Wet	8.90 AAHUs

Initial screening reduced the number of potential mitigation measures (appendix A, figure 3) from over 400 to 49.

2.2 MITIGATION PROJECT DEVELOPMENT BY HABITAT TYPE

Following initial screening, 49 potential mitigation measures remained. These remaining measures were refined by either combining them with other measures or reshaping (re-configuring) them by habitat type. Reshaping of measures occurred when multiple measures existed in a common geographical area. In such cases, these measures were reshaped into a single project by habitat type that maximized the potential returns for that site while meeting the mitigation requirement only. As such, the original measure may not have been eliminated outright, but rather carried forward in an altered state. In some cases, reshaping resulted in the remaining portions of the original larger measures that existed outside the reshaped project boundaries, being eliminated from the proposed project for that habitat type. Refining measures resulted in 20 potential mitigation projects by habitat type (appendix A, figure 4).

At the time of screening, mitigation banks in LPV basin existed that had BLH-Wet, swamp, and brackish marsh credits available for purchase. Those mitigation banks in the LPV basin that met the initial screening criteria were only able to mitigate the BLH-Wet/Dry and swamp general impacts. As a result, the final array of potential mitigation projects for LPV includes the option to purchase mitigation bank credits to satisfy the BLH and/or swamp general impact mitigation requirements only. It is not known which banks would be available when the decision whether to purchase bank credits or not is made: some banks may not have enough credits remaining, some may be closed, and additional mitigation banks may be approved. As such, a general mitigation bank project for each of these two habitat types was created for the next step of the mitigation project analysis using information obtained from existing banks in the basin and no specific banks were identified. The Regulatory In lieu fee and Bank Information Tracking System (RIBITS) (http://geo.usace.army.mil/ribits/index.html) has information on all currently approved banks in the basin including their credit availability.

Mitigation Projects Eliminated following Screening

A project to address non-refuge swamp mitigation requirements through a river diversion to enhance existing swamp in the LaBranche Wetlands was eliminated from the final array of potential mitigation projects following screening. The wetland value assessment for this proposed project resulted in -0.92 AAHUs/per acre; incurring negative impacts from its construction rather than producing benefits.

2.3 FINAL ARRAY OF MITIGATION PROJECTS BY HABITAT TYPE

The 49 mitigation measures that were refined resulted in the following final array of potential mitigation projects by habitat type. These projects are described in detail in sections 2.3.1 through 2.3.6. The project descriptions in those sections are based on the project design at the time of the AEP. See Table 2-3 for a summary of design changes since the AEP for the TSMP projects.

Non-Refuge BLH-Dry/Non-Refuge BLH-Wet

- Bonnet Carré BLH-Dry and BLH-Wet Restoration
- Frenier BLH-Dry and BLH-Wet Restoration
- Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration
- General Mitigation Bank

Non-refuge Swamp

- Bonnet Carré Swamp Restoration

- Caernarvon Swamp Restoration
- Milton Island Swamp Restoration
- General Mitigation Bank

Non-Refuge Intermediate Marsh

- Bayou Des Mats Marsh Restoration
- Caernarvon Marsh Restoration
- Fritchie Marsh Restoration
- Big Branch Marsh Restoration
- LaBranche Marsh Restoration
- Milton Island Marsh Restoration

Non-Refuge/Refuge Brackish Marsh

- Big Branch Marsh Restoration
- Golden Triangle Marsh Restoration
- Fritchie Marsh Restoration
- Bayou Sauvage Marsh Restoration

Refuge Protected Side BLH-Wet

- Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration

Refuge Flood Side BLH-Wet

- Fritchie Refuge BLH-Wet Enhancement

All mitigation projects were designed using the intermediate sea level rise (SLR) scenario. Sea level rise is measured by a tide gauge with respect to the land upon which it is situated. There are three classifications of SLR; low (historic), intermediate, and high. The intermediate and high SLR scenarios are predictions of possible future sea level change. Utilizing the intermediate SLR scenario for project design may result in a larger mitigation project than required, as the intermediate SLR rate is higher than the historic. However, remobilizing to construct additional marsh habitat if the mitigation requirement is not met under the historic SLR scenario would not produce additional savings (due to mobilization costs for dredge equipment). In addition, if an increase in elevation became necessary for forested habitats, borrow placement would be extremely problematic and likely result in an unacceptable increase in mortality of already established forest species, which could necessitate complete rebuild of the project. Since the USACE is required to mitigate the habitat's functions and services lost due to construction of the HSDRRS improvements and since future funding for additional construction is uncertain, overbuilding of the mitigation projects (in size, not elevation) was determined to be the least risk design alternative.

2.3.1 MITIGATION FOR IMPACTS TO NON-REFUGE BLH-DRY AND BLH-WET

2.3.1.1 General Mitigation Bank Project

Consistent with the screening criteria, the PDT identified all active mitigation banks with perpetual conservation servitudes within the LPV watershed with enough credits available to meet 100 percent of

the BLH mitigation requirement. Three banks were initially identified in the LPV watershed. The PDT developed a generic mitigation bank project for the final array based upon information obtained from these three banks. This mitigation project assumes that all of the 50.46 BLH-Wet AAHUs and the 17.08 BLH-Dry AAHUs required could be satisfied through the purchase of mitigation bank BLH-Wet credits and that purchase of mitigation bank credits from a bank with perpetual conservation servitude would yield a result similar to a mitigation project constructed by the Corps (Corps constructed).

If the general mitigation bank project becomes the tentatively selected mitigation project (TSMP) for this habitat type in the TSMPA, but at the time of solicitation, no banks exist that can meet 100 percent of the mitigation requirement by habitat type or the Corps does not receive satisfactory bids (based on cost and/or other factors), then the second-ranked mitigation project would take its place as the TSMP for that habitat type in the TSMPA. In addition, if the actual costs for purchasing the mitigation bank credits turn out to be more than what was estimated for the general mitigation bank project during AEP, a re-analysis comparing the mitigation bank project to the other mitigation projects would be conducted to verify the ranking of the projects and the selection of the mitigation bank project as the TSMP. If the costs for implementing the mitigation bank project based on the proposals received exceed those for the second ranked project, then the second ranked project would likely become the new TSMP for that habitat type in the TSMPA.

If purchase of mitigation bank credits were included in the LPV Mitigation TSMPA, BLH-Dry and BLH-Wet impacts would be mitigated with the purchase of BLH-Wet credits equaling 67.54 AAHUs. Mitigation banks would be required to run the same version of the WVA model as was used to assess the impacts from constructing the HSDRRS to ensure that the assessment of the functions and services provided by the mitigation bank match the assessment of the lost functions and services at the impacted site.

2.3.1.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

This mitigation project would be constructed within the Bonnet Carré Spillway and between Hwy 61 and the I-10 and consists of two parts or features. This project is shown in appendix A, figure 5.

Bonnet Carré FS BLH-Dry Restoration feature has a mitigation potential of 0.64 AAHUs per acre, providing the required 17.08 AAHUs for general impacts through restoration of a minimum of 26.7 acres of FS BLH-Dry and the Bonnet Carré FS BLH-Wet Restoration feature has a mitigation potential of 0.63 AAHUs per acre, providing the required 50.46 AAHUs for general impacts through restoration of a minimum of 80.1 acres of FS BLH-Wet.

As shown in appendix A, figure 5, the Bonnet Carré BLH Restoration mitigation project is comprised of BLH-Wet elements BC12, 13, 14, and 18, and BLH-Dry element BC19. As initially proposed, BLH restoration mitigation would be constructed within the central and southern portions of the project boundary. Restoration would consist of the placement of dedicated dredge material, to be obtained from either Lake Pontchartrain at the north end of the Bonnet Carré spillway, or possibly the Mississippi River at the southern end, with placement of material to be concentrated within areas of existing shallow open water areas. The project would restore approximately 80.7 acres to BLH-Wet habitat, and approximately 26.9 acres to a BLH-Dry habitat. The proposed targeted elevation for BLH-Wet habitat is within a range of +2.0 to +3.0 ft. The initial fill elevation would be to an elevation of +3.5 ft to allow

for subsidence and provide longevity of this desired habitat. Existing ridges within the various feature polygons would be used to assist in retention of the dredged material and ridges of elevation exceeding +3.0 ft would be degraded with the degraded material placed within the open water areas to be filled.

For the BLH-Dry habitat, the targeted elevation is greater than +3.0 ft. The fill would be placed to an initial elevation of +4.5 ft to allow for subsidence and provide longevity of this desired habitat. Again, existing ridges within the various feature polygons would be used to assist in retention of the dredged material and ridges of elevation exceeding +3.5 ft would be degraded with the degraded material placed within the open water areas to be filled.

The areas to be converted to BLH habitat would be cleared and grubbed of all existing trees prior to placement of dredged material/fill. The debris from clearing and grubbing operations may be placed within the adjacent borrow pits and later backfilled with dredged material. As the dredged material is expected to be fairly sandy, retention dikes are not anticipated to be required. Rather, the material would be allowed to naturally stack up in isolated locations and would later be transferred throughout the mitigation area until all elements are filled to the proper elevation. Land based equipment required for this work could consist of dozers, backhoes, scrapers, and possibly dump trucks.

Some hydrologic improvements may be required to encourage alternating wet/dry periods within the site and to allow for interchange between this feature and the adjacent estuarine system. Hydrologic modifications that could be used to assist in facilitating interconnectivity between the site and the adjacent estuarine system could entail either a) breaching banks of existing drainage ditches/canals, b) construction of earthen weirs within existing drainage ditches/canals in order to facilitate sheet flow, c) construction of bifurcation channels off of existing ditches/canals, and/or d) installing or replacing existing culverts within roads.

Ingress and egress to the site would be via Lake Pontchartrain and/or the Mississippi River, as well as via Federal, state and local highways and the Bonnet Carré Spillway.

Following the construction required to modify these features to their respective habitat topography, plantings within all features would be performed. Planting and monitoring for all features would be in accordance with the applicable guidelines contained in appendix J.

Borrow Requirements

Earthen material required to construct the BLH-Dry and BLH-Wet habitat features would be obtained from within Lake Pontchartrain and/or the Mississippi River (appendix A, figure 6). Based on Laser Identification Detection and Ranging (LIDAR) data, and assumptions regarding existing conditions within borrow pits, it is estimated that approximately 790,000 cubic yards (cys), approximately 60 acres, would be required to construct these mitigation features; approximately 540,000 cys would be required to complete the BLH-Wet feature and approximately 250,000 cys would be required to construct the BLH-Dry feature. The proposed borrow sites are depicted in appendix A, figure 6. Borrow excavation within Lake Pontchartrain would be restricted to a maximum depth of -20 ft and a maximum depth of -60 ft would be used in the Mississippi River.

2.3.1.3 Frenier BLH-Dry and BLH-Wet Restoration Project

This project would be constructed northwest of the Bonnet Carré Spillway and between Hwy 61 and the Frenier swamps which are south of the I-10. This project is shown in appendix A, figure 7.

The Frenier BLH-Wet Restoration feature has a mitigation potential of 0.63 AAHUs per acre, providing the required 50.46 AAHUs for general impacts through restoration of a minimum of 80.1 acres of FS BLH-Wet, and the Frenier FS BLH-Dry Restoration feature has a mitigation potential of 0.58 AAHUs per acre, providing the required 17.08 AAHUs for general impacts through restoration of a minimum of 29.4 acres of FS BLH-Dry.

The Frenier project consists of two features: Feature FA1 – BLH-Dry Restoration and Feature FA2 – BLH-Wet Restoration. As initially proposed, both BLH-Wet (FA2) and BLH-Dry (FA1) mitigation features would be constructed within the eastern portion of the agricultural (Ag) areas that exist immediately west of the existing Frenier swamps. The topography of approximately 81.08 acres of Ag lands would be modified to elevations conducive to a BLH-Wet habitat and an additional 29.65 acres would be modified to elevations conducive to a BLH-Dry habitat. For Feature FA2, an elevation range of +2 ft to +3 ft is desired for BLH-Wet habitat. Based on LIDAR survey data, the majority of the acres targeted for BLH-Wet habitat is currently within this targeted elevation range. Thus, minimal degrading would be required to prepare these portions of Ag fields for BLH-Wet habitat plantings. Degrading would be required near the edges of the adjacent proposed BLH-Dry Feature FA1. The targeted elevation for BLH-Dry is greater than +3.0 ft. Fill would be placed to an initial elevation of +4.5 ft to allow for subsidence and provide longevity of this desired habitat. Existing drainage ditches, ridges, and roads exist within the project area boundary. These features would be allowed to remain, but may require slight modifications in order to allow for interchange and distribution of freshwater water throughout the BLH restoration feature cells. The material excavated during the process of creating the BLH-Wet feature would be placed within the limits of the proposed BLH-Dry feature. The BLH-Dry feature FA1 would be constructed within existing Ag fields adjacent to Feature FA2, with the material removed from FA2 distributed within feature FA1. Approximately 14,100 cys of material would be excavated from feature FA2 and placed within feature FA1. No retention dikes would be needed.

The site for this BLH project is within cleared Ag fields, thus clearing and grubbing would not be required.

Some hydrologic improvements may be required to encourage alternating wet/dry periods within the site and to allow for interchange between this feature and the adjacent estuarine system. Hydrologic modifications that could be used to assist in facilitating interconnectivity between the site and the adjacent estuarine system could entail any of the following measures: a) breaching banks of existing drainage ditches/canals, b) construction of earthen weirs within existing drainage ditches/canals in order to facilitate sheet flow across the BLH-Wet feature, c) construction of bifurcation channels off of the ditches and leading into the BLH-Wet sites, and/or d) installing or replacing existing culverts.

Ingress and egress to the site would be via Federal, state, and local highways. At this time, access to the site from Highway 61 is planned via Oswald Ave. A staging area, between the northern edge of feature FA2 and Oswald Ave, would be required for staging of equipment and temporary storage of plants. The staging area would be approximately 3.55 acres in size.

Following the construction required to modify features to their required BLH habitat topography, plantings within both features would be performed. Planting and monitoring for both features would be in accordance with the applicable guidelines contained in appendix J.

Borrow Requirements

All earthen material required to construct the BLH-Dry and BLH-Wet habitat sites would be obtained from within the project site itself. No additional outside borrow would be required for this project.

2.3.1.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

This project is located on the north shore of Lake Pontchartrain on the north-east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, LA. 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. This project is shown in appendix A, figure 8.

With a mitigation potential of 0.44 AAHUs per acre for BLH-Wet restoration, 0.2 AAHUs per acre for BLH-Wet enhancement, and 0.03 AAHUs per acre for BLH-Dry enhancement, the combination non-refuge BLH-Dry enhancement/BLH-Wet enhancement/BLH-Wet restoration project would provide the required 50.46 AAHUs for general BLH-Wet impacts and 17.08 AAHUs for general BLH-Dry impacts through restoration of a minimum of 44 acres of FS BLH-Wet, enhancement of 229.76 acres of FS BLH-Wet and enhancement of 152.33 acres of FS BLH-Dry. Because only 152.33 acres of BLH-Dry were available within the project area, which provides only 4.57 of the 17.08 AAHUs required for BLH-Dry impacts, the remaining BLH-Dry AAHUs would be achieved through additional restoration of BLH-Wet. Thus, it was determined that this project would consist of 153 acres of FS BLH-Dry enhancement, 44 acres of FS BLH-Wet restoration (which mitigates for both BLH-W and BLH-Dry impacts), and 230 acres of FS BLH-Wet enhancement.

This project consists of a BLH-Wet restoration feature (FM9), two BLH-Wet enhancement features (FM1 and FM8) and two BLH-Dry enhancement features (FM6 and FM7). BLH-Wet restoration feature FM9 requires filling of 44 acres of open water adjacent to the existing BLH-Wet/Dry ridge to an elevation conducive to BLH-Wet habitat. Existing bottom elevations at the proposed site are anticipated to be similar to the proposed marsh creation locations immediately north. The initial target elevation for fill material would be approximately +3.0 NAVD88, to ultimately achieve a final target elevation of +2.0 NAVD88, The small 44 acre size is problematic for hydraulic filling. The confined area would quickly fill with dredge effluent, and potential turbid waters would be overflowing the weir locations. A 2 ft freeboard requirement, with dikes established to +5.0, would be mandated to allow effluent waters to pond as long as possible. This would allow fill material to settle to achieve target elevation, while minimizing effects on water quality. Analysis of the borrow material characteristics would be performed during the next phase of design to determine stackability of the fill material. This analysis would determine the need for any additional dewatering during construction, movement of discharge pipeline, and/or interior baffle dikes. Approximately 8,400 ft of retention dike construction would be required. The dikes would ultimately settle to a lower elevation, possibly less than +4.0 NAVD88, which is within the range for hardwood establishment, and dike degrading would not be mandated. The dikes would ultimately settle, breach, and erode, but in the meantime would serve to pond freshwater during rain events. If the dikes restrict tidal exchange into the newly created acreage, then they would

be gapped at approximately 500 ft intervals at the time of planting. This would result in approximately 6 gaps with 25 ft bottom widths +2.0 and elevation to assure tidal exchange.

Within the BLH-Wet (FM1 and FM8) and Dry (FM6 and FM7) enhancement sites, no fill or grade manipulation requirements would be required. Invasive species eradication would be performed. This would entail removal of undesirable vegetation, ringing of trees, and the application of required herbicide treatment. Healthy existing BLH species would remain untouched. Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or mid-story species may remain, but in a spatial distribution that leaves relatively large "gaps" in the canopy stratum and/or the mid-story stratum. Where needed, reforestation (planting) would be performed. The schedule and plan for tree plantings, including species, quantity, and layout would be as per the applicable guidelines found in appendix J.

Staging Area(s) required for construction would be established in the next phase of design. The non-refuge BLH-Dry enhancement sites (FM6:143 acres and FM7:10 acres) and the BLH-Wet enhancement sites (FM1: 217 acres and FM8: 13 acres) would best be accessed from US Hwy 90 for eradication and planting.

Borrow Requirements

Borrow plan would be obtained from Lake Pontchartrain, requiring a buffer of 2000 ft between the existing shoreline and the borrow area limit (appendix A, figure 22). The proposed BLH-Wet restoration effort would require 400,000 cubic yards of borrow material. This equates to approximately a 25 acre borrow site. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow excavation would not be allowed greater than 10ft below the existing lake bottom, except that a tolerance of 1ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be placed from the lake to the proposed BLH-Wet creation site. The proposed corridor remains in deeper water fronting the existing marina facilities along the lakefront, then hugs the shallow water shoreline towards US Highway 90. The pipeline location would require buoy markers and lights to notify mariners of its location. In order to stay out of the US 90 corridor, the pipeline access corridor must cross the beach and Old Spanish Trail roadway well to the east of the highway. Although the pipeline could likely cross temporarily on top of the Old Spanish Trail (with temporary ramping), the cost estimate for this project includes a jack-and-bore of the roadway to minimize local impacts. The proposed pipeline access route from Old Spanish Trail to US 90 through open water is on private property, not on the refuge. After crossing this roadway, the access corridor parallels the west side of US Highway 90 until it reaches the proposed BLH-Wet footprint at two locations. The corridor would be restricted to 200 ft in width in open water and across the beach, but would be restricted in the northern reach to the available corridor between the existing tree line and Hwy 90. This existing corridor measures approximately 75 ft in width. The access corridor would be used for a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the access corridor, by using Hwy 90 for daily transportation of supplies and personnel where possible. A fiber-optic cable potentially runs along the project's eastern boundary, paralleling the US Hwy 90. This utility would need to be considered and the owner consulted to determine the final layout of the proposed access corridor.

2.3.2 MITIGATION FOR IMPACTS TO NON-REFUGE SWAMP

2.3.2.1 General Mitigation Bank Project

Consistent with the screening criteria, the PDT identified all active mitigation banks with perpetual conservation servitudes within the LPV watershed with enough credits available to meet 100 percent of the swamp mitigation requirement. Three banks were initially identified in the LPV watershed. The PDT developed a generic mitigation bank project for the final array based upon information obtained from these three banks. This project assumes that all of the 97.72 swamp AAHUs required could be satisfied through the purchase of mitigation bank credits and that purchase of mitigation bank credits from a bank with perpetual conservation servitude would yield a result similar to a mitigation project constructed by the Corps (Corps constructed).

If the general mitigation bank project becomes the TSMP for this habitat type in the TSMPA, but at the time of solicitation, no banks exist that can meet 100 percent of the mitigation requirement by habitat type or the Corps does not receive satisfactory bids (based on cost and/or other factors), then the second-ranked mitigation project would take its place as the TSMP for that habitat type in the TSMPA. In addition, if the actual costs for purchasing the mitigation bank credits turn out to be more than what was estimated for the general mitigation bank project during AEP, a re-analysis comparing the mitigation bank project to the other mitigation projects would be conducted to verify the ranking of the projects and the selection of the mitigation bank project as the TSMP. If the costs for implementing the mitigation bank project based on the proposals received exceed those for the second ranked alternative, then the second ranked project would likely become the new TSMP for that habitat type in the TSMPA.

If purchase of mitigation bank credits were included in the LPV Mitigation TSMPA, swamp impacts would be mitigated with the purchase of swamp credits equaling 97.72 AAHUs. Mitigation banks would be required to run the same version of the WVA model as was used to assess the impacts from constructing the HSDRRS to ensure that the assessment of the functions and services provided by the mitigation bank match the assessment of the lost functions and services at the impacted site.

2.3.2.2 Bonnet Carré Swamp Restoration Project

This project would be constructed within the Bonnet Carré Spillway and between Hwy 61 and the I-10. This project is shown in appendix A, figure 5.

With a mitigation potential of 0.39 AAHUs per acre, this swamp restoration project project would provide the required 97.72 AAHUs for general impacts through restoration of a minimum of 250.6 acres of FS swamp.

The Bonnet Carré Swamp Restoration mitigation project, comprised of Elements BC1 through 11, would be constructed in the more northern part of the Bonnet Carré Spillway. Restoration would consist of the concentrated placement of dredge material, to be obtained from Lake Pontchartrain at the north end of the Bonnet Carré Spillway within existing shallow open water areas. Restoration would commence at the northern-most portion of the project area and proceed towards the river until the restoration of approximately 250.6 acres is completed. As the proposed final targeted elevation for this habitat is within a range of +1.5 to +2.0 ft, the initial fill elevation would be to an elevation of +3.0 ft to

allow for subsidence and provide longevity for this desired habitat. Existing ridges within the various feature polygons would be used to assist in retention of the dredged material and ridges of elevation exceeding +2.5 ft would be degraded and excess min the areas being filled. Prior to placement of dredged material, the area would be cleared and grubbed of all existing trees. The debris from clearing and grubbing operations may be placed within the adjacent borrow pits and later backfilled with dredged material. As the material to be dredged is expected to be of a fairly sandy nature, retentions dikes are not anticipated to be required. Rather, the material would be stacked in isolated locations until needed and then transferred to the placement area until all elements are filled to the proper elevation. The swamp features would be planted in year 1 post construction, according to the planting guidelines and species listing provided in appendix J.

Ingress and egress to the site would be via Lake Pontchartrain, as well as by Federal, state, and local highways and the Bonnet Carré Spillway. To accommodate construction, two areas would be provided for the temporary staging of barge(s), the dredge pipeline, and required land-based equipment. One staging area (approximately 23.5 acres) would be located along the Lake Pontchartrain shoreline and immediately west of the east guide levee. Excavation for floatation access to this staging area may be required. Where floatation access dredging is required, the excavated material would be placed adjacent to the floatation channel and the material used to backfill the channel upon completion of work. The other staging area (approximately 8.5 acres) would be located inside the spillway and just south of the rail road trestles spanning the north end of the spillway. There would be no excavation to access this staging area.

Borrow Requirements

Earthen material required to construct the swamp habitat feature would be obtained from within Lake Pontchartrain (appendix A, figure 6). Based on available LIDAR data, and assumptions of existing conditions within the proposed borrow sites, it is estimated that approximately 1,130,000 cys, approximately 95 acres, would be required to complete this feature. To assure adequate borrow, the proposed pit size would be nearly doubled (1.75 times the original pit size) to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow excavation within Lake Pontchartrain would be restricted to a maximum depth of -20 ft. The dredge material/fill would be transported via hydraulic dredge and a discharge pipeline which would run through/under the I-10 and railroad trestles at the north end of the Bonnet Carré Spillway, and then through water bodies or cleared land so as to minimize impacts to existing vegetation.

2.3.2.3 Caernarvon Swamp Restoration Project

This restoration project is located between the Mississippi River and Lake Lery in the general vicinity of Caernarvon, LA. The swamp feature is located in Big Mar, a remnant agricultural site which converted to open water located at the outflow of the Caernarvon Fresh Water Diversion outflow channel. This location assures a fresh water source for the proposed swamp platform. The site is bounded by the Mississippi River to the north, the Delacroix Canal to the south, and the Caernarvon Diversion outfall canal to the east. This project is shown in (appendix A, figures 9, 24).

With a mitigation potential of 0.149 AAHUs per acre, this swamp restoration project would provide the required 97.72 AAHUs for general impacts through restoration of a minimum of 655.8 acres of FS

swamp. This mitigation potential was derived from a WVA that utilized a smaller polygon than the 656-acre site currently under consideration; however, the mitigation potential would likely remain relatively consistent throughout the 656-acre site as it is primarily open water.

The proposed swamp footprint, comprised of three restoration features (C-1A, C-1B, and C-1C), is connected to the Mississippi River via the Caernarvon Fresh Water Diversion and offers viable freshwater habitat for potential swamp creation. The swamp footprint would be subdivided by east/west flowage canals to allow Caernarvon Diversion waters to migrate into the existing wetlands west of the proposed swamp site. It is imperative that this swamp restoration project does not impact the operating requirements of the freshwater diversion and that it can accommodate the diversion's maximum allowable flow rate. The proposed drainage canals (total length of approximately 8,000 linear ft) would be constructed to a 50 ft bottom width and to an elevation of -5.0 NAVD88. Material excavated in the construction of these canals would be used in the construction of the swamp restoration area retention dikes. The canal construction would result in three sub-units of swamp restoration. The northern unit would be 396 acres, the middle unit would be 97 acres, and the southern unit would be 174 acres. The sub-units would require total retention around the perimeter to be provided by dikes. Available LIDAR data was used to evaluate existing elevations in the proximity of the project swamp site. It appears, in general, that all areas supporting woody growth had ground elevations exceeding +2.0 NAVD88. With an initial target fill elevation of approximately +2.5 NAVD88 and final target elevation of +2.0 NAVD88, the dikes would be constructed to elevation +5.0 to accommodate 1.5 ft of freeboard above the target elevation during construction. Respective required dike construction lengths would be: north cell – 10,200 ft, middle cell – 9,700 ft, and south cell – 12,000 ft. The retention dikes would be constructed with a 5 ft crown width. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. In addition to obtaining borrow from the drainage canal construction, borrow for these retention dikes, would come from within the swamp creation cells. The allowable borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability.

Upon completion of construction and approximately 1 year of consolidation of dredged materials, the entire middle and southern dike, as well as the southern open water boundary of the northern cell, would be degraded to swamp elevation. In addition, the western boundary of the northern cell would be breached at all existing natural waterways to accommodate water exchange between the existing western wetlands. The gaps would be constructed at approximately 500 ft intervals with a 25 ft bottom width at invert elevation 0.0 NAVD88. Approximately 10 gaps are anticipated. Finally, a trenasse (shallow ditch) of approximately 7,800 linear ft would be constructed within the northern cell, initiating in the north east corner at an existing pump station and meandering west, southwest into the swamp footprint. This trenasse would allow adequate discharge necessary for existing pump station operations, introduce fresh water into the northern limits of the swamp creation feature, and serve as a tidal creek to facilitate water and fisheries exchange. The trenasse would be constructed to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The trenasse width, if constructed in this fashion, would be the width of marsh buggy (10-12 ft). If the resulting depression is not adequate for minimal water flow, the marsh buggy mounted excavation equipment can remove material along the proposed alignment, not to exceed a 5-ft bottom width by 2-ft deep channel. The minimal material excavated by this procedure would be side cast along either bankline to assure no significant

buildup of material occurs. The swamp features would be planted in year 1 post construction, meeting the applicable planting guidelines and species listing provided in appendix J.

Access to the project site is restricted to boat access. Immediately north of the project site, with access from Highway 39 via an existing shell road, are two boat launches and a lift facility capable of launch for small-craft vessels and/or air boats. The launch is located on the right descending bank of the Caernarvon Canal. This launch site would likely be used as a staging area if necessary during the planting operations. No staging area requirement is anticipated for the dredging operation at this time; however, the launch site would likely be used to ferry personnel back and forth from the dredge and project site.

Borrow Requirements

The borrow plan is to obtain material from Lake Lery, requiring a buffer of 1,500 ft between the existing shoreline and the borrow area limit (appendix A, figure 12). The swamp restoration features would require a total of 4.7 million yards of borrow material, based on the assumptions described previously. The required borrow sites would be approximately 290 acres. To assure adequate borrow, the proposed pit would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Oil/gas pipelines are known to exist within Lake Lery. A minimum buffer of 300 ft “no dredging” area would be required between the borrow site footprint and any pipelines found in the vicinity. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be created from the lake to the proposed swamp creation site, following the existing Bayou Mandeville waterway connecting Big Mar and Lake Lery. The pipeline would be laid within this existing waterway to avoid damage to existing marsh. The contractor would be instructed to minimize usage and damage within the swamp access corridor by using existing waterways for daily transportation of supplies and personnel where possible.

2.3.2.4 Milton Island Swamp Restoration Project

This swamp restoration project is located on the north shore of Lake Pontchartrain, west of the Causeway Bridge. Selection of a swamp creation site was desired as far north as possible from Lake Pontchartrain to maximize fresh water influences within the selected boundary. The swamp location was purposely situated north of the existing Milton’s Ridge to minimize salt water impacts. Proposed retention dikes and water interchange locations are also strategically located to maximize input of fresh water. This project is shown in appendix A, figure 10.

With a mitigation potential of 0.32 AAHUs per acre for restoration and 0.12 AAHUs per acre for enhancement, this project would provide the required 97.72 AAHUs for general impacts through restoration of a minimum of 284.4 acres of FS swamp and enhancement of 56 acres of FS swamp.

This project consists of two restoration features, (the northern polder and the southern polder). The northern polder measures approximately 214 acres, but includes approximately 56 acres of existing swamp habitat. The southern polder measures approximately 133 acres. Available LIDAR data of the existing swamp north and west of the project sites indicates existing elevations between +1.5 and +1.0 NAVD88. The proposed swamp platform would be targeted to a fill height of +1.5 NAVD88. Initial

fill height elevation would be for approximately +2.0 NAVD88 to allow for settling of fill material. The existing perimeter dike would be used for retention of dredged material. This existing dike has a paved crown, at approximate elevation +8.0. If dike rehabilitation is required, material for dike maintenance would come from within the proposed footprint. Upon completion of construction, the eastern dike would remain intact. The existing western and northern dikes would be gapped as discussed below. The southern dike would be degraded to restore hydrologic connection with the adjacent existing swamp and southern polder. While the northern polder would require no exterior dike construction, some retention dike construction would be required in the southern polder. The southern polder contains more acres than needed to fulfill the desired swamp restoration. Interior dikes would be required to limit the acres created. Approximately 4,400 linear ft of retention dikes would be constructed to maintain a minimum of 2 ft of freeboard during dredging disposal operations. Newly constructed retention dikes would be constructed to elevation +5.0 NAVD88, with a 5 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The allowable borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. The proposed dikes would be situated to exclude the most isolated eastern reach of polder acreage (which would remain an impounded pond), and the south-western corner of the polder footprint. The rationale for excluding this southwestern corner is to maintain the most northern footprint possible which would limit saltwater interaction and minimize overlapping the footprint of an existing transmission line corridor. To maintain these desired conditions, the constructed retention dikes would remain in place upon completion of the swamp restoration efforts. The existing northern dike and southern ridge is assumed adequate for retention of dredged material. Allowances in the project cost estimate would be included for rehabilitation of these retention features, if necessary. Upon completion of pumping operations and suitable consolidation of the swamp platform, the existing exterior dikes to the west and north would be gapped to restore hydrologic connection with the adjacent existing swamp and northern polder. The dikes would be gapped at approximate 500 ft intervals to ensure adequate exchange and throughput across the swamp. The gaps would be constructed at 25 ft bottom widths to an invert elevation that would be developed through coordination with the resource agencies. The swamp features would be planted in year 1 post construction, according to the applicable planting guidelines and species listing provided in appendix J.

Vehicular access is available to the site via existing public and private roads, which could be used to transport personnel as necessary to and from the worksite. If used, permission to park vehicle would be required from the landowner. It is envisioned that large equipment access would all come from Lake Pontchartrain and the access corridor shown in appendix A, figure 10 to minimize impacts to private roads and lands. The existing perimeter retention dike (with paved crown) is large enough to be used for storage of plants along the slopes, if desired during the planting effort, and would be considered a viable staging area for that effort. This entire dike footprint would be within the proposed right-of-way to allow for retention dike maintenance if required.

Borrow Requirements

The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 23). The combined swamp restoration features would require a total of 1.6 million yards of borrow material, based on the

assumptions described above. The required borrow site would be approximately 106 acres. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Existing transmission lines are located in Lake Pontchartrain, south of the proposed borrow site. A minimum buffer of 300 ft "no dredging" area would be required between the borrow site footprint and the transmission line alignment. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be established from the lake to the proposed swamp creation site, crossing the existing lakeshore south of the site. The proposed corridor would extend north to the southeast corner of the southern swamp restoration site and then jog east to intercept an existing canal along the eastern border of the northern swamp restoration site. The borrow pipeline would be laid within this existing canal to avoid existing swamp and would extend northward to the southern limit of the northern swamp restoration site. The corridor would be restricted to a 200 ft width in the open water areas and would be constricted to utilize the existing canal width in the vicinity of the Fredric's Canal. The access corridor would be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the access corridor by using existing waterways for daily transportation of supplies and personnel where possible.

2.3.3 MITIGATION FOR IMPACTS TO NON-REFUGE INTERMEDIATE MARSH

2.3.3.1 Bayou Des Mats Marsh Restoration Project

This intermediate marsh restoration project is located on the north shore of Lake Pontchartrain, approximately 2.5 miles southwest of Lacombe, LA, in St. Tammany Parish. The project site is an open water area approximately 400 ft inshore of the Lake Pontchartrain shoreline. This project is shown in appendix A, figure 10.

With a mitigation potential of 0.39 AAHUs per acre, this project would provide the required 107.87 AAHUs for general impacts through restoration of a minimum of 276.6 acres of FS intermediate marsh. As planned, this project would consist of 277 acres of intermediate tidal marsh restoration.

This project consists of one feature (BDM-1). Initial target elevation for dredge fill would be to approximately elevation +2.0 NAVD88 with a target marsh elevation ranging from +1.5 to +1.0 NAVD88. Total perimeter retention would be required to retain dredge material and to allow for vertical accretion. Approximately 16,000 linear ft of retention dike would be required. Dependent upon borrow soil boring results, portions of this retention feature could be lowered to allow overflow of effluent to nourish adjacent marshes. Previous United States Geological Survey (USGS) mapping of Lake Pontchartrain indicates that a higher sand content is found on the north shore than in other portions of the lake. It is anticipated that the proposed borrow source would contain approximately 25 percent to 40 percent sand, which would greatly improve retention of pumped borrow material. Retention dikes would be constructed to maintain a minimum of 1ft of freeboard during dredging operations. The retention dikes would be constructed to elevation +4.0 NAVD88, with an 8 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The allowable borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the

existing ground elevation. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Plugs would be left in the borrow canal at 1000-ft 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. If deemed necessary by the construction contractor, a low level interior weir can be constructed to assist in vertical stacking of dredged material. If necessary, approximately 2,600 ft of interior dike, crown width of 5-ft and dike height of +3.0 NAVD88 would be constructed.

Approximately half of the retention dike 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 proposed dike at elevation +4.0 NAVD88 is anticipated to settle to a long-term elevation of approximately +3.0, closely matching the elevation of the current shoreline. The remaining northeastern half of the retention dike would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The crown width would provide adequate width to serve as an equipment platform for this dike degrading effort. Approximately 2-ft of dike degrading is anticipated after the initial year of settlement, to lower the dike footprint down to the desired marsh elevation. The degraded material can be placed into the original borrow ditch if post-consolidation elevations allow, or it can be side cast to the open water areas exterior of the marsh creation footprint. Approximately 1.5 yards/linear ft of material is anticipated to be removed during this degrading operation. In conjunction with the dike degrading effort, trenasses would be constructed as necessary to serve as tidal creeks to facilitate water and fisheries exchange. The trenasses would be constructed to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The trenasse width, if constructed in this fashion, would be the width of a marsh buggy (10-12 ft). If the resulting depression is not adequate for minimal water flow, marsh buggy mounted excavation equipment can remove material along the proposed alignment, not to exceed a 5-ft bottom width by 2-ft deep channel. The minimal material excavated by this procedure would be side cast along either bankline to assure no significant buildup of material occurs. Approximately 4,000 ft of trenasse development would be anticipated.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The contractor would use the same access corridors to the site for year 1 operations as were used during initial construction. As access to the site is restricted to Lake Pontchartrain, it is envisioned that all required staging activities would be barge founded.

Borrow requirements

The borrow plan is to obtain material from Lake Pontchartrain, which would require a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 11). Marsh creation would require borrow of approximately 2.4 million cubic yards of material. The required borrow site would be approximately 125 acres. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow excavation would not be allowed greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be allowed to account for inaccuracies in the dredging process. Two access corridors would be allowed across the lake to the

proposed marsh creation site. These corridors would be restricted to 200 ft in width and can be used to establish a pipeline corridor, offload equipment as necessary, and transport personnel to and from the worksite.

2.3.3.2 Caernarvon Marsh Restoration Project

This intermediate marsh restoration project is located in St. Bernard Parish, in the general vicinity of Caernarvon, LA in St. Bernard Parish on the north rim of Lake Lery. This project is shown in appendix A, figures 12 and 24.

With a mitigation potential of 0.19 AAHUs per acre, this marsh restorationproject would provide the required 107.87 AAHUs for general impacts through restoration of a minimum of 567.7 acres of FS intermediate marsh. This project consists of 570 acres of FS intermediate marsh restoration.

The Caernarvon restoration project consists of a FS intermediate marsh restoration feature (C-2). Initial elevation for dredge fill would be to approximate elevation +1.5 NAVD88, to ultimately hit a target marsh elevation of +1.0 NAVD88. Total perimeter retention would likely be required to retain dredge material and to allow for vertical accretion. Approximately 26,000 linear ft of new retention dike would be required along the project footprint. Approximately 5,000 ft of existing spoil berm along the eastern perimeter would likely require rehabilitation prior to filling of the marsh creation site. Slurry elevation of approximately +2.5 would be required during the pumping operations to achieve target elevation. The retention dike would be built with a 5 ft crown width to elevation +3.5 NAVD88, to provide one ft of freeboard during pumping operation. Borrow for the retention dikes would come from within the marsh creation footprint. Plugs would be left in the borrow canal at 1,000-ft intervals to minimize water flow during pumping operations. The eastern dike, along the existing pipeline canal would remain in place post construction. The proposed marsh layout results in an open water area immediately north and adjacent to the marsh footprint. The northern dike would be degraded after year 1, upon settlement and dewatering of the created marsh platform, allowing immediate access for fish and wildlife between the open water and marsh platform. The degraded material can be disposed of in the original borrow canal if settlement allows, or side cast into the open water immediately outside of the project footprint. The southern and western retention dikes would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. The gaps would require a 25-ft bottom at approximately elevation +0.0 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh. Approximately 23 gaps are anticipated.

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. If deemed necessary by the construction contractor, low level interior weirs or baffle dikes can be constructed to assist in vertical stacking of dredged material. Construction of trenasses is not proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

The marsh footprint would be planted upon satisfactory settlement and dewatering, probably one year after initial construction. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The planting contractor would use the lake side access corridor to the site for year

1 operations. Staging areas, if required, would be located during the preconstruction engineering and design (PED) phase of design. As access to the site is basically restricted by boat via Lake Lery, it is envisioned that all required staging activities would be barge founded.

Based on review of aerial photography, the marsh creation site would likely require some degree of lake shoreline restoration to assure a viable project life. Aerial photography indicates that this shoreline has breached, and lake waters are free to enter and exit the marsh footprint. Approximately 3,300 feet of earthen berm would be constructed at the breached sites fronting the marsh creation perimeter and would be a part of the required retention feature. The berm would be constructed with a wider crown to withstand waves. The shoreline repair would be an earthen dike feature, with a minimum crown width of 25 feet. The repair section would tie into stable shoreline on the eastern and western limits. Planting would be required upon completion of fill placement. At a minimum, lightweight turf reinforcement would be considered to minimize shoreline scour upon completion. If this project is selected for advanced design, additional erosion protection measures along the lake side face of the newly constructed berm may be considered, such as earth filled geotextile bags, or lightweight turf reinforcement, both of which can be planted upon completion of installation. The use of stone protection in such a short reach of lake shoreline is not recommended, as scour would result on both ends of the protected reach; likely flanking the completed protection.

Borrow Requirements

The borrow plan would be to obtain material from Lake Lery, requiring a buffer of 1,500 ft between the existing shoreline and the borrow area limit (appendix A, figure 12). Marsh restoration would require borrow of approximately 4.6 million cubic yards of material. The required borrow site would be approximately 290 acres. To assure adequate borrow, the proposed pit would be oversized by 50 percent to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be allowed to account for inaccuracies in the dredging process. Oil/gas pipelines are known to exist within Lake Lery. A minimum buffer of 300 ft "no dredging" area would be required between the borrow site footprint and any pipelines. The marsh creation site is adjacent to the north shore of Lake Lery. Two short access corridors are proposed on the east and west limits of the proposed work. These corridors could be restricted to 200 ft in width. The access corridors can be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite.

2.3.3.3 Fritchie Marsh Restoration Project

This intermediate marsh restoration project is located on the north shore of Lake Pontchartrain on the north-east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, LA. 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. The project footprint abuts the proposed brackish marsh restoration also being considered at the Fritchie site. This project is shown in appendix A, figure 13.

With a mitigation potential of 0.34 AAHUs per acre, this intermediate marsh restoration project would provide the required 107.87 AAHUs for general impacts through restoration of a minimum of 317.3

acres of FS intermediate marsh. This project currently consists of 325 acres of FS intermediate marsh restoration.

This project contains one non-refuge intermediate marsh restoration feature (FM10B). Initial target elevation for dredge fill would be approximately +1.5 NAVD88, to ultimately hit a final target marsh elevation ranging from +1.5 to +1.0 NAVD88. The minimum fill height, fairly firm bottom, and anticipated sandy borrow source minimize concerns of any significant settlement of the proposed marsh platform.

Total perimeter retention would likely be required to retain dredge material and allow for vertical accretion. Previous USGS mapping of Lake Pontchartrain indicates that a higher sand content is found on the north shore than other parts of the lake, with the highest sand content in the vicinity of this project. It is anticipated that the borrow source proposed would contain approximately 25-40 percent sand, which would greatly improve retention of pumped borrow material. Slurry elevation of approximately +2.5 would be required during the pumping operations to achieve target elevation. Retention dikes would be constructed to maintain a minimum of 1 ft of freeboard during dredging operations, thus allowing for dike settlement during construction. The retention dikes would be constructed to elevation +3.5 NAVD88, with a 5 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Unexcavated portions of the borrow ditch would be left at 1000-ft 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 15,700 linear ft of retention dike would be required. The entire southern and western boundaries and a portion of the northeast boundary dike would be built in open water. These dike reaches, approximately 10,300 linear ft, would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The degraded material can be disposed of in the original borrow canal if settlement allows, or cast into the open water immediately outside of the project footprint. Approximately 1.5 cubic yards per linear ft of material are anticipated to be removed during this degrading operation. The remaining reaches of eastern retention dike would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. Approximately 4 gaps are anticipated. The gaps would require a 25-ft bottom at approximate elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh.

As this potential marsh creation project is bound by open water areas, construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

Finally, it is anticipated that the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform after 1 year. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant

species can be found in appendix J. The planting Contractor would use US Highway 90 for access to the site for Year 1 operations.

Borrow Requirements

The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 22). This intermediate marsh restoration project would require 2.0 million cubic yards of material. The proposed borrow site would be approximately 125 acres. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1 ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be established from the lake to the proposed marsh creation site. The proposed corridor would be in deeper water fronting the existing marina facilities along the lakefront, and then hug the shallow water shoreline towards US Highway 90. The borrow pipeline location would require buoy markers and lights to notify mariners of its location. In order to stay out of the US-90 corridor, the pipeline access corridor must cross the beach and Old Spanish Trail roadway well to the east of the highway. Although the pipeline could likely cross temporarily over the Old Spanish Trail (with temporary ramping), the cost estimate for this project includes a jack-and-bore of the roadway to minimize local impacts. The pipeline access route from Old Spanish Trail to US 90 through open water is on private property, not on the refuge. After crossing this roadway, the access corridor parallels the west side of US Highway 90 until it parallels the marsh creation site. It would then extend westward into the proposed marsh creation footprint. This route requires crossing the proposed BLH-Wet footprint at two locations, but these access corridors would be kept to a minimum width and replanted in conjunction with the year 1 planting schedule. The corridor would be restricted to 200 ft in width in open water and across the beach, but would be restricted in the northern reach to the available corridor between the existing tree line and Hwy 90. This existing corridor measures approximately 75 ft in width. Staging areas, if required for offloading pipeline from Hwy 90, would be sited during the PED phase of design.

The access corridor can be used for pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the access corridor by using Hwy 90 for daily transportation of supplies and personnel where possible. A fiber-optic cable potentially runs along the projects eastern boundary, paralleling the US Hwy 90. This utility would need to be considered and the owner consulted to determine the final layout of the proposed access corridor.

2.3.3.4 Big Branch Marsh Restoration Project

This intermediate marsh restoration project is located on the north shore of Lake Pontchartrain, approximately 4 miles southwest of Slidell, LA and immediately west of Highway 11. The project site is buffered on the west by the proposed Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) project, Bayou Bonfouca Marsh Creation Project (PO-104). The proposed CWPPRA project footprint was reserved during these 35 percent design proceedings, in anticipation of future CWPPRA construction and as per USFWS request. The site is partially buffered from Lake

Pontchartrain by Carr Drive and the residences and camps along that road. This project is shown in appendix A, figure 14 and 21.

With a mitigation potential of 0.37 AAHUs per acre, the intermediate marsh restoration project would provide the required 107.87 AAHUs for general impacts through restoration of a minimum of 291.5 acres of FS intermediate marsh. Thisproject currently consists of 298 acres of FS intermediate restoration.

This intermediate marsh restoration project has one feature (BB1-A). Initial target elevation for dredge fill would be approximate +2.0 NAVD88, to ultimately hit a target marsh elevation ranging from +1.5 to +1.0 NAVD88.

Total perimeter retention would likely be required to retain dredge material and allow for vertical accretion. Approximately 17,600 linear ft of retention dike would be required. It was assumed that the CWPPRA project would not be constructed prior to initiation of these mitigation efforts. Previous USGS mapping of Lake Pontchartrain indicate that a higher sand content is found on the north shore than other parts of the lake. The proposed borrow source would likely contain approximately 25-40 percent sand, which would greatly improve retention of pumped borrow material. Slurry elevation of approximately +3.0 would be required during the pumping operations to achieve target elevation. Retention dikes would be constructed to maintain a minimum of 1 ft of freeboard during dredging operations. The retention dikes would be constructed to elevation +4.0 NAVD88, with a 5 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Plugs would be left in the borrow canal at 1000-ft 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.

The entire eastern and western boundaries and a portion of the northwest boundary dike would be built in open water. These dike reaches, approximately 8,200 linear ft, would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The degraded material can be disposed of in the original borrow canal if settlement allows, or side cast into the open water immediately outside of the project footprint. Approximately 1.4 cubic yards/linear ft of material is anticipated to be removed during this degrading operation. The remaining reaches of the southern and northern retention dike, would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. Approximately 10 gaps are anticipated. The gaps would require a 25-ft bottom at approximately elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh. In conjunction with dike degrading efforts, trenasses would be constructed as necessary to serve as tidal creeks to facilitate water and fisheries exchange. The trenasses would be constructed to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The trenasse width, if constructed in this fashion, would be the width of a marsh buggy (10-12 ft). If the resulting depression is not adequate for minimal water flow, marsh buggy mounted excavation equipment can remove material along the proposed alignment, not to exceed a 5-ft bottom width by 2-ft deep channel. The minimal material excavated by this procedure

would be side cast along either bankline to assure no significant buildups of material occur. The project would require approximately 2,800 linear ft of trenasse.

The marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The planting contractor would use existing open water access routes to the site for year 1 operations, or potentially stage barge operations in Bayou Bonfouca and access the site across the northwest limit of the proposed CWPPRA project. Staging and delivery of dredge pipeline and heavy equipment would be within the open waters of Lake Pontchartrain. The potential exists to deliver plants, personnel, and supplies from Highway 11. This would require a safe parking/unloading area immediately west of the highway and shallow draft transportation across the open waters between the highway and the proposed worksite.

Borrow Requirements

The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 14). This project would require 1.8 million cubic yards of material. The proposed borrow site would be approximately 103 acres. To assure adequate borrow, the proposed borrow pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1 ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be established from the lake to the proposed marsh creation site. The proposed corridor cuts across existing marsh habitat. The contractor would be allowed to (1) pump in a roadway prior to construction, to be degraded to preexisting elevations upon completion of the project; (2) use board roads across the existing marsh habitat, to be planted and/or filled as necessary upon completion of the project; or (3) upon completion of construction, pump in the rutted access corridor to existing adjacent healthy marsh elevations and plant as required. The access corridor would be restricted to 200 ft in width and can be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the access corridor by using existing waterways for daily transportation of supplies and personnel where possible.

2.3.3.5 LaBranche Marsh Restoration Project

This intermediate marsh restoration project consists of project feature LB1. This feature is bounded by the south shoreline of Lake Pontchartrain on the north, a drainage outfall canal on the east, the west bound span of the I-10 on the south, and the previously constructed CWPPRA PO-17 marsh restoration site on the west. The project is located within St Charles Parish, LA. This project is shown in appendix A, figure 15.

Feature LB 1 has a mitigation potential of 0.34 AAHUs per acre and would provide the required 107.87 AAHUs of general impacts through restoration of a minimum of 317.3 acres of FS intermediate marsh. As initially proposed, marsh restoration element LB 1 would consist of restoring approximately 318 acres of marsh through dedicated dredging.

Field data obtained for the design of the original CWPPRA LaBranche project constructed in 1994 were used for estimating the amount of required borrow material. The average elevation within the open water area in 1994 was approx –1 ft NAVD88 and the adjacent marsh between +0.5 ft and +1 ft NAVD88. The dredge material would be placed within the marsh creation site to a maximum slurry elevation of +4 ft NAVD88 in order to achieve an elevation of between +1.5 ft NAVD88 to +2 ft NAVD88 after dewatering and initial consolidation, and a long-term elevation of approximately +1ft NAVD88. Disposal within the marsh restoration site would be semi-confined, with dredge effluent water discharged towards the south.

Due to the nature of the soils in this area, two options for retention are being proposed. Option 1 consists of total retention through construction of earthen dikes and closures along the west, north and east sides of the restoration area, as well as an earthen weir along the south side facing the I-10. This option would call for construction of approximately 22,150 ft of earthen perimeter dikes along the west, north and east sides, and an earthen weir, approximately 6,800 ft in length, along the south side of the restoration area. Retaining dikes and closures would be constructed from adjacent borrow obtained from within the marsh restoration site. The perimeter dikes would be constructed to a crown elevation of approximately +5 ft and a minimum of 1ft of freeboard would be maintained at all times during pumping operations. The rear earthen weir would be constructed to a crown elevation of +3.0 to +3.5 ft and may be either gapped and/or degraded in order to allow excess water to drain from the area and facilitate in development of the restoration site. The earthen retention features would be constructed to a minimum 5 ft crown width, with slopes no steeper than 1V on 3H, and with a minimum 40 ft interior berm to be maintained between the inside toe of the retention dikes and the top of the adjacent borrow pits. The perimeter dikes would be constructed in open water to avoid impacts to adjacent marsh. In addition to the dikes, several closures with larger cross sections than the retention dike would also be required in order to prevent effluent sedimentation from exiting the marsh restoration site during pumping operations. The closures shall be constructed of earthen materials. Upon completion of the project, the closures may either be left in place to naturally degrade, or removed if deemed appropriate. However, no closure removal or dike degradation would occur until dewatering and soil compaction within the mitigation site has occurred. Silt screens/curtains may also be used if necessary to prevent effluent sedimentation from entering the adjacent canal along the east side of the project area. Under Option 2, the rear weir would consist of earthen material stacked against hay bales to assist in retention of the dredged solids. For this option, it is estimated that approx 1,500 round hay bales, 4 to 5 ft in height and approximately 6 ft in diameter, would be used to construct the rear weir. The bales would be secured in place with either 4x4 posts or some other type of anchor and rope/cable mechanism. Other features would be the same as the retention system for Option 1.

As this potential marsh creation project is bound by open water areas, construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs would develop over the project life.

Access to the restoration site for dike and weir equipment would be via the existing outlet and canal that separates the existing shoreline protection from the new shoreline protection being proposed under this feature. Excavation for flotation may be required and would be limited to -7 ft deep by 60 ft wide with the excavated material side cast adjacent to the access canal and spread to not exceed 2 ft above the existing wetlands.

The project scope includes the following shoreline protection features that were part of the initial CWPPRA PPL 17 candidate project for this same site. That CWPPRA proposal includes the maintenance of approx 6,500 ft of existing foreshore protection that was constructed by St. Charles Parish in approximately 1993-1994, along with the construction of approximately 3,300 ft of new foreshore protection/bank paving, requiring a total of approximately 11,000 tons of crushed limestone. Floatation access adjacent to the shoreline would be required to repair the existing foreshore protection as well as to install approximately 3,300 ft of new foreshore protection. Shoreline protection is critical in assuring the viability and longevity of this marsh restoration effort.

Current surveys of the restoration site are not available and all elevation assumptions are based on data that had been obtained for the previously constructed CWPPRA PO-17 project immediately west of this feature. Detailed surveys would be required to verify/refine the actual quantities and scope of work should this project proceed to the next phase of design, especially in light of the potential impacts to bathymetry in Lake Pontchartrain following the 2011 opening of the Bonnet Carré Spillway.

Ingress and egress to the site would be via Lake Pontchartrain, as well as via Federal, state, and local highways. A construction access and staging area along the Lake Pontchartrain shoreline immediately adjacent to the CWPPRA PO-17 LaBranche restoration project constructed in 1994 would be used for this project. This access and staging area would extend from the lake shoreline to the PO-17 borrow area. This area would allow temporary staging of barge(s), dredge pipeline, and other construction equipment. In addition, two temporary access corridors leading from this construction access and staging area would extend adjacent to and along the limits of the proposed mitigation site. Excavation for floatation access may be required. Where floatation access dredging is required, the excavated material would be placed adjacent to the floatation channel(s) and the material used to backfill the channel(s) upon completion of work.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J.

Borrow Requirements

Borrow material would be obtained from a borrow site located within Lake Pontchartrain at the mouth of the Bonnet Carré Spillway (appendix A, figure 15). This site is labeled as “Primary Borrow Area” on the plates located in appendix A, figure 15. This borrow area was utilized for the construction of the CWPPRA PO-17 “LaBranche Wetlands Restoration” project, constructed in 1994. If necessary, a secondary borrow site, proposed for use by National Resource Conservation Service for CWPPRA PO-75, could also be used. It is estimated that approximately 1,800,000 cubic yards of dredged material would be required for the construction of this marsh creation project. The proposed borrow site would be approximately 160 acres. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds.

All borrow excavation within the lake would be limited to a maximum elevation of -20 ft NAVD88. Access for the dredge pipeline and equipment would be via the designated access corridors depicted in appendix A, Figure 15. This access plan consists of an easterly expansion of the CWPPRA PO-17 project access plan in order to allow for access of dredge pipeline and other associated dredging and disposal equipment.

2.3.3.6 Milton Island Marsh Restoration Project

This intermediate marsh restoration project is located near Madisonville on the north shore of Lake Pontchartrain, west of the Causeway Bridge. The marsh site is immediately adjacent to the Lake Pontchartrain shoreline. In fact, the eastern 1,000 ft of lakeshore marsh boundary has been breached into the lake, and a shoreline restoration feature is proposed to provide future protection of the proposed marsh feature from the lake environment. This project is shown in appendix A, figures 16 and 23.

With a mitigation potential of 0.40 AAHUs per acre, the FS intermediate marsh restoration project would provide the required 107.87 AAHUs for general impacts through restoration of a minimum of 269.7 acres of FS intermediate marsh. This project currently consists of 272 acres of FS intermediate marsh restoration.

The Milton FS intermediate marsh restoration project consists of project feature MI-2. Initial elevation for dredge fill would be to approximate elevation +1.5 NAVD88, to ultimately hit a target marsh elevation of +1.0 NAVD88. Total perimeter retention would be required to retain dredge material and to allow for vertical accretion. Approximately 5,400 linear ft of new retention dike would be required along the northern limit of the project footprint. The dike would be built with borrow obtained within the marsh creation footprint to an elevation +3.5 NAVD88 and with a 5 ft crown width, to provide one ft of freeboard during pumping operation. Plugs would be left in the borrow ‘canal’ at 1,000-ft intervals to minimize water flow during pumping operations. This dike would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The degraded material may be disposed in the original borrow canal if settlement allows, or cast into open water immediately outside of the project footprint. Existing retention features exist along the east, west, and south perimeters of the project footprint, except for a 1,000 ft reach of Lake Shoreline, which would require restoration efforts as described at the end of this section. Allowances would be made in the project cost estimate for rehabilitation of the remaining existing dikes as necessary. 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. If deemed necessary by the construction contractor, low-level interior weir or baffle dikes can be constructed to assist in vertical stacking of dredged material. The existing eastern and western retention features would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. The gaps would require a 25-ft bottom at approximately elevation +0.0 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh. Approximately 10 gaps are anticipated.

The proposed marsh layout results in an open water area immediately north and adjacent to the marsh footprint. The entire northern retention dike would be degraded to marsh elevation in year one, allowing immediate access for fish and wildlife between the open water and marsh platforms. The created marsh would provide an additional expanse of shoreline buffer for other interior swamp and marsh habitats.

Construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

The marsh footprint would be planted upon satisfactory settlement and dewatering of the dredged material, approximately 1 year after initial construction. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The planting contractor would use the lake side access corridor to the site for year 1 operations, or potentially use the existing canal and proposed gaps along the eastern border. No additional staging areas are envisioned. As project access is restricted to Lake Pontchartrain, all required storage and staging areas would likely be barge founded.

The southern limit of the proposed marsh creation footprint is bounded by the Lake Pontchartrain shoreline. Aerial photography confirmed by a site visit shows that this shoreline has breached, and lake waters are free to enter and exit the marsh footprint. An approximate 1,000 ft reach of Lake Pontchartrain shoreline restoration is proposed to reestablish the shoreline to better maintain fresh water levels in the mitigation site. The shoreline repair would be an earthen dike feature, approximate crown width of 25 ft, to match existing shoreline elevations to the east and west. Planting would be required upon completion of fill placement. At a minimum, lightweight turf reinforcement would be considered to minimize shoreline scour upon completion. An earthen-filled bag system, which would accommodate planting of shoreline vegetation, would be considered as a viable shoreline protection alternative, and included in the construction cost estimate. The use of stone protection in such a short reach of lake shoreline is not recommended, as scour would result on both ends of the protected reach, likely flanking the completed protection.

Borrow Requirements

The borrow plan is to obtain material from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 16). Marsh restoration would require borrow of approximately 1.5 million cubic yards of material. A borrow site of 106 acres would accommodate this requirement. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow excavation would not be allowed greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be allowed to account for inaccuracies in the dredging process. Existing transmission lines are located in Lake Pontchartrain, south of the proposed borrow site. A minimum buffer of 300 ft “no dredging” area would be required between the borrow site footprint and the transmission line alignment. An access corridor would be created from the lake to the proposed marsh creation site, crossing the existing lakeshore approximately at the east/west midpoint of the marsh polygon. The access corridor can 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 access corridor, by using existing waterways for daily transportation of supplies and personnel where possible.

2.3.4 MITIGATION FOR IMPACTS TO NON-REFUGE/REFUGE BRACKISH MARSH

2.3.4.1 Big Branch Marsh Restoration Project

This brackish marsh restorationproject consists of one restoration feature (BB1-B)located on the north shore of Lake Pontchartrain, approximately 4 miles southwest of Slidell, LA and immediately west of Highway 11. The project site is buffered on the west by a proposed CWPPRA project, namely the "Bayou Bonfouca Marsh Creation Project (PO-104)." The proposed CWPPRA project footprint was reserved during these 35 percent design proceedings, in anticipation of future construction and at the request of Big Branch NWR. The site is partially buffered from Lake Pontchartrain by Carr Drive and the residences and camps along that road. This project is shown in appendix A, figures 17 and 21.

With a mitigation potential of 0.42 AAHUs per acre, the brackish marsh restoration feature would provide the required 96.13 AAHUs of general impacts and 9.21 AAHUs of refuge impacts totaling 105.34 AAHUs through restoration of a minimum of 250.8 acres of FS brackish marsh. This project currently consists of 255 acres of brackish marsh restoration.

Total perimeter retention would be required to retain dredge material and allow for vertical accretion. It was assumed that the CWPPRA project would not be constructed prior to initiation of these mitigation efforts. Previous USGS mapping of Lake Pontchartrain indicate that a higher sand content is found on the north shore than other parts of the lake. It is anticipated that the borrow source proposed would contain approximately 25-40 percent sand, which would greatly improve retention of pumped borrow material. Slurry elevation of approximately +3.0 would be required during the pumping operations to achieve target elevation. Initial elevation for dredge fill would be approximately +2.0 NAVD88, to ultimately hit a target marsh elevation ranging from +1.5 to +1.0 NAVD88. Retention dikes would be constructed to maintain a minimum of 1 ft of freeboard during dredging operations. The retention dikes would be constructed to elevation +4.0 NAVD88, with a 5 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The allowable borrow ditch template would be a 40 ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Unexcavated portions of the borrow ditch would be left in place at 1,000-ft 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 16,800 linear ft of retention dike would be required. The entire eastern boundary and a portion of the northwest boundary dike are built in open water. These dike reaches, approximately 4,200 linear ft, would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The degraded material can be disposed of in the original borrow canal if settlement allows, or cast into open water immediately outside of the project footprint. The remaining reaches of the southern and northern retention dike would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. Approximately 10 gaps are anticipated. The gaps would require a 25-ft bottom at approximately elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh.

In conjunction with dike degrading efforts, trenasses would be constructed as necessary to serve as tidal creeks to facilitate water and fisheries exchange. The trenasses would be rutted to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The trenasse width, if constructed in this fashion, would be the width of marsh buggy (10-12 ft). If the resulting depression is not adequate for minimal water flow, marsh buggy mounted excavation equipment could remove material along the proposed alignment, not to exceed a 5 ft bottom width by 2 ft deep channel. The minimal material excavated by this procedure would be side cast along either bankline to assure no significant buildup of material occurs. The brackish marsh construction efforts would require approximately 2,800 linear ft of trenasse.

Finally, it is anticipated that the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform after approximately 1 year. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. Planting Contractor shall use existing open water access routes to the site for year 1 operations, or potentially stage barge operations in Bayou Bonfouca and access the site across the northwest limit of the proposed CWPPRA project.

Borrow Requirements

Borrow material would be excavated from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 17). This project would require 1.6 million cubic yards of material, requiring approximately 103 acres. To assure adequate borrow, the proposed pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow excavation would not be allowed greater than 10 ft below the existing lake bottom, except that a tolerance of 1 ft below this target elevation would be allowed to account for inaccuracies in the dredging process. An access corridor would be allowed from the lake to the proposed marsh creation site. The proposed corridor cuts across existing marsh habitat. The contractor would be allowed to (1) pump in a roadway prior to construction, to be degraded as necessary upon completion of the project; (2) use board roads across the existing marsh habitat, to be planted or filled as necessary upon completion of the project; or (3) upon completion of construction, pump in the rutted access corridor to marsh elevations and plant as required. The corridor would be restricted to 200 ft in width and can 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 access corridor, by using existing waterways for daily transportation of supplies and personnel where possible.

2.3.4.2 Golden Triangle Marsh Restoration Project

This brackish marsh restoration project would be constructed between the GIWW, Lake Borgne and the newly constructed IHNC Surge Barrier and in the vicinity of Michoud in New Orleans East. This project is shown in appendix A, in figure 18.

With a mitigation potential of 0.43 AAHUs per acre, this project would provide the required 96.13 AAHUs of general impacts and 9.21 AAHUs of refuge impacts totaling 105.34 AAHUs through restoration of a minimum of 245 acres of FS brackish marsh.

The Golden Triangle Area FS brackish marsh restoration project has project feature GT1. The dredge material would be placed confined within the marsh restoration site to a maximum slurry elevation of +4 ft in order to achieve an elevation of between +1.5 to +2 ft after dewatering and initial consolidation, and a long-term elevation of approximately +1 ft. Dredge effluent waters would be allowed to run over adjacent marsh at various spill box locations for marsh nourishment, as well as within adjacent water bodies. All dikes, weirs, and closures for this feature would be earthen and constructed from adjacent borrow to be obtained from within the marsh restoration site. Approximately 28,200 ft of perimeter earthen retention dikes would be required and a minimum of 1ft of freeboard would be maintained at all times during pumping operations. In order to assist in the development of Feature GT 1, an earthen weir, approximately 920 ft in length, would also be constructed. The earthen retention dikes and weir would be constructed to a min 5 ft crown width, slopes no steeper than 1V on 3H, and with a minimum 40 ft interior berm to be to be maintained between the inside toe of the retention dikes and earthen weirs and the top of cut of the adjacent borrow pits. The perimeter dikes would be constructed to an approximate elevation of +5.0 ft and the interior earthen weir in Feature GT 1 would be constructed to an approximate elevation of +3.0 ft. In addition to the dikes and weir, several closures would also be required in order to prevent effluent sedimentation from entering the GIWW and Bayou Bienvenue during pumping operations. The closures would be constructed of earthen materials. Upon completion of the project, the closures may either be left in place to naturally degrade, or removed if deemed necessary.

As this potential marsh creation project is bound by open water areas, construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs would develop over the project life.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, Lake Borgne, and Bayou Bienvenue, as well as Federal, State and local highways. All equipment and pipeline would be staged off shore and adjacent to the Lake Borgne shoreline.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform. Plugs of appropriate marsh vegetation would be planted over 100percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. Planting Contractor shall use existing open water access routes to the site for Year 1 operations.

Borrow Requirements

All dredge material would be obtained from a borrow site within Lake Borgne, recently cleared under the MRGO 3rd and 4th Supplemental EIS and ROD, located within the north lobe of Lake Borgne and northeast of the mouth of Bayou Bienvenue (appendix A, figure 18). This brackish marsh restoration would require 2.1 million cubic yards of material, requiring approximately 165 acres. To assure adequate borrow, the proposed borrow pit size would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow within the lake would be limited to a maximum of 10 ft-11 ft below the lake bottom. Access for the dredge pipeline and equipment from Lake Borgne would be via the designated access corridors in both Lake Borgne and the Golden Triangle area, as addressed in the MRGO 3rd and 4th Supplemental EIS and ROD.

2.3.4.3 Fritchie Marsh Restoration Project

This brackish marsh restoration project is located on the north shore of Lake Pontchartrain on the north east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, LA. 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. The project footprint abuts the proposed intermediate marsh restoration also being considered at the Fritchie site. This project is shown in appendix A, figure 13.

With a mitigation potential of 0.38 AAHUs per acre, the brackish marsh restoration project would provide the required 96.13 AAHUs of general impacts and 9.21 AAHUs of refuge impacts totaling 105.34 AAHUs through restoration of a minimum of 277.2 acres of FS brackish marsh. This project currently consists of 280 acres of FS brackish marsh restoration.

This project has one brackish marsh restoration feature (FM10A). The initial elevation for dredge fill would be approximately +1.5 NAVD88, to ultimately hit a target marsh elevation ranging from +1.5 to +1.0 NAVD88. The minimum fill height, fairly firm bottom, and anticipated sandy borrow source minimize concerns on any significant settlement of the proposed marsh platform. Total perimeter retention would be required to retain dredge material and allow for vertical accretion. Previous USGS mapping of Lake Pontchartrain indicate that a higher sand content is found on the north shore than in other parts of the lake, with the highest sand content in the vicinity of this project. The proposed borrow source would contain approximately 25 percent to 40 percent sand, which would greatly improve retention of pumped borrow material. Slurry elevation of approximately +2.5 would be required during the pumping operations to achieve target elevation. Retention dikes would be constructed to maintain a minimum of 1 ft of freeboard during dredging operations. The retention dikes would be constructed to elevation +3.5 NAVD88, with a 5 ft crown to assure dike integrity. Borrow for these retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The allowable borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation. The dikes are assumed to have 1 vertical on 4 horizontal side slopes. Portions of the borrow ditch would be left unexcavated at 1,000-ft 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 14,700 linear ft of retention dike would be required. The entire western boundary and northern boundary dikes are built in open water. These dike reaches, approximately 7,000 linear ft, would be degraded in year 1, upon settlement and dewatering of the created marsh platform. The degraded material could be disposed of in the original borrow canal if settlement allows, or cast into open water immediately outside of the project footprint. The remaining reaches of southern and eastern retention dike would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500 ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. Approximately 10 gaps are anticipated. The gaps would require a 25 ft bottom at approximately elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh.

As this brackish marsh restoration scenario is bounded by open water areas, construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform after approximately 1 year. Plugs of appropriate marsh vegetation would be planted over 100percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The planting Contractor would use US Highway 90 for access to the site for Year 1 operations. There are existing turnoffs and viable staging platforms in the immediate vicinity of the project site, immediately west of Highway 90, which can be used during these planting operations.

Borrow Requirements

Borrow plan would be excavated from Lake Pontchartrain, requiring a buffer of 2000 ft between the existing shoreline and the borrow area limit (appendix A, Figure 22). This brackish marsh restoration would require 1.7 million cubic yards of material, requiring approximately 125 acres. To assure adequate borrow, the proposed pit size would be approximately doubled (1.75 times the original pit size) to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be provided to the contractor to account for inaccuracies in the dredging process. An access corridor would be allowed from the lake to the proposed marsh creation site. The alignment, requirements, and restrictions applied to this proposed access corridor are the same as those discussed in section 2.3.3.3 for the intermediate marsh restoration also being considered at the Fritchie site. The corridor would be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. The contractor would be instructed to minimize usage and damage within the access corridor, by using Hwy 90 for daily transportation of supplies and personnel where possible. A fiber-optic cable potentially runs along the projects eastern boundary, paralleling the US Hwy 90. This utility would need to be considered and coordinated in final layout of the proposed access corridor.

2.3.4.4 Bayou Sauvage Marsh Restoration Project

This brackish marsh restoration project is located in the far eastern section of Lake Pontchartrain, immediately east of the Interstate 10, fronting the community of Irish Bayou in Orleans Parish, LA. Completion of this project would result in marsh creation that would provide protection to the U.S. Highway 90, Interstate 10, and the Irish Bayou Community. This project is shown in appendix A, figure 19.

With a mitigation potential of 0.41 AAHUs per acre, this project would provide the required 96.13 AAHUs of general impacts and 9.21 AAHUs of refuge impacts totaling 105.34 AAHUs through restoration of a minimum of 256.9 acres of FS brackish marsh. This project currently consists of 259 acres of FS brackish marsh restoration. The project site has two open water areas (BSFS-2 and BSFS-3) immediately inshore of the Lake Pontchartrain shoreline. Initial elevation for dredge fill would be to approximate elevation +2.5 NAVD88, to ultimately hit a target marsh elevation ranging from +1.5 to +1.0 NAVD88. Total perimeter retention would be required to retain dredge material and allow for

vertical accretion. Site BSFS3 (123 acres) would require a combination of 1,900 ft of rock retention at the lake shoreline, 4,600 ft of shoreline restoration along the western border at the existing canal, and approximately 6,700 ft of earthen retention along the north and south borders. The rock foreshore dike at this site would continue further north to protect the broken marsh north of BSFS3, and help to assure the integrity of these completed works. Continued breaching and erosion of the shoreline would ultimately be detrimental to proposed restoration. Site BSFS2 would require restoration of approximately 3,300 linear ft of existing rock shoreline at the lake, and an additional 11,500 ft of earthen retention dike along the existing marsh perimeter. A total of 18,200 linear ft of standard retention dike would be required. Slurry elevation of approximately +3.5 would be required during the pumping operations to achieve target elevation. The retention dikes would be constructed to elevation +4.5 NAVD88, with a 5 ft crown. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Retention dikes would be constructed to maintain a minimum of 1 ft of freeboard during dredging operations. It is anticipated that the borrow source proposed would contain approximately 10 percent to 30 percent sand, which would greatly improve retention of pumped borrow material. The interior earthen shoreline restoration dike crown would be expanded to a 12-ft width to enhance this feature and provide for its longevity. This shoreline reestablishment is proposed as a permanent feature, and would not be gapped or degraded post-construction. Borrow for all earthen retention dikes would come from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. The allowable borrow ditch template would be a 40-ft bottom width, with excavation not to exceed 7 ft below the existing ground elevation; except that the width requirement would be expanded as required to assure borrow for the larger shoreline restoration feature. Portions of the borrow ditch would be left unexcavated at 1000-ft intervals to minimize water flow during pumping operations.

The reaches of standard retention dike for both features would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-ft intervals, with care being taken to locate gaps at all existing natural bayous or openings. The gaps would require a 25-ft bottom at approximately elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh.

The proposed rock foreshore dike construction and rehabilitation on the Lake Pontchartrain shoreline is critical in minimizing shoreline erosion fronting the proposed project site. The proposed rock section would call for a 5-ft wide crown at elevation +4.5 NAVD88 to account for anticipated settlement prior to and during marsh creation efforts. The rock dike would be used as the eastern retention, and may require that a layer of visqueen be placed on the marsh side to minimize losses of fill material and lake turbidity. The rock dike section would be constructed with 650# topsize stone place on a layer of geotextile fabric.

As this potential marsh creation project is bound by open water areas, construction of trenasses would not be proposed within the marsh platform. It is anticipated that natural sloughs and/or access corridors would develop over the project life.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform after approximately 1 year. Plugs of appropriate marsh vegetation would be planted over 100percent of the marsh restoration acreage on 7-ft centers. Planting guidelines and required plant species can be found in appendix J. The project site is accessible on by water. All major equipment,

dredge pipeline, and rock would be delivered via the open waters of Lake Pontchartrain. As such, any required staging activities would be within the lake or on barge. Planting operations would also deliver materials and personnel by boat/barge. It is likely that these vessels may elect to stage within Irish Bayou to remain in more protected waters during any wind events. It is anticipated for all operations however, that no additional land based staging areas would be require.

Borrow Requirements

Borrow would be excavated from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 19). Marsh creation would require borrow of approximately 2.4 million cubic yards of material. The required borrow site would be approximately 150 acres. To assure adequate borrow, the proposed borrow pit would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 ft below the existing lake bottom, except that a tolerance of 1-ft below this target elevation would be provided the contractor to account for inaccuracies in the dredging process. Two access corridors (one to each site) would be allowed from the lake to the proposed marsh creation site. These corridors would be restricted to 200 ft in width and would be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. 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.

2.3.5 MITIGATION FOR IMPACTS TO REFUGE PROTECTED SIDE BLH-WET AND REFUGE PROTECTED SIDE INTERMEDIATE MARSH

2.3.5.1 Bayou Sauvage Refuge BLH-Wet and Intermediate Marsh Restoration Project

This project is located within an impounded area on the Bayou Sauvage NWR and in Orleans Parish, LA. The site is located immediately off the north bank of the GIWW and approximately 2.75 miles east of Michoud Slip, and adjacent to an existing outfall canal adjacent to Industrial Parkway road in New Orleans East. This project is shown in appendix A, figure 20.

Bayou Sauvage PS BLH-Wet Restoration Feature BSPS3 has a mitigation potential of 0.56 AAHUs per acre and would provide the required 134.38 AAHUs for refuge impacts through restoration of a minimum of 240 acres of PS BLH-Wet.

Bayou Sauvage PS intermediate marsh Restoration Feature BSPS4 has a mitigation potential of 0.26 AAHUs per acre and would provide the required 27.99 AAHUs for refuge impacts through restoration of a minimum of 107.7 acres of PS intermediate marsh.

This project has two features: a PS BLH-Wet feature (BSPS3) and an intermediate marsh feature (BSPS4). The project would create approximately 111.2 acres of intermediate marsh (Element BSPS4) within the impounded area through dedicated dredging of material, as well as approximately 242.2 acres of BLH-Wet habitat (Element BSPS3). Restoration would be accomplished through dedicated dredging of material to be borrowed from Lake Borgne. The material would be obtained via hydraulic dredge and transported directly to the designated restoration sites (Elements BSPS3 and BSPS4) via pipeline. Access for the dredge pipeline and equipment from Lake Borgne would be via the designated access

corridors in both Lake Borgne and open waters within the Golden Triangle area, also addressed in the MRGO 3rd and 4th Supplemental EIS and ROD. The dredge pipeline would then have to cross the GIWW in order to reach the restoration sites. A submerged discharge line would be installed across the GIWW in order to not impede navigation. After crossing the GIWW, the discharge pipeline would then cross the hurricane protection levee/floodwall along the north bank of the GIWW via a 200 ft access corridor. Additional pipeline and equipment (i.e. marsh buggies for dike construction) could also be brought in from the north via Chef Menteur Hwy/Hwy 90 and Recovery Drive.

Disposal within the BLH-Wet restoration site would be confined, with dredge effluent waters allowed to be returned to the adjacent outfall canal via spill box weirs. Effluent waters would also be allowed to enter the adjacent intermediate marsh restoration site over the proposed earthen weir that would be required to separate element BSPS3 from element BSPS4. The dredge material would be placed confined to a maximum slurry elevation of +5.5 ft NAVD88 within the BLH-Wet site in order to achieve an elevation of between +2.5 to +3.5 ft after dewatering and initial consolidation, and a long-term elevation ranging between +2 to +3 ft NAVD88. After the BLH-Wet site is filled to capacity, the dredge discharge pipe would be placed into the marsh restoration cells. The dredge material would be placed confined to a maximum slurry elevation of +4.0 ft NAVD88 in order to achieve an elevation of between +1.5 to +2 ft after dewatering and initial consolidation, and a long-term elevation of approximately +1 ft within the intermediate marsh restoration sites. Spill box weirs may be constructed to control the pool level within the restoration areas and the earthen weirs/dikes may be gapped and/or degraded as necessary to facilitate development of the restoration sites. Effluent waters would also be allowed to be discharged immediately east of the marsh restoration site.

A drainage structure exists within the levee that forms the western boundary of the restoration site. Drainage to this structure is to remain unimpeded. Thus, retaining dikes would be required within both the BLH-Wet and intermediate marsh sites in order to prevent dredged material from blocking off drainage to this structure. As no geotechnical data or surveys of the site were available at the 35% design level, it was anticipated that all retaining dikes for this feature would be earthen and constructed from adjacent borrow to be obtained from within the marsh restoration site. Approximately 11,920 ft of earthen retention dikes would be required, along with 3.550 ft in interior earthen weirs. Earthen weirs would be constructed and maintained at all times during pumping operations. The earthen retention dikes and weirs would be constructed to a min 5 ft crown width, slopes no steeper than 1V on 3H, and with a minimum 40 ft interior berm to be maintained between the inside toe of the retention dikes and earthen weirs and the top of cut of the adjacent borrow pits. The dikes and weirs would be constructed to various elevations, dependent upon location and would vary from +7.5 ft NAVD88 along the interior of the BLH-Wet site in order to maintain drainage to the existing structure in the levee along the western boundary, to +5 ft NAVD88 within the marsh restoration site. It is assumed that no retention features would be required along the western and southern boundaries of the restoration sites and that the existing levee would be of sufficient grade to retain the dredged material. Upon completion of the project, the dikes and weir 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. Some shaping of material may be required in order to get the BLH-Wet site to the desired grades.

In order to estimate the amount of borrow material that would be required, it was assumed that the average existing elevation of the restoration site was approximately -2.7 ft, based off of an assumed tide reading of 0.0 ft during the site visit on 6 Apr 11. Detailed surveys of the project area, as well as the

borrow site(s) to be used, would be required to verify/ refine the actual quantities and scope of work should this feature proceed to the next phase of design.

Ingress and egress to the site would be via the GIWW/MRGO, Chef Pass, and Lake Borgne, as well as Federal, state, and local highways. Equipment, including dredge pipeline, could be staged within the adjacent GIWW and/or adjacent to the Lake Borgne shoreline where the dredge pipeline access corridor meets Lake Borgne.

Following construction, plantings within elements BSPS3 and BSPS4 would be performed. Planting and monitoring would be in accordance with the applicable guidelines in appendix J.

Borrow Requirements

All dredge material would be excavated from a borrow site within Lake Borgne, recently cleared under the MRGO 3rd and 4th Supplemental EIS and ROD, located within the north lobe of Lake Borgne and northeast of the mouth of Bayou Bienvenue (appendix A, figure 20). Approximately 2,630,000 cubic yards of dredged material would be required for the construction of these BLH-Wet and marsh restoration projects. The proposed borrow site would be approximately 300 acres. To assure adequate borrow, the proposed pit size would be approximately doubled (1.75 times the original pit size) to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow within the lake would be limited to a maximum of 10 ft-11 ft below the lake bottom.

2.3.6 MITIGATION FOR IMPACTS TO REFUGE FLOOD SIDE BLH-WET

2.3.6.1 Fritchie Refuge BLH-Wet Enhancement Project

The Fritchie Refuge BLH-Wet Enhancement project is located on the north shore of Lake Pontchartrain on the north-east quadrant of the lake, immediately adjacent to U.S. Highway 90, and approximately 5 miles east of Slidell, LA. It 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. This project is shown in appendix A, figure 8 and 22.

With a mitigation potential of 0.2 AAHUs per acre, this BLH-Wet enhancement project would provide the required 8.9 AAHUs for refuge impacts through enhancement of a minimum of 44.5 acres of FS BLH-Wet. It was determined that this project would consist of 51 acres of refuge FS BLH-Wet enhancement.

The project site has three small cheniers (FM-2, FM-3 and FM-5). In construction of this refuge BLH-Wet feature, no fill or grade manipulation requirements are envisioned. Invasive species eradication and reforestation (where applicable) would be performed. This entails removal of undesirable vegetation, ringing of trees, and the application of required herbicide treatment. Healthy existing BLH species should remain on the site. Where initial enhancement activities include the eradication of invasive and nuisance plant species, significant numbers of native canopy and/or mid-story species may remain, but in a spatial distribution that leaves relatively large “gaps” in the canopy stratum and/or the mid-story stratum. The schedule and plan for tree plantings, including species, quantity, and layout would be as per the applicable guidelines found in appendix J. Staging Area(s) as required would be established in

the next phase of design. The proposed 51 acres of refuge BLH-Wet enhancement acres (FM2:26 acres, FM3: 14 acres, and FM5: 11 acres) are located most southerly and can be accessed independently from Old Spanish Trail for eradication and planting activities.

2.4 SELECTION RATIONALE FOR TENTATIVELY SELECTED MITIGATION PROJECTS

The Alternatives Evaluation Process (AEP) was utilized to compare projects mitigating for the same habitat type in the final array to determine the best project for that habitat type. Throughout the AEP process and during screening of projects in the final array, the projects were referred to as 'alternatives' for mitigating an impact to a specific habitat type. These projects were not in and of themselves able to mitigate all impacts incurred from construction of the LPV HSDRRS, but were "project alternatives" for a certain habitat type. Each project is a feature of an overall 'alternative plan' to mitigate all the LPV HSDRRS impacts. It is only the combination of projects by habitat type that can together fully mitigate LPV HSDRRS impacts. During the AEP, mitigation projects within the same habitat type were compared to one another using the following selection criteria:

- Risk and Reliability – This criterion considers issues such as a proposed projects' susceptibility and resiliency to stressors, long-term sustainability, uncertainty relative to CEMVNs ability to implement the project, and uncertainty relative to project success.
- Environmental – This criterion evaluates a proposed project's adverse and beneficial impacts to human and natural resources.
- Time - Time evaluates the duration to contract award and to initial ecological success or Notice of Construction Complete (NCC).
- Cost Effectiveness –This criterion evaluates the average annual cost per average annual habitat unit.
- Other Cost Considerations – This criterion evaluates total proposed project costs including construction, real estate, operations and maintenance, total project and average annual costs over the 50 year period of analysis.
- Watershed and Ecological Site Considerations – This criterion evaluates the proposed project site characteristics such as the role that a potential project would play in terms of creating habitat linkages or wildlife corridors, whether the project is consistent with watershed plans such as Coast 2050, and its proximity to the HSDRRS impacts.

The relative scoring of each project for each criterion under each habitat type produced an overall score for each project. A ranking was then established for the projects under each habitat type based on each project's overall score. The highest ranked project for that habitat type was selected as the TSMP for that habitat type in the TSMPA. Chapter 4 provides an impact assessment on the final array of mitigation projects by habitat type that could reasonably be utilized in developing alternative plans. Chapter 5 looks at the environmental impacts of the alternative plans identified for mitigating the LPV HSDRRS impacts as required by NEPA. AEP Plan Selection Criteria details can be found in appendix F. Selection criteria matrices used during the AEP for can be found in appendix B, tables 2-8. A summary of the selection rationale for each habitat type is provided below.

Non-Refuge BLH-Wet/BLH-Dry

The mitigation bank project performed better than all other proposed projects under the Risk and Reliability, Environmental, Time, and Other Cost Considerations criteria and was therefore the highest ranked project based on AEP results. Mitigation banks have minimal uncertainty relative to achieving ecological success because the banks are already established and are monitored through CEMVN's regulatory program. Additionally, the banks have financial assurances in place to ensure that funds are available if needed and do not require any real estate acquisitions. Mitigation banking instruments are binding agreements in which the mitigation bank is obligated to monitor ecological success, adaptively manage the site to ensure ecological success, and maintain financial assurances to ensure project success. Because the mitigation banks are already constructed and operating and have credits available, they have no negative environmental impacts compared to existing and future without project conditions. The purchase of bank credits can proceed considerably faster than the design, contract award and construction of the other potential projects.

Because multiple eligible mitigation banks exist within the LPV mitigation basin from which credits can be purchased, mitigation banks wishing to sell credits to satisfy the HSDRRS mitigation obligations would be encouraged to submit competitive bids. However, if, based on cost and considering other factors, the CEMVN determines the purchase of mitigation bank credits is not cost effective or would not be appropriate, the next ranked project for that habitat type would become the preferred project as a component of the TSMPA. Bonnet Carré project was the second-ranked project to mitigate non-refuge BLH-Wet/BLH-Dry impacts based on the AEP results. Further benefits attributable to the Bonnet Carré project in the form of potential cost savings could be realized by building the Bonnet Carré BLH and swamp projects as a single project which could occur if the mitigation bank project is determined not implementable (i.e. not cost effective, no acceptable bids received, etc.) for both the non-refuge BLH and non-refuge swamp mitigation requirements. The Frenier project performed as well as the Bonnet Carré project overall, but did not have the same opportunity as the Bonnet Carré project to combine projects and capture cost savings. As such, even though the results of the AEP had these two proposed projects at nearly the same overall total score, the Frenier project was considered by the PDT as the third ranked project. The Fritchie project performed the worst under Risk and Reliability, Environmental, Time, Cost Effectiveness and Other Cost Considerations compared to all other projects and therefore received the lowest ranking based on the AEP results.

Non-refuge Swamp

For the same reasons stated above, the mitigation bank project performed better than all other proposed projects under the Risk and Reliability, Environmental, Time, Cost Effectiveness and Other Cost Considerations criteria and was therefore the highest ranked project based on AEP results. The Bonnet Carré project was the second ranked project mitigating non-refuge swamp impacts because the Bonnet Carré did not perform as well as the mitigation bank project under the Risk and Reliability, Environmental, Time, Cost Effectiveness and Other Cost Considerations criteria; but did perform better than the Milton Island and Caernarvon projects under all criteria. Additional benefits could also be attributed to the Bonnet Carré project in the form of cost savings realized by building both the Bonnet Carré swamp and BLH projects as a single project which could occur if the mitigation bank project is not implementable for both the non-refuge BLH and non-refuge swamp mitigation requirements. The Milton Island project was the third ranked project mitigating non-refuge swamp impacts because it did

not perform as well as the Bonnet Carré project under every criteria, but did perform better than the Caernarvon project under the Risk and Reliability, Environmental, Cost Effectiveness and Other Cost Considerations criteria. The Caernarvon project performed the worst under the Risk and Reliability, Environmental, Cost Effectiveness and Other Cost Considerations criteria compared to all other projects and therefore received the lowest ranking based on the AEP results.

Non-Refuge/Refuge Brackish Marsh

All projects performed similarly under the Environmental and Time criteria. Bayou Sauvage performed better than all other projects for that habitat type under the Risk and Reliability and Watershed and Ecological Considerations criteria. The long-term sustainability of Bayou Sauvage, measured in the percent of created marsh that is anticipated to remain at the end of the 50 year period of analysis under the Risk and Reliability criteria was considerably higher than the other projects. Bayou Sauvage also ranked more significant than the other projects within the watershed because it is contiguous with and within a resource managed area, located in a parish which had HSDRRS impacts, enhances lake rim and a land bridge (both of which are considered critical geomorphic features) and is part of a Louisiana Coastal Protection and Restoration Report (LaCPR) Critical Landscape Feature. As such, Bayou Sauvage was the highest ranked project. The Big Branch, Fritchie and Golden Triangle projects performed similarly under the Risk and Reliability criteria, but much lower than the Bayou Sauvage project. The Golden Triangle project performed better than the other projects in terms of Cost Effectiveness and Other Cost Considerations, but these criteria were not weighted as heavily as the other criteria resulting in its second place ranking. Overall Big Branch and Fritchie performed similarly under most criteria except under the Cost Effectiveness and Other Cost Considerations criteria. Big Branch performed better than Fritchie under these 2 criteria making it the third ranked project and Fritchie fourth.

Non-Refuge Intermediate Marsh

The Milton Island project performed better than all other projects for this habitat type under the Risk and Reliability, Cost Effectiveness and Other Cost Considerations criteria, and performed as well as most under the Time criterion. The long-term sustainability of the Milton Island project, as measured by the percent of created marsh anticipated to remain at the end of the 50 year period of analysis under the Risk and Reliability criteria, was among the highest of all the projects. The Milton Island project also has limited environmental impact, and it's borrow source would not impact critical habitat for the threatened Gulf sturgeon. The Milton Island project is appreciably more cost effective than the other potential projects, and has the lowest total project cost. The Bayou Des Mats project also performed well in terms of Risk and Reliability, Cost Effectiveness and Other Cost Considerations, but did not score as high as the Milton Island project resulting in its second place ranking. The LaBranche project performed the highest under the Watershed and Ecological Site Considerations criteria, but did not score as high as Bayou Des Mats under the Risk and Reliability, Cost Effectiveness and Other Cost Considerations criteria resulting in its third place ranking. The Big Branch and Fritchie projects performed the same under the Risk and Reliability, Environmental, and Watershed and Ecological Site Considerations criteria but not as high as the LaBranche project under the Risk and Reliability, and Watershed and Ecological Site Considerations criteria. The Big Branch project performed better than the Fritchie project under Cost Effectiveness and Other Cost Considerations criteria resulting in a fourth place ranking for the Big Branch project and a fifth place ranking for the Fritchie project. The Caernarvon

project performed the best under the Environmental criterion, but the lowest under the Risk and Reliability, Cost Effectiveness and Other Cost Considerations criteria and was therefore ranked the lowest performing project based on the AEP results.

2.5 TENTATIVELY SELECTED MITIGATION PLAN ALTERNATIVE

The following tentatively selected mitigation projects (TSMPs) by habitat type were combined like building blocks to form the tentatively selected mitigation plan alternative (TSMPA) for the LPV HSDRRS Mitigation Plan (appendix A, figure 25). Following the AEP, the HSDRRS construction impacts were reassessed using the 95-100 percent HSDRRS design plans, as well as available HSDRRS as-built plans, and adjusted accordingly. The adjustment in the impacts necessitated the resizing of the TSMPs as well as the second ranked mitigation projects for the habitat types where a mitigation bank was identified as the TSMP (BLH and swamp). Table 2-3 presents the changes in the design for the TSMPs that reflect the adjusted mitigation requirement and therefore differ somewhat from the project descriptions used during the AEP. See sections 2.9.2.1 and 2.9.2.2 for the revised descriptions for the second ranked projects to the current TSMPs for BLH and swamp. Resizing of all projects in the final array was not done because the change in the mitigation requirement would have affected all potential projects for the same habitat type equally and therefore would not have resulted in changes significant enough to affect the AEP ranking of the proposed projects.

The revised mitigation requirement is provided in Table 2-2. Totals include TFG impacts (see section 1.4.4). Table 2-3 provides a summary of the changes made to the designs of the TSMPs to address this revised mitigation requirements. Additional information regarding design changes for the Bayou Sauvage Marsh Restoration project is provided in section 2.5.1.

Table 2-2. Revised Mitigation Requirement

Habitat Type	AAHUs Impacted
Non-Refuge BLH-Wet/Dry	93.85 AAHUs
Non-Refuge Swamp	108.01 AAHUs
Non-Refuge Fr/Int. Marsh	45.70 AAHUs
Non-Refuge Brackish Marsh	118.06 AAHUs
Refuge Brackish Marsh	8.79 AAHUs
Refuge PS BLH-Wet	83.92 AAHUs
Refuge Int. Marsh	41.29 AAHUs
Refuge FS BLH-Wet	8.91 AAHUs

Table 2-3. Summary of Changes to TSMP designs

TSMP	Original Design	Revised Design
Mitigation Bank (BLH-Wet/Dry)	Purchase credits to satisfy 67.54 AAHUs requirement using a single bank	Purchase credits to satisfy 93.85 AAHUs requirement using one or more banks
Mitigation Bank (Swamp)	Purchase credits to satisfy 93.85 AAHU requirement using a single bank	Purchase credits to satisfy 108.01 AAHU requirement using one or more banks

Milton Island Marsh Restoration (Intermediate Marsh)	• Figures 16 and 23 • 272 acres • 5,400 linear ft. dike, el. +3.5 • 10 gaps in existing E and W retention • 106 acres, 1.5M cy of borrow • 300 ft. no dredging buffer between site and transmission line	• Figure 26 • 115 acres • 5,300 linear ft. dike, el. +4.0 • 6 gaps in existing E and W retention • 55 acres, 800,00 cy of borrow • 800 ft. no dredging buffer between site and transmission line
Bayou Sauvage Marsh Restoration (Brackish Marsh)	• Figure 19 • 255 acres • Initial target elevation +2.0 • Slurry elevation +3.0 • Retention dike el. +4.0 • Rock shoreline retention • 103 acres, 1.6M cy of borrow	• Figure 27 • 302 acres • Initial target elevation +3.0 • Slurry elevation +3.0 • Retention dike el. +4.5 • No rock shoreline retention • 184 acres, 2.7M cy of borrow
Bayou Sauvage Refuge BLH-Wet/ Intermediate Marsh Restoration	• Figure 20 • 240 acres BLH-Wet; 107.7 acres IM • 11,920 linear ft retention dike • 3,550 linear ft interior earthen weirs	• Figure 28 • 155.3 acres BLH-Wet; 141.9 acres IM • 10,825 linear ft retention dike • 5,840 linear ft interior earthen weirs
Fritchie Refuge BLH-Wet Enhancement	• Figures 8 and 22 • 51 acres of BLH-Wet	• Figure 29 • No change

2.5. 1 ADDITIONAL DESIGN CHANGES TO TSMP FOR MITIGATING IMPACTS TO NON-REFUGE/REFUGE BRACKISH MARSH

The initial design for the Bayou Sauvage FS Marsh Restoration Project is discussed in Section 2.3.4.4 and is presented in appendix A, figure 19. The reassessment of HSDRRS construction impacts discussed in Section 2.5 determined that this project would need to provide a total of 126.85 AAHUs

(118.06 AAHUs for non-refuge brackish marsh impacts plus 8.79 AAHUs for refuge brackish marsh impacts) as opposed to a total of 105.34 AAHUs which served as the basis for the initial project design.

As such, this project was modified to include additional acres of brackish marsh restoration in a pond to the north (appendix A, figure 27). Engineering design was then advanced for the newly expanded project which added engineering features (large lakeside armored berms) to retain dredged material effluent and provide shoreline protection. These features resulted in huge cost increases for the project. As such, CEMVN in coordination with the resource agencies redesigned the project to avoid these engineering features by utilizing interior open water areas in the project area. The revised design now includes both the restoration of brackish marsh habitats in existing open water areas as well as the enhancement of existing brackish marsh habitats through marsh re-nourishment activities. As such, the name of this proposed TSMP was changed to be the Bayou Sauvage Marsh Restoration and Enhancement Project (appendix A, figure 30).

This project currently consists of approximately 222.6 acres of flood side brackish marsh restoration along with the nourishment of approximately 104 acres of existing marsh. The project site has two restoration feature areas (BSFS-4 and BSFS-5) inshore of the Lake Pontchartrain shoreline.
With a mitigation potential of .41 per acre at the BSFS-4 site and 0.39 AAHUs per acre at the BSFS-5 site, this project would provide the required 118.06 AAHUs of general impacts and 8.79 AAHUs of refuge impacts totaling 126.85 AAHUs.

Initial elevation for dredge fill would be to an approximate elevation between +3.0 to +2.5 NAVD88, to ultimately hit a target marsh elevation ranging from +1.5 to +1.0 NAVD88. Total perimeter retention would be required to retain dredge material and allow for vertical accretion. Site BSFS-4 (48.8 acres) is a marsh restoration site and would require approximately 7,045 feet of perimeter earthen retention dikes along the existing marsh perimeter. Site BSFS-5 is approximately 277.8 acres in size, comprised of approximately 173.8 acres of open water and 104 acres of broken up marsh. Site BSFS-5 would require approximately 18,000 ft of perimeter earthen retention dikes. A slurry elevation of approximately +3.5 would be required during the pumping operations to achieve target elevation. The retention dikes would be constructed to elevation +4.5 NAVD88, with a 5 foot crown. For initial quantity estimates, the dikes are assumed to have 1 vertical on 4 horizontal side slopes. Retention dikes would be constructed to maintain a minimum of 1 foot of freeboard during dredging and disposal operations. Available borings of the borrow site do indicate lenses of sandy clay, which may benefit the stacking of pumped borrow material. Borrow for all earthen retention dikes would come from within the marsh restoration/nourishment footprints. The borrow ditch would be offset a minimum of 40 feet from the dike to assure dike stability. The allowable borrow ditch template would be a 40-foot bottom width, with excavation not to exceed 7 feet below the existing ground elevation. Portions of the borrow ditch would be left unexcavated at 1000-foot intervals (plugs) to minimize erosive channeling adjacent to the retention dikes during pumping operations.

The earthen retention dikes for BSFS-4 would be gapped in year 1, upon settlement and dewatering of the created marsh platform. The gaps would be spaced at approximately 500-foot intervals, with care being taken to locate gaps at all existing natural bayous or openings. The gaps would require a 25-foot bottom at approximately elevation +0.5 NAVD88 (lower limit of existing marsh platform) to assure water interchange with the existing marsh. The earthen retention dikes for BSFS-5 would be degraded in year 1, after settlement and dewatering of the dredge fill. The dikes would be degraded to the

elevation of the adjacent fill and the degraded material would be placed within the remaining shallow borrow pits associated with the initial construction of the earthen retention dikes. The backfilled material will not exceed the elevation of the adjacent fill material.

As this potential marsh restoration and nourishment project boundary is intercepted by natural trenasses and sloughs, it is anticipated that these waterways will develop naturally into the restoration footprints during the project life. As such, construction of trenasses will not be proposed within the marsh platform.

Finally, the marsh footprint would be planted upon satisfactory settlement and dewatering of the marsh platform after approximately 1 year. Plugs of appropriate marsh vegetation would be planted over 100 percent of the marsh restoration acreage on 7-foot centers. Planting guidelines and required plant species can be found in appendix J. The project site is accessible only by water. All major equipment, dredge pipeline, and equipment required for construction of earthen retention dikes, would be delivered via the open waters of Lake Pontchartrain, Irish Bayou, Chico Lagoon, and others existing waterways. As such, any required staging activities would be within the lake or on barge. Planting operations would also deliver materials and personnel by boat/barge. It is likely that these vessels may elect to stage within Irish Bayou to remain in more protected waters during any wind events. It is anticipated for all operations however, that no additional land based staging areas would be required.

Borrow Requirements

Borrow would be excavated from Lake Pontchartrain, requiring a buffer of 2,000 ft between the existing shoreline and the borrow area limit (appendix A, figure 30). Marsh creation and nourishment would require borrow of approximately 2.2 million cubic yards of material. The required borrow site would be approximately 150 acres. To assure adequate borrow, the proposed borrow pit would be approximately doubled to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow would not be excavated greater than 10 feet below the existing lake bottom, except that a tolerance of 1-foot below this target elevation would be provided the contractor to account for inaccuracies in the dredging process. Two access corridors (one to each site) would be allowed from the lake to the proposed marsh creation/nourishment sites. These corridors would be restricted to 200 feet in width and would be used to establish a pipeline corridor, to offload equipment as necessary, and to transport personnel to and from the worksite. Spill boxes or weirs would be constructed at pre-determined locations within the retention dikes to allow for effluent water release from within the marsh creation/nourishment areas. These weir locations would be located to nourish surrounding marsh during the disposal operations.

2.6 WVA MODEL AND SEA LEVEL RISE ANALYSES

WVA Model Certification

The WVA Bottomland Hardwood and Swamp Community Models used for the HSDRRS Mitigation completed model certification in accordance with EC 1105-2-412 and were approved for regional use 8 November 2011.

Version 1.0 of the Coastal Marsh Community WVA model was also approved for use for the HSDRRS Mitigation project (appendix G). This approval for use was based on the decision of the Headquarters USACE Model Certification Panel which considered the National Ecosystem Restoration Planning Center of Expertise's (ECO-PCX) assessment of the model. Adequate technical reviews have been accomplished and the model meets the certification criteria contained in EC 1105-2-412. However, as indicated by the ECO-PCX, there are a number of unresolved issues related to the form of suitability graphs for model Variables 1, 2, and 3 and the aggregation methods used to combine the marsh habitat units and open water habitat units for each sub-model.

To increase the understanding of the sensitivity of the Coastal Marsh Community WVA model to the unresolved issues and to assess the impact the model differences may have had on decision-making, the ECO-PCX worked with the PDT to conduct sensitivity analyses for the application of the marsh model to the HDRRS Mitigation project (appendix H). These sensitivity analyses were performed on the final array of potential mitigation projects involving mitigation of impacts to marsh habitats (e.g. the four Non-Refuge Intermediate Marsh mitigation projects and the four Non-Refuge/Refuge Brackish Marsh mitigation projects discussed in section 2.3). The primary objective of the analyses was to determine whether the ECO-PCX's suggested revisions to the marsh WVA models would have changed the rankings of the cited marsh mitigation projects compared to the rankings of these projects that were based on the Version 1.0 Coastal Marsh Community WVA models (refer to section 2.4, which discusses the selection rationale; the ranking of potential marsh mitigation projects was partially based on outputs from the Version 1.0 marsh WVA models). The sensitivity analyses indicated that use of the ECO-PCX's suggested changes to the marsh WVA models would have had relatively little effect on the rankings.

WVAs

The WVA methodology operates under the assumption that optimal conditions for general fish and wildlife habitat within a given coastal wetland type can be characterized, and that existing or predicted conditions can be compared to that optimum level to provide an index of habitat quality. Habitat quality is estimated or expressed through the use of a mathematical model developed specifically for each wetland type. Each model consists of: 1) a list of variables that are considered important in characterizing fish and wildlife habitat; 2) a Suitability Index graph for each variable, which defines the assumed relationship between habitat quality (Suitability Index) and different variable values; and 3) a mathematical formula that combines the Suitability Index for each variable into a single value for wetland habitat quality. That single value is referred to as the Habitat Suitability Index, or HSI.

The following WVA models (version 1.0) were used for the HSDRRS mitigation effort: 1) CWPPRA, WVA Methodology, Bottomland Hardwood Community Model; 2) CWPPRA, WVA Methodology, Swamp Community Model; 3) CWPPRA, WVA Methodology, Coastal Marsh Community Model for Fresh/Intermediate Marsh; and 4) CWPPRA, WVA Methodology, Coastal Marsh Community Model for Brackish Marsh.

The WVA models assess the suitability of each habitat type for providing resting, foraging, breeding, and nursery habitat to a diverse assemblage of fish and wildlife species. This standardized, multi-species, habitat-based methodology facilitates the assessment of project-induced impacts on fish and wildlife resources. The coastal marsh WVA models consists of six variables: 1) percent of wetland area

covered by emergent vegetation; 2) percent of open water area covered by aquatic vegetation; 3) marsh edge and interspersion; 4) percent of open water area ≤ 1.5 ft deep in relation to marsh surface; 5) salinity; and 6) aquatic organism access. The swamp WVA model consists of four variables: 1) stand structure; 2) stand maturity; 3) water regime; and 4) salinity. The Bottomland Hardwood Community Model, which was used for BLH-Wet and BLH-Dry features, consists of seven variables: 1) stand structure; 2) stand maturity; 3) understory/midstory; 4) hydrology; 5) size of contiguous forests areas; 6) suitability and traversability of surrounding land uses; and 7) disturbance.

Values for variables used in the models are derived for existing conditions and are estimated for conditions projected into the future if no mitigation efforts are applied (i.e., FWOP), and for conditions projected into the future if the proposed mitigation project is implemented (i.e., FWP), providing an index of habitat quality, or habitat suitability, for the period of analysis. The HSI is combined with the acres of habitat to generate a number that is referred to as "habitat units." Expected project impacts/benefits are estimated as the difference in habitat units between the FWP scenario and the FWOP scenario. To allow comparison of WVA benefits to costs for overall project evaluation, total benefits are averaged over a 50-year period, with the result reported as AAHUs. Assumptions used for the LPV HSDRRS mitigation WVAs are found in appendix I.

Sea Level Rise Analysis

Wetland Acreage Predictions Under Increased Sea Level Rise (SLR) Rates

In compliance with USACE policy (EC1165-2-212), the performance of all projects under all three SLR scenarios was analyzed to verify selection of the TSMPs. Potential increases in SLR could affect the performance and therefore ability of a mitigation project to achieve replacement of the services and functions of the impacted habitat types. Because all of the mitigation projects were designed based on the intermediate SLR scenario to account for potential uncertainties in future SLR impacts, the risk of the proposed projects not successfully meeting the mitigation requirement due to SLR has been minimized.

The intent of compensatory mitigation is to offset unavoidable habitat losses by replacing those impacted habitats by restoring (re-establishment or rehabilitation), establishing (creation), or enhancing a naturally functioning system. Once the project meets its long term success criteria, it will experience natural successional phases common to that habitat type. Once the functions and services of the affected habitat have been replaced and the mitigation project becomes a naturally functioning, self-sustaining system whose habitat is protected in perpetuity, the compensatory mitigation obligation is satisfied.

Using USACE-predicted future water levels under the SLR scenarios, those water levels were converted into relative sea level rise (RSLR) rates, incorporating sea level rise effects measured at the gauges and land loss experienced in the extended project area for each project. No operations and maintenance activities were planned for any of the projects in relation to future elevation changes. The WVA then utilized the RSLR rates and project design to predict FWP acres left at the end of the 50-year period of analysis. Long term sustainability (percent land left at the end of the period of analysis) was used to analyze the impact the different SLR scenarios had on the project areas. Comparison between the long term sustainability numbers experienced under the intermediate and high SLR scenarios for all of the projects in the final array supported the choice of the TSMPs, namely all the TSMPs for all habitat types

performed the best under the influence of both the intermediate and high SLR scenarios (all projects selected had the highest long term sustainability numbers). This comparison also supported the second place ranking for the projects mitigating general BLH and swamp requirements (where a mitigation bank is the current TSMP). See appendix B, table 9 for details of the 3 SLR analyses.

2.7 DATA GAPS AND UNCERTAINTIES

Impact Assessment

The LPV mitigation requirement has been assessed through review of the 95-100 percent design plans for all the HSDRRS work. Once as-builts for the whole HSDRRS are complete, a final reassessment would be completed to ensure all impacts from construction of the HSDRRS are fully mitigated. If additional impacts are identified beyond what has been mitigated at that time, then an additional NEPA document would be prepared analyzing options to complete the outstanding mitigation. This document would be available for public review and comment.

Tropical Storms

Tropical storm events can directly and indirectly contribute to coastal land loss through erosion from increased wave energies, removal and/or scouring of vegetation from storm surge and saltwater intrusion into estuaries and interior wetlands. Wetland loss and degradation of large areas can occur over a short period of time as a result of storms.

Approximately 52,480 acres of marsh were permanently or temporarily converted to open water in the Pontchartrain Basin following Hurricane Katrina, (Barras, 2009). There is a risk that a single storm event, or multiple storms over a short period of time, could significantly reduce or eliminate anticipated benefits of mitigation plans in areas susceptible to storm surge and shearing. All of the features of the TSMPA (and the associated costs and benefits) are at some risk from storm damage. The extent of potential damage is dependent upon several unknown variables, including: the track and intensity of the storm, the development stage of the project, changes in future conditions in the study area, and variability of project performance from forecast conditions due to other factors of risk and uncertainty.

The benefits of shoreline protection features could also be reduced by a storm through the displacement of rocks and damage to the structures. Repair of storm damage to these features could necessitate maintenance of the shoreline protection features in order to secure anticipated erosion reduction benefits, reducing the cost-effectiveness of these features.

Increased Sea Level Rise

Increased sea level rise could convert emergent wetlands to shallow open water, and shallow open water to deeper water habitat, reducing or eliminating the effectiveness of mitigation plans.

Climate Change

Extreme changes in climate (temperature, rain, evaporation, wind) could result in conditions that cannot support the types of habitat restored, reducing the effectiveness of the mitigation plan. Extreme climate

change could essentially eliminate the benefits of vegetative plantings, if the change resulted in plant mortality. The monitoring plan for all USACE constructed projects would monitor the success of any vegetative plantings and includes provisions for replanting if mortalities become such that meeting the required success criteria is in jeopardy.

Errors in Analysis

Future conditions are inherently uncertain. The forecast of future conditions is limited by existing science and technology. Future conditions described in this study are based on an analysis of historic trends and the best available information. Some variation between forecast conditions and reality is certain. Mitigation features were developed in a risk-aware framework to minimize the degree to which these variations would affect planning decisions. However, errors in analysis or discrepancies between forecast and actual conditions could affect plan effectiveness.

All of the models used in this study are abstract mathematical representations of reality. Models simulate complex systems by simplifying real processes into expressions of their most basic variables. These tools assist with finding optimal solutions to problems, testing hypothetical situations, and forecasting future conditions based on observed data. No model can account for all relevant variables in a system. The interpretation of model outputs must consider the limitations, strengths, weaknesses, and assumptions inherent in model inputs and framework. Inaccurate assumptions or input errors could change benefits predicted by models used in this study. The potential for significant changes due to errors has been reduced through technical review, sensitivity analyses, and quality assurance procedures. However, there is inherent risk in reducing complex natural systems into the results of mathematic expressions driven by the simplified interaction of key variables.

WVA Model Uncertainties

WVAs models were run on the entire final array of mitigation projects using site-specific data collected at all project sites except for the Caernarvon, Golden Triangle, Fritchie Refuge BLH-Wet Enhancement and LaBranche mitigation projects. For the Caernarvon, Golden Triangle, and LaBranche mitigation projects, existing site data from other projects, such as CWPRRA projects, were used. Since these data were from projects in the immediate vicinity of the mitigation projects obtained in the recent past, confidence is high that these data are representative of actual site conditions. For the Fritchie Refuge BLH-Wet Enhancement project, data was collected from an adjacent site with similar habitat. Since the adjacent land appeared to be in better condition than the Fritchie site, the results of the WVAs are expected to be a conservative estimate of what the mitigation potential would actually be using site-specific data for the Fritchie project. If this is accurate, then the current project size of the Fritchie Refuge BLH-Wet Enhancement project may be larger than necessary to mitigate the BLH-Wet FS refuge impacts. Once ROE is obtained, site-specific WVAs would be run and a final resizing of the project completed.

In addition to the WVA model uncertainties discussed above, one should note that the current design for the Bayou Sauvage FS Marsh Restoration and Enhancement project is also based on some uncertainty in regards the WVA models used to predict the net gain in AAHUs that would result from this project. Site-specific data were used to determine the mitigation potential (net gain in AAHUs per acre) for proposed brackish marsh restoration features; hence the confidence for this mitigation potential, 0.42

AAHUs/acre, is high. However, the mitigation potential for proposed mitigation features (elements) involving both marsh restoration (creation of marsh in existing open water areas) and marsh enhancement (re-nourishment of existing marsh habitats) activities should be considered preliminary at this stage. The mitigation potential for such features, estimated as 0.39 AAHUs/acre, was based on the assumption that existing conditions within a given feature would be comprised of 60 percent open water and 40 percent marsh. This mitigation potential was also based on various other assumptions given the lack of site-specific data pertaining to existing marsh habitats and the preliminary status of the revised mitigation design plan.

As design proceeds, final WVAs would be completed for each TSMP to determine their final size. Currently, final WVAs have been run for the Bonnet Carré mitigation projects for BLH-Wet and swamp as they would take the place of the current TSMPs for those habitat types if utilizing a mitigation bank was not ultimately implementable.

Implementation

The timing for implementation is an uncertainty that must be considered. If the plan is not implemented in the near future, the conditions in the study area would continue to degrade. The impact of the uncertainties associated with the future condition of the study area could increase mitigation costs, decrease mitigation benefits, or both.

If a proposed project becomes infeasible due to difficulties in implementation or changed conditions, the CEMVN will take appropriate action to ensure satisfaction of its mitigation requirement.

If the Fritchie project mitigating for flood side BLH-Wet refuge impacts could not be implemented, the CEMVN in coordination with the resource agencies would explore other options to mitigate these impacts. Potential mitigation options could include an expansion of the Bayou Sauvage protected side project mitigating for BLH-Wet and intermediate marsh protected side refuge impacts or identification of other opportunities on or within the acquisition boundary of the Big Branch NWR.

If expansion of the Bayou Sauvage protected side project was pursued, the BLH-Wet portion of the project would be expanded to account for the 8.9 AAHUs of flood side BLH-Wet refuge impacts. Using the BLH-Wet protected side mitigation potential of 0.56 AAHUs/acre, the increase to the BLH-Wet portion of the protected side project to account for the BLH-Wet flood side impacts would be approximately 16 acres (appendix A, figure 31). Impacts from constructing the additional 16 acres of protected side BLH-Wet at Bayou Sauvage would be the same (only on a smaller scale) as those identified for the protected side project as discussed in section 4.2.3. Existing conditions for the significant resources found at this site can be found in section 4.2.3 also. The expansion would be constructed at the same time as the BLH-Wet and intermediate marsh project and would utilize the same construction methods. The currently identified borrow source for the BLH-Wet and intermediate protected side project originally identified twice as much borrow as necessary to build the project. As such, more than enough borrow material exists in the borrow site to build the additional 16 acres of BLH-Wet at the Bayou Sauvage site and no expansion or deepening of the project's borrow source would be required. Further detail and analysis of this project and the impacts from constructing it would be presented in the TIER for this habitat type.

As another option, the PDT in coordination with the resource agencies could identify other opportunities on or within the acquisition boundary of the Big Branch NWR. Though extensive investigations on this NWR have not resulted in additional BLH enhancement projects to date, if another BLH enhancement opportunity becomes available, it is anticipated that such a project would involve invasive species control and planting similar to what is planned for Fritchie Refuge BLH-Wet Enhancement project. As such, the mitigation potential used for the Fritchie Refuge BLH-Wet Enhancement project would be a close approximation of the benefits that could be obtained by enhancing another site and the acreage necessary to meet the BLH-Wet mitigation requirement for this project would be similar to what is necessary at the Fritchie site. Impacts from enhancing another site would likely be similar to those identified in section 4.2.4 for the Fritchie project. Further detail and analysis of this project and the impacts from constructing it would be presented in the TIER for this habitat type.

If during advanced engineering design, implementation problems arise with the Bayou Sauvage FS Marsh Restoration and Enhancement Project (section 2.5.1) movement of the mitigation features into other adjacent open water and/or broken marsh in the vicinity of the current project could be proposed. Initial coordination with the resource agencies has been completed should this be necessary and ponds acceptable for utilization for this effort have been identified in appendix A, figure 32. Since any movement into adjacent ponds would be in the vicinity of the current project, existing conditions and impacts would be the same as those identified for the Bayou Sauvage FS Marsh Restoration and Enhancement Project in section 5.2.2. Further detail and analysis on any redesign of this project and the impacts from constructing it would be presented in the TIER for this habitat type.

Mitigation for Coastal Zone Impacts

Depending on the projects implemented, LDNR may determine that, in its view, such projects do not mitigate for coastal zone impacts. If deemed necessary, additional mitigation for coastal zone impacts may be required.

2.8 PROPOSED ACTION

Although this is a programmatic NEPA document, some of the TSMPs that make up the overall LPV TSMPA are fully assessed in this PIER and are recommended for implementation. These TSMPs, termed “Constructible Features” (or “constructible portions”), mitigate general (e.g. non-refuge) BLH-Wet, BLH-Dry, and swamp impacts and would involve the purchase of BLH-Wet and swamp mitigation bank credits in the LPV basin. The TSMPs that comprise the remainder of the LPV HSDRRS TSMPA are termed “Programmatic Features”. These programmatic features require further design at a feasibility level for which the details and impacts would be released in subsequent NEPA documents that would tier off of this programmatic NEPA document (TIER). These features would not be considered constructible until the TIER is complete.

For the constructible features identified in the PIER, the CEMVN would purchase BLH-Wet and swamp mitigation bank credits in the LPV basin to mitigate 93.85 AAHUs of BLH-Wet/Dry impacts and 108.01 AAHUs of swamp impacts. Purchase of credits would be dependent on receipt of an acceptable proposal and total purchase cost. No particular bank(s) is(are) proposed for use at this time. The bank(s) from which credits would be purchased would be selected through a solicitation process, through which any mitigation bank meeting eligibility requirements and having the appropriate resource

type of credits could submit a proposal to sell credits. If appropriate and cost-effective, the Corps may choose to purchase mitigation bank credits from more than one bank to fulfill the compensatory mitigation requirements for a particular habitat type.

Those mitigation banks within the LPV basin that may be capable of supplying the credits needed to meet the BLH and swamp general mitigation requirements at the time of solicitation is uncertain. Banks currently able to meet the mitigation requirements may not be able to do so at the time of solicitation. In addition, new banks able to meet the mitigation requirement may become approved by the time the solicitation is released. Accordingly, identification of particular banks that could be used to meet the mitigation requirement cannot occur with any degree of certainty and has not been done for this PIER. If, at the time of solicitation, the Corps does not receive acceptable proposals that will allow the Corps to purchase sufficient credits to meet 100 percent of the mitigation requirement by habitat type, then Mitigation Plan Alternative 2 containing the Bonnet Carré projects for BLH and swamp as constructible features for those habitat types (see section 2.9.2) would likely be implemented. Since the bank(s) that may ultimately be selected to provide the necessary mitigation credits is unknown, the existing conditions present at the bank site(s) are similarly unknown. Existing bank habitat quality varies depending on the success criteria met, as specified in the bank's MBI. Typically, as mitigation success criteria are met and the quality of the habitat increases within the bank, more credits are released for purchase.

2.9 ALTERNATIVES TO THE PROPOSED ACTION

This section presents the future without project condition (no action alternative) in which no mitigation projects would be implemented and is compared to the future with project condition or the proposed action.

2.9.1 NO ACTION ALTERNATIVE

NEPA requires that in analyzing alternatives to a proposed action, a Federal agency consider an alternative of "No Action." Typically the No Action alternative evaluates not implementing any of the alternatives and represents the FWOP condition by which alternatives considered in detail are compared. However, because compensatory mitigation for unavoidable impacts is required by law (e.g. Clean Water Act, WRDAs of 1986 and 2007), the No Action alternative should consider implementing the mitigation, albeit somewhere else in the basin other than what is proposed in the current PIER. However, doing so would result in the loss of a baseline essential for impact assessment and alternative analysis. As such, for this PIER, although the No Action alternative represents the FWOP condition (not completing mitigation), it would not be an alternative that could actually be selected.

Under the no action alternative (also FWOP), 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, 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 from the construction of the HSDRRS. The No Action alternative considers previous, current, and reasonably foreseeable future projects, which could impact the resources evaluated in the PIER. These additional projects outside the HSDRRS mitigation project are considered in the FWOP condition. The location of these projects is shown in appendix A, figure 33. For

the purpose of this study, a project is considered "reasonably foreseeable" if it meets one of the following criteria:

- USACE authorized ecosystem restoration , flood risk reduction, and/or navigation project with an anticipated Tentative Selected Plan;
- CWPPRA project authorized at a Phase 2 – construction status;
- Coastal Impact Assistance Program (CIAP) ecosystem restoration or flood risk reduction project which is funded for construction;
- State of Louisiana Surplus-funded ecosystem restoration or flood risk reduction project funded for construction; or
- Louisiana Levee District permitted flood risk reduction project.

Appendix B, tables 10-12 list projects involving wetland or ecosystem restoration activities considered part of the no action alternative that could counter, to a degree, the current land loss trends throughout the basin and progression of wetlands to open water. In addition to the name, general location, and a general description of each project, the tables note whether a project directly overlaps with one of the mitigation projects evaluated in this PIER or whether the extended boundary of the project's wetland value assessment overlaps with one of the mitigation projects evaluated in this PIER.

In addition to these wetland or ecosystem restoration projects, a number of flood risk reduction and navigation projects are listed that have been built or would be built within the Pontchartrain basin that would continue to influence the hydrodynamics within the basin. Previously constructed flood risk reduction and navigation projects include:

- Bonnet Carré Spillway: The spillway was constructed in 1931 and is designed to divert flood waters from the Mississippi River north into Lake Pontchartrain.
- CIAP PO-71 Waterline Booster Pump Station, East Bank: The project, constructed in 2011, includes the installation of a waterline booster pump station in Convent, LA along LA Highway 44 in St. James Parish.
- East Plaquemines Non-Federal Levee: The non-Federal hurricane protection levee was constructed by the Plaquemines Parish government and private entities to reduce flooding risk along the east bank of the Mississippi River between the communities of Caernarvon and Belair in Plaquemines Parish, LA.
- Forty Arpent Levee, Orleans and St Bernard Parish: A non-Federal back flood protection levee built in 1948 along the Forty Arpent Canal in Orleans and St. Bernard Parishes to help protect residential and commercial areas from flooding. The State of Louisiana has elevated low lying reaches of the levee in St. Bernard Parish utilizing 2007 Louisiana State surplus funds. The project is titled Forty Arpent Canal Levee Repairs (PO-61) and construction was completed in January 2012.
- GIWW Navigation System: A continuous waterway located inland and parallel to the Gulf of Mexico coast extending approximately 1,100 miles from Brownsville, TX, to Carrabelle, FL. The Federally authorized navigation project was designed to provide interstate commerce among the Gulf Coast States.
- I-10 Mile 246 to 248 Non-Federal Levee: A non-Federal levee located between Interstate 10 highway miles 246 to 248 in Orleans Parish. The levee aids in storm protection for the communities in eastern New Orleans, LA.

- Little Woods/Maxent Non-federal Levee: The non-Federal levee constructed in 1953 extends south from Lake Pontchartrain along Paris Road then turns southeast near Lake Forest Blvd until it reaches Michoud Canal. The levee aids in storm protection for the communities in eastern New Orleans, LA and is under the authority of the Orleans Levee District. This levee served as the initial storm protection levee for New Orleans East prior to the LPVHPP levees.
- Lower Ninth Ward Non-Federal Levee: The non-Federal flood protection levee extends along the Orleans/St. Bernard Parish line from the 40 Arpent Canal Levee southwest to the Mississippi River. It was constructed in 1948 to reduce the risk of flooding to the Lower Ninth Ward communities. The levee is under the authority of the Orleans Levee District.
- Maxent Lagoon Non-Federal Levee: The non-Federal levee is located along the western border of the Bayou Sauvage NWR extending from Pump Station #15 at the confluence of the GIWW and Maxent Canal north to Interstate 10. The levee aids in storm protection for the communities in eastern New Orleans, LA and is under the authority of the Sewerage and Water Board of New Orleans (SWBNO). After Hurricane Katrina, the levee was rebuilt and raised by SWBNO and USFWS to provide additional hurricane protection.
- Mississippi River Gulf Outlet (MRGO): The MRGO was authorized in 1956 by the Act of Congress, Public Law 84-455, to provide a shorter navigational route between the New Orleans area and the Gulf of Mexico. The deep draft navigational channel construction was completed in 1968. After the devastating effects of Hurricane Katrina, the channel from the GIWW to the Gulf of Mexico was de-authorized in 2007 by section 7013 of WRDA 2007, Public Law 110-114.
- Mississippi River Levees: Mississippi River and Tributaries (MR&T) Project: The flood control plan authorized by the Flood Control Act of 1928 designed to control a Mississippi River flooding event that is greater than the 1927 flood within the lower Mississippi River Valley. The project includes levees, floodways, channel improvements and stabilization as well as tributary basin improvements.
- Mississippi River Navigation Channel: Operations and maintenance of the Mississippi River for navigational purposes.
- Monticello Non-Federal Levee: A non-Federal flood protection levee constructed in 1913 extending north/south along Monticello Avenue from the Mississippi River levee to the 17th Street Canal pumping station in Jefferson Parish, LA.
- MRGO Closure at Bayou La Loutre: The rock closure structure was built across the MRGO channel near Bayou la Loutre as a result of the de-authorization of the MRGO. The closure was authorized by section 7013 of WRDA 2007, Public Law 110-114 and completed in 2009.
- Ormond Non-Federal Levees: A non-Federal flood protection levee in St Charles Parish built to reduce the risk of flooding to the areas in the vicinity of Ormond in Destrehan, LA. The levee is bounded by Airline Highway on the north and the railroad tracks in Destrehan to the south within the Pontchartrain Levee District.

Flood risk reduction and navigation projects currently under construction or reasonably foreseeable include:

- Hurricane and Storm Damage Risk Reduction System, Lake Pontchartrain and Vicinity (HSDRRS-LPV): The project is currently under construction by the USACE and provides flood damage risk reduction against a storm which has a 1 percent chance of occurring in a given year (100-year level of risk reduction). The 126-mile risk reduction system includes the construction

and/or enhancement to existing levees, floodwalls, pumps, canal closures, floodgates and a storm barrier and would provide storm damage risk reduction to the New Orleans Metropolitan Area on the east bank of the Mississippi River including portions of Jefferson, Orleans, St. Bernard, and St. Charles Parishes. The project was authorized as the Lake Pontchartrain and Vicinity, Louisiana Project (LPV) by the Flood Control Act of 1965 and the Water Resources Development Acts of 1974, 1986, 1990, 1992, 1996, 1999, and 2000. Additional emergency supplemental appropriations aimed at completing, restoring, and improving the project were authorized by Congress following Hurricane Katrina and include 3rd Supplemental (PL 109-148, Title 1,Chapter 3, [119 STAT. 2761-2763]), 4th Supplemental (PL 109-234, Title II, Chapter 3, [120 STAT. 454-455]), 5th Supplemental (PL 110-28, Title IV, Chapter3, [121 STAT. 153-154]), 6th Supplemental (PL 110-252, Title III, Chapter 3, [122 STAT. 2349-2350]), and 7th Supplemental (PL 110-329 Title I, Chapter 3 [122 STAT. 3589-3590]). Construction of the 100 year features began in July 2007 and is over 80 percent complete. Anticipated completion date for the entire LPV HSDRRS system is September 2013.

- IHNC Lock Replacement: The lock, completed in 1923, allows for navigational passage between Lake Pontchartrain and the Mississippi River via the IHNC/GIWW in Orleans Parish, LA. The lock was originally authorized for replacement by the River and Harbors Act of 1956 to allow for the expansion of the navigational lock passage to accommodate larger vessels and alleviate traffic congestion. The project is presently on hold while a supplemental EIS is prepared.
- New Orleans to Venice Levees: The Federal hurricane damage risk reduction levee, originally authorized by the Flood Control Act of 1962, extends 16 miles along the east bank of the Mississippi River and 71 miles along the west bank of the Mississippi River in Plaquemines Parish, LA and provides storm flood damage risk protection. Following Hurricane Katrina additional work has been authorized by Congress through additional emergency supplemental appropriations 3rd Supplemental (PL 109-148, Title 1,Chapter 3, [119 STAT. 2761-2763]), 4th Supplemental (PL 109-234, Title II, Chapter 3, [120 STAT. 454-455]), 6th Supplemental (PL 110-252, Title III, Chapter 3, [122 STAT. 2349-2350]), and 7th Supplemental (PL 110-329 Title I, Chapter 3 [122 STAT. 3589-3590]). The work includes restoring, armoring, and accelerated completion of the existing Federal levees and the incorporation of certain non-Federal levees into the New Orleans to Venice project to provide the authorized design grade of 50-year (2 percent) level of storm risk reduction. Anticipated repairs should begin in late Fall 2012 and construction is expected to continue into 2017.

2.9.2 MITIGATION PLAN ALTERNATIVE 2

This alternative is made up of the same TSMPs as those found in the TSMPA except for those mitigating BLH-Wet, BLH-Dry, and swamp general impacts. For these habitat types, the projects that ranked second in the AEP to the current TSMPs (mitigation banks) would be utilized (Corps constructed projects at the Bonnet Carré). The Bonnet Carré flood side BLH-Wet mitigation project discussed below would take the place of the TSMP involving purchase of BLH-Wet mitigation bank credits, while the Bonnet Carré flood side swamp mitigation project would take the place of the TSMP involving purchase of swamp mitigation bank credits. This alternative would be implemented if mitigation bank credit availability or cost did not support the selection of the current TSMPs for BLH-Wet, BLH-Dry, and swamp general impacts.

2.9.2.1 Bonnet Carré BLH-Wet Restoration Project

The following description has been updated to reflect the adjusted mitigation requirement as discussed in section 2.5 as well as other project design revisions, and therefore differs somewhat from the project descriptions used during the AEP.

This mitigation project would be constructed within the Bonnet Carré Spillway, between Hwy 61 and the I-10. This project is shown in appendix A, figure 34.

The Bonnet Carré BLH-Wet mitigation project has a mitigation potential of 0.63 AAHUs per acre, and would provide more than the required 93.85 AAHUs for HSDRRS BLH-Wet and BLH-Dry general impacts and TFG BLH-Dry impacts combined. This would be achieved through restoration of approximately 156.2 acres of FS BLH-Wet habitat (156.2 acres X 0.63 AAHUs/acre = 98.4 AAHUs, compared to the total of 93.85 AAHUs required).

The Bonnet Carré BLH Restoration features, comprised of BLH-Wet elements (features) BC1 through BC4, would be constructed in the Bonnet Carré Spillway. As currently proposed, BLH restoration mitigation would be constructed within the central and southern portions of the project boundary. Restoration would consist of the placement of dedicated dredge material, to be obtained from Lake Pontchartrain at the north end of the Bonnet Carré spillway, with placement of material to be concentrated within areas of existing shallow open water areas (areas previously disturbed/excavated to acquire borrow for other projects). The proposed project would restore approximately 156.2 acres to BLH-Wet habitat. The proposed targeted elevation for BLH-Wet habitat is within a range of +2.0 to +3.0 ft. As such, the initial fill elevation would be to an elevation of +3.5 ft to allow for subsidence and provide longevity of this desired habitat. Existing ridges within the various feature polygons would be used to assist in retention of the dredged material and ridges of elevation exceeding +3.0 ft would be degraded with the degraded material placed within the open water areas to be filled.

The areas to be converted to BLH-Wet habitat would be cleared and grubbed of all existing trees prior to placement of dredged material/fill. The debris from clearing and grubbing operations may be placed within the adjacent borrow pits and later backfilled with dredged material. As the material to be dredged is expected to be of a fairly sandy nature, retention dikes are not anticipated to be required. Rather, the material would be allowed to be stacked up in isolated locations and later transferred throughout the mitigation area until all elements are filled to the proper elevation. However, in the event retention dikes would be required, the dike would be constructed from in-situ material that would be obtained from within the pits themselves. Upon completion of placement of material within the pits, any retention dikes constructed would be degraded to match the fill grade within +/- 0.5’.

Some hydrologic improvements may be required to encourage alternating wet/dry periods within the site and to allow for interchange between this feature and the adjacent estuarine system. Hydrologic modifications which could be used to assist in facilitating interconnectivity between the sites could entail any of the following measures: a) breaching banks of existing drainage ditches/canals; b) construction of earthen weirs within existing drainage ditches/canals in order to facilitate sheet flow; c) construction of bifurcation channels off of existing ditches/canals; and/or d) installing or replacing existing culverts within roads.

Ingress and egress to the site would be via Lake Pontchartrain, as well as Federal, state, and local highways and the Bonnet Carré Spillway. To accommodate construction, two areas would be provided for the temporary staging of barge(s), dredge pipeline, and required land-based equipment. One staging area (approximately 23.5 acres) would be located along the Lake Pontchartrain shoreline and immediately west of the east guide levee. Excavation for floatation access to this staging area may be required. Where floatation access dredging is required, the excavated material would be placed adjacent to the floatation channel and the material used to backfill the channel upon completion of work. The other staging area (approximately 8.5 acres) would be located inside the spillway and just south of the rail road trestles spanning the north end of the spillway. Excavation to access this staging area would not be allowed.

Following the construction required to modify these features to their respective habitat topography, plantings within all features would be performed. Planting and monitoring for all features would be in accordance with the proposed mitigation program (mitigation plan) contained in appendix K.

Borrow Requirements

Earthen material required to construct the BLH-Wet habitat features would be obtained from within Lake Pontchartrain (appendix A, figure 34). Based on available LIDAR data, recently completed surveys, and assumptions of existing conditions within pits, it is estimated that approximately 800,000 cubic yards (cys) would be required to construct the proposed BLH-Wet restoration features. These features would require approximately 60 acres of borrow. To assure adequate borrow, the proposed borrow pit size would be approximately doubled (1.75 times the original pit size) to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow within Lake Pontchartrain would be restricted to a maximum depth of -20 ft. The dredge material/fill would be transported via hydraulic dredge and the discharge pipeline run through/under the I-10 and railroad trestles at the north end of the Bonnet Carré Spillway, and then within existing water bodies or cleared land so as to minimize impacts to existing vegetation.

2.9.2.2 Bonnet Carré Swamp Restoration Project

The following description has been updated to reflect the adjusted mitigation requirement as specified in section 2.5 as well as other project design revisions, and therefore differs somewhat from the project descriptions used during the AEP.

This mitigation project would be constructed within the Bonnet Carré Spillway and between Hwy 61 and the I-10. This project is shown in appendix A, figure 34.

With a mitigation potential of 0.39 AAHUs per acre, this swamp restoration mitigation project would provide the required 108.01 AAHUs for general impacts through restoration of approximately 310.3 acres of FS swamp (310.3 acres X 0.39 AAHUs/acre = 121.02 AAHUs).

The proposed Bonnet Carré Swamp Restoration Features (elements), comprised of restoration features BC6, BC7, and BC8, would be constructed in the more northern part of the Bonnet Carré Spillway. Restoration would consist of the placement of dedicated dredge material, to be obtained from Lake Pontchartrain at the north end of the Bonnet Carré spillway, with placement of material to be

concentrated within areas of existing shallow open water areas. Restoration would commence at the northern-most portion of the project area and proceed towards the river until the restoration of approximately 310.3 acres is completed. As the proposed final targeted elevation for this habitat is within a range of +1.5 to +2.0 ft, the initial fill elevation would be to an elevation of +3.0 ft to allow for subsidence and provide longevity of this desired habitat. Existing ridges within the various feature polygons would be used to assist in retention of the dredged material and ridges of elevation exceeding +2.5 ft would be degraded with the degraded material placed within the open water areas to be filled. Prior to placement of dredged material within the area, the area would be cleared and grubbed of all existing trees. The debris from clearing and grubbing operations may be placed within the adjacent borrow pits and later backfilled with dredged material. As the material to be dredged is expected to be of a fairly sandy nature, retentions dikes are not anticipated to be required. Rather, the material would be allowed to be stacked up in isolated locations and later transferred throughout the mitigation area until all elements are filled to the proper elevation. However, in the event retention dikes would be required, the dike would be constructed from in-situ material that would be obtained from within the pits themselves. Upon completion of placement of material within the pits, any retention dikes constructed would be degraded to match the fill grade within +/- 0.5 ft. The swamp features would be planted in year 1 post construction, in accordance with the proposed mitigation program (mitigation plan) provided in appendix L.

Ingress and egress to the site would be via Lake Pontchartrain, as well as Federal, state, and local highways and the Bonnet Carré Spillway. To accommodate construction, two areas would be provided for the temporary staging of barge(s), dredge pipeline and required land-based equipment. One staging area (approximately 23.5 acres) would be located along the Lake Pontchartrain shoreline and immediately west of the east guide levee. Excavation for floatation access to this staging area may be required. Where floatation access dredging is required, the excavated material would be placed adjacent to the floatation channel and the material used to backfill the channel upon completion of work. The other staging area (approximately 8.5 acres) would be located inside the spillway and just south of the railroad trestles spanning the north end of the spillway. Excavation to access this staging area would not be allowed.

Borrow Requirements

Earthen material required to construct the swamp habitat feature would be obtained from within Lake Pontchartrain (appendix A, figure 34). Based on available LIDAR data, recently received surveys, and assumptions of existing conditions within the pits, it is estimated that approximately 1,300,000 cys would be required to complete the proposed swamp restoration features. These features would require approximately 95 acres of borrow. To assure adequate borrow, the proposed pit size would be approximately doubled (1.75 times the original pit size) to account for unsuitable materials, unknown utilities, unidentified anomalies, and/or unsighted cultural finds. Borrow within Lake Pontchartrain would be restricted to a maximum depth of -20 ft. The dredge material/fill would be transported via hydraulic dredge and the discharge pipeline run through/under the I-10 and railroad trestles at the north end of the Bonnet Carré Spillway, and then within existing water bodies or cleared land so as to minimize impacts to existing vegetation.

2.9.3 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

Two alternatives were considered, but eliminated from further consideration during the planning process. An alternative comprised of mitigating LPV HSDRRS impacts to all habitat types utilizing mitigation banks only and an alternative comprised of mitigating LPV HSDRRS impacts with Corps constructed projects only.

2.9.3.1 Mitigation Banks Only Alternative

This alternative would have met the whole mitigation requirement for all habitat types through the purchase of mitigation bank credits of the same habitat type. Because mitigation banks in the LPV basin with sufficient in kind credits to meet the mitigation requirement currently do not exist, this alternative was eliminated from further consideration.

2.9.3.2 Corps Constructed Project Only Alternative

This alternative would have met the whole mitigation requirement for all habitat types through the implementation of Corps constructed alternatives of the same habitat type. Although opportunity exists within the LPV basin to meet the LPV HSDRRS mitigation requirement through restoration or enhancement of the same habitat types as those impacted; because NEPA requires the analysis of all reasonable alternatives (which would include banks); because banks exist in the LPV basin that can meet some of the LPV HSDRRS mitigation requirement; because WRDA 2007, §Section 2036(c) requires that where appropriate, mitigation banks should be considered when mitigating habitat impacts if the impacts occur within the service area of the bank and the bank contains sufficient credits to offset the impact; and because mitigation banks can represent cost a effective option, the Corps Constructed Project Only Alternative was eliminated from further consideration.

3. AFFECTED ENVIRONMENT

3.1 ENVIRONMENTAL SETTING

The LPV HSDRRS Mitigation 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 LPV HSDRRS work did not impact the barrier islands (appendix A, figure 2).

Major features in the LPV Mitigation basin include: Lake Maurepas and its adjacent wetlands and swamps; Lake Pontchartrain and Lake Borgne, separated from one another by the East Orleans Landbridge but hydrologically linked through tidal passes at the Rigolets, Chef Menteur Pass, and the manmade IHNC; the Mississippi River; and the de-authorized MRGO.

Geomorphic and Physiographic Setting

Most of the present landmass of southeast LA was formed by deltaic processes of the Mississippi River. Over the past 7,000 years, the Mississippi River deposited massive volumes of sediment in five deltaic complexes. The LPV Mitigation Basin lies within the Mississippi Delta Region (figure 3-1) comprised of three geomorphic regions, which are further divided into multiple smaller geomorphic areas.

The Pleistocene Terrace Region is the area north of Lakes Maurepas, Pontchartrain, and Borgne. This region is defined as the area north of the Mississippi River Deltaic Plain and the lowlands surrounding Lakes Pontchartrain and Maurepas.

The Marginal Deltaic Basin is comprised of the estuarine marshes and forested wetlands of Lakes Pontchartrain and Maurepas (figure 3-1 and 3-2). This region includes some of the largest remaining tracts of forested wetlands in the Lower Mississippi River Valley. The Marginal Deltaic Basin is divided into the following eight geographic areas: Maurepas Swamp, Manchac Landbridge, Southwest Pontchartrain, Lake Pontchartrain, North Shore Marsh, Bayou Sauvage, East Orleans Landbridge, and Pearl River Mouth.

The Marginal Deltaic Basin lies within the LA Coastal Zone and is influenced by wetland loss, subsidence, saltwater intrusion, and shoreline erosion. USACE data indicates relative sea level rise in the region of less than 0.5 feet per century, but in many localized areas, the rate is greater. Shoreline erosion is taking place around the entire perimeter of Lakes Pontchartrain, Maurepas, and Borgne, except for sections where shoreline protection has been installed.

The Mississippi River Deltaic Plain lies south of the lakes. The salinity gradient within this region decreases from east (saltwater of the Gulf of Mexico) to west (fresher waters in the coastal plain) through the Pontchartrain Basin.

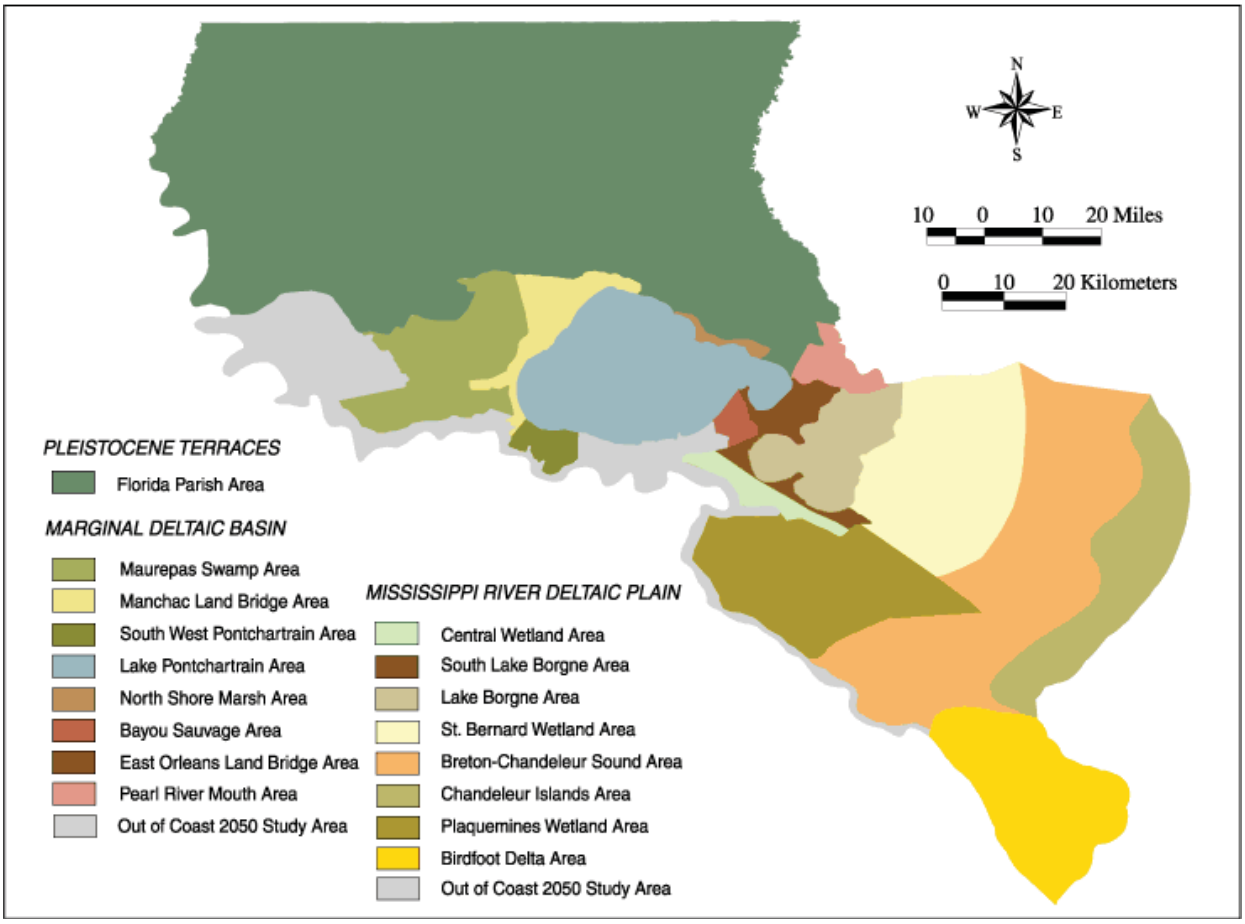

Figure 3-1: Mississippi Deltaic Region (Coast 2050)

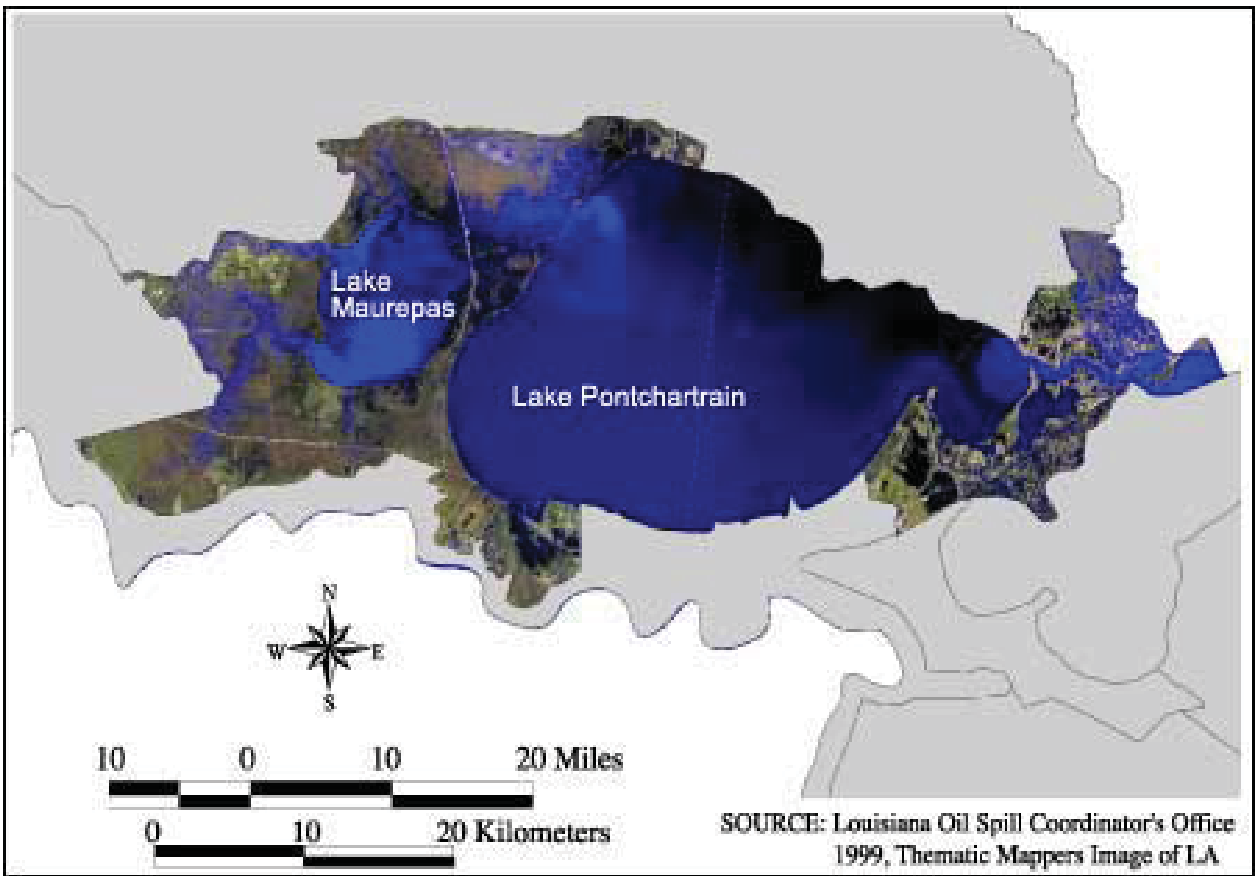

Figure 3-2: Marginal Deltaic Basin

The LPV Corps constructed mitigation TSMPs are located in Florida Parish Area of the Pleistocene Terraces; in the Manchac Land Bridge and Bayou Sauvage Areas of the Marginal Deltaic Basin; and in the South Lake Borgne Area of the Mississippi River Deltaic Plain. Mitigation banks with suitable habitat for the BLH and swamp TSMPs are generally found in the Maurepas Swamp and Manchac Land Bridge Areas of the Marginal Deltaic Basin. The second ranked projects to implementing BLH and swamp mitigation at a mitigation bank (Bonnet Carré projects) are in the South West Pontchartrain Area of the Marginal Deltaic Basin.

Climate

The Lake Pontchartrain basin is located within a subtropical latitude. The climate is influenced by the many water surfaces of the nearby wetlands, rivers, lakes, streams, and the Gulf of Mexico. Throughout the year, these water areas modify relative humidity and temperature conditions, decreasing the range between the extremes. Summers are long and hot, with an average daily temperature of 82° Fahrenheit (°F), average daily maximum of 91°F, and high average humidity. Winters are influenced by cold, dry polar air masses moving southward from Canada, with an average daily temperature of 54°F and an average daily minimum of 44°F. Annual precipitation averages 54 inches.

3.2 SIGNIFICANT RESOURCES

This section contains a list of the significant resources located in the vicinity of the proposed mitigation projects, and describes in detail those resources that would be impacted, directly or indirectly, by construction of them.

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. Further detail on the significance of each of these resources can be found by contacting the CEMVN, or on www.nolaenvironmental.gov, which offers information on the ecological and human value of these resources, as well as on the laws and regulations governing each resource. Search for "Significant Resources Background Material" in the website's digital library for additional information. See appendix A, figure 35 for the habitats found in the LPV mitigation basin. See appendix B, table 13-15 for scientific names of species identified throughout the document.

3.2.1 MITIGATION FOR IMPACTS TO NON-REFUGE INTERMEDIATE MARSH

3.2.1.1 Wetlands and other Surface Waters

3.2.1.1.1 LPV Basin

See appendix A, figure 35 for the habitats and their quantity found in the LPV Mitigation Basin. Wet BLH forests in the Lake Pontchartrain Basin are dominated by water oak, nuttall oak, green ash, red maple, and pignut hickory. Swamps in the Lake Pontchartrain Basin are dominated by bald cypress and water tupelo, which have regenerated since extensive logging of virgin forest more than 70 years ago. The Louisiana swamps generally lack a mature canopy as was present in the forests before logging occurred and have lower productivity where isolated from riverine influences (Shaffer et al., 2003). The greatest potential to restore and sustain coastal forests is near the Mississippi River where freshwater reintroductions may be implemented. Other local sources of freshwater may be municipal wastewater or storm water. Economically important natural resources associated with these swamps include fisheries of crawfish, blue catfish, and channel catfish, as well as logging. A list of plant species referenced in this document and their scientific names can be found in appendix B, table 13.

Various mitigation banks within Louisiana may be capable of supplying enough credits to meet the intermediate marsh mitigation requirements. Since the bank that may ultimately be selected to provide the necessary mitigation credits is unknown, the existing conditions present at the bank site are similarly unknown. Existing bank habitat quality varies depending on the success criteria met, as specified in the bank's MBI. Typically, as mitigation success criteria are met and the quality of the habitat increases within the bank, more credits are released for purchase.

3.2.1.1.2 Bayou Des Mats

The project area is primarily shallow open water interspersed with approximately 56 acres of marsh (i.e., 11 percent marsh). Vegetation mapping conducted in 1949 classified the area as

brackish marsh (O'Neil 1949). Since then the area and surrounding marsh has been has been classified as intermediate marsh (Chabreck and Linscombe 1997, Sasser et al. 2008). The adjacent marsh vegetation is consistent with intermediate and brackish marsh plant communities. The long term water salinities in the area, as documented in Coastwide Reference Monitoring System (CRMS) surveys (http://www.lacoast.gov/crms_viewer/), indicates a wide range of salinity movement throughout the year and among years resulting in conditions appropriate for both intermediate and brackish marsh plant species survival. Submerged aquatic vegetation (SAV) is prevalent.

3.2.1.1.3 Caernarvon

The project area is primarily shallow open water with approximately 40 acres of marsh (i.e., 7 percent marsh). Adjacent marsh has been classified as intermediate marsh consistently since 2001, after the freshwater from the Caernarvon diversion project converted the previously brackish marsh (O'Neil 1949, Chabreck and Linscombe 1997, Chabreck et. al. 2001, Sasser et al. 2008). SAV is prevalent.

3.2.1.1.4 Fritchie

The project area is primarily shallow open water with less than 10 acres of existing marsh (i.e., less than 3 percent marsh). Chabreck and Linscombe (1997) identified both brackish and intermediate marsh as occurring within the project area while Sasser et al. (2008) classified the area as brackish marsh. The adjacent marsh vegetation is consistent with intermediate and brackish marsh plant communities. The long term water salinities in the area, as documented in CRMS surveys (http://www.lacoast.gov/crms_viewer/), indicates a wide range of salinity movement throughout the year and among years resulting in conditions appropriate for both intermediate and brackish marsh plant species survival. SAV is prevalent.

3.2.1.1.5 Big Branch

The project area is primarily open water with approximately 13 acres of marsh (i.e., 4 percent marsh). Chabreck and Linscombe (1997) identified both brackish and intermediate marsh as occurring within the project area while Sasser et al. (2008) classified the area as brackish marsh. The adjacent marsh vegetation is consistent with intermediate and brackish marsh plant communities. The long term water salinities in the area, as documented in CRMS surveys (http://www.lacoast.gov/crms_viewer/), indicates a wide range of salinity movement throughout the year and among years resulting in conditions appropriate for both intermediate and brackish marsh plant species survival. SAV was found in the project area, but is not prevalent.

3.2.1.1.6 LaBranche

The project area is primarily shallow open water with approximately 26 acres of marsh (i.e., 8 percent marsh). Sasser et al. (2008) classified the adjacent marsh as intermediate. SAV is prevalent.

3.2.1.1.7 Milton (TSMP)

The project area is primarily shallow open water with 18 acres of marsh (i.e., 4 percent) present. Chabreck and Linscombe (1997) identified fresh marsh as occurring within the project area, while Sasser et al. (2008) classified the area as intermediate marsh. SAV is prevalent.

3.2.1.2 Wildlife

3.2.1.2.1 LPV Basin

Louisiana's coastal wetlands support numerous neotropical and other migratory avian species, such as rails, gallinules, shorebirds, wading birds, and numerous songbirds. The rigors of long distance flight require most neotropical migratory birds to rest and refuel several times before they reach their final destination. Louisiana coastal wetlands provide neotropical migratory birds essential stopover habitat on their annual migration routes. The coastal wetlands in the LPV Mitigation Basin provide important and essential fish and wildlife habitats, especially transitional habitat between estuarine and marine environments, used for shelter, nesting, feeding, roosting, cover, nursery, 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 (LCWCRTF & WCRA, 1999).

Open water habitats such as Lake Pontchartrain and Lake Borgne 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 (LCWCRTF & WCRA, 1999).

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 and Lake Borgne. There are coastal populations that migrate into bays, estuaries and river mouths as well as offshore populations that inhabit waters along the continental shelf. Their coloration ranges from light gray to black with lighter coloration on the belly. Inshore (coastal) and offshore individuals vary in color and size. Inshore animals are smaller and lighter in color, while offshore animals are larger, darker in coloration and have smaller flippers. Coastal animals prey on benthic invertebrates and fish, and offshore animals feed on squid and fish.

A list of common wildlife species found in the LPV basin and their scientific names can be found in appendix B, table 14.

3.2.1.2.2 Bayou Des Mats

The project area provides important habitat for a variety of wildlife, including waterfowl, wading birds, shorebirds, mammals, reptiles and amphibians. The project area provides wintering habitat for migratory puddle ducks including gadwall, blue-winged teal, green-winged teal, American widgeon, and northern shoveler. Diving duck species which utilize the project area include lesser scaup and ring-necked ducks. The resident mottled duck, which nests in fresh to brackish marshes, is found in the area throughout the year.

Common wading bird species which utilize the project area include the great blue heron, green heron, tricolored heron, great egret, snowy egret, yellow-crowned night-heron, black-crowned night-heron, and white ibis. Mudflats and shallow-water areas provide habitat for numerous species of shorebirds and seabirds. Shorebirds include the American avocet, willet, black-necked stilt, dowitchers, and various species of sandpipers. Seabirds include the white pelican, black skimmer, herring gull, laughing gull, and several species of terns.

Migratory and resident non-game birds, such as the boat-tailed grackle, red-winged blackbird, seaside sparrow, northern harrier, belted kingfisher, and marsh wrens, also utilize the project area. Important gamebirds found in the area include the clapper rail, sora rail, Virginia rail, American coot, common moorhen, and common snipe in addition to resident and migratory waterfowl.

Mammals found within the project area include nutria, muskrat, mink, river otter, and raccoon, all of which are commercially important furbearers. Bottlenose dolphins may be found foraging in the proposed borrow area. Reptiles and amphibians are fairly common in the low-salinity marshes found within the project area. Reptiles include the American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle. Amphibians expected to occur in the area include the bullfrog, southern leopard frog, and Gulf coast toad.

3.2.1.2.3 Caernarvon

A great variety of mammals, birds, reptiles, and amphibians are found in the vicinity of the Caernarvon project. Abundant furbearers, including nutria, muskrat, mink, river otter, and raccoon, formerly supported a trapping industry in the Terrebonne Basin. Other species occurring in the vicinity of the project area include white-tailed deer, skunks, rabbits, squirrels, armadillos, and a variety of smaller mammals. Large populations of migratory waterfowl, including gadwalls, blue-winged teal, green-winged teal, widgeons, mottled ducks, lesser scaup, shovelers, pintails, and mallards, are present during winter in the area. Mottled ducks are present year-round. These waterfowl are highly sought by sportsmen. In addition, coots, gallinules, rails, mourning doves, and snipe are important game species.

Non-game wading birds, shore birds, and sea birds include egrets, ibis, herons, sandpipers, willets, black-necked stilts, gulls, terns, skimmers, grebes, loons, cormorants, and white and brown pelicans. Various raptors such as barred owls, red-shouldered hawks, northern harriers (marsh hawks), American kestrel, and red-tailed hawks are present. Passerine birds present include sparrows, vireos, warblers, Northern mockingbirds, grackles, red-winged blackbirds,

wrens, blue jays, northern cardinals, and crows. Many of these birds are present primarily during periods of spring and fall migrations. The area provides habitat for salamanders, toads, frogs, turtles, and several species of poisonous and nonpoisonous snakes. The American alligator is abundant in fresh to intermediate marsh and is caught commercially for its hides and meat throughout the area.

3.2.1.2.4 Fritchie

Since the Fritchie site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Fritchie for wildlife should be similar to those for Bayou Des Mats.

3.2.1.2.5 Big Branch

Since the Big Branch site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Big Branch for wildlife should be similar to those for Bayou Des Mats.

3.2.1.2.6 LaBranche

Since the LaBranche site is adjacent to Lake Pontchartrain, existing conditions at LaBranche for wildlife should be similar to those for Bayou Des Mats.

3.2.1.2.7 Milton (TSMP)

Since the Milton site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Milton for wildlife should be similar to those for Bayou Des Mats.

3.2.1.3 Threatened and Endangered Species

3.2.1.3.1 LPV Basin

Within the State of Louisiana there are 30 animal and three plant species (some with critical habitat) under the jurisdiction of the USFWS and/or the NMFS, presently classified as endangered or threatened. Of those 30, table 3-2 identifies those that are known to occur in the parishes where projects in the final array are situated. The USFWS and the NMFS share jurisdictional responsibility for sea turtles and the 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 the bald eagle and the 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.

Table 3-2: Project Parishes and LA Threatened and Endangered Species

Species	Parish	Critical Habitat	Status	Jurisdiction	
				USFWS	NFMS
Animal					
Louisiana Black Bear (*Ursus americanus luteolus*)	St. B, St. C, St. J, St. T, O, Pl		T	X	
West Indian Manatee (*Trichechus manatus*)	St. B, St. C, St. J, St. T, O, Pl		E	X	
Piping Plover (*Charadrius melodus)*	St. B, Pl	X	T	X	
Red Cockaded Woodpecker (*Picoides borealis*)	St. T		E	X	
Gopher Tortise (*Gopherus polyphemus*)	St. T		T	X	
Ringed Map Turtle (*Graptemys oculifera*)	St. T		T	X	
Hawksbill Sea Turtle (*Eretomchelys imbricata*)	St. B, Pl		E	X	X
Kemp's Ridley Sea Turtle (*Lepidochelys kempii*)	St. B, Pl		E	X	X
Leatherback Sea Turtle (*Dermochelys coriacea*)	St. B, Pl		E	X	X
Green Sea Turtle (*Chelonia mydas*)	St. B, Pl		T	X	X
Loggerhead Sea Turtle (*Caretta caretta*)	St. B, Pl		T	X	X
Pallid Sturgeon (*Scaphirhynchus albus*)	St. B, St. C, St. J, O, Pl		E	X	
Gulf Sturgeon (*Acipenser oxyrinchus desotoi*)	St. B, St. C, St. J, St. T, O, Pl	X	T	X	X
Alabama Heelsplitter Mussel (*Potamilus inflatus*)	St. T		T	X	
Plant					
Louisiana Quillwort (*Isoetes louisianensis*)	St. T		E	X	

3.2.1.3.2 Bayou Des Mats

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. The borrow site for this project is in Gulf sturgeon critical habitat.

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 ft and a weight of over 2,200 pounds. It occurs in both freshwater and saltwater habitats within tropical and subtropical regions. 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).

The manatee can occur throughout the coastal regions of the southeastern United States and may travel greater distances during warmer months; it has been sighted as far north as Massachusetts and as far west as Texas. However, the manatee is a subtropical species with little tolerance for cold, and it returns to and remains in the vicinity of warm-water sites in peninsular Florida during the winter (USFWS 2001, USFWS 2007). Thus, the manatee is not a year-round resident in Louisiana, but it may migrate there during warmer months. Manatees prefer access to natural springs or manmade warm water and waters with dense beds of submerged aquatic or floating vegetation. Manatees prefer to forage in shallow grass beds that are adjacent to deeper channels. They seek out quiet areas in canals, creeks, lagoons, or rivers and use deeper channels as migratory routes (USFWS 1999).

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). In order to minimize the potential for construction activities to cause adverse impacts to manatees, the following standard manatee protection measures 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. Siltation barriers, if used, would be made of material in which manatees could not become entangled and would be properly secured and monitored. 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 U.S. Fish and Wildlife Service (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 30 September 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 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 21 degrees Celsius and would spend eight to nine months each year in the rivers before returning to estuaries or the Gulf of Mexico by the beginning of October. Thus, the Gulf sturgeon spends the majority of its life in fresh water (USFWS and Gulf States Marine Fisheries Commission [GSMFC] 1995). Spawning takes place in upper river reaches and appears to be river-specific. After spawning, most adults move downstream to summer holding or resting areas. Eggs are demersal and adhesive, tending to sink and adhere to the bottom (USFWS and GSMFC 1995). Spawning areas require clean cobble substrate or gravel to which eggs can adhere and in which developing larvae can find shelter (USFWS and NMFS 2003).

Subadult and adult Gulf sturgeon do not feed significantly in freshwater; instead, they rely almost entirely on estuarine and marine areas for feeding. Young-of-the-year and juveniles feed mostly in the riverine environment (USFWS and NMFS 2003). The diet of the Gulf sturgeon consists predominantly of invertebrates; the types and sizes consumed vary with life history stage and annual migration. Juveniles consume amphipods, isopods, annelid worms, aquatic insects, small bivalves, and small shrimp. Subadults also consume mud or ghost shrimp. Adults in estuaries and coastal waters consume mainly amphipods, isopods, gastropods, brachiopods, polychaete worms, lancelets, and shrimp (USACE 2006a).

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 the eastern half of Lake Pontchartrain east of the causeway, Lake Catherine, Lake Borgne, out into the Mississippi Sound (USACE 2006a). Studies conducted 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. Most records of Gulf sturgeon from Lake Pontchartrain have been located east of the causeway, particularly on the eastern north shore. Gulf sturgeon have also 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 are air-breathing reptiles with large flippers and streamlined bodies. They inhabit tropical and subtropical marine and estuarine waters around the world. Of the seven species in the world, six occur in waters of the U.S., 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 sea turtle 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 has a 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 and Lake Borgne range from older juveniles to adults.

3.2.1.3.3 Caernarvon

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions.

3.2.1.3.4 Fritchie

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.1.3.5 Big Branch

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.1.3.6 LaBranche

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions.

3.2.1.3.7 Milton (TSMP)

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to

potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions.

3.2.1.4 Fisheries, Aquatic Resources and Water Quality

3.2.1.4.1 LPV Basin

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.

Major water bodies within the basin include Lake Maurepas, Lake Pontchartrain, Lake Borgne, Breton Sound, and Chandeleur Sound. NMFS has indicated that these water bodies 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).

A list of fish and aquatic species referenced in this document and their scientific names can be found in appendix B, table 15.

The existing emergent wetlands and shallow open water within the project area provide important habitat and Essential Fish Habitat (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. Historically and currently, the area provides valuable recreational and commercial fishing habitat, oyster culture, and nursery areas for a wide variety of finfish and shellfish (Rounsefell, 1964; Penland et al., 2002).

The project area encompasses all or part of five U.S. Geological Survey (USGS) Cataloging Units: 08090202 – Lake Pontchartrain, 08090203 – Eastern Louisiana Coastal Watershed, 08090201 – Liberty Bayou-Tchefuncta Watershed, 08070205 – Tangipahoa Watershed, and 08070204 – Lake Maurepas Watershed. Within each of these Cataloging Units, the state has delineated hydrologic units, or subsegments, within the state.

Section 305(b) of the Clean Water Act requires each state to monitor and report on surface and groundwater quality, which the Environmental Protection Agency (EPA) synthesizes into a report to Congress. The Louisiana Department of Environmental Quality (LDEQ) produces a Section 305(b) Water Quality Report that provides monitoring data and water quality summaries for hydrologic units (subsegments) throughout the state.

Water quality criteria are elements of state water quality standards that represent the quality of water that will support a particular designated use. These criteria are expressed as constituent concentrations, levels, or narrative statements. There are currently eight designated uses adopted for Louisiana's surface waters: Primary Contact Recreation, Secondary Contact Recreation, Fish and Wildlife Propagation ("subcategory" for Limited Aquatic life and Wildlife), Drinking Water Supply, Oyster Propagation, Agriculture, and Outstanding Natural Resource Waters. Table B-20 shows those hydrologic units or subsegments which include both waterbodies which are considered "impaired" according to the 2010 Integrated Report and one of the HSDRRS LPV Mitigation alternative footprints. Appendix A, figure 36 shows the location of the subsegments within which these impaired waterbodies and project footprints are found.

3.2.1.4.2 Bayou Des Mats

The project area supports a diverse assemblage of estuarine-dependent fishes and shellfishes, and species presence 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. 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 of the hydrologic unit which this project is in does not fully support one of its designated uses: 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 it designated uses.

3.2.1.4.3 Caernarvon

The project area supports a diverse assemblage of estuarine-dependent fishes and shellfishes, and species presence is largely dictated by salinity levels and season. Commercially important species include the American oyster, brown and white shrimp, blue crab, Gulf menhaden, and striped mullet.

Freshwater species commonly taken in the area include largemouth bass, warmouth, bluegill, redear sunfish, channel catfish, and blue catfish. Other fishes likely to be present include yellow bullhead, freshwater drum, bowfin, carp, buffaloes, and gars.

The water quality of the hydrologic units which this project and its borrow source are in are considered to fully support their designated uses.

3.2.1.4.4 Fritchie

Since the Fritchie site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Fritchie for fisheries, aquatic resources and water quality should be similar to those for Bayou Des Mats.

The water quality of the hydrologic unit which this project is in does not fully support one of its designated uses: Primary Contact Recreation. The suspected source of this impairment, fecal coliform, is from on-site treatment systems, such was septic systems and similar decentralized systems. Lake Pontchartrain, the project's borrow source, is considered to fully support it designated uses.

3.2.1.4.5 Big Branch

Since the Big Branch site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Big Branch for fisheries, and aquatic resources should be similar to those for Bayou Des Mats.

The water quality of the hydrologic unit which this project is in does not fully support two of its designated uses: Fish and Wildlife Propagation and Secondary Contact Recreation. The suspected sources of these impairments, presence of benzo(a)pyrene, include contaminated sediments and a contaminated Superfund site in the area. Lake Pontchartrain, the project's borrow source, is considered to fully support it designated uses.

3.2.1.4.6 LaBranche

Since the LaBranche site is adjacent to Lake Pontchartrain, existing conditions at LaBranche for fisheries, and aquatic resources should be similar to those for Bayou Des Mats.

The water quality of the hydrologic unit which this project is in does not fully support two of its designated uses: Fish and Wildlife Propagation and Outstanding Natural Resource. The suspected sources of these impairments include natural sources, forced drainage pumping, changes in tidal circulation and flow alterations. Lake Pontchartrain, the project's borrow source, is considered to fully support it designated uses.

3.2.1.4.7 Milton (TSMP)

Since the Milton site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Milton for fisheries, and aquatic resources should be similar to those for Bayou Des Mats.

The water quality of the hydrologic unit which this project is in does not fully support one of its designated uses: Fish and Wildlife Propagation. The suspected sources of these impairments include loss of wetlands, littoral/shore area modifications, atmospheric deposition of toxins, and habitat modification. Lake Pontchartrain, the project's borrow source, is considered to fully support it designated uses.

3.2.1.5 Essential Fish Habitat

3.2.1.5.1 LPV Basin

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 of the National Oceanic and Atmospheric Administration, regional Fishery Management Councils (FMC), and other Federal agencies to identify and protect EFH of economically important marine and estuarine fisheries. 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 3-3 lists the expected salinity zones in LPV region and the abundance of the managed species expected. Table 3-4 shows the EFH for the managed species expected in those areas.

Table 3-3: Salinity Zones And Abundance for Federally Managed Species In Lake Pontchartrain

Salinity Zone	Life Stage	Brown Shrimp	White Shrimp	Red Drum
0 -0.5 ppt.	Adults			
	Eggs			
	Juveniles			
	Larvae			
	Spawners			
0.5 - 5 ppt.	Adults	R	R	R to C
	Eggs			
	Juveniles	C to HA	C to A	C
	Larvae			
	Spawners			
5 -15 ppt.	Adults	R	C	R to C
	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)

Table 3-4: Essential Fish Habitat For Life Stages		
Species	**Life Stage**	**Essential Fish Habitat**
Brown Shrimp	Adults	Gulf of Mexico <110 m, Silt sand, muddy sand
	Juvenile	Marsh edge, SAV, tidal creeks, inner marsh
White Shrimp	Adults	Gulf of Mexico <33 m, Silt, soft mud
	Juvenile	Marsh edge, SAV, marsh ponds, inner marsh, oyster reefs
Red Drum	Adults	Gulf of Mexico & estuarine mud substrate, oyster reef
	Juvenile	SAV, estuarine mud substrate, marsh/water interface
(NMFS, 1998)		

3.2.1.5.2 Bayou Des Mats

The project is located within an area identified as EFH 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, SAV (estimated to be found within 55 percent of site), estuarine water column, and mud substrates.

3.2.1.5.3 Caernarvon

The project is located within an area identified as EFH 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, SAV (estimated to be found within 60 percent of the site), estuarine water column, and mud substrates.

3.2.1.5.4 Fritchie

The project is located within an area identified as EFH 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, SAV (estimated to be found within 41 percent of the site), estuarine water column, and mud substrates.

3.2.1.5.5 Big Branch

The project is located within an area identified as EFH 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, SAV (estimated to be found within 25 percent of project area), estuarine water column, and mud substrates.

3.2.1.5.6 LaBranche

The project is located within an area identified as EFH 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, SAV (estimated to be found within 50 percent of the site), estuarine water column, and mud substrates.

3.2.1.5.7 Milton (TSMP)

The project is located within an area identified as EFH 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, SAV (estimated to be found within 50 percent of the site), estuarine water column, and mud substrates.

3.2.1.6 Cultural Resources

3.2.1.6.1 LPV Basin

Prehistoric and historic archaeological sites, as well as standing structures, are generally located along the natural levees bordering active streams and abandoned stream channels. Any projects that cross or run along such geographic features would have the possibility of impacting historic properties that may be eligible for listing on the National Register of Historic Places (NRHP). Adverse impacts to historic properties can be mitigated by either avoiding the historic properties or by performing data recovery (excavation). Identification of historic properties is made through a Phase I survey which simply identifies the location, extent, and depth of potential historic properties. If these potential historic properties cannot be avoided, then a Phase II study is required. In a Phase II study, the sites are tested by standard archaeological procedures to determine if they are indeed eligible for the NRHP or if standing structures are involved, then more detailed research would be performed. If a site is found to be eligible and the project cannot be designed to avoid such properties, full scale excavations would be conducted for archaeological sites, and historic buildings would be recorded following the procedures of the Historic American Buildings Survey and/or the Historic American Engineering Record.
High probability areas for archaeological sites are the ridges adjacent to bayous and natural levees. Other areas with the possibility of encountering important cultural resources are the off-shore borrow areas, especially in and around Lake Pontchartrain and Lake Borgne. The potential exists for finding boats and ships that took part in the 1814-1815 Battle of New Orleans in Lake

Borgne. Archaeological sites are very common along the shorelines of Lakes Maurepas, Pontchartrain and Borgne. Archaeological sites are also common along the rivers and bayous draining into these bodies of water, especially along the lower reaches of these streams.

Historic plantations are very common along the main channel of the Mississippi River. These are often represented by the remains of sugar mills and plantation related grave yards. Important vernacular house types are also situated along the Mississippi River and along the upper reaches of Mississippi River distributaries.

3.2.1.6.2 Bayou Des Mats

There have been no previous surveys for cultural resources conducted in the proposed project boundary. There is a low probability that cultural resources exist within the open water portion of the project area proposed for marsh restoration. Based on the distribution of known cultural resources in other areas along the Lake Pontchartrain shoreline, it is highly possible that cultural resources could exist along the shoreline between Lake Pontchartrain and the project area. The establishment and use of two access corridors on the shoreline, the construction of retention dikes along natural levees and exposed land surfaces, and the removal of sediment from the borrow areas could impact previously undiscovered cultural resources. Cultural resources surveys will be completed and any identified cultural resources that are determined to be eligible for listing to the NRHP will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the Louisiana State Historic Preservation Officer (LA SHPO), Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.6.3 Caernarvon

The Caernarvon Marsh Restoration project area was investigated for cultural resources in 1987 for the Caernarvon Freshwater Diversion. Investigations consisted of pedestrian surveys in the drier areas and bank surveys by boat of the Big Mar and surrounding canal shorelines. Two archaeological sites were identified during the surveys, and neither site was determined to be eligible for listing to the NRHP. The proposed project area is predominately under water and has been impacted by activities associated with the operation of the Caernarvon Freshwater Diversion. Given the level of previous cultural resources surveys, it is not anticipated that additional cultural resources will be identified in the proposed project area. Any cultural resources that have been determined to be eligible for listing to the NRHP will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.6.4 Fritchie

A small portion of the proposed project area was investigated for cultural resources in 1999 for a proposed fiber optic project. One cultural site, 16ST19, was identified within the project area. The site has been determined not eligible for listing to the NRHP. There is a low probability that cultural resources exist within the open water portion of the project area that is proposed for marsh restoration. There is a high probability for sites along bayous, natural levees, and shorelines. Cultural resources previously identified along the Lake Pontchartrain shoreline and within one mile of the project area include a historic ferry landing and prehistoric village site (16ST5), the remains of a historic lighthouse of undetermined eligibility (16OR60), and the

foundation of a historic hospital facility (16OR34). The Fort Pike State Historic Site (SHS) (16OR57) is located within a mile of the project area. Deposits with these sites are thought to be submerged in Lake Pontchartrain, and given the close proximity to Fort Pike and other known cultural resources, there is a moderate to high probability that submerged cultural resources could exist near the proposed borrow areas and sediment pipeline corridor in Lake Pontchartrain. Surveys for cultural resources will be completed in the proposed project and associated borrow areas and any identified cultural resources that are determined to be eligible for listing to the NRHP will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.6.5 Big Branch

Several surveys for cultural resources have been carried out within close proximity to the project area. A preliminary survey for cultural resources was conducted along Bayou Bonfouca in 1988 and several sites were identified. Cultural resource sites are most common along bankline locations and tend to be concentrated in areas where the natural environment offers the maximum range of subsistence potential with a high probability of finding cultural resources in the ecological interface between the uplands and the bayous and marsh. There are identified cultural resources along the shoreline of Lake Pontchartrain, and it is possible that previously unidentified cultural resources could exist in areas not yet surveyed. The proposed marsh restoration area is predominately open water, so there is a low probability that cultural resources are present. There is a possibility that cultural resources could exist in dry areas along natural levees and bayous within the project area and proposed access corridor. Cultural resources could be impacted by the construction of retention dikes, use of staging and access areas, and other

activities associated with the project. There is also the possibility that submerged resources could exist within the proposed borrow areas. Cultural resources surveys will be completed and any identified cultural resources that are determined to be eligible for listing to the NRHP will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.6.6 LaBranche

A portion of the project area has been previously surveyed, including the proposed Primary Borrow Area. Cultural resources have been identified along the Lake Pontchartrain shoreline in close proximity to the project area. No submerged cultural resources were identified by remote sensing survey of the Primary Borrow Area. There is a low probability for the presence of cultural resources within the open water portion of the marsh restoration project area, but it is possible that cultural resources could exist in the dry areas not previously surveyed. Any unidentified cultural resources could be impacted by project related activities. Cultural resources surveys will be completed along the shoreline, exposed areas that are accessible, and the proposed Secondary Borrow Area in Lake Pontchartrain. Cultural resources identified during surveys that are determined to be eligible for listing to the NRHP will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested

parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.6.7 Milton (TSMP)

The closest area to the proposed project area that has been surveyed for cultural resources is located in the southern half of Section 33, Township 7 South, Range 10 East and is approximately 1.5 miles from the project area. No surveys for cultural resources have been identified within the proposed project area, but one cultural resource site (16ST45) has been identified within 100 meters of the southern portion of the project area. NRHP eligibility has not been determined for site 16ST45, and the site could be adversely impacted by activities associated with the proposed project. There is a moderate to high probability that cultural resources could be located in dry areas, on natural levees, and along natural bayous within the project area. If sites are present they could be adversely impacted by activities associated with the project such as retention dike construction, gapping along natural bayous, degrading of dikes, staging area location, access corridor use, and other activities. Cultural resources surveys will be completed in dry areas and the proposed borrow areas in Lake Pontchartrain, and any identified cultural resources that are determined eligible for listing to the NRHP will be avoided during design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.1.7 Recreational Resources

3.2.1.7.1 LPV Basin

Recreation areas that were examined in the LPV Mitigation Basin include two NWRs, four LA Wildlife Management Areas, four LA State Parks, and one SHS, as well as other significant recreation 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. These recreation areas provide opportunities for hunting, hiking, biking, boating, bird watching, fishing and crabbing, crawfishing, shrimping, education, camping, picnicking, and playing. The fishing industry alone is the second largest industry in the state, and has brought in over 1 billion dollars in the last year from waterways east of Lake Pontchartrain. Appendix B, table 16 shows the number of fishing licenses, hunting licenses and boat registrations as well as the percent of state licenses and boat registrations in the LPV Mitigation Basin.

Although fishing and boating marinas are periodically damaged in hurricanes, and some are completely obliterated, because of the high demand of this recreational activity, marinas typically rebuild almost immediately. This industry has proven to be strong, and it is important to maintain the land area surrounding these facilities including the boat launches. There are 113 boat launches throughout the LPV Mitigation Basin. People enjoy pleasure boating and fishing in and around these recreational boat launches. The vicinity map found in appendix A, figure 37 shows the recreational features in the LPV Mitigation Basin.

Appendix B, table 17 lists the state and Federal recreational facilities that are located in the LPV basin and provides information about size and recreational features.

The Louisiana Statewide Comprehensive Outdoor Recreation Plan (SCORP) provides a statewide inventory of recreation resources and identifies recreational needs. While regions defined in the SCORP do not fit perfectly within the LPV Mitigation Basin, SCORP Region 1 includes the LPV Mitigation Basin. The state- and Federally-managed areas described previously

represent just a portion of the more than 282,000 acres of recreational facilities inventoried for SCORP Region 1. Federal, state, parish, and municipal public recreational facilities within Region 1 provide more than 196,000 acres for hunting, 123 boat ramps, 1,833 picnic tables, 10 beaches, and 320-acres for camping with 263 tent sites and 1,739 trailer sites. The SCORP-prioritized needs in this region include improving access to enable fishing and boating, funding to support consumptive and non-consumptive activities on all public recreation areas, use of more sustainable building practices, more wilderness or primitive camping areas, identifying and acquiring large tracts of waterfront lands for large scale parks, and addressing the dwindling state of marine resources.

Other recreational features are provided by parishes and historic communities that attract visitors to a variety of heritage and cultural festivals, historical sites, parks offering opportunities for passive and active recreation that include tennis courts, soccer and softball fields, swimming pools, and golf courses.

Funds from the Land and Water Conservation Fund (LWCF) have supported 131 different recreational projects in the LPV Mitigation Basin since 1964. LWCF projects in the LPV Mitigation Basin have provided numerous boat ramps, other facilities or lands that enhance opportunities for recreation. Actual LWCF expenditures not adjusted for inflation exceed $20 million in the LPV Mitigation Basin. Appendix B, table 18 summarizes the number and cost of projects implemented in parishes in the LPV Mitigation Basin. (Source: http://waso-lwcf.ncrc.nps.gov/public/index.cfm).

3.2.1.7.2 Bayou Des Mats

About one-third of the Bayou Des Mats restoration site is in the Big Branch NWR and another third is in the St. Tammany Wildlife Refuge, which is adjacent to Lake Pontchartrain. The proposed restoration area, accessible by boat, is isolated from the more frequented part of the Big Branch NWR, which is southwest of the site or below Highway 434. A variety of resident wildlife species inhabit the St. Tammany Wildlife Refuge including furbearers and alligators. The St. Tammany Wildlife Refuge also serves as a resting and feeding area for wintering waterfowl. With heavy hunting pressure in adjacent private marshes, this small refuge serves an important purpose as a resting area for waterfowl. The other one-third of the Bayou Des Mats site that is outside of the Big Branch NWR is privately-owned and leased for duck hunting. In general, recreational use of the Bayou Des Mats site is minimal but would include birding, fishing, hunting and canoeing.

3.2.1.7.3 Caernarvon

The area of the proposed marsh restoration, 570 acres of open water, is leased for fishing, (predominately bass), and hunting. However, most of the recreational fishermen and hunters that launch from the nearby ramps by Big Mar hunt and fish farther away. The more sought after duck species tend to be found in the more isolated areas.

3.2.1.7.4 Fritchie

Approximately two-thirds of the 325 acre site is currently privately-owned open water leased for fishing and duck hunting. The other one-third of the Fritchie site is located in the Big Branch NWR. Project land in the refuge is used for fishing and hunting; however, most of the day use that takes place in the refuge is further north and west of the site, across Highway 11.

3.2.1.7.5 Big Branch

The site, approximately 300 acres of open water, is located in the Big Branch NWR in St. Tammany Parish. Environmental education, birding, fishing, hunting, biking, hiking, wildlife observation, photography and canoeing takes place within the refuge, although these activities mainly take place at the Boy Scout Road boardwalk and trail area just northwest of the Big Branch mitigation site. Fishing and hunting does occur at the project site.

3.2.1.7.6 LaBranche

The 318 acre open water site currently offers recreational fishing and hunting opportunities.

3.2.1.7.7 Milton (TSMP)

Some public use recreation, mainly fishing, occurs at this site even though this land is privately-owned. Most of the site is open water (254 acres) while the remaining 18 acres is marsh.

3.2.1.8 Aesthetic Resources

3.2.1.8.1 LPV Basin

Visually, the area encompassing the LPV Mitigation Basin is a complex series of landscapes that vary throughout the full spectrum of eco-regions, ecosystems, habitat types, and topography. From Baton Rouge, east to the Mississippi Sound; and from U.S. Interstate 12, south to the Mississippi River, this large basin has many different visually, culturally and historically significant areas that all add to the flavor and life of southeastern Louisiana.

Public and Institutional Visual significance is derived from the many State Parks and Historic sites, NWRs, LA Wildlife Management Areas, Scenic Byways, and Scenic Streams that dot the landscape. These elements give cultural, recreational, historic, aesthetic, and archeological intrinsic value to the public (locally, statewide, and nationwide). For details on the visual resources found in the LPV Basin, please see appendix A, figure 37 and appendix M.

Technically Significant Visual interests include those elements of design (be it natural or man-made) that make a place memorable and are of high visual quality. Typically these areas are defined by form, line, texture, color, repetition, or other basic design elements that break down a scenic vista into its constituent parts. By doing this, the scenic vista can be better explained and quantified for basin. This is the “how” and “why” a resource is visually significant. Man-made elements with superior visual interest may include artistic, architectural and/ or engineering

marvels; while natural elements may include swamps and marsh where texture and color are in overabundance, open water framed by stands of cypress, or active habitat areas where flora and fauna create focal points and action for the viewer.

One other important factor to consider for visual resources is access. If no one can access it, then it does not bring any aesthetic or visual value to the public.

3.2.1.8.2 Bayou Des Mats

The Bayou Des Mats site is adjacent to and partially within the Big Branch NWR; is visually inaccessible and has no significant visual attributes.

3.2.1.8.3 Caernarvon

The Caernarvon site is primarily open water; is visually inaccessible and has no significant visual attributes.

3.2.1.8.4 Fritchie

The Fritchie site is adjacent to and within the Big Branch NWR; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.1.8.5 Big Branch

The Big Branch site is primarily open water within the Big Branch NWR; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.1.8.6 LaBranche

The LaBranche site is primarily open water; is visually inaccessible and has no significant visual attributes.

3.2.1.8.7 Milton (TSMP)

The Milton Island site is primarily open water; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.1.9 Air Quality

3.2.1.9.1 LPV Basin

The EPA, under the requirements of the Clean Air Act of 1963 (CAA), has established National Ambient Air Quality Standards (NAAQS) for seven contaminants, referred to as criteria

pollutants (40 CFR 50). These are carbon monoxide, nitrogen dioxide, ozone, particulate matter less than 10 microns in diameter (PM_{10}), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), lead, and sulfur dioxide. The NAAQS standards include primary and secondary standards. The primary standards were established at levels sufficient to protect public health with an adequate margin of safety. The secondary standards were established to protect the public welfare from the adverse effects associated with pollutants in the ambient air. The primary and secondary standards are presented in table 3-5.

Table 3-5. National Ambient Air Quality Standards (NAAQS)

Pollutant and Averaging Time	Primary Standard		Secondary Standard	
	μg/m³	**parts per million (ppm)**	**μg/m³**	**ppm**
Carbon Monoxide				
8-hour concentration	10,000[1]	9[1]	-	
1-hour concentration	40,000[1]	35[1]	-	
Nitrogen Dioxide				
Annual Arithmetic Mean	100	0.053	Same as primary	
Ozone				
8-hour concentration	157	0.08[2]	Same as primary	
Particulate Matter				
$PM_{2.5}$:				
Annual Arithmetic Mean	15[3]	-	Same as primary	
24-hour Maximum	35[4]	-		
PM_{10}:				
24-hour concentration	150[1]	-		
Lead				
Quarterly Arithmetic Mean	1.5	-	Same as primary	
Sulfur Dioxide				
Annual Arithmetic Mean	80	0.03	-	-
24-hour concentration	365[1]	0.14[1]	-	-
3-hour concentration	-	-	1300[1]	0.50[1]

Notes:
[1] Not to be exceeded more than once per year.
[2] 3-year average of the 4th highest daily maximum 8-hour concentration may not exceed 0.08 ppm.
[3] Based on 3-year average of annual averages.
[4] Based on 3-year average of annual 98th percentile values.
Source: *40 CFR 50*.

National Ambient Air Quality Standard Attainment Status

Areas that meet the NAAQS for a criteria pollutant are designated as being "in attainment;" areas where a criteria pollutant level exceeds the NAAQS are designated as being "in nonattainment."

3.2.1.9.2 Bayou Des Mats

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.1.9.3 Caernarvon

This project is in St Bernard Parish which is currently in attainment of NAAQS.

3.2.1.9.4 Fritchie

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.1.9.5 Big Branch

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.1.9.6 LaBranche

This project is in St Charles Parish which is currently in attainment of NAAQS.

3.2.1.9.7 Milton (TSMP)

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.1.10 Noise

3.2.1.10.1 LPV Basin

The Noise Control Act of 1972 regulates and promotes both an environment for all Americans free from noise that jeopardizes their health or welfare and the Occupational Safety and Health Standards (29 CFR, part 1910) set standards regarding protection against the effects of noise exposure. Noise levels exceeding sound pressure levels are technically significant because noise can negatively affect the physiological or psychological well-being of an individual (Kryter, 1994). These effects can range from annoyance to adverse physiological responses, including permanent or temporary loss of hearing, and other types of disturbance to humans and animals, including disruption of colonial nesting birds. Noise is publicly significant because of the public's concern for the potential annoyance and adverse effects of noise on humans and wildlife.

Noise is generally described as unwanted sound, which can be based either on objective effects (hearing loss, damage to structures, etc.) or subjective judgments (such as community annoyance). Sound is usually represented on a logarithmic scale with a unit called the decibel

(dB). Sound on the decibel scale is referred to as sound level. The threshold of human hearing is approximately 0 dB, and the threshold of discomfort or pain is around 120 dB.

Noise levels are computed over a 24-hour period and adjusted for nighttime annoyances to produce the day-night average sound level (DNL). DNL is the community noise metric recommended by EPA and has been adopted by most Federal agencies (USEPA 1974). A DNL of 65 weighted decibels (dBA) is the level most commonly used for noise planning purposes and represents a compromise between community impact and the need for activities like construction. (The A-weighted sound level, used extensively in this country for the measurement of community and transportation noise, represents the approximate frequency response characteristic of the average young human ear.) Areas exposed to a DNL above 65 dBA are generally not considered suitable for residential use. A DNL of 55 dBA was identified by EPA as a level below which there is no adverse impact (USEPA 1974).

Most parishes in the LPV Mitigation Basin have noise ordinances addressing loud machinery. Noise is typically associated with human activities and habitations, such as operation of commercial and recreational boats, water vessels, air boats, and other recreational vehicles; operation of machinery and motors; and human residential-related noise (air conditioner, lawn mower, etc.). The Corps constructed project areas are remote and uninhabited. The noise from distant urban areas surrounding the uninhabited portions of the project area contributes little, if any, to the natural noise levels of the area.

3.2.1.10.2 Bayou Des Mats

The project area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.1.10.3 Caernarvon

The project area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.1.10.4 Fritchie

There is a highway on the southeastern side of the project area with several houses on the other side. Noise is produced by consistent and sporadically heavy traffic on this road. Sporadic boat traffic near these houses in adjacent canals may produce noise levels that exceed 55 dBA.

3.2.1.10.5 Big Branch

The project area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.1.10.6 LaBranche

The project area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.1.10.7 Milton (TSMP)

The project area is within 1,000 ft of several residences. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.1.11 Hazardous, Toxic, and Radioactive Waste

3.2.1.11.1 LPV Basin

In accordance with ER 1165-2- identification and evaluation of all HTRW contamination within the vicinity of the proposed project is required. USACE policy is to avoid the use of project funds for HTRW removal and remediation activities. Costs for necessary special handling or remediation of wastes (e.g., those regulated by the Resource Conservation and Recovery Act), pollutants and other contaminants, which are not regulated under the Comprehensive Environmental Response, Compensation, and Liability Act, would be treated as project costs if the requirement is the result of a validly promulgated Federal, state, or local regulation.

The proposed mitigation sites were surveyed via aerial photographs, topographic maps, and database searches in the four Zone Improvement Plan (ZIP) code areas where they would be located. Although there were numerous small incidents recorded in the database searches, none of the recorded incidents, either individually or cumulatively, would have any adverse effects on the proposed mitigation areas. The proposed sites are all on property that has not been developed within historic times. The probability of encountering HTRW on any of the sites is very small. Prior to use of any site a Phase 1 Environmental Site Assessment would be completed for the project area.

3.2.1.11.2 Bayou Des Mats

No Recognized Environmental Conditions (RECs) were found within or near the proposed Bayou Des Mats Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.11.3 Caernarvon

No RECs were found within or near the proposed Caernarvon Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.11.4 Fritchie

No RECs were found within or near the proposed Fritchie Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.11.5 Big Branch

No RECs were found within or near the proposed Big Branch Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.11.6 LaBranche

No RECs were found within or near the proposed LaBranche Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. One plugged and abandoned well was identified approximately 400 ft from the proposed mitigation site, but the mitigation project would be unlikely to affect the site. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.11.7 Milton (TSMP)

No RECs were found within or near the proposed Milton Island Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.1.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.1.12.1 LPV Basin

The LPV Mitigation basin encompasses the area surrounding Lake Pontchartrain and Lake Borgne and consists of several heavily populated low-lying communities, including the City of New Orleans, Metairie, La Place, Covington, Mandeville and Slidell, LA. The area also includes several wetland areas under the LPV Mitigation plan. This resource is institutionally significant because of the NEPA of 1969; the Estuary Protection Act; the Clean Water Act; the River and Harbors Acts; the Watershed Protection and Flood Protection Act; and the Water Resources Development Acts. Of particular relevance is the degree to which the proposed action affects public health, safety, and economic well-being and the quality of the human environment. These resources are technically significant because the social and economic welfare of the Nation may be positively or adversely impacted by the proposed action. These resources are publicly significant because of the public's concern for health, welfare, and economic and social well-being from water resources projects.

3.2.1.12.2 Bayou Des Mats

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Bayou Des Mats Marsh Restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Bayou Des Mats Marsh Restoration project is Lake Pontchartrain. The Bayou Des Mats project area provides a valuable estuary supporting a diverse assemblage of estuarine-dependent fishes important to commercial fisherman in nearby Lake Pontchartrain.

3.2.1.12.3 Caernarvon

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Caernarvon marsh restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Caernarvon marsh restoration project is the Mississippi River and Big Mar Lake. In addition, the Caernarvon project area supports commercially important species including the American oyster, brown and white shrimp, blue crab, Gulf menhaden, and striped mullet.

3.2.1.12.4 Fritchie

The existing conditions as they relate to socio-economic resources at the Fritchie site are similar to those at the Bayou Des Mats project site. See section 3.2.12.1.2, Bayou Des Mats, for more information.

3.2.1.12.5 Big Branch

The existing conditions as they relate to socio-economic resources at the Big Branch site are similar to those at the Bayou Des Mats project site. See section 3.2.12.1.2, Bayou Des Mats, for more information.

3.2.1.12.6 LaBranche

The existing conditions as they relate to socio-economic resources at the LaBranche site are similar to those at the Bayou Des Mats project site. See section 3.2.12.1.2, Bayou Des Mats, for more information.

3.2.1.12.7 Milton (TSMP)

The existing conditions as they relate to socio-economic resources at the Milton site are similar to those at the Bayou Des Mats project site. See section 3.2.12.1.2, Bayou Des Mats, for more information.

3.2.2 MITIGATION FOR IMPACTS TO NON-REFUGE/REFUGE BRACKISH MARSH

3.2.2.1 Wetlands and other Surface Waters

3.2.2.1.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.1.1.

3.2.2.1.2 Big Branch

The project area is primarily shallow open water with approximately 5 acres of existing marsh (i.e., 2 percent marsh). See Big Branch existing conditions for wetlands and other surface waters in section 3.2.1.1.6.

3.2.2.1.3 Golden Triangle

The project area is primarily open water with less than 5 acres of existing marsh (i.e., less than 2 percent marsh). The adjacent marsh has been classified as brackish marsh. No SAVs were found in the project area.

3.2.2.1.4 Fritchie

The project area is primarily shallow open water with less than 10 acres of existing marsh (i.e., less than 3 percent marsh). See Fritchie existing conditions for wetlands and other surface waters in section 3.2.1.1.4.

3.2.2.1.5 Bayou Sauvage

The project area is primarily shallow open water with less than 15 acres of existing marsh (i.e., less than 6 percent marsh). The project area and surrounding marsh has been classified as brackish marsh consistently from 1949 to 2007 (O'Neil 1949, Chabreck and Linscombe 1997, Sasser et al. 2008). Dominant marsh species found in the area are marshhay cordgrass and three-corner grass with smooth cordgrass found along the perimeter of ponds and along the shoreline. Submerged aquatic vegetation is prevalent in most of the ponds in the area.

3.2.2.2 Wildlife

3.2.2.2.1 LPV Basin

See LPV basin existing conditions for wildlife in section 3.2.1.1.1.

3.2.2.2.2 Big Branch

Since the Big Branch site is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Big Branch for wildlife should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for wildlife in section 3.2.1.1.2.

3.2.2.2.3 Golden Triangle

A variety of birds and a few mammal and reptile species are known to utilize wetland habitats within the project area. Bird species diversity varies seasonally, with highest diversity during spring and fall migrations. The lowest species diversity occurs during the summer breeding season, with low to moderate usage during the winter. White pelicans and a variety of seagulls and terns were observed within the project areas during the site visit. Wading birds observed included great blue heron, cattle egret, and glossy ibis, which utilize the area year-round for foraging. The interior marshes provide potential nesting and foraging habitat for other species such as mottled ducks, clapper rail, black-necked stilt, common yellowthroat, and seaside sparrow.

During the fall and winter months, the marshes and open-waters within the area potentially provide valuable foraging and resting habitat for migratory waterfowl. Early migrants include both green-wing teal and blue-wing teal, often common throughout the area by September. Later arrivals include mallard, American widgeon, gadwall, lesser scaup, and American coot. Waterfowl utilize the marsh and open-water habitats until the return migration in March.

Several mammal species can utilize shallow, open-waters within the terrestrial habitats. Potential species include bats, which forage on flying insects. Other mammalian species include marsh rice rat, muskrat, nutria, and rabbit. Bottlenose dolphins could be found foraging in the proposed borrow area. Reptilian species include American alligator, diamondback terrapin, and a variety of snakes.

3.2.2.2.4 Fritchie

Since the Fritchie site is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Fritchie for wildlife should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for wildlife in section 3.2.1.1.2.

3.2.2.2.5 Bayou Sauvage

Since the Bayou Sauvage site is in the vicinity of the Golden Triangle intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Bayou Sauvage for wildlife should be similar to those for Golden Triangle. See Golden Triangle existing conditions for wildlife in section 3.2.1.1.3. Part of the Bayou Sauvage project area could be utilized by bottlenose dolphins. In order to minimize the potential for construction activities to cause adverse impacts

to dolphins, the following measures for reducing entrapment would be implemented during dredged material disposal:

1. Pre-construction planning. During project design, the Federal Action Agency or project proponents must incorporate at least one escape route into the proposed retention structure(s) to allow any protected species to exit the area(s) to be enclosed. Escape routes must lead directly to open water outside the construction site and must have a minimum width of 100 feet. Escape routes should also have a depth as deep as the deepest natural entrance into the enclosure site and must remain open until a thorough survey of the area, conducted immediately prior to complete enclosure, determines no Protected Species are present within the confines of the structure (see item 5 below for details).

2. Pre-construction compliance meeting. Prior to construction, the Federal Action Agency, project proponents, the contracting officer representative, and construction personnel should conduct a site visit and meeting to develop a project-specific approach to implementing these preventative measures.

3. Responsible parties. The Federal Action Agency will instruct all personnel associated with the project of the potential presence of protected species in the area and the need to prevent entrapment of these animals. All construction personnel will be advised that there are civil and criminal penalties for harming, harassing, or killing protected species. Construction personnel will be held responsible for any protected species harassed or killed as a result of construction activities. All costs associated with monitoring and final clearance surveys are the responsibility of project proponents and must be incorporated in the construction plan.

4. Monitoring during retention structure construction. It is the responsibility of construction personnel to monitor the area for protected species during dike or levee construction. If protected species are regularly sighted over a 2 or 3 day period within the enclosure area during retention structure assembly, construction personnel must notify the Federal Action Agency. It is the responsibility of the Federal Action Agency to then coordinate with the National Marine Fisheries Service (NMFS) Marine Mammal Health and Stranding Response team (1-877-WHALE HELP [1-877-942-5343]) or the appropriate State Coordinator for the Sea Turtle Stranding and Salvage Network (see http://www.sefsc.noaa.gov/species/turtles/stranding_coordinators.htm) to determine what further actions may be required. Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area.

5. Pre-closure final clearance. Prior to completing any retention structure by closing the escape route, the Federal Action Agency will insure that the area to be enclosed is observed for protected species. Surveys must be conducted by experienced marine observers during daylight hours beginning the day prior to closure and continuing during closure. This is best accomplished by small vessel or aerial surveys with 2-3 experienced marine observers per vehicle (vessel/helicopter) scanning for protected species. Large areas (e.g. >300 acres) will likely require the use of more than one vessel or aerial survey to insure full coverage of the area. These surveys will occur in a Beaufort sea state (BSS) of 3 feet or less, as protected species are

difficult to sight in choppy water. Escape routes may not be closed until the final clearance determines the absence of protected species within the enclosure sight.

6. Post closure sightings. If protected species become entrapped in an enclosed area, the Federal Action Agency and NMFS must be immediately notified. If observers note entrapped animals are visually disturbed, stressed, or their health is compromised then the Action Agency may require any pumping activity to cease and the breaching of retention structures so that the animals can either leave on their own or be moved under the direction of NMFS.

a. In coordination with the local stranding networks and other experts, NMFS will conduct an initial assessment to determine the number of animals, their size, age (in the case of dolphins), body condition, behavior, habitat, environmental parameters, prey availability and overall risk.
b. If the animal(s) is/are not in imminent danger they will need to be monitored by the Stranding Network for any significant changes in the above variables.
c. Construction personnel may not attempt to scare, herd, disturb, or harass the protected species to encourage them to leave the area. Coordination by the Federal Action Agency with the NMFS SER Stranding Coordinator may result in authorization for these actions.
d. NMFS may intervene (catch and release and/or rehabilitate) if the protected species are in a situation that is life threatening and evidence suggests the animal is unlikely to survive in its immediate surroundings.
e. Surveys will be conducted throughout the area at least twice or more in calm surface conditions (BSS 3 feet or less), with experienced marine observers, to determine whether protected species are no longer present in the area.

3.2.2.3 Threatened and Endangered Species

3.2.2.3.1 LPV Basin

See LPV basin existing conditions for threatened and endangered species in section 3.2.1.3.1.

3.2.2.3.2 Big Branch

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow site. See section 3.2.1.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.2.3.3 Golden Triangle

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow site. See section 3.2.1.3.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.2.3.4 Fritchie

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow site. See section 3.2.1.3.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.2.3.5 Bayou Sauvage

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow site. See section 3.2.1.3.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.2.4 Fisheries, Aquatic Resources, and Water Quality

3.2.2.4.1 LPV Basin

See LPV basin existing conditions for fisheries, aquatic resources, and water quality in section 3.2.1.4.1.1.

3.2.2.4.2 Big Branch

Since the Big Branch site is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Big Branch for fisheries, and aquatic resources should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for fisheries, and aquatic resources in section 3.2.1.4.2. See Big Branch existing conditions for water quality in section 3.2.1.4.5.

3.2.2.4.3 Golden Triangle

Recreationally and commercially important shellfish and finfish found in the project area include oysters, brown shrimp, white shrimp, blue crabs, menhaden, red drum, spotted sea trout, black drum, striped mullet, Gulf flounder, Gulf kingfish, Spanish mackerel and Atlantic croaker.

The shallow estuarine open water habitat of the project area provides an interior habitat essential to fish, shellfish, and wildlife species. This area represents the nursery habitat for estuarine-dependent species, which utilize shallow open water for nursery grounds. Fish species such as menhaden favor shallow open water to flooded marsh for nursery grounds in their larval and juvenile life stages. Much of the shallow estuarine open water offers refuge to fish, crabs, and shrimp when water levels drop such that use of the marsh is no longer possible/preferable because it is no longer inundated. The water quality of the hydrologic units which this project and its borrow site are in are considered to fully support their designated uses.

3.2.2.4.4 Fritchie

Since the Fritchie site is in the vicinity of the Bayou Des Mats site and adjacent to Lake Pontchartrain, existing conditions at Fritchie for fisheries, aquatic resources and water quality should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for the fisheries, aquatic resources and water quality in section 3.2.1.4.2. See Fritchie existing conditions for water quality in section 3.2.1.4.4.

3.2.2.4.5 Bayou Sauvage

Since the Bayou Sauvage site is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Bayou Sauvage for fisheries, aquatic resources and water quality should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for fisheries, aquatic resources and water quality in section 3.2.1.4.2. The water quality within the hydrologic units which this project and its borrow pit are in are considered to fully support their designated uses.

3.2.2.5 Essential Fish Habitat

3.2.2.5.1 LPV Basin

See LPV basin existing conditions for essential fish habitat in section 3.2.1.5.1.

3.2.2.5.2 Big Branch

The project is located within an area identified as EFH 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, SAV (abundant on site), estuarine water column, and mud substrates.

3.2.2.5.3 Golden Triangle

The project is located within an area identified as EFH 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, SAV (currently none found on site), estuarine water column, and mud substrates.

3.2.2.5.4 Fritchie

The project is located within an area identified as EFH 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, SAV (estimated to be found within 41percent of the site), estuarine water column, and mud substrates.

3.2.2.5.5 Bayou Sauvage

The project is located within an area identified as EFH 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, SAV (estimated to be found within 83percent of the site), estuarine water column, and mud substrates.

3.2.2.6 Cultural Resources

3.2.2.1.1 LPV Basin

See LPV basin existing conditions for cultural resources in section 3.2.1.6.1.

3.2.2.6.2 Big Branch

See Big Branch existing conditions for cultural resources in section 3.2.1.6.5.

3.2.2.6.3 Golden Triangle

The project area was surveyed for cultural resources in 2008, to include the proposed Primary and Secondary Borrow areas in Lake Borgne. No cultural resources eligible for listing to the NRHS were identified in the project area, and no additional surveys are recommended.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.2.6.4 Fritchie

See Fritchie existing conditions for cultural resources in section 3.2.1.6.4.

3.2.2.6.5 Bayou Sauvage

Surveys for cultural resources have occurred in the vicinity of the proposed marsh restoration area along U.S. Highway 11 and the existing levee, but not in the immediate project area. Given that the proposed marsh restoration area is predominately open water, there is a low probability that cultural resources are present in those areas. There is a possibility that cultural resources could exist along the Lake Pontchartrain shoreline, exposed dry areas within the project boundary, and submerged cultural resources could be present in the borrow areas and access corridors. Cultural resources could be impacted by the construction of retention dikes, use of staging and access areas, and other activities associated with the project. Cultural resources surveys will be completed and any identified cultural resources that are determined to be eligible for listing to the NRHS will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.2.7 Recreational Resources

3.2.2.7.1 LPV Basin

See LPV basin existing conditions for recreational resources in section 3.2.1.7.1.

3.2.2.7.2 Big Branch

The site, approximately 255 acres of open water, is located in the Big Branch NWR in St. Tammany Parish. Environmental education, birding, fishing, hunting, biking, hiking, wildlife observation, photography and canoeing take place within the refuge although the major public use area is the Boy Scout Road boardwalk and trail just northwest of the Big Branch mitigation site. Fishing and hunting take place at the site.

3.2.2.7.3 Golden Triangle

Just under half of the Golden Triangle restoration site is located in the Bayou Sauvage NWR and the other half of the 253 acre open water site is privately-owned. Fishing and hunting are predominate recreational activities. The Golden Triangle site that is in the Refuge is part of a larger area identified as a waterfowl hunting area; the entire restoration site is only accessible by boat.

3.2.2.7.4 Fritchie

A vast majority of the 280 acre site is currently privately-owned open water leased for fishing and duck hunting. The northwest corner of the Fritchie site is located in the Big Branch NWR. The land in the refuge is used for fishing and hunting; however, most of the day use that takes place in the refuge is on other parts further north and west of the project site, across Highway 11.

3.2.2.7.5 Bayou Sauvage

Located just outside the Bayou Sauvage NWR, recreation opportunities do not currently exist at the 355 acre open water site which was formerly a birding rookery before a levee expansion removed trees attractive to migrating birds. Today, the site is open water and offers no recreational opportunities.

3.2.2.8 Aesthetic Resources

3.2.2.8.1 LPV Basin

See LPV basin existing conditions aesthetic resources in section 3.2.1.8.1.

3.2.2.8.2 Big Branch

See Big Branch existing conditions for aesthetic resources in section 3.2.1.8.5.

3.2.2.8.3 Golden Triangle

The Golden Triangle site is primarily open water within the Bayou Sauvage NWR; it is visually inaccessible and has no significant visual attributes.

3.2.2.8.4 Fritchie

See Fritchie existing conditions for aesthetic resources in section 3.2.1.8.4.

3.2.2.8.5 Bayou Sauvage

The Bayou Savage site is primarily open water; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.2.9 Air Quality

3.2.2.9.1.1 LPV Basin

See LPV basin existing conditions for air quality in section 3.2.1.9.1.

3.2.2.9.2 Big Branch

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.2.9.3 Golden Triangle

This project is in Orleans Parish which is currently in attainment of NAAQS.

3.2.2.9.4 Fritchie

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.2.9.5 Bayou Sauvage

This project is in Orleans Parish which is currently in attainment of NAAQS.

3.2.2.10 Noise

3.2.2.10.1 LPV Basin

See LPV basin existing conditions for noise in section 3.2.1.10.1.

3.2.2.10.2 Big Branch

See Big Branch existing conditions for noise in section 3.2.1.10.5.

3.2.2.10.3 Golden Triangle

The area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.2.10.4 Fritchie

See Fritchie existing conditions for noise in section 3.2.1.10.4.

3.2.2.10.5 Bayou Sauvage

The area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.2.11 Hazardous, Toxic, and Radioactive Waste

3.2.2.11.1 LPV Basin

See LPV basin existing conditions for HTRW in section 3.2.1.11.1.

3.2.2.11.2 Big Branch

See Big Branch existing conditions for HTRW in section 3.2.1.11.5.

3.2.2.11.3 Golden Triangle

No RECs were found within or near the proposed Golden Triangle Marsh Restoration mitigation area. There are three pipelines crossing the proposed mitigation area, but these would not be disturbed by designating the site as a mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.2.11.4 Fritchie

See Fritchie existing conditions for HTRW in section 3.2.1.11.4.

3.2.2.11.5 Bayou Sauvage

No RECs were found within or near the proposed Bayou Sauvage Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.2.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.2.12.1 LPV Basin

See LPV basin existing conditions for socioeconomics/land use, environmental justice, transportation, navigation, and commercial fisheries in section 3.2.1.12.1.

3.2.2.12.2 Big Branch

See Big Branch Existing Conditions section 3.2.1.12.5 for socioeconomics/land use, environmental justice, transportation, navigation, and commercial fisheries information.

3.2.2.12.3 Golden Triangle

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Golden Triangle marsh restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Golden Triangle marsh restoration project is Lake Pontchartrain. The shallow estuarine open water habitat of the project area provides an interior habitat essential to commercial fish, shellfish, and wildlife species. This area represents the nursery habitat for estuarine-dependent species, which utilize shallow open water for nursery grounds. Commercially important shellfish and finfish found in the project area include oysters, brown shrimp, white shrimp, blue crabs, menhaden, red drum, spotted sea trout, black drum, striped mullet, Gulf flounder, Gulf kingfish, Spanish mackerel and Atlantic croaker.

3.2.2.12.4 Fritchie

See Fritchie Existing Conditions section 3.2.1.12.4 for socioeconomics/land use, environmental justice, transportation, navigation, and commercial fisheries information.

3.2.2.12.5 Bayou Sauvage

According to 2010 U.S. Census data, there are no residents located within the boundaries of the LaBranche marsh restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Bayou Sauvage restoration project is Lake Pontchartrain. The project area provides a valuable estuary supporting a diverse assemblage of estuarine-dependent fishes important to commercial fisherman in nearby Lake Pontchartrain.

3.2.3 MITIGATION FOR IMPACTS TO REFUGE PROTECTED SIDE BLH-WET INTERMEDIATE MARSH

3.2.3.1 Wetlands and other Surface Waters

3.2.3.1.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.1.1.

3.2.3.1.2 Bayou Sauvage

The project area is currently open water within an impounded system with a fixed crest weir utilized to control water levels. The HSDRRS hydrologically isolates the project area from the adjacent estuary; precipitation the only source of water input for the area. The adjacent impounded marsh has been classified by the USFWS as intermediate marsh. Early successional BLH species exist along the raised portions of adjacent roads and levees.

3.2.3.2 Wildlife

3.2.3.1.1 LPV Basin

See LPV basin existing conditions for wildlife in section 3.2.1.2.1.

3.2.3.2.2 Bayou Sauvage

Since the marshes adjacent to the Bayou Sauvage protected side project are classified as intermediate and since the site is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Bayou Sauvge for wildlife are expected to be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for wildlife in section 3.2.1.2.2. Bottlenose dolphins could be found foraging in the proposed borrow area (Lake Borgne) for this project.

3.2.3.3 Threatened and Endangered Species

3.2.3.3.1 LPV Basin

See LPV basin existing conditions for threatened and endangered species in section 3.2.1.3.1.

3.2.3.3.2 Bayou Sauvage

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow site. See section 3.2.1.3.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.3.4 Fisheries, Aquatic Resources and Water Quality

3.2.3.4.1 LPV Basin

See LPV basin existing conditions for fisheries, and aquatic resources in section 3.2.1.4.1.

3.2.3.4.2 Bayou Sauvage

Since the marshes adjacent to the Bayou Sauvage protected side project are classified as intermediate, since the area has been inundated in the past by tropical storms and hurricanes, and

since the project is in the vicinity of the Bayou Des Mats intermediate marsh site and adjacent to Lake Pontchartrain, existing conditions at Bayou Sauvage for fisheries, aquatic resources and water quality should be similar to those for Bayou Des Mats. See Bayou Des Mats existing conditions for fisheries, aquatic resources and water quality in section 3.2.1.4.2. The water quality of the hydrologic unit which this project is in does not fully support two of its designated uses: Fish and Wildlife Propagation and Primary Contact Recreation. The suspected sources of these impairments include sanitary sewer overflows and surrounding urbanization. Lake Borgne, from which borrow would be excavated for this project, is considered to fully support it's designated uses.

3.2.3.5 Essential Fish Habitat

3.2.3.5.1 LPV Basin

See LPV basin existing conditions for essential fish habitat in section 3.2.1.5.1.

3.2.3.5.2 Bayou Sauvage

No EFH exists in the restoration area. However, the project's borrow site is located within an area designated as EFH for postlarval/juvenile brown shrimp; postlarval/juvenile white shrimp; and postlarval/juvenile and adult red drum pursuant to provisions of the MSFCMA (P.L. 104-297). The 2005 generic amendment of the FMP for the Gulf of Mexico, prepared by the Gulf of Mexico FMC, identifies EFH in the project's borrow area to be SAV (currently none found on site), estuarine water column, and mud substrates.

3.2.3.6 Cultural Resources

3.2.3.6.1 LPV Basin

See LPV basin existing conditions for cultural resources in section 3.2.1.6.1.

3.2.3.6.2 Bayou Sauvage

The area proposed for BLH-Wet and intermediate marsh restoration is open water, and cultural resources are not likely to exist. A large portion of the project area was surveyed for cultural resources in 2008, to include the proposed access corridor and Primary and Secondary Borrow areas in Lake Borgne. No cultural resources eligible for listing to the NRHS have been identified in the project area, and no additional surveys are recommended.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be

coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.3.7 Recreational Resources

3.2.3.7.1 LPV Basin

See LPV basin existing conditions for recreational resources in section 3.2.1.7.1.

3.2.3.7.2 Bayou Sauvage

Located just outside the Bayou Sauvage NWR, recreation opportunities do not currently exist at the 355 acre open water site which was formerly a birding rookery before a levee expansion removed trees attractive to migrating birds. Today, the site is open water and offers no recreational opportunities.

3.2.3.8 Aesthetic Resources

3.2.3.8.1 LPV Basin

See LPV basin existing conditions for aesthetic resources in section 3.2.1.8.1.

3.2.3.8.2 Bayou Sauvage

The Bayou Savage site is primarily open water; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.3.9 Air Quality

3.2.3.9.1 LPV Basin

See LPV basin existing conditions for air quality in section 3.2.1.9.1.

3.2.3.9.2 Bayou Sauvage

This project is in Orleans Parish which is currently in attainment of NAAQS.

3.2.3.10 Noise

3.2.3.10.1 LPV Basin

See LPV basin existing conditions for noise in section 3.2.1.10.1.

3.2.3.10.2 Bayou Sauvage

The project site is within 1,000 ft of a commercial facility. A highway to the south is in close proximity. Travel on this road is sporadically heavy.

3.2.3.11 Hazardous, Toxic, and Radioactive Waste

3.2.3.11.1 LPV Basin

See LPV basin existing conditions for HTRW in section 3.2.1.11.1.

3.2.3.11.2 Bayou Sauvage

No RECs were found within or near the proposed Bayou Sauvage BLH-Wet and Intermediate Marsh Restoration mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.3.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.3.12.1 LPV Basin

See LPV basin existing conditions for socioeconomics/land use, environmental justice, transportation, navigation and commercial fisheries in section 3.2.1.12.1.

3.2.3.12.2 Bayou Sauvage

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Bayou Sauvage PS BLH and marsh restoration project. As this is a Programmatic NEPA

document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Bayou Sauvage PS BLH and marsh restoration project is the GIWW and Lake Borgne.

3.2.4 MITIGATION FOR IMPACTS TO REFUGE FLOOD SIDE BLH-WET

3.2.4.1 Wetlands and other Surface Waters

3.2.4.1.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.1.1.

3.2.4.1.2 Fritchie

The existing forest in the project area is an early successional, nearly monoculture of young Chinese tallow trees sparsely interspersed with large mature live oaks in varying degrees of health. Based on available LIDAR technology, elevations in the project area are appropriate for BLH-Wet establishment and survival.

3.2.4.2 Wildlife

3.2.4.2.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.2.1.

3.2.4.2.2 Fritchie

Numerous wildlife species not only inhabit natural ridges but depend on them for survival. Bald eagle nests and waterbird nesting colonies are present within or rely upon natural ridge forests. Vertical structure, such as trees or shrubs, is required for bird nests for these species. This type of vertical structure is only found in or adjacent to forests and not in the nearby marshes. Bald eagles, in particular, require trees of substantial size to support nests which may weigh several thousand pounds (del Hoyo et al 1994). Waterbird nesting colonies include a number of species of herons, egrets, ibises, and terns as well as anhingas, olivaceous cormorants, roseate spoonbills, laughing gulls, and black skimmers (Martin and Lester 1990).

Although many species of concern are known to occur along natural ridges, the greatest wildlife value is to the many neotropical migrant songbirds that rely on these forests during migration. The ridges of Louisiana are uniquely situated to provide final feeding grounds for those species beginning their migratory flights in the fall or initial resting grounds for those species returning to the US in the spring. Two specific examples of neotropical migrant songbirds that are dependent upon cheniers and natural ridges are the Eastern wood-pewee and the common yellowthroat.

Some wildlife species anticipated to utilize the ridge habitat at the Fritchie site are the yellow crowned night heron, black crowned night heron, great blue heron, tricolored heron, green heron, great egret, cattle egret, snowy egret, double-crested cormorant, belted kingfisher, common moorhen, American coot, marsh wren, mourning dove, red-winged blackbird, common grackle, American alligator, swamp rabbit, northern raccoon, white-tailed deer, muskrat, nutria, coyote, mink, river otter, bobcat, and feral hog.

3.2.4.3 Threatened and Endangered Species

3.2.4.3.1 LPV Basin

See LPV basin existing conditions for threatened and endangered species in section 3.2.1.3.1.

3.2.4.3.2 Fritchie

No threatened or endangered species are expected to be found in the project area.

3.2.4.4 Fisheries, Aquatic Resources and Water Quality

3.2.4.4.1 LPV Basin

See LPV basin existing conditions for fisheries, aquatic resources and water quality in section 3.2.1.4.1.

3.2.4.4.1.2 Fritchie

Fisheries and Aquatic Resources currently do not exist in the project area. See Fritchie existing conditions for water quality in section 3.2.1.4.4.

3.2.4.5 Essential Fish Habitat

3.2.4.5.1 LPV Basin

See LPV basin existing conditions for essential fish habitat in section 3.2.1.5.1.

3.2.4.5.2 Fritchie

This resource does not exist in the project area as it is a BLH site currently.

3.2.4.6 Cultural Resources

3.2.4.6.1 LPV Basin

See LPV basin existing conditions for cultural resources in section 3.2.1.6.1.

3.2.4.6.2 Fritchie

A small portion of the proposed project area was investigated for cultural resources in 1999 for a proposed fiber optic project. One cultural site, 16ST19, was identified within the project area. The site has been determined not eligible for listing to the NRHS. There is a high probability for sites along bayous, natural levees, and shorelines. Cultural resources previously identified along the Lake Pontchartrain shoreline and within one mile of the project area include a historic ferry landing and prehistoric village site (16ST5), the remains of a historic lighthouse of undetermined eligibility (16OR60), and the foundation of a historic hospital facility (16OR34). The Fort Pike SHS (16OR57) is located within a mile of the project area. Deposits with these sites are thought to be submerged in Lake Pontchartrain.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.4.7 Recreational Resources

3.2.4.7.1 LPV Basin

See LPV basin existing conditions for recreational resources in section 3.2.1.7.1.

3.2.4.7.2 Fritchie

The privately-owned BLH-W land is leased for recreational hunting and not currently available for public use.

3.2.4.8 Aesthetic Resources

3.2.4.8.1 LPV Basin

See LPV basin existing conditions for aesthetic resources in section 3.2.1.8.1.

3.2.4.8.2 Fritchie

The Fritchie site is adjacent to the Big Branch NWR; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.4.9 Air Quality

3.2.4.9.1 LPV Basin

See LPV basin existing conditions for air quality in section 3.2.1.9.1.

3.2.4.9.2 Fritchie

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.4.10 Noise

3.2.4.10.1 LPV Basin

See LPV basin existing conditions for noise in section 3.2.1.10.1.

3.2.4.10.2 Fritchie

There is a highway on the southwestern side of the project area with a subdivision on the other side. Noise is produced by consistent and sporadically heavy traffic on this road. Sporadic boat traffic near this subdivision in adjacent canals may produce noise levels that exceed 55 dBA.

3.2.4.11 Hazardous, Toxic, and Radioactive Waste

3.2.4.11.1 LPV Basin

See LPV basin existing conditions for HTRW in section 3.2.1.11.1.

3.2.4.11.2 Fritchie

No RECs were found within or near the proposed Fritchie BLH Enhancement mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.4.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.4.12.1 LPV Basin

See LPV basin existing conditions for socioeconomics/land use, environmental justice, transportation, navigation and commercial fisheries in section 3.2.1.12.1.

3.2.4.12.2 Fritchie

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Fritchie BLH-W enhancement project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Fritchie BLH enhancement project is Lake Pontchartrain.

3.2.4.13 Prime and Unique Farmlands

3.2.4.13.1 LPV Basin

There are 15, 463.7 acres of Abita silt loam in St. Tammany Parish.

3.2.4.13.2 Fritchie

The entire Fritchie site is classified as Prime Farmlands; Abita silt loam, 0 to 2 percent slopes. The site is not currently being used for agricultural purposes and is heavily forested with Chinese tallow trees and some mature large live oak trees in varying degrees of health.

3.2.5 MITIGATION FOR IMPACTS TO NON-REFUGE BLH-DRY AND NON-REFUGE BLH-WET

3.2.5.1 Wetlands And Other Surface Waters

3.2.5.1.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.1.1.

3.2.5.1.2 Bonnet Carré

Jurisdictional wetlands comprise the entire Bonnet Carré Spillway from the Mississippi River to Lake Pontchartrain. The spillway functions as a catch-basin during flood control operations when floodwaters from the Mississippi River are diverted into Lake Pontchartrain. The proposed mitigation site, located within the non-forested area of the Bonnet Carré Spillway known as French Cut, is approximately 110 acres of shallow inundated borrow pits which are segmented

by disturbed scrub/shrub and perennial herb ridges. This area has been repeatedly disturbed by past clay and sand excavation activities. Many various size canals and ponds are located within the spillway. Most of these are shallow and are filled with aquatic vegetation, while others are deeper and exhibit open water. Emergent, floating, and submersed plants in these water bodies include water hyacinth, delta duck potato, duckweeds, alligator weed, water pennywort, mosquito fern, sedges, and rushes, floating water primrose and pickerelweed.

The area has been modified to a great extent by man. Different plant communities may be found in these disturbed areas following each operation of the spillway. Sand-loving colonizers become established on dunes formed from deposition of river alluvium. Perennial herbs are more common in the disturbed areas following successional trends after several years without a spillway operation. These disturbed areas have a rich and diversified flora. Common species found in the proposed mitigation site include: black willow, carpetweed, southern waterhemp, pigweed, mock bishopweed, ragweed, asters, spiny thistle, yankeeweed, goldenrod, cocklebur, peppergrass, morning glories, woolly croton, coffeeweed, clovers, ironweed, evening primroses, wood sorrel, bushy beardgrass, Bermuda grass, Dallis grass, smartweeds, buttercups, bedstraw, vervain, peppervine, and numerous grasses, rushes, and sedges.

3.2.5.1.3 Frenier

The Frenier project area is currently farmed agricultural land at elevations conducive to BLH-Wet establishment. Adjacent property is heavily forested with a mix of BLH and swamp species.

3.2.5.1.4 Fritchie

The project area is a combination of forested land and open water. The area was heavily damaged during hurricane Katrina and the existing forest is currently dominated by Chinese tallow. Some large live oaks and pine trees in varying degrees of health still remain on the site. Elevations throughout the site are either currently conducive to BLH establishment or would be created from open water through pump and fill operations.

3.2.5.2 Wildlife

3.2.5.2.1 LPV Basin

See LPV basin existing conditions for wildlife in section 3.2.1.2.1.

3.2.5.2.2 Bonnet Carré

A great diversity of avian fauna inhabits the Bonnet Carré Spillway and the proposed mitigation site including sea birds, waterfowl, shorebirds, wading birds, songbirds, and raptors. Seabirds include American white pelican, herring gull, ring-billed gull, Forster's tern, laughing gull, and gull-billed tern. Waterfowl include mallard, mottled duck, green and blue-winged teal, northern pintail, and wood duck. Wading birds present include such species as the tricolored heron, great blue heron, yellow-crowned night-heron, green-backed heron, cattle egret, great egret, snowy

egret, white ibis, glossy ibis, and white-faced ibis. Shorebirds common to the area include black-necked stilt, killdeer, greater and lesser yellowlegs, and numerous sandpipers. Common raptors include red-shouldered hawk, red-tailed hawk, barred owl, and American kestrel. Other non-game birds inhabiting the area are the Carolina wren, northern cardinal, white-eyed vireo, boat-tailed grackle, common grackle, red-winged blackbird, and belted kingfisher. A complete listing of fauna present in the Bonnet Carré Spillway can be found in the July 2010 Final Master Plan for the Bonnet Carré Spillway.

Approximately 30 species of mammals would typically be found within the non-forested areas of the proposed mitigation site: eastern pipistrelle, red bat, Seminole bat, northern yellow bat, evening bat, Rafinesque's big-eared bat, Brazilian free-tailed bat, nine-banded armadillo, swamp rabbit, American beaver, marsh rice rat, fulvous harvest mouse, white-footed mouse, cotton mouse, hispid cotton rat, muskrat, roof rat, Norway rat, house mouse, nutria, coyote, northern raccoon, mink, river otter, white-tailed deer, feral hog, red fox, gray fox, and bobcat. Bottlenose dolphins could be found foraging in the proposed borrow area.

Numerous species of reptiles and amphibians are found in the Bonnet Carré Spillway and the proposed mitigation site. The American alligator, common snapping turtle, red-eared slider, stinkpot, green anole, ground skink, banded water snake, and western cottonmouth are common reptiles. Amphibians in the area include the bullfrog, pig frog, bronze frog, Southern leopard frog, Gulf coast toad, green and squirrel treefrogs and several species of salamanders.

The bald eagle, a former Federally-listed protected species, inhabits the Bonnet Carré Spillway. In July 2007 (*72 Federal Register 37346*), the bald eagle was delisted by the USFWS as a result of a reduction in the threats to the bald eagle and the increase in populations in the contiguous 48 states. The bald eagle is still afforded protection under the Bald Eagle Protection Act of 1940 (16 U.S. Code [U.S.C.] 668-668d) and the Migratory Bird Treaty Act of 1972 (16 U.S.C. 703-712). The Bald Eagle Protection Act was amended in 1962 to add protection for the golden eagle and the amended statute became known as the Bald and Golden Eagle Protection Act.

One known active nest site is located in the Bonnet Carré Spillway and several known bald eagle nest sites are located in the vicinity of the Bonnet Carré Spillway. Bald eagle nest sites are considered environmentally sensitive areas. Bald eagle nest site guidelines would be developed and implemented in coordination with USFWS as part of the proposed mitigation plan if a nest the project area falls within the buffer zone of the nest.

3.2.5.2.3 Frenier

The Frenier project area is currently under agricultural production. Common wildlife species utilizing this type of habitat when crops are present would be the northern raccoon, nine-banded armadillo, white-tailed deer, feral hog, coyote, red fox, gray fox, bobcat, red-winged black bird, fulvous harvest mouse, white-footed mouse, cotton mouse, hispid cotton rat, roof rat, Norway rat, house mouse, cattle egret, mourning dove, red-tailed hawk, barred owl, and eastern cottontail rabbit. When the land is fallow, use of the land is not anticipated to include the white-tailed deer and use of it by the aforementioned species would be greatly reduced.

3.2.5.2.4 Fritchie

See existing conditions for the Fritchie Refuge BLH-Wet Enhancement project in section 3.2.4.2.2.

3.2.5.3 Threatened and Endangered Species

3.2.5.3.1 LPV Basin

See LPV basin existing conditions for threatened and endangered species in section 3.2.1.3.1.

3.2.5.3.2 Bonnet Carré

One Federally-listed threatened wildlife species, the American alligator, occurs in the Bonnet Carré Spillway. Currently, American alligators are listed as threatened under the Similarity of Appearance clause in the ESA of 1973, as amended and are not subject to ESA Section 7 consultation. According to the 2009 Draft Bonnet Carré Spillway Master Plan, the alligator population in the Bonnet Carré Spillway is very robust and individuals can be expected in all waterways and open water (e.g., ponds) on spillway lands.

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; pallid sturgeon, and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow areas. See section 3.2.1.3.2 for detailed species descriptions for all but the pallid sturgeon. In addition, shovelnose sturgeon listed as threatened under the Similarity of Appearance clause in the Endangered Species Act (ESA) of 1973, as amended have the potential to occur in the Mississippi River borrow site but are not subject to ESA Section 7 consultation.

Pallid Sturgeon

The pallid sturgeon was listed as endangered throughout its range on October 9, 1990. The pallid sturgeon is a bottom oriented, large river obligate inhabiting the Missouri and Mississippi Rivers from Montana to Louisiana and the Atchafalaya River. The pallid sturgeon was listed due to the apparent lack of recruitment for over 15 years, and the habitat threats existing at the time of listing. Destruction and alteration of habitats by human modification of the river system is believed to be the primary cause of decline in reproduction, growth, and survival of the pallid sturgeon. The curtailment of range and habitat destruction/modification were primarily attributed to the construction and operation of dams on the upper Missouri River and modification of riverine habitat by channelization of the lower main stem Missouri and Mississippi Rivers. Until this past decade, they were considered a rare occurrence in the Lower Mississippi. New information from recent collection efforts indicates that the Mississippi River currently supports substantial numbers of wild fish.

3.2.5.3.3 Frenier

No threatened or endangered species are expected to be found in the project area.

3.2.5.3.4 Fritchie

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions. The borrow site for this project is in Gulf sturgeon critical habitat.

3.2.5.4 Fisheries, Aquatic Resources, and Water Quality

3.2.5.4.1 LPV Basin

See LPV basin existing conditions for fisheries, aquatic resources and water quality in section 3.2.1.4.1.1.

3.2.5.4.2 Bonnet Carré

The Bonnet Carré Spillway offers areas for both freshwater and saltwater fishing, and at times anglers are able to catch sunfish, bass, spotted/speckled trout, and red drum (redfish) from the same area. However, the sand excavation areas in the spillway, known as borrow pits, which would be converted into BLH habitat are presently very shallow, and provide minimal habitat for game fish. The Spillway also offers areas to catch blue crabs, shrimp, and crawfish. Fish species that are normally caught in the Mississippi River can be caught in the spring overflow from the river into the forebay area. In the Bonnet Carré Spillway, there are four fish species of special concern; the pallid sturgeon, shovelnose sturgeon, Gulf sturgeon and paddlefish. None of these species are expected to occur in the borrow pits that will be converted to BLH-Wet due to their shallow depth and resulting water quality extremes (temperature and dissolved oxygen).

Several species of introduced fish and clams can be found within ponds and lakes of the Bonnet Carré Spillway. Several species of Asian carp can be found in the spillway including silver, bighead, grass, and common carp. These species degrade aquatic ecosystems and grow rapidly feeding on plants and microorganisms. The Rio Grand Cichlid is another harmful non-native fish species that can be found in the spillway. This species poses a threat to aquatic vegetation, out-competes native fish, and can harbor parasites harmful to native fish. Two introduced species of clams can be found in the spill way, the Asiatic clam and the zebra mussel.

The proposed borrow pit in Lake Pontchartrain has distinctively different aquatic resources than the restoration site. The Lake Pontchartrain estuary is inhabited by a wide range of brackish water species including bay anchovy, gulf menhaden, Atlantic croaker, inland silverside, sheepshead minnow, hardhead catfish, rainwater killifish, spot, stripped mullet, and sand seatrout (O'Connell et al 2004). Sport and commercial fishery species found in the lake include blue crab, white shrimp, brown shrimp, (NMFS 1998), speckled seatrout, black drum, red drum, sheepshead, and flounder (USACE 1986). Lake Pontchartrain and its adjacent wetlands function as a typical estuary where marine-spawned and estuary dependent fish and shellfish species utilize different regions of the estuary for various life stages.

The water quality of the hydrologic unit which this project is in does not fully support two of its designated uses: Fish and Wildlife Propagation and Primary Contact Recreation. The suspected sources of these impairments include loss of wetlands and habitat modification. Water quality in Lake Pontchartrain, from which borrow would be excavated, is considered to fully support it designated uses.

3.2.5.4.3 Frenier

The existing agricultural fields presently do not provide fisheries or aquatic resources. The water quality of the hydrologic unit which this project and its borrow site are in does not fully support one of its designated uses: Fish and Wildlife Propagation. The suspected sources of these impairments include loss of wetlands and site clearance for land development or redevelopment.

3.2.5.4.4 Fritchie

The areas designated for the153 acres of BLH-Dry enhancement and the 230 acres of BLH-Wet enhancement presently do not provide fisheries or aquatic resources. The 44 acres of open water designated for BLH-Wet restoration provides habitat for various fisheries and aquatic species. The project area supports a diverse assemblage of estuarine-dependent fishes and shellfishes, and species presence 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. 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 25 acres borrow site in Lake Pontchartrain provides habitat for the same fisheries and aquatic species as found in the project area during periods of high-salinity. The water quality of the hydrologic unit which this project is in does not fully support one of its designated uses: Primary Contact Recreation. The suspected source of Primary Contact Recreation impairment, fecal coliform, is on-site treatment systems; such was septic systems and similar decentralized systems. Lake Pontchartrain, from which borrow would be obtained, is considered to fully support it designated uses.

<u>3.2.5.5 Essential Fish Habitat</u>

3.2.5.5.1 LPV Basin

See LPV basin existing conditions for essential fish habitat in section 3.2.1.5.1.

3.2.5.5.2 Bonnet Carré

The BLH-Wet restoration area has limited tidal connections and is not considered EFH. However, the project's borrow site is located within an area designated as EFH for postlarval/juvenile brown shrimp; postlarval/juvenile white shrimp; and postlarval/juvenile and

adult red drum pursuant to provisions of the MSFCMA (P.L. 104-297). The 2005 generic amendment of the FMP for the Gulf of Mexico, prepared by the Gulf of Mexico FMC, identifies EFH in the borrow area to be SAV (currently none found on site), estuarine water column, and mud substrates.

3.2.5.5.3 Frenier

The existing agricultural fields presently are not classified as EFH.

3.2.5.5.4 Fritchie

The areas designated for the153 acres of BLH-Dry enhancement and the 230 acres of BLH-Wet enhancement are non tidal and as such are not designated as EFH. The 44 acre placement site is tidal, but is not designated as EFH in the GIS database layers provided by the NOAA – National Marine Fisheries Service website (http://www.habitat.noaa.gov/protection/efh/newInv/index.html). The 25 acre borrow site is located within an area identified as EFH 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 water column, and mud substrates.

3.2.5.6 Cultural Resources

3.2.5.6.1 LPV Basin

See LPV basin existing conditions for cultural resources in section 3.2.1.6.1.

3.2.5.6.2 Bonnet Carré

Cultural resources inventories and probability assessments to determine the potential for cultural resources within the Bonnet Carré Spillway were conducted in 1985 and 1988. There are no identified cultural resources within the immediate vicinity of the proposed Bonnet Carré BLH-Dry and BLH-Wet Restoration project. There are several previously identified cultural resources within one mile of the Bonnet Carré Spillway. The proposed borrow area in Lake Pontchartrain was previously surveyed for submerged cultural resources in 1993 and 2012. No cultural resources were identified during the survey. The depositional environment within the Bonnet Carré Spillway is very dynamic, and the possibility exists for deeply buried cultural resources greater than two meters below the existing ground surface. Based on previous investigations it is not anticipated that additional cultural resources would be encountered within the proposed project area. Any cultural resources that have been determined eligible for listing to the NRHS would be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested

parties. Any cultural resources surveys determined to be required would be completed prior to the start of construction activities for the proposed action, and the results of surveys would be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings and the NEPA process. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.5.6.3 Frenier

No previous cultural resources investigations have been identified within the proposed project area. The project area appears as the Bonnet Carre Oil Field on more recent topographic maps. A review of the 1935 topographic map does not indicate the presence of any structures or defined uses, but there are several small roads in the project area that provide access to canals and drainages. Modern use of the area is agriculture, and though the area has been plowed and used for agriculture there still remains the possibility for intact cultural resources below the limit of plowing. Surveys for cultural resources would be completed in the proposed project area, and any identified cultural resources that are determined to be eligible for listing to the National Register of Historic Places will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and Federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings and the NEPA process. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.5.6.4 Fritchie

A small portion of the proposed project area was investigated for cultural resources in 1999 for a proposed fiber optic project. One cultural site, 16ST19, was identified within the project area. The site has been determined not eligible for listing to the National Register of Historic Places. There is a high probability for sites along bayous, natural levees, and shorelines. Cultural resources previously identified along the Lake Pontchartrain shoreline and within one mile of the project area include a historic ferry landing and prehistoric village site (16ST5), the remains of a historic lighthouse of undetermined eligibility (16OR60), and the foundation of a historic hospital facility (16OR34). The Fort Pike State Historic Site (16OR57) is located within a mile of the project area. Deposits with these sites are thought to be submerged in Lake Pontchartrain, and given the close proximity to Fort Pike and other known cultural resources, there is a moderate to high probability that submerged cultural resources could exist near the proposed borrow areas and sediment pipeline corridor in Lake Pontchartrain. Surveys for cultural resources will be completed in the proposed project and associated borrow areas, and any cultural resources that are determined eligible for listing to the National Register of Historic Places will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the NHPA of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the LA SHPO, Federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings and the NEPA process. The Programmatic

Agreement is scheduled to be executed was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.5.7 Recreational Resources

3.3.7.1 LPV Basin

See LPV basin existing conditions for recreational resources in section 3.2.1.7.1.

3.2.5.7.2 Bonnet Carré

The Bonnet Carré Spillway offers various public-use, recreational areas during non-flood use periods. These include lands for recreation outgrants for remote controlled airplane and ATV use, boat launches, primitive camping sites and picnic tables, Montz Park, mountain bike trails and general hiking paths. Fishing is spread throughout the spillway as certain areas lend themselves to crawfishing, crabbing and fishing, depending on the season.

3.2.5.7.3 Frenier

No recreational opportunities exist at the Frenier site since the land is currently used for agricultural purposes.

3.2.5.7.4 Fritchie

A part of the 427 acre Fritchie site, which consists mainly of BLH-W, is leased to private groups for recreational hunting while 44 acres of open water is leased for fishing.

3.2.5.8 Aesthetic Resources

3.2.5.8.1 LPV Basin

See LPV basin existing conditions for aesthetic resources in section 3.2.1.8.1.

3.2.5.8.2 Bonnet Carré

The Bonnet Carré Spillway features a 7,000 foot long concrete weir flood control structure adjacent to the Mississippi River. The control structure consists of 350 bays that collectively act as a valve to hold back or allow the Mississippi River's floodwaters to flow through the flood control structure into Bonnet Carré's floodway on its way to Lake Ponchartrain. Approximately once every 10 years turbulent floodwater flows through Bonnet Carré's floodway; it is a significant visual event having attracted approximately 30,000 visitors a day the first week of the 9 May –20 June 2011 Mississippi River flood event.

3.2.5.8.3 Frenier

The Frenier site's current land use is agricultural; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.5.8.4 Fritchie

The Fritchie site is adjacent to the Big Branch Marsh National Wildlife Refuge; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.5.9 Air Quality

3.2.5.9.1 LPV Basin

See LPV basin existing conditions for air quality in section 3.2.1.9.1.

3.2.5.9.2 Bonnet Carré

The Bonnet Carré is in St Charles Parish which is currently in attainment of NAAQS.

3.2.5.9.3 Frenier

The Bonnet Carré is in St Charles Parish which is currently in attainment of NAAQS.

3.2.5.9.4 Fritchie

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.5.10 Noise

3.2.5.10.1 LPV Basin

See LPV basin existing conditions for noise in section 3.2.1.10.1.1.

3.2.5.10.2 Bonnet Carré

Currently there are numerous borrow excavation operations occurring within the spillway. In addition, there are recreational ATV trails where, during use, noise levels exceed a DNL of 55 dBA.

3.2.5.10.3 Frenier

The project area is remote. Use of agricultural equipment during farming operations may produce noise levels that exceed 55 dBA within the project area.

3.2.5.10.4 Fritchie

The project area is bordered by two highways; one to the southeast with several houses on the other side and one on the southwest with a subdivision on the other side. Noise is produced by consistent and sporadically heavy traffic on these roads. Sporadic boat traffic near the houses and subdivision in adjacent canals may produce noise levels that exceed 55 dBA.

3.2.5.11 Hazardous, Toxic, and Radioactive Waste

3.2.5.11.1 LPV Basin

See LPV basin existing conditions for HTRW in section 3.2.1.11.1.

3.2.5.11.2 Bonnet Carré

The area around the Bonnet Carré Spillway is heavily industrialized, with numerous chemical and petrochemical plants within a few miles. These plants typically emit small quantities of chemicals on a regular basis. In the most recent reporting year (2010) for the Toxic Release Inventory, seven facilities reported multiple releases of various substances. Most of these releases were small, but four incidents released over 100,000 pounds of chemicals (titanium tetrachloride, sulfuric acid, ethylene, and propylene).

Phase I Environmental Site Assessments (ESAs) following the ASTM 1527-05 protocol, supplemented with sampling reports, have been prepared for the Bonnet Carré Spillway, as a whole, and for parts of the Bonnet Carré Spillway, as follows:

- HTRW #07-30: Bonnet Carré Borrow Area, North of Airline Highway, St. Charles Parish, Louisiana, dated 23 July 2007
- HTRW #08-08: Verification Sampling Report, Verification Sampling & Waste Pile Characterization, Bonnet Carré Spillway, St. Charles Parish, Louisiana, dated 6 February 2008
- HTRW #09-12: Upper Guide Levee, Bonnet Carré Spillway, St. Charles Parish, Louisiana, dated 26 August 2009
- HTRW #09-16: Bonnet Carré High Water 2010 Stockpile Site, East St. John North Location, St. John the Baptist Parish, Louisiana, dated 20 October 2009
- HTRW #09-17: Bonnet Carré High Water 2010 Stockpile Site, East St. John South Location, Laplace, St. John the Baptist Parish, Louisiana, dated 21 October 2009
- HTRW #10-18: Master Plan for Bonnet Carré Spillway, Norco, St. Charles Parish, Louisiana, dated 14 October 2010.

In spite of the documented history of chemical releases in the area, there is little evidence of any persistent contamination of Bonnet Carré Spillway property. Bayou Trepagnier, located southeast of Bonnet Carré Spillway, was contaminated by decades of refinery discharges. This contamination has been removed, to the extent possible, and new discharges have been halted. The proposed mitigation area is not affected by Bayou Trepagnier.

3.2.5.11.3 Frenier

There are no pipelines crossing the proposed mitigation area, although there are several in the vicinity. None of the pipelines are a cause for concern under present conditions. There are several abandoned wells and waste pits within and near the proposed mitigation area; there would be a moderate probability of encountering substances of concern or petroleum products in the soil near these wells and pits. These sites would be a source of concern if any excavation were planned near them. However, designating the area as a mitigation site would not increase the probability of encountering HTRW, which would remain low overall.

3.2.5.11.4 Fritchie

No RECs were found within or near the proposed mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or waste pits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

3.2.5.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.5.12.1 LPV Basin

See LPV basin existing conditions for socioeconomics/land use, environmental justice, transportation, navigation and commercial fisheries in section 3.2.1.12.1.

3.2.5.12.2 Bonnet Carré

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Bonnet Carré BLH Restoration project. Additionally, there are no commercial/industrial properties, public facilities, transportation infrastructure or commercial fishing within the project boundaries. The nearest navigable waterways to the Bonnet Carré BLH-Wet Restoration project is the Mississippi River and Lake Pontchartrain, LA.

3.2.5.12.3 Frenier

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Frenier BLH Restoration project. Additionally, there are no commercial/industrial properties, public facilities, transportation infrastructure or commercial fishing within the project boundaries. The nearest navigable waterways to the Frenier BLH Restoration project is Lake Pontchartrain, LA.

3.2.5.12.4 Fritchie

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Fritchie BLH Enhance/ Restore project. Additionally, there are no commercial/industrial properties, public facilities, transportation infrastructure or commercial

fishing within the project boundaries. The nearest navigable waterways to the Frenier BLH Restoration project is Lake Pontchartrain, LA., at the Rigolets.

3.2.5.13 Prime and Unique Farmlands

3.2.5.13.1 LPV Basin

There are 15, 464 acres of Abita silt loam in St. Tammany Parish and 6,545 acres of Carville silt loam in St. John the Baptist Parish.

3.2.5.13.2 Bonnet Carré

There are no prime and unique farmlands found in the project area.

3.2.5.11.3 Frenier

The entire Frenier site is classified as Prime Farmlands; Carville silt loam, 0 to 1 percent slopes. The site is currently being farmed.

3.2.5.13.4 Fritchie

The entire Fritchie site is classified as Prime Farmlands; Abita silt loam, 0 to 2 percent slopes. The site is not currently being used for agricultural purposes and is heavily forested with Chinese tallow trees and some mature large live oak and pine trees in varying degrees of health.

3.2.6 MITIGATION FOR IMPACTS TO NON-REFUGE SWAMP

3.2.6.1 Wetlands and Other Surface Waters

3.2.6.1.1 LPV Basin

See LPV basin existing conditions for wetlands and other surface waters in section 3.2.1.1.1.

3.2.6.1.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.1.2.

3.2.6.1.3 Caernarvon

The site is currently open water with SAVs present. CRMS data from stations 0117 and 0128 indicate that mean growing season salinities of 0.83 and 0.34 respectively. Mean annual salinities for those stations were approximately 1 and 0.5 ppt. Examination of Caernarvon Annual Reports from 2003 to 2005 indicated that salinities at Reggio Canal (approximately 6 miles southwest of the project location) never exceeded a monthly mean of 0.25 ppt during the growing season therefore a conservative salinity estimate of 0.5 was used (also represents approximate mean of two CRMS stations).

3.2.6.1.4 Milton Island

Of the project area's 360 acres, 291 acres is open water with SAVs present, 13 acres is degraded cypress in poor health, and 56 acres is moderately forested with cypress (35% overstory canopy cover) in fair health.

3.2.6.2 Wildlife

3.2.6.2.1 LPV Basin

See LPV basin existing conditions for wildlife in section 3.2.1.2.1.

3.2.6.2.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.2.2.

3.2.6.2.3 Caernarvon

Migratory waterfowl, including gadwalls, blue-winged teal, green-winged teal, widgeons, mottled ducks, lesser scaup, shovelers, pintails, and mallards, are present during winter in the project area. Mottled ducks are present year-round. Wading birds, shore birds, and sea birds utilizing the project area include egrets, ibis, herons, sandpipers, willets, black-necked stilts, gulls, terns, skimmers, grebes, loons, cormorants, coots, gallinules, rails, and white and brown pelicans. Various raptors such as osprey, red-shouldered hawks, northern harriers (marsh hawks), American kestrel, and red-tailed hawks are present. The nutria, otter, and the American alligator can also be found in the project area.

3.2.6.2.4 Milton Island

Migratory waterfowl, including gadwalls, mottled ducks, lesser scaup, bufflehead, red head, wood duck, and mallards are present during winter in the area. Wading birds and shore birds utilizing the project area include egrets, ibis, herons, grebes, loons, cormorants, coots, gallinules, and rails. Colonial nesting birds, such as the yellow crowned night heron, snowy egret, great blue heron, great egret, anhinga and white ibis have used the existing cypress trees in the project area for nesting and roosting. Mammals found within the project area include nutria, mink, river otter, and raccoon. Bottlenose dolphins may be found foraging in the proposed borrow area. Reptiles using the project area include the American alligator, western cottonmouth, water snakes, speckled kingsnake, rat snake, and eastern mud turtle. Amphibians expected to occur in the area include the bullfrog, southern leopard frog, and Gulf coast toad.

3.2.6.3 Threatened and Endangered Species

3.2.6.3.1 LPV Basin

See LPV basin existing conditions for threatened and endangered species in section 3.2.1.3.1.

3.2.6.3.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.3.2.

3.2.6.3.3 Caernarvon

No threatened or endangered species are expected to be found in the project area.

3.2.6.3.4 Milton Island

Of the animals and plants under USFWS and/or NMFS jurisdiction, only the West Indian manatee; Gulf sturgeon; and Kemp's Ridley, loggerhead, and green sea turtles are expected to potentially be found in the project's borrow area. See section 3.2.1.3.1.2 for detailed species descriptions.

3.2.6.4 Fisheries, Aquatic Resources, and Water Quality

3.2.6.4.1 LPV Basin

See LPV basin existing conditions for fisheries, aquatic resources, and water quality in section 3.2.1.4.1.1.

3.2.6.4.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.4.2.

3.2.6.4.3 Caernarvon

The 667 acres of open water in the swamp restoration area in Big Mar and the 290 acre borrow site in Lake Lery support a diverse assemblage of estuarine-dependent fishes and shellfishes, and species presence is largely dictated by salinity levels and season. Commercially important species include the American oyster, brown and white shrimp, blue crab, Gulf menhaden, and striped mullet. Freshwater species commonly taken in the Big Mar area include largemouth bass, warmouth, bluegill, redear sunfish, channel catfish, and blue catfish. Other fishes likely to be present include yellow bullhead, freshwater drum, bowfin, carp, buffaloes, and gars. These species may be found in the Lake Lery area but in lower numbers. The water quality of the hydrologic units which this project and it's borrow source are in are considered to fully support their designated uses.

3.2.6.4.4 Milton Island

The Milton site is essentially cut off from tidal influence and is dominated by fresh water species such as sunfish, bowfin, catfish, and bass. The water quality of the hydrologic unit which this project is in does not fully support one of its designated uses: Fish and Wildlife Propagation. The suspected sources of these impairments include loss of wetlands, littoral/shore area

modifications, atmospheric deposition of toxins, and habitat modification. Lake Pontchartrain, the project's borrow source, is considered to fully support it designated uses.

3.2.6.5 Essential Fish Habitat

3.2.6.5.1 LPV Basin

See LPV basin existing conditions for essential fish habitat in section 3.2.1.5.1.

3.2.6.5.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.5.2.

3.2.6.5.3 Caernarvon

Both the restoration site and borrow area are located within an areas identified as EFH 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, SAV, estuarine water column, and mud substrates.

3.2.6.5.4 Milton Island

The placement site is not designated as EFH in the GIS database layers provided by the NOAA – National Marine Fisheries Service website. The borrow site is located within an area identified as EFH 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 water column, and mud substrates.

3.2.6.6 Cultural Resources

3.2.6.6.1 LPV Basin

See LPV basin existing conditions for cultural resources in section 3.2.1.6.1.

3.2.6.6.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.6.2.

3.2.6.6.3 Caernarvon

The Caernarvon Swamp Restoration project area was investigated for cultural resources in 1987 for the Caernarvon Freshwater Diversion. Investigations consisted of pedestrian surveys in the drier areas and bank surveys by boat of the Big Mar and surrounding canal shorelines. Two archaeological sites were identified during the surveys, and neither site was determined to be

eligible for listing to the National Register of Historic Places. The proposed project area is predominately under water and has been impacted by activities associated with the operation of the Caernarvon Freshwater Diversion. Given the level of previous cultural resources surveys, it is not anticipated that additional cultural resources will be identified in the proposed project area. Any cultural resources that have been determined eligible for listing to the National Register of Historic Places would be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the National Historic Preservation Act of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the Louisiana State Historic Preservation Officer (LA SHPO), federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings and the NEPA process. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.6.6.4 Milton Island

No surveys for cultural resources have been carried out within the proposed project area, but one cultural resource site (16ST45) has been identified within 100 meters of the southern portion of the project area. National Register of Historic Places eligibility has not been determined for site 16ST45, and the site could be adversely impacted by activities associated with the proposed project. There is a low probability that cultural resources are present within the open water portions of the project boundary, but there is a moderate to high probability that cultural resources could be located in dry areas, on natural levees, and along natural bayous within the project area. If sites are present they could be adversely impacted by activities associated with the project such as retention dike construction, gapping along natural bayous, degrading of dikes, staging area location, access corridor use, and other activities. Cultural resources surveys will be completed and any identified cultural resources that are determined to be eligible for listing to the National Register of Historic Places will be avoided during project design.

The CEMVN has elected to fulfill its obligations under Section 106 of the National Historic Preservation Act of 1966, as amended through the execution and implementation of a Programmatic Agreement. The Programmatic Agreement was developed in consultation with the Advisory Council on Historic Preservation, the Louisiana State Historic Preservation Officer (LA SHPO), federally recognized Indian Tribes, and other identified interested parties. Any cultural resources surveys determined to be required will be completed prior to the start of construction activities for the proposed action, and the results of surveys will be coordinated with the LA SHPO and federally recognized Indian Tribes for review in accordance with the stipulations of the Programmatic Agreement.

The following Federally recognized Indian tribes were invited to participate in the development of the Programmatic Agreement: 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, Quapaw Tribe of Oklahoma, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and the Tunica-Biloxi Tribe of Louisiana to consult in the development of the Programmatic Agreement.

The CEMVN in coordination with the LA SHPO has taken measures to identify other interested parties and organizations to participate in the development and execution of the Programmatic Agreement. The CEMVN notified interested parties and the public of the development of the Programmatic Agreement through mailings and the NEPA process. The Programmatic Agreement was executed 18 June 2013 and the CEMVN requirement for consultation, pursuant to Section 106 of the NHPA, is complete.

3.2.6.7 Recreational Resources

3.2.6.7.1 LPV Basin

See LPV basin existing conditions for recreational resources in section 3.2.1.7.1.

3.2.6.7.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.7.2.

3.2.6.7.3 Caernarvon

The area of the proposed swamp restoration, approximately 660 acres of open water, is used predominately by private groups leasing land for freshwater bass fishing and hunting. However, most of the recreational fisherman and hunters that launch from the nearby boat ramps bypass Big Mar to hunt and fish farther away. The more sought after duck species tend to be found in the more isolated areas.

3.2.6.7.4 Milton Island

There are no public use recreational areas at the proposed site. The proposed 291 acre swamp restoration site is privately-owned with limited public access and is leased by private groups for fishing.

3.2.6.8 Aesthetic Resources

3.2.6.8.1 LPV Basin

See LPV basin existing conditions for aesthetic resources in section 3.2.1.8.1.

3.2.6.8.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.8.2.

3.2.6.8.3 Caernarvon

The Caernarvon site is primarily open water; it is visually inaccessible and has no significant visual attributes.

3.2.6.8.4 Milton Island

The Milton Island site is primarily open water; its visual significance has not been recognized by national or state designations. Technically, the site contains no unique visual characteristics. Public significance is undetermined.

3.2.6.9 Air Quality

3.2.6.9.1 LPV Basin

See LPV basin existing conditions for air quality in section 3.2.1.9.1.

3.2.6.9.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.9.2.

3.2.6.9.3 Caernarvon

This project is in St Bernard Parish which is currently in attainment of NAAQS.

3.2.6.9.4 Milton Island

This project is in St Tammany Parish which is currently in attainment of NAAQS.

3.2.6.10 Noise

3.2.6.12.1 LPV Basin

See LPV basin existing conditions for noise in section 3.2.1.10.1.

3.2.6.10.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.10.2.

3.2.6.10.3 Caernarvon

The project area is remote. The nearest residences are approximately 3,000 feet away behind a storm protection levee. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.6.10.4 Milton Island

The project area is remote. Sporadic boat traffic may produce noise levels that exceed 55 dBA within the project area.

3.2.6.11 Hazardous, Toxic, and Radioactive Waste

3.2.6.11.1 LPV Basin

See LPV basin existing conditions for HTRW in section 3.2.1.11.1.

3.2.6.11.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.11.2.

3.2.6.11.3 Caernarvon

No RECs were found within or near the proposed mitigation area. There are no pipelines crossing the proposed mitigation area. There is one plugged and abandoned well within the proposed mitigation area, but use of the site as a mitigation area would not increase the likelihood of exposure to HTRW.

3.2.6.11.4 Milton Island

No RECs were found within or near the proposed mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified.

3.2.6.11.2 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

3.2.6.12.1 LPV Basin

See LPV basin existing conditions for socioeconomics/land use, environmental justice, transportation, navigation, and commercial fisheries in section 3.2.1.12.1.

3.2.6.12.2 Bonnet Carré

See Bonnet Carré Spillway existing conditions under section 3.2.5.12.2.

3.2.6.12.3 Caernarvon

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Caernarvon swamp restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed project does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Caernarvon marsh restoration project is the Mississippi River and Big Mar Lake. In addition, the Caernarvon project area supports commercially important species including the American oyster, brown and white shrimp, blue crab, Gulf menhaden, and striped mullet.

3.2.6.12.4 Milton Island

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Milton Island swamp restoration project. As this is a Programmatic NEPA document, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. The proposed does not require any acres of agricultural or forestry land to be converted. The nearest navigable waterway to the Milton Island swamp restoration project is Lake Pontchartrain.

4. ENVIRONMENTAL CONSEQUENCES OF THE FINAL ARRAY OF MITIGATION PROJECTS

4.1 INTRODUCTION

This section describes the direct, indirect and cumulative effects of mitigation projects based on their description at the time of the AEP. Table 4-1 shows those significant resources found within the LPV mitigation basin, and notes whether they would be impacted by implementation of the project. The period of impact analysis begins when project construction is completed and generally extends 50 years for USACE projects. No natural and scenic rivers or upland resources would be impacted with implementation of any of the projects in the final array.

Direct impacts are those that are caused by the action taken and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR §1508.8(b)). Cumulative impacts are the effects on the environment that results from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future action, regardless of what agency or person undertakes such actions. More information on the Cumulative impacts is discussed in section 6.

4.2 MITIGATION PROJECTS BY HABITAT TYPES

The mitigation projects examined here are based on their description at the time of the AEP. The mitigation projects are grouped by the type of habitat being mitigated.

4.2.1 MITIGATION FOR IMPACTS TO NON-REFUGE INTERMEDIATE MARSH

4.2.1.1 Wetlands and other Surface Waters

4.2.1.1.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

Approximately 280 acres of open water habitat containing SAVs would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open water habitat in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

Table 4-1. Significant Resources in the LPV Basin

		Programmatic Features												
		Wetlands & Other Surface Waters	Wildlife	Threatened & Endangered Species*	Fisheries, Aquatic Resources, & Water Quality	Essential Fish Habitat	Cultural Resources*	Recreational Resources	Aesthetics	Air Quality	Noise	HTRW*	Prime & Unique Farmland	Socioeconomics/ Land Use, Environmental Justice, Transportation, Navigation & Commercial Fisheries
Non-Refuge Intermediate Marsh	Bayou Des Mats Marsh Restoration	X	X		X	X		X						
	Caernarvon Marsh Restoration	X	X		X	X		X						
	Fritchie Marsh Restoration	X	X		X	X		X			X			
	Big Branch Marsh Restoration	X	X		X	X		X						
	LaBranche Marsh Restoration	X	X		X	X		X						
	Milton Island Marsh Restoration	X	X		X	X		X			X			
Non-Refuge/ Refuge Brackish Marsh	General Mitigation Bank													
	Big Branch Marsh Restoration	X	X		X	X		X						
	Golden Triangle Marsh Restoration	X	X		X	X		X						
	Fritchie Marsh Restoration	X	X		X	X		X						

		Wetlands & Other Surface Waters	Wildlife	Threatened & Endangered Species *	Fisheries, Aquatic Resources, & Water Quality	Essential Fish Habitat	Cultural Resources*	Recreational Resources	Aesthetics	Air Quality	Noise	HTRW*	Prime & Unique Farmland	Socioeconomics/ Land Use, Environmental Justice, Transportation, Navigation & Commercial Fisheries
	Bayou Sauvage Marsh Restoration	X	X		X	X		X						
Refuge Protected Side BLH-Wet	**Bayou Sauvage Refuge BLH-Wet and Intermediate Marsh Restoration**	X	X		X	X		X			X			
Refuge Flood Side BLH-Wet	**Fritchie Refuge BLH-Wet Enhancement**		X								X		X	

*** Project design and construction methods would avoid adverse impacts**

Constructible Features														
		Wetlands & Other Surface Waters	Wildlife	Threatened & Endangered Species*	Fisheries, Aquatic Resources, & Water Quality	Essential Fish Habitat	Cultural Resources*	Recreational Resources	Aesthetics	Air Quality	Noise	HTRW*	Prime & Unique Farmland	Socioeconomics/ Land Use, Environmental Justice, Transportation, Navigation & Commercial Fisheries
Non-Refuge BLH-Dry/ Non-Refuge BLH-Wet	General Mitigation Bank													
	Bonnet Carré BLH-Dry and BLH-Wet Restoration	X	X		X	X		X						
Non-Refuge Swamp	General Mitigation Bank													
	Bonnet Carré Swamp Restoration	X	X		X	X		X						

*** Project design and construction methods would avoid adverse impacts**

4.2.1.1.2 Caernarvon Marsh Restoration Project

Direct Impacts

Approximately 570 acres of open water habitat containing SAVs would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open water habitat in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

4.2.1.1.3 Fritchie Marsh Restoration Project

Direct Impacts

Approximately 325 acres of open water habitat containing SAVs would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open water habitat in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

4.2.1.1.4 Big Branch Marsh Restoration Project

Direct Impacts

Approximately 300 acres of open water habitat containing SAVs would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open

water habitat in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

4.2.1.1.5 LaBranche Marsh Restoration Project

Direct Impacts

Approximately 320 acres of open water would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open water habitat containing SAVs in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

4.2.1.1.6 Milton Island Marsh Restoration Project (TSMP)

Direct Impacts

Approximately 275 acres of open water would be converted to intermediate emergent marsh. The impact to SAVs would be mitigated as intermediate marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of intermediate 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 open water habitat containing SAVs in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin.

4.2.1.2 Wildlife

4.2.1.2.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

Approximately 280 acres of shallow open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.1.2.2 Caernarvon Marsh Restoration Project

Direct Impacts

Approximately 570 acres of open water habitat would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. Many species utilizing the current habitat type would thrive with the additional foraging, cover and resting habitat the project would create.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.1.2.3 Fritchie Marsh Restoration Project

Direct Impacts

Approximately 325 acres of open water habitat would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.1.2.4 Big Branch Marsh Restoration Project

Direct Impacts

Approximately 300 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins. As such, construction of the project should not result in entrapment of this species within the marsh creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.1.2.5 LaBranche Marsh Restoration Project

Direct Impacts

Approximately 320 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.1.2.6 Milton Island Marsh Restoration Project (TSMP)

Direct Impacts

Approximately 275 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. Many species utilizing the current habitat type would thrive with the additional foraging, cover and resting habitat the project would create. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Cumulative Impacts

This project would prevent an overall loss in the basin of intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

<u>4.2.1.3 Threatened and Endangered Species</u>

4.2.1.3.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period (approximately 1-2 months), the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Approximately 125 acres of Gulf sturgeon critical habitat would be deepened to obtain the borrow necessary for project construction. Depth of excavation (-10 ft) is not anticipated to result in exposure of a different substrate and re-colonization of benthic species Gulf sturgeon prey upon is anticipated within a couple growing seasons. No migratory pathways would be blocked by the proposed borrow activities.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of a 403,200 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim. As such, no impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor impacts to water quality and benthic species from construction of the project.

Cumulative Impacts

Potential cumulative impacts to the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Bayou Des Mats project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the size of the designated Gulf sturgeon critical habitat in Lake Pontchartrain (approximately half of the lake), the relatively small size of the borrow area (125 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging (approximately 1-2 months), and the ability of these species to avoid the project area during the construction period, the Bayou Des Mats project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.1.3.2 Caernarvon Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No direct impacts to Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The Kemp's ridley, loggerhead, and green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

Dredging in Lake Lery for borrow would occur via hydraulic cutterhead dredge. Entrainment of sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to sea turtles are anticipated.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of a 5,000 acre estuarine/brackish lake. As such, no impacts to sea turtles are anticipated from temporary minor impacts to water quality.

Cumulative Impacts

Potential cumulative impacts to the threatened or endangered species (sea turtles) that could occur in the vicinity of the project area from construction of the Caernarvon project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Lery (5,000 acres), the relatively small size of the borrow area (290 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Caernarvon project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.1.3.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those described for the Bayou Des Mats project. The borrow site for this project is approximately125 acres.

4.2.1.3.4 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those described for the Bayou Des Mats project. The borrow site for this project is approximately103 acres.

4.2.1.3.5 LaBranche Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those described for the Bayou Des Mats project. The borrow site for this project is approximately160 acres. No critical habitat would be impacted from implementation of this alternative.

4.2.1.3.6 Milton Island Marsh Restoration Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those described for the Bayou Des Mats project. The borrow site for this project is approximately100 acres. No critical habitat would be impacted from implementation of this alternative.

4.2.1.4 Fisheries, Aquatic Resources and Water Quality

4.2.1.4.1 Bayou Des Mats Marsh Restoration Project

Direct and Indirect Impacts

Approximately 280 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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 subsegment, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.4.2 Caernarvon Marsh Restoration Project

Approximately 570 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Lery from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.4.3 Fritchie Marsh Restoration Project

Direct and Indirect Impacts

Approximately 325 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and

impact filter feeders, but this impact is expected to cease and benthic species 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. The limited water impacts in the fill area would not add to the water quality impairment of this subsegment because it would not contribute fecal coliform to the adjacent waterbodies.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.4.4 Big Branch Marsh Restoration Project

Direct and Indirect Impacts

Approximately 300 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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 not add to the water quality impairment of this subsegment because it would not contribute benzo(a)pyrene to the adjacent waterbodies.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have

the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.4.5 LaBranche Marsh Restoration Project

Direct and Indirect Impacts

Approximately 320 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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. The water quality impacts in the fill area would temporarily add to the water quality impairment of this subsegment through increased turbidity, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.4.5 Milton Island Marsh Restoration Project (TSMP)

Direct and Indirect Impacts

Approximately 275 acres of open water and mud substrate would be replaced with intermediate marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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. The water quality impacts in the fill area would temporarily add to the water quality impairment of this subsegment through increased turbidity, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.1.5 Essential Fish Habitat

4.2.1.5.1 Bayou Des Mats Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate and SAV would be permanently replaced with estuarine emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp, and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.5.2 Caernarvon Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate and SAV would be permanently replaced with estuarine emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created

marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Lery would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.5.3 Fritchie Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate and SAV would be permanently replaced with estuarine emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp, and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.5.4 Big Branch Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate, SAV would be permanently replaced with emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate,

which could impact postlarval and juvenile brown shrimp, white shrimp, and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.5.5 LaBranche Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate and SAV would be permanently replaced with estuarine emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.5.6 Milton Island Marsh Restoration Project (TSMP)

Direct and Indirect Impacts

Estuarine water column, mud substrate and SAV would be permanently replaced with estuarine emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

4.2.1.6 Cultural Resources

4.2.1.6.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.6.2 Caernarvon Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.6.3 Fritchie Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.6.4 Big Branch Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance,

would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.6.5 LaBranche Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.6.6 Milton Island Marsh Restoration Project (TSMP)

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated

with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.1.7 Recreational Resources

4.2.1.7.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

Conversion of open water to marsh improves fishery habitat by providing additional foraging, spawning, nursery and cover habitat, increasing the opportunity for recreational fishing at the site and in adjacent waters. Once the project is complete, duck hunting could improve as marsh habitat replaces open water thereby providing an attractive feeding habitat for waterfowl. Public-use could improve at the Bayou Des Mats site if the state chooses to manage the area for recreational activities.

Borrow material needed for marsh restoration will come from Lake Pontchartrain via a floating pipeline. Impacts associated with excavation of borrow material from the lake are expected to be minimal and consist of a disruption in fishing in the immediate vicinity due to increases in turbidity and to boaters from the floating pipeline. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

Improved marsh habitat could provide waterfowl a better feeding ground that could attract larger numbers to the general area. Cumulative impacts include improved fish and wildlife habitat that would increase use of the area by desirable species which would consequently provide a better recreational experience.

4.2.1.7.2 Caernarvon Marsh Restoration Project

Direct Impacts

The project would improve 570 acres of habitat for hunting. Once the project is complete, duck hunting could improve as marsh habitat replaces open water providing an attractive feeding area for waterfowl. The marsh restoration would provide additional foraging, spawning, nursery and cover habitat for fish species, improving fishing opportunities while also attracting waterfowl to the surrounding environs.

Borrow material needed for marsh restoration will come from Lake Lery via a floating pipeline. Impacts associated with excavation of the borrow material from the Lake include a minimal disruption in fishing due to increases in turbidity and to boaters from the floating pipeline. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

Improved habitat for wildlife and fisheries should attract more species to the vicinity of the project area. Cumulatively, recreation opportunities should improve once all of the LPV mitigation sites are nourished or restored.

4.2.1.7.3 Fritchie Marsh Restoration Project

Direct Impacts

Once the marsh restoration is complete, a more productive fishery habitat could produce more public fishing and hunting opportunities at the site if the new land owner, the State, manages the site for recreational activities. Short-term impacts include disruption of fishing and hunting activities from the dredging and placement activities in the borrow site in Lake Pontchartrain and in the receiving areas. Additionally, boaters may have to bypass the floating pipeline that will be used to convey the dredge material from the borrow site 2,800 ft off of the shore, to the marsh restoration site.

Indirect and Cumulative Impacts

Fish and wildlife in adjacent waters should benefit from an improved habitat resulting from the intermediate marsh restoration. Cumulative impacts include better recreational fishing and hunting opportunities in the LPV basin as marsh and swamp are restored at the other LPV mitigation sites.

4.2.1.7.4 Big Branch Marsh Restoration Project

Direct Impacts

After the marsh restoration is complete, 298 acres of improved marsh habitat could improve recreational opportunities since the marsh restoration would provide additional foraging, spawning, nursery and cover habitat for fish species and grasses and nutrients attracting waterfowl.

The primary borrow site for materials used to restore the marsh will be piped in from a site just offshore in Lake Pontchartrain. Direct, temporary impacts to recreational fishing from dredging may occur in the immediate vicinity due to increases in turbidity and from the placement of the material in the receiving area. Additionally, the floating pipeline may cause a temporary inconvenience to boaters.

Indirect and Cumulative Impacts

Indirect impacts would be minimal and include temporary disruption of recreational fishing and hunting in nearby waters from the dredging and placement of the material used for restoration. Cumulative impacts are positive; as more areas are restored including the CWPPRA project to restore wetlands adjacent to the marsh site in Big Branch, recreational opportunities will improve.

4.2.1.7.5 LaBranche Marsh Restoration Project

Direct Impacts

Once the site is restored, recreational fishing and hunting opportunities could improve as the marsh restoration project produces a higher quality habitat attracting waterfowl and an improved foraging, spawning, nursery and foraging habitat for fish species.

The primary and secondary borrow sites are located just offshore from the proposed project in Lake Pontchartrain. Recreational fishing could be temporarily impacted due to dredging for material to place at the marsh restoration site. The floating pipeline used to convey the material will affect boaters, however the length of the pipeline will only cause minimal inconveniences. Fishing in the borrow area should return to normal once dredging activities are completed. Additionally, fishing and hunting at the marsh restoration site at LaBranch will also be temporarily disrupted during placement of the dredge material.

Indirect and Cumulative Impacts

Adjacent waters to the borrow areas in the Lake may be impacted by an increase in turbidity caused by dredging activities. Additionally, areas adjacent to the marsh restoration site could also be minimally temporarily impacted from placement of the dredge material. Recreational opportunities should improve in Lake Pontchartrain once all of the LPV mitigation sites are

restored as these areas will provide valuable habitat to both fish and wildlife using the lake and surrounding marshes.

4.2.1.7.6 Milton Island Marsh Restoration Project (TSMP)

Direct Impacts

The 272 acre intermediate marsh restoration project would improve the fishery and waterfowl habitat in the area which could attract more fish, ducks and wildlife as the site develops over time. Positive benefits would accrue to recreational fishing and hunting at this site and in nearby waters.

Temporary, direct impacts to recreational fishing could occur at the borrow site in Lake Pontchartrain from dredging activities and increases in turbidity. Similar affects could be seen at the marsh restoration site; as material is pumped in, turbidity would temporarily increase.

Indirect and Cumulative Impacts

Adjacent waters to the borrow site and receiving areas may be impacted by increased turbidity caused by dredging and placement activities. Recreational opportunities should improve in Lake Pontchartrain once all of the LPV mitigation sites are restored as these areas will provide valuable habitat to both fisheries and wildlife using the Lake and surrounding marshes.

4.2.1.8 Aesthetic Resources

4.2.1.8.1 Bayou Des Mats Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the Bayou Des Mats site is visually inaccessible and has no significant visual attributes.

4.2.1.8.2 Caernarvon Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the Caernarvon site is visually inaccessible and has no significant visual attributes.

4.2.1.8.3 Fritchie Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the Fritchie site has no significant visual attributes.

4.2.1.8.4 Big Branch Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the Big Branch site has no significant visual attributes.

4.2.1.8.5 LaBranche Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the LaBranche site is visually inaccessible and has no significant visual attributes.

4.2.1.8.6 Milton Island Marsh Restoration Project (TSMP)

Direct, Indirect and Cumulative Impacts

No impacts would be expected as the Milton Island site has no significant visual attributes.

4.2.1.9 Air Quality

4.2.1.9.1 Bayou Des Mats Marsh Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, tender boats, marsh buggies, etc. and from vehicles used to access the project area. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal, especially considering that

placement of dredged material would not create fugitive dust. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.1.9.2 Caernarvon Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.9.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.9.4 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.9.5 LaBranche Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.9.6 Milton Island Marsh Restoration Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.10 Noise

4.2.1.10.1 Bayou Des Mats Marsh Restoration Project

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats

should be largely undisturbed by the additional noise from this project's construction. No impact to human populations is anticipated as this project area is remote and uninhabited.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is remote, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.1.10.2 Caernarvon Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.10.3 Fritchie Marsh Restoration Project

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. No impact to human populations is anticipated as noise levels would quickly drop off due to the vegetative buffer along the road.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is buffered by vegetation, and avoidance of the project area would occur due to the movement of machinery in the area even without the additional noise.

4.2.1.10.4 Big Branch Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.10.5 LaBranche Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

Impacts would be similar to the Bayou Des Mats intermediate marsh restoration project.

4.2.1.10.6 Milton Island Marsh Restoration Project (TSMP)

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. Residences could experience higher than ambient noise levels during construction, however these levels would be temporary during the period of construction and would be limited to daylight hours.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary during the period of construction, restricted to daylight hours and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.1.11 Hazardous, Toxic, and Radioactive Waste

4.2.1.11.1 Bayou Des Mats Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.11.2 Caernarvon Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.11.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.11.4 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.11.5 LaBranche Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.11.6 Milton Island Marsh Restoration Project (TSMP)

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.1.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.1.12.1 Bayou Des Mats Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Bayou Des Mats marsh restoration project and therefore impacts to population or housing are not expected to occur. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. No impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation during project construction from heavy vehicle traffic in the vicinity of the restoration site. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the project site.

The nearest navigable waterway to the Bayou Des Mats project is Lake Pontchartrain. There would be no direct impacts to navigation from implementation of the Bayou Des Mats project. Potential indirect impacts to navigation would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Bayou Des Mats project due to borrow dredging. Indirect impacts would be a result of increased silt disruption around the adjacent LPV

area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake. Positive indirect impacts from Bayou Des Mats intermediate marsh restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain (403,200 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Bayou Des Mats project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

4.2.1.12.2 Caernarvon Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Caernarvon marsh restoration project and therefore no impacts to population or housing are expected to occur. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Caernarvon project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site

that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Lery and all construction activities would be within the project site.

The nearest navigable waterways to the Caernarvon project are the Mississippi River and Big Mar Lake. There would be no direct and only a potential of indirect impacts to navigation from implementation of the Caernarvon project. The project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Caernarvon project due to borrow dredging in nearby Lake Lery. Indirect impacts would be a result of increased silt disruption in the vicinity of the borrow area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 5,000 acre lake. Positive indirect impacts from the Caernarvon intermediate marsh restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Lery (5,000 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Caernarvon project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

4.2.1.12.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the Fritchie intermediate marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.1.12.4 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the Big Branch intermediate marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.1.12.5 LaBranche Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the La Branche intermediate marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.1.12.6 Milton Island Marsh Restoration Project (TSMP)

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there is a subdivision near the boundaries of the Milton marsh restoration project, but not within the project area. There may be some noise disruption to the subdivision as a result of the increased construction activity, but this disturbance would be temporary during the period of construction and would be limited to daylight hours. There are no anticipated impacts to population, housing, or minority or low-income areas from construction of the project other than the aforementioned noise. As this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Milton project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the project site.

The nearest navigable waterway to the Milton project is Lake Pontchartrain. There would be no direct impact to navigation from implementation of the Milton project. Potential indirect impacts would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from

implementation of the Milton project due to borrow dredging. Indirect impacts would be a result of increased silt disruption around the adjacent LPV area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake. Positive indirect impacts from Milton Island intermediate marsh restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain (403,200 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Milton Island project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

4.2.2 MITIGATION FOR IMPACTS TO NON-REFUGE/REFUGE BRACKISH MARSH

4.2.2.1 Wetlands and other Surface Waters

4.2.2.1.1 Big Branch Marsh Restoration Project

Direct Impacts

Approximately 255 acres of open water habitat containing SAVs would be converted to brackish emergent marsh. The impact to SAVs would be mitigated as brackish marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of 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 open water habitat in the LPV basin, but this habitat would remain prevalent throughout the basin.

4.2.2.1.2 Golden Triangle Marsh Restoration Project

Direct Impacts

Approximately 253 acres of open water habitat would be converted to brackish emergent marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of 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 open water habitat in the LPV basin, but this habitat would remain prevalent throughout the basin.

4.2.2.1.3 Fritchie Marsh Restoration Project

Direct Impacts

Approximately 280 acres of open water habitat containing SAVs would be converted to brackish emergent marsh. The impact to SAVs would be mitigated as brackish marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of 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 open water habitat in the LPV basin, but this habitat would remain prevalent throughout the basin.

4.2.2.1.4 Bayou Sauvage Marsh Restoration Project

Direct Impacts

Approximately 259 acres of open water habitat containing SAVs would be converted to brackish emergent marsh. The impact to SAVs would be mitigated as brackish marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of 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 open water habitat in the LPV basin, but this habitat would remain prevalent throughout the basin.

4.2.2.2 Wildlife

4.2.2.2.1 Big Branch Marsh Restoration Project

Direct Impacts

Approximately 255 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds and raptors (LCWCRTF and WCRA, 1999) as well as muskrat, raccoon and river otter. The loss of this open water habitat would not be expected to adversely affect species that utilize this habitat currently as there is ample open water habitat in the basin. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins. As such, construction of the project should not result in entrapment of this species within the marsh creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of brackish marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.2.2.2 Golden Triangle Marsh Restoration Project

Direct Impacts

Approximately 253 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds and raptors (LCWCRTF and WCRA, 1999) as well as muskrat, raccoon and river otter. The loss of this open water habitat would not be expected to adversely affect species that utilize this habitat currently as there is ample open water habitat in the basin. The

project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins. As such, construction of the project should not result in entrapment of this species within the marsh creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 area would be free to relocate during construction since the borrow area encompasses only a small section of a 162,505 acre estuarine/brackish lake.

Cumulative Impacts

This project would prevent an overall loss in the basin of brackish marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open waer.

4.2.2.2.3 Fritchie Marsh Restoration Project

Direct Impacts

Approximately 280 acres of open water would be converted to intermediate emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds and raptors (LCWCRTF and WCRA, 1999) as well as muskrat, raccoon and river otter. The loss of this open water habitat would not be expected to adversely affect species that utilize this habitat currently as there is ample open water habitat in the basin. The project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 creation site.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of brackish marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.2.2.4 Bayou Sauvage Marsh Restoration Project

Direct Impacts

Approximately 259 acres of open water would be converted to brackish emergent marsh. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds and raptors (LCWCRTF and WCRA, 1999) as well as nutria, muskrat, raccoon and river otter. The loss of this open water habitat would not be expected to adversely affect species that utilize this habitat currently as there is ample open water habitat in the basin. Bottlenose dolphins could utilize part of the project area, but with the utilization of the measures for reducing entrapment found in section 3.2.2.2.5, no impacts to this species are anticipated

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of brackish marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.2.3 Threatened and Endangered Species

4.2.2.3.1 Big Branch Marsh Restoration Project

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Approximately 103 acres of Gulf sturgeon critical habitat would be deepened to obtain the borrow necessary for project construction. Depth of excavation (-10 ft) is not anticipated to result in exposure of a different substrate and re-colonization of benthic species Gulf sturgeon prey upon is anticipated within a couple growing seasons. No migratory pathways would be blocked by the proposed borrow activities.

Indirect Impacts

Indirect impacts on endangered or threatened species are effects that could occur later in time but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced from the movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of a 403,200 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim. As such, no impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor impacts to water quality and benthic species from construction of the project.

Cumulative Impacts

Potential cumulative impacts to threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the size of the designated Gulf sturgeon critical habitat in Lake Pontchartrain (approximately half of the lake), the relatively small size of the borrow area (103 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Big Branch project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.2.3.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts to threatened and endangered species would be similar to those described for the Big Branch project. The borrow site for this project deepen approximately 165 acres of a 162,505 acre lake.

4.2.2.3.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts to threatened and endangered species would be similar to those described for the Big Branch project. The borrow site for this project is approximately125 acres.

4.2.2.3.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts to threatened and endangered species would be similar to those described for the Big Branch project. The borrow site for this project is approximately150 acres.

4.2.2.4 Fisheries, Aquatic Resources, and Water Quality

4.2.2.4.1 Big Branch Marsh Restoration Project

Direct and Indirect Impacts

Approximately 255 acres of open water and mud substrate would be replaced with brackish marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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. Impacts to the fill area would not add to the water quality impairment of this subsegment because it would not contribute benzo(a)pyrene to the adjacent waterbodies.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.2.4.2 Golden Triangle Marsh Restoration Project

Direct and Indirect Impacts

Approximately 253 acres of open water and mud substrate would be replaced with brackish marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Borgne from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.2.4.3 Fritchie Marsh Restoration Project

Direct and Indirect Impacts

Approximately 280 acres of open water and mud substrate would be replaced with brackish marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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. The limited impacts to the fill area would not add to the water quality impairment of this subsegment because it would not contribute fecal coliform to the adjacent waterbodies.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.2.4.4 Bayou Sauvage Marsh Restoration Project

Direct and Indirect Impacts

Approximately 259 acres of open water and mud substrate would be replaced with brackish marsh, increasing spawning, nursery, forage and cover habitat for fisheries resources. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.2.5 Essential Fish Habitat

4.2.2.5.1 Big Branch Marsh Restoration Project

Direct and Indirect Impacts

Estuarine water column, mud substrate, SAV would be permanently replaced with emergent marsh. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp, and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum..

Cumulative Impacts

This project would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed project is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species in the borrow site are not anticipated to result in significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat. The borrow area will continue to be categorized as EFH after construction, just at a different depth.

4.2.2.5.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those incurred by the Big Branch brackish marsh restoration project.

4.2.2.5.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those incurred by the Big Branch brackish marsh restoration project.

4.2.2.5.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to those incurred by the Big Branch brackish marsh restoration project.

4.2.2.6 Cultural Resources

4.2.2.6.1 Big Branch Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.2.6.2 Golden Triangle Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous

research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.2.6.3 Fritchie Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could

work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.2.6.4 Bayou Sauvage Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.2.7 Recreational Resources

4.2.2.7.1 Big Branch Marsh Restoration Project

Direct Impacts

After the marsh restoration is complete, fishing and duck hunting at the 255 acre site could improve since the restoration will provide additional foraging, spawning, nursery and cover habitat for fish species and grasses and nutrients attracting waterfowl.

The primary borrow site for dredge material used to restore the marsh will be piped in from a site just offshore in Lake Pontchartrain. Direct impacts from dredging may occur in the immediate vicinity due to increases in turbidity and from the placement of the material in the receiving area. Additionally, the floating pipeline may cause a temporary inconvenience to boaters traveling in the area.

Indirect and Cumulative Impacts

Indirect impacts are minimal and include temporary disruption of recreational fishing and hunting in adjacent waters from the dredging and placement of the material used for restoration. Cumulative impacts are positive; as more areas are restored including the CWPPRA project to restore wetlands adjacent to the marsh restoration site in Big Branch, recreational opportunities will improve.

4.2.2.7.2 Golden Triangle Marsh Restoration Project

Direct Impacts

Once the brackish marsh restoration is complete, hunting and fishing opportunities could increase due to improved foraging, spawning, nursery, forage and cover habitat. Temporary impacts to recreational fishing and hunting will occur from dredging of the borrow areas and placement of material into the receiving areas due to an increase in turbidity.

Indirect and Cumulative Impacts

Indirect impacts are minimal and include temporary disruption of recreational fishing and hunting in nearby areas from the dredging and placement of the material used for restoration. Cumulative impacts are positive; as more areas are restored, recreational opportunities will improve compared to the no action plan.

4.2.2.7.3 Fritchie Marsh Restoration Project

Direct Impacts

Once the brackish marsh restoration is complete, a more productive fishery habitat could produce more fishing and hunting opportunities if the State manages the site for recreational activities.

Short-term impacts include increases in turbidity which could result in poor fishing opportunities due to dredging activities at the borrow site in Lake Pontchartrain and from placement in the receiving areas. Additionally, boaters may have to bypass the floating pipeline that will be used to convey the dredge material from the borrow site 2,800 feet offshore to the marsh restoration site.

Indirect and Cumulative Impacts

Fishing and hunting in adjacent waters should improve from creation of an improved habitat. Cumulative impacts include better recreational fishing and hunting opportunities as marsh and swamp are restored at the other LPV sites.

4.2.2.7.4 Bayou Sauvage Marsh Restoration Project

Direct Impacts

Through the establishment of wet, brackish marsh, the 259 acre site could improve the fishery habitat and provide opportunities for fishing. Marsh could also benefit migratory birds by providing foraging habitat.

Temporary, direct impacts to recreational fishing may occur due to increases in turbidity from the dredging of borrow sites in Lake Borgne. Additionally, a 500 foot wide floating pipeline corridor in Lake Borgne that connects the borrow site to the restoration site will affect boaters in this part of the Lake and in the vicinity of Bayou Sauvage NWR.
Indirect and Cumulative Impacts

Indirect impacts to recreation associated with both borrow sites include temporary disruption of fishing from dredging activities, which should return to normal after the project is complete. Indirect impacts to the marsh restoration site include improved marsh habitat that could improve fishing in the surrounding open water area.

Cumulative impacts include better recreational fishing and birding opportunities in the basin as bottomland hardwoods and marsh are restored at the other LPV mitigation sites.

4.2.2.8 Aesthetic Resources

4.2.2.8.1 Big Branch Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impact as the Caernarvon site has no significant visual attributes.

4.2.2.8.2 Golden Triangle Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impact as the Golden Triangle site is visually inaccessible and has no significant visual attributes.

4.2.2.8.3 Fritchie Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impact as the Fritchie site has no significant visual attributes.

4.2.2.8.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impact as the Bayou Sauvage site has no significant visual attributes.

4.2.2.9 Air Quality

4.2.2.9.1 Big Branch Marsh Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, tender boats, marsh buggies, etc. and from vehicles used to access the project area. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal, especially considering the method

of construction for this project. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.2.9.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Big Branch brackish marsh restoration project.

4.2.2.9.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Big Branch brackish marsh restoration project.

4.2.2.9.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Big Branch brackish marsh restoration project.

4.2.2.10 Noise

4.2.2.10.1 Big Branch Marsh Restoration Project

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. No impacts to human populations are anticipated as this project area is remote and uninhabited.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is remote, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.2.10.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Big Branch brackish marsh restoration project.

4.2.2.10.3 Fritchie Marsh Restoration Project

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. No impacts to human populations are anticipated as this project area is remote and uninhabited.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is remote, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.2.10.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Big Branch brackish marsh restoration project.

4.2.2.11 Hazardous, Toxic, and Radioactive Waste

4.2.2.11.1 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts
No impacts anticipated.

4.2.2.11.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.2.11.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.2.11.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.2.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.2.12.1 Big Branch Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the Big Branch brackish marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.2.12.2 Golden Triangle Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Golden Triangle marsh restoration project and therefore no impacts to population or housing are expected to occur. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Golden Triangle project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Borgne and all construction activities would be within the project site.

The nearest navigable waterway to the Golden Triangle project is Lake Borgne. There would be no direct impacts to navigation from implementation of the Golden Triangle project. Potential

indirect impacts would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Golden Triangle project due to borrow dredging in Lake Borgne. Indirect impacts would be a result of increased silt disruption in the vicinity of the project area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 162,505 acre lake. Positive indirect impacts from the Golden Triangle brackish marsh restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Borgne (162,505 acres), the relatively small size of the borrow area, the temporary nature of the borrow activities and the duration of dredging, the Golden Triangle project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents.

4.2.2.12.3 Fritchie Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the Fritchie brackish marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.2.12.4 Bayou Sauvage Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct, Indirect and Cumulative impacts from the Bayou Sauvage brackish marsh restoration project would be similar to those described for the Bayou Des Mats intermediate marsh restoration project (see section 4.2.1.12.1).

4.2.3 MITIGATION FOR IMPACTS TO REFUGE PROTECTED SIDE BLH-WET INTERMEDIATE MARSH

4.2.3.1 Wetlands and other Surface Waters

4.2.3.1.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct Impacts

Approximately 355 acres of protected side open water habitat would be converted to BLH-Wet intermediate emergent marsh.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of BLH and intermediate 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 open water habitat in the LPV basin, but this habitat would remain prevalent throughout the basin.

4.2.3.2 Wildlife

4.2.3.2.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Approximately 355 acres of protected side open water would be converted to 110 acres of intermediate marsh and 245 acres of BLH-W habitat. This conversion would eliminate wintering habitat for brown pelican, and would increase habitat for wading birds, shorebirds and raptors (LCWCRTF and WCRA, 1999) as well as for a variety of species that utilize transition zones between habitat types including raccoon, bobcat, and fox.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin of refuge BLH-Wet and intermediate marsh habitat necessary for many wildlife species. 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 overall decline of wildlife species within the basin and would be beneficial both to preserve the species bio-diversity and combat the current trend of conversion of marsh to open water.

4.2.3.3 Threatened and Endangered Species

4.2.3.3.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. Manatee; Gulf sturgeon; and Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Borgne for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Approximately 300 acres of Gulf sturgeon critical habitat would be deepened to obtain the borrow necessary for project construction. Depth of excavation (-10 ft) is not anticipated to result in exposure of a different substrate and re-colonization of benthic species Gulf sturgeon prey upon is anticipated within a couple growing seasons. No migratory pathways would be blocked by the proposed borrow activities.

Indirect Impacts

Indirect impacts on endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those affects would be temporary and would be reduced from the movement of the tides. Any manatees, Gulf sturgeon or sea turtles in

the area would be free to relocate during construction since the project area encompasses only a small section of a 162,505 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Borgne in the interim. As such, no impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor impacts to water quality and benthic species from construction of the project.

Cumulative Impacts

Potential cumulative impacts the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Bayou Sauvage project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Borgne (162,505 acres), the size of the designated Gulf sturgeon critical habitat in Lake Borgne (all 162,505 acres), the relatively small size of the borrow area (300 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Bayou Sauvage project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.3.4 Fisheries, Aquatic Resources and Water Quality

4.2.3.4.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct and Indirect Impacts

Approximately 355 acres of protected side open water would be converted to 110 acres of intermediate marsh and 245 acres of BLH-W habitat, reducing habitat for blue crab, largemouth bass and catfish in the portion of the project area being converted to BLH-W. These species may continue to use the 110 acres that is converted to intermediate marsh (LCWCRTF and WCRA, 1999). Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species 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. Turbidity impacts to the fill area would temporarily add to the water quality impairment of this hydrologic unit through increased turbidity which could cause localized dissolved oxygen depletion, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting marsh would provide a cumulative

benefit in the form of additional spawning, nursery, forage and cover habitat for important fish species in the LPV basin.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include marsh restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.3.5 Essential Fish Habitat

4.2.3.5.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

There is no EFH in the restoration area. Excavation of borrow from Lake Borgne would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp, and red drum. However, impacts to cover and foraging for EFH species in the borrow site are not anticipated to result in significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat. The borrow area will continue to be categorized as EFH after construction, just at a different depth.

4.2.3.6 Cultural Resources

4.2.3.6.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and

integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.3.7 Recreational Resources

4.2.3.7.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct Impacts

Through the establishment of wet, bottomland hardwoods, the 242 acre site could once again attract migratory birds providing excellent recreational birding opportunities as it once did. The 111 acres of intermediate marsh restoration could improve the fishery habitat and provide opportunities for fishing. Marsh could also benefit migratory birds by providing foraging habitat.

Temporary, direct impacts to recreational fishing may occur due to increases in turbidity from the dredging of borrow sites in Lake Borgne. Additionally, a 500 foot wide floating pipeline corridor in Lake Borgne that connects the borrow site to the restoration site will affect boaters in this part of the Lake and in this area of the Golden Triangle.

Indirect and Cumulative Impacts

Indirect impacts to recreation associated with both borrow sites include temporary disruption of fishing from dredging activities, which should return to normal after the project is complete. Indirect impacts to the marsh restoration site include improved marsh habitat that could improve fishing in the surrounding open water area.

Cumulative impacts include better recreational fishing and birding opportunities as bottomland hardwoods and marsh are restored at the other LPV mitigation sites.

4.2.3.8 Aesthetic Resources

4.2.3.8.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct, Indirect and Cumulative Impacts

No impact. The Bayou Sauvage site has no significant visual attributes.

4.2.3.9 Air Quality

4.2.3.9.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, back hoe, etc and from vehicles used to access the project area. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.3.10 Noise

4.2.3.10.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct and Indirect Impacts

Cutterhead dredges, bulldozers, and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. The commercial facility could experience higher than ambient noise levels during construction,

however these levels would be temporary during the period of construction and would be limited to daylight hours

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary during the period of construction, restricted to daylight hours and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.3.11 Hazardous, Toxic, and Radioactive Waste

4.2.3.11.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.3.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.3.12.1 Bayou Sauvage Refuge BLH-W and Intermediate Marsh Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Bayou Sauvage marsh restoration project and therefore no impacts to population or housing are expected to occur. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Bayou Sauvage project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Borgne and all construction activities would be within the project site.

The nearest navigable waterway to the Bayou Sauvage project is the GIWW and Lake Borgne. Since the dredge disposal pipeline would be submerged on the substrate of the GIWW, there would be no direct impact to navigation from implementation of the Bayou Sauvage project. Potential indirect impacts to navigation would be minimal in Lake Borgne as the project area could be avoided with minor course corrections. There would be no direct impact to commercial

fisheries from implementation of the Bayou Sauvage project due to borrow dredging. Potential indirect impacts would be a result of increased silt disruption in the vicinity of the project area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 162,505 acre lake.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Borgne (162,505 acres), the relatively small size of the borrow area, the temporary nature of the borrow activities and the duration of dredging, the Bayou Sauvage project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents.

4.2.4 MITIGATION FOR IMPACTS TO REFUGE FLOOD SIDE BLH-WET

4.2.4.1 Wetlands and other Surface Waters

4.2.4.1.1 Fritchie Refuge BLH-W Enhancement Project

Direct Impacts

Approximately 51 acres of existing early successional BLH-Wet and invasive species would be replaced with high quality BLH-Wet species.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of refuge BLH habitat. The proposed project would increase the overall quantity and quality of BLH forests within the system.

4.2.4.2 Wildlife

4.2.4.2.1 Fritchie Refuge BLH-W Enhancement Project

Direct Impacts

Approximately 51 acres of existing early successional BLH-Wet and invasive species would be replaced with high quality BLH-Wet species. Some more immobile wildlife species (e.g. salamanders, frogs, turtles, mice) may experience demise during construction.

Indirect Impacts

Species that utilize the current low quality habitat may be forced into adjacent habitat during project construction. Competition with resident species may occur. However, these impacts would be temporary. Species utilizing the current habitat type would thrive with the improved foraging, cover and resting habitat the project would create.

Cumulative Impacts

This project would prevent an overall loss in the basin of FS refuge BLH-Wet habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the LPV basin, would help retard the loss of wetlands and overall decline of wildlife species within the basin.

4.2.4.3 Threatened and Endangered Species

4.2.4.3.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect, and Cumulative Impacts

Construction of this project requires no borrow and would not impact open water. As such, no impacts to threatened and endangered species or any designated critical habitat are anticipated with construction of this project.

4.2.4.4 Fisheries, Aquatic Resources and Water Quality

4.2.4.4.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect, and Cumulative Impacts

No impacts are anticipated as this site is existing low quality bottomland hardwood habitat and does not currently contain fisheries or aquatic resources. No impacts to water quality are anticipated with project construction that would not be temporary and minimized via best management practices (BMPs).

4.2.4.5 Essential Fish Habitat

4.2.4.5.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect, and Cumulative Impacts

No impacts to EFH are anticipated.

4.2.4.6 Cultural Resources

4.2.4.6.1 Fritchie Refuge BLH-W Enhancement Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.4.7 Recreational Resources

4.2.4.7.1 Fritchie Refuge BLH-W Enhancement Project

Direct Impacts

The privately-owned, 324 acre Fritchie BLH-W project sites could become public-use lands if the mitigation areas are brought into the Big Branch National Wildlife Refuge boundaries, which are nearby. The refuge could manage the site for improved hunting opportunities or other recreational activities as yet undetermined once the BLH-W are enhanced.

Indirect and Cumulative Impacts

Improved BLH-W habitat should attract migratory birds and other wildlife to nearby areas, thereby improving recreational opportunities. Cumulative impacts are positive; as more areas are restored, recreational opportunities will improve compared to the no action plan.

4.2.4.8 Aesthetic Resources

4.2.4.8.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect and Cumulative Impacts

No impact as the Fritchie site has no significant visual attributes.

4.2.4.9 Air Quality

4.2.4.9.1 Fritchie Refuge BLH-W Enhancement Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include 1) exhaust emissions from operations of various types of non-road construction equipment such as a hydro axe, skidder, ATV etc. and 2) fugitive dust due to earth disturbance. Emission of fugitive dust near the construction area is not anticipated to be a problem as the site is small and remote, and the majority of the work is anticipated to be completed by hand.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.4.10 Noise

4.2.4.10.1 Fritchie Refuge BLH-W Enhancement Project

Direct and Indirect Impacts

A hydro ax and ATVs would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. No impacts to nearby subdivision residents or human populations are anticipated as noise levels would quickly drop off due to the vegetative buffer along the road.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is buffered by vegetation, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.4.11 Hazardous, Toxic, and Radioactive Waste

4.2.4.11.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect, and Cumulative Impacts

No RECs were found within or near the proposed Fritchie Refuge BLH-Wet Enhancement mitigation area. There are no pipelines crossing the proposed mitigation area. No wells or wastepits have been identified. There would be a low probability of encountering HTRW or petroleum products in the proposed mitigation area.

4.2.4.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.4.12.1 Fritchie Refuge BLH-W Enhancement Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Fritchie BLH enhancement project and therefore no impacts to population, housing, or minority or low-income populations are expected to occur. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural land to be converted. Approximately 51 acres of existing early successional BLH-Wet species would be replaced with high quality BLH-Wet species.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Fritchie project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that only minor additional transportation impacts would occur until the project construction is complete.

The nearest navigable waterway to the Fritchie project is Lake Pontchartrain. There would be no direct, indirect, or cumulative impacts to navigation or commercial fisheries from implementation of the Fritchie project since borrow from the lake is not necessary for project construction nor is any part of the construction occurring in the water.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Impacts from restoration projects can temporarily disrupt transportation. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents.

4.2.4.13 Prime and Unique Farmlands

4.2.4.13.1 Fritchie Refuge BLH-W Enhancement Project

Direct and Indirect Impacts

Approximately 51 acres of Abita silt loam, 0 to 2 percent slopes, classified as Prime Farmland (NRCS, 2011) would be impacted by this project. Once the site is developed for mitigation, this area could not be used as productive farmland in the future. However, the project area is not currently being farmed and is heavily forested with invasive species (Chinese tallow trees).

Cumulative Impacts

There are 15,463.7 acres of Abita silt loam in St. Tammany parish. The project would result in 51 acres of Abita silt loam, which is less than .3% of the Abita silt loam currently found in St. Tammany parish, being removed from future potential agricultural development. Since the project area is presently not being farmed, current agricultural production in the parish would not be affected. Though the project area could potentially be developed for agricultural purposes in the future, implementation of a project that affects such a small amount of prime farmland would have negligible effect on agricultural production in the parish.

4.2.5 MITIGATION FOR IMPACTS TO NON-REFUGE BLH-DRY AND NON-REFUGE BLH-WET

4.2.5.1 Wetlands And Other Surface Waters

4.2.5.1.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

As the proposed action, the CEMVN would purchase sufficient BLH-Wet credits from a bank within the LPV basin to mitigate 93.85 AAHUs. The particular bank to be utilized is unknown at this time. Since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to wetlands and other surface waters would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.1.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Approximately 110 acres of shallow open water and early successional wetland plant species would be replaced with high quality BLH-Dry and BLH-Wet species.

Indirect Impacts

As a result of borrow placement and the type of containment utilized for this project, land adjacent to the mitigation project may receive material suspended in the dredge effluent. This would nourish adjacent forested habitat and may cause adjacent shallow open water to become shallower or be filled; encouraging the existing habitat to move through early successional phases faster.

Cumulative Impacts

This project would prevent an overall loss in the basin to BLH from construction of the HSDRRS system. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.5.1.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Approximately 110 acres of agricultural fields would be planted with high quality BLH-Dry and BLH-Wet species.

Indirect and Cumulative Impacts

This project would prevent an overall loss in the basin to BLH from construction of the HSDRRS system. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.5.1.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

Approximately 383 acres of existing early successional BLH-Wet, BLH-Dry and invasive species would be replaced with high quality BLH-Wet and BLH-Dry species. In addition, 44 acres of BLH-Wet would be created from open water.

Indirect and Cumulative Impacts

Implementation of this project would prevent an overall loss in the basin of BLH habitat. The proposed project would increase the overall quantity and quality of BLH forests within the system. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands within the

basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.5.2 Wildlife

4.2.5.2.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to wildlife would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.2.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Approximately 110 acres of shallow open water and early successional wetland plant species would be replaced with high quality BLH-Dry and BLH-Wet species. Some more immobile wildlife species (e.g. salamanders, frogs, turtles, mice) may experience demise during construction. Species that utilize early successional habitats such as low nesting wading birds (ex. yellow-crown night-heron), may be permanently displaced from the habitat conversion while other species would be temporarily displaced by construction activity. However, the creation of high quality habitat and a corridor for transient wildlife species, such as deer and bobcat, on either side of the proposed project greatly outweighs the loss of an early successional habitat type that exists in abundance throughout the basin. The current project area is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 restoration site.

Indirect Impacts

Species that utilize early successional habitats may be forced into nearby early successional habitat. Competition with resident species may occur. Since this type of habitat is abundant throughout the basin, indirect impacts from the habitat conversion would be minimal. Many species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create. Additionally, the new BLH habitat would attract new species to the project area such as raptors, resident and migrant birds, rabbit, squirrel and deer, and would improve habitat quality for nutria, muskrat, mink, otter, and raccoon (LCWCRTF and WCRA, 1999). 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin to BLH habitat necessary for many wildlife species. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species within the basin.

4.2.5.2.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Approximately 110 acres of agricultural fields would be replaced with high quality BLH-Dry and BLH-Wet species. Some more immobile wildlife species (e.g. mice, rats) may experience demise during construction. Species that utilize agricultural fields when crops are present, may be temporarily displaced during by construction activity. However, the creation of high quality BLH habitat and a permanent corridor for transient wildlife species, such as deer and bobcat, on either side of the proposed project greatly outweighs the loss of agricultural fields that are periodically used for crop production.

Indirect Impacts

Species that utilize early successional habitats may be forced into adjacent habitats. Competition with resident species may occur. Since early successional habitat is abundant throughout the basin, indirect impacts from the habitat conversion would be minimal. Many species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create. Additionally, the new BLH habitat would attract new species to the project area such as mink, resident and migrant birds, and squirrel as well as improve habitat quality for deer, red fox, gray fox, bobcat and raccoon.

Cumulative Impacts

This project would prevent an overall loss in the basin to BLH habitat necessary for many wildlife species. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species within the basin.

4.2.5.2.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

Approximately 383 acres of existing early successional BLH-Wet, BLH-Dry and invasive species would be replaced with high quality BLH-Wet and BLH-Dry species. In addition, 44 acres of BLH-Wet would be created from open water. Some more immobile wildlife species (e.g. salamanders, frogs, turtles, mice) may experience demise during construction. Species that utilize early successional habitat would be temporarily displaced by construction activity.

However, the creation of high quality habitat greatly outweighs the loss of an early successional habitat type that exists in abundance throughout the basin. The part of the current project area to be created from open water is not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is sufficient access 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 restoration part of the project.

Indirect Impacts

Species that utilize the current low quality habitat may be forced into adjacent habitat during project construction. Competition with resident species may occur. However, these impacts would be temporary. Species utilizing the current habitat type would thrive with the improved foraging, cover and resting habitat the project would create.

Cumulative Impacts

This project would prevent an overall loss in the basin of BLH habitat necessary for many wildlife species. This project, when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the LPV basin, would help retard the loss of wetlands and overall decline of wildlife species within the basin.

4.2.5.3 Threatened and Endangered Species

4.2.5.3.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to threatened and endangered species would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.3.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

No direct impacts to the West Indian Manatee, Gulf sturgeon or the Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of the Bonnet Carré project. The borrow pits within the spillway to be filled for BLH-Dry and BLH-Wet restoration are not of sufficient depth to be utilized by any of these species, nor is access such that it is likely that any of these species would find their way to these borrow pits. If for some reason any of these species were to find their way to these borrow pits the depth and resulting temperature extremes and low dissolved oxygen would either induce the species to move or result in their expiration.

The manatee; the Gulf sturgeon; the pallid sturgeon and the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the

project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. Dredging in the Mississippi River, if utilized for borrow, would occur via hydraulic cutterhead dredge. Entrainment of pallid sturgeon is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species.

As such, the CEMVN has made a 'no effect' determination for this project's impacts to manatee, Gulf sturgeon, pallid sturgeon and sea turtles.

Indirect Impacts

Indirect impacts on endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those affects would be temporary and would be reduced from the movement of the tides. Any manatees, Gulf sturgeon, pallid sturgeon or sea turtles in the area would be free to relocate during construction since the borrow area in Lake Pontchartrain (60 acres) encompasses only a small section of a 403,200 acre estuarine/brackish lake and the borrow area in the Mississippi River only impacts a small section on the east side of the Mississippi River. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, pallid sturgeon, and sea turtles to utilize throughout Lake Pontchartrain and the Mississippi River in the interim. As such, no indirect impacts to manatee, Gulf sturgeon, pallid sturgeon or sea turtles are anticipated.

Cumulative Impacts

Potential cumulative impacts to threatened or endangered species (manatee, Gulf sturgeon, pallid sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Bonnet Carré project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the size of the Mississippi River, the small size of the borrow area (60 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Bonnet Carré project would add very little and only temporary impacts to any other impacts

resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.5.3.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts to threatned or endangered species are anticipated.

4.2.5.3.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Approximately 25 acres of Gulf sturgeon critical habitat would be deepened to obtain the borrow necessary for project construction. Depth of excavation (-10 ft) is not anticipated to result in exposure of a different substrate and re-colonization of benthic species Gulf sturgeon prey upon is anticipated within a couple growing seasons. No migratory pathways would be blocked by the proposed borrow activities.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the project area encompasses only a

small section of a 403,200 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim. As such, no impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor impacts to water quality and benthic species from construction of the project.

Cumulative Impacts

Potential cumulative impacts to the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Fritchie project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the size of the designated Gulf sturgeon critical habitat in Lake Pontchartrain (approximately half of the lake), the relatively small size of the borrow area (25 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Fritchie project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.5.4 Fisheries, Aquatic Resources, and Water Quality

4.2.5.4.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to fisheries, aquatic resources or water quality would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.4.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct and Indirect Impacts

With implementation of this project, there would be some direct and indirect impacts to fisheries in the form of physically altered open water substrate habitat, and temporary increases in turbidity during construction activities. Approximately 110 acres of existing borrow pit ponds in the spillway would be converted to BLH-Dry and BLH-Wet habitat. Approximately 60 acres of lake water bottoms would be deepened by an average of 12 feet. It is anticipated that anoxic conditions would be avoided with this depth of dredging and that mobile fishery species would avoid the proposed borrow site during construction, thereby minimizing direct and indirect impacts to those species. Sediment particles suspended due to construction activities may impact filter feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high at the dredge site and adjacent to the placement site. Due to the lack of escape routes, most fish species in the placement area would be experience demise

during borrow material placement. There would also be direct impact to the benthic community due to burial and conversion from manmade ponds to BLH habitat. These species are commonly found throughout the basin in similar shallow water environments that exist in abundance. As such, impacts to the overall population of these species in the basin from the borrow placement is expected to be negligible. Direct impacts caused by increases in suspended sediments during placement of stabilization materials would be minimal, localized, and short-lived. Although construction of this project would fill approximately 110 acres of existing borrow pit ponds in the spill way, the Bonnet Carré is regularly mined for borrow material by the government and commercial interests. As such, similar shallow water ponds are regularly created via these operations that would provide similar habitat for the same species currently utilizing the mitigation site. 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. Impacts to the fill area would temporarily add to the water quality impairment of this subsegment through increased turbidity, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Though construction of this project would result in the loss of marginal fisheries habitat, some fish, and temporary impacts to water quality and benthic habitat; this habitat is abundant throughout the basin, impacts to existing fisheries are minimal, and water quality and benthic species would rebound once project construction is complete. As such, construction of this project would result in minimal loss to fisheries, aquatic resources, and water quality experienced in the basin from the past, present and reasonably foreseeable projects in the basin The reinstitution of BLH in areas that are currently manmade ponds in the spillway could provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus.

Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include wetlands restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.5.4.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect Impacts and Cumulative Impacts

No impacts are anticipated as this site is existing agricultural fields and does not currently contain fisheries or aquatic resources. No impacts to water quality are anticipated with project construction that would not be temporary and minimized via best management practices (BMPs).

4.2.5.4.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct and Indirect Impacts

Approximately 44 acres of open water and mud substrate would be replaced with BLH-wet, decreasing spawning, and nursery habitat for fisheries resources. During flood events some of the area may become accessible for forage and cover. The 25 acres borrow site in Lake Pontchartrain would be converted to deeper water, but is being designed to limit the possibility of anoxic conditions. There would be a temporary indirect impact to these resources during construction and mobile species would avoid the area. Non mobile species will be directly impacted by being buried at the placement site and killed or trans-located if found in the borrow site. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and filter feeders, but this impact is expected to cease once construction is complete. BMPs would be utilized to minimize the effects on water quality. The temporary impacts to Lake Pontchartrain from borrow excavation are not anticipated to be substantial enough to cause water quality impairment under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. The limited water quality impacts in the fill area would not add to the water quality impairment of this subsegment because it would not contribute fecal coliform to the adjacent waterbodies.

Cumulative Impacts

Although there would be a loss of open water from construction of this project, open water is found in abundance throughout the LPV basin. The resulting BLH-wet habitat would provide leaf litter and increase the lower trophic end of the food web providing a benefit to fisheries and aquatic resources. Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include wetlands restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.5.5 Essential Fish Habitat

4.2.5.5.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to EFH would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.5.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct and Indirect Impacts

With implementation of this project, there would some direct and indirect impacts to EFH (silt, silt sand, muddy sand, soft mud, and SAV), in the form of physically altered bottom substrates in the borrow site. Approximately 60 acres of estuarine water column in Lake Pontchartrain would be made deeper. However, with the periodic opening of the Bonnet Carré Spillway during flood stage levels in the Mississippi River, the borrow pit is expected to refill and return to pre-project conditions in the future. The borrow site used for the CWPPRA PO-17 project in the vicinity of the proposed borrow site has refilled with the periodic opening of the Bonnet Carré Spillway.

Cumulative Impacts

Although there would be impacts to EFH in Lake Ponchartrain from borrow dredging for this project, these impacts are expected to be minimal and reversed over time with the periodic opening of the Bonnet Carré Spillway. When added to the impacts of from the past, present and reasonably foreseeable projects in the basin, construction of this project results in a minimal addition of impacts to EFH in the basin.

4.2.5.5.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect Impacts and Cumulative Impacts

No EFH would be impacted from construction of this project.

4.2.5.5.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct and Indirect Impacts

There would be a small amount of long term direct impacts to EFH caused by this project at the placement site (44 acres) with the conversion of mud substrate, SAV, and estuarine water column to BLH habitat. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

The project is not expected to contribute significantly to overall EFH impacts in the basin from projects in the FWOP conditions due to the size of this project's permanent impacts (44 acres). If necessary, mitigation for direct impacts to EFH from construction of this project could be constructed so as to avoid adding to the overall cumulative impacts to EFH in the basin. Impacts to cover and foraging for EFH species in the borrow site are not anticipated to result in significant increases in cumulative impacts to EFH species experienced from the implementation

of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat. The borrow area will continue to be categorized as EFH after construction, just at a different depth.

4.2.5.6 Cultural Resources

4.2.5.6.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to cultural resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.6.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect would be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies would be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.5.6.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the State of LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.5.6.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the State of LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic

Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this alternative would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.5.7 Recreational Resources

4.2.5.7.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to recreational resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.7.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

The BLH-Dry and BLH-Wet restoration proposed for the Bonnet Carré Spillway would eliminate approximately 110 acres of scrub shrub interspersed with fishing/crawfishing/crabbing ponds, which are used seasonally by recreational fisherman. Once restored, 110 acres of hiking/birding and limited crawfishing would be available at the project site. However, other fishing/crawfishing/crabbing ponds are available at the Spillway.

Borrow material needed for creating the wet habitat would come from Lake Pontchartrain via an existing canal in the spillway. Impacts associated with excavation of the borrow material from the Lake are expected to be minimal and consist of disruption in fishing in the immediate vicinity due to increases in turbidity. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

There are no indirect recreational impacts associated with implementation of this project. Cumulative impacts from the loss of fishing areas are expected to be very minimal as there are many other lands and water available for recreational crawfishing and line fishing in the spillway and in the vicinity of the project. Additionally, other LPV mitigation sites would improve recreation opportunities by restoring habitat suitable for fish and wildlife.

4.2.5.7.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

Converting the land from an agricultural use to 111 acres of BLH-D and -W could attract more wildlife species which could, depending on how the State wishes to manage the site, provide recreational opportunities such as hunting or birding. Maurepas Swamp WMA Eastern Tract owned by LDWF is nearby and is part of a larger holding that extends well into St. John the Baptist.

Indirect and Cumulative Impacts

There are no indirect or cumulative impacts associated with implementation of this alternative.

4.2.5.7.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

Upon completion of the proposed project, land could continue to be used for recreational hunting or other recreational activities and could be open to the public-at-large; depending on how the new land owner (the State of Louisiana) would manage the site. Upon completion of the project, the enhancement and restoration of BLH acres would improve habitat and conditions for hunting or birding. Fishing in the 44 acres of open water would be lost since the site would be converted to BLH habitat which would lend itself to recreational hunting or birding.

Borrow material for the BLH wet restoration would be piped into the project sites from borrow areas in Lake Pontchartrain. Impacts to recreational resources, including fishing and boating, would occur in the Lake in the vicinity of dredging of the borrow material. Approximately 6 miles of floating pipeline might impact boaters as they traverse the Lake shoreline and interior marshes near the project site but these impacts would be short-term. The borrow sites are approximately 2,800 feet offshore.

Indirect and Cumulative Impacts

BLH-W and BLH–D enhancements and BLH-Wet restoration, which will increase the habitat quality in the project area, would enable the land to support an increased population size of the

wildlife species currently utilizing the area. Cumulative impacts of these improvements along with other LPV mitigation restoration projects in St. Tammany Parish and throughout the greater area will improve recreational resources, particularly fishing and hunting.

4.2.5.8 Aesthetic Resources

4.2.5.8.1 Mitigation Bank Project (TSMP)

Direct, Indirect and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to aesthetic resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.8.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

The Bonnet Carré Spillway's flood control structure would continue to periodically be operated to divert Mississippi River floodwaters into Lake Ponchartrain; the event would continue to attract thousands of visitors. Construction of this project would not alter operation of the spillway nor result in any direct, indirect or cumulative impacts to visual resources in the area.

4.2.5.8.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

No impact as the Frenier site has no significant visual attributes.

4.2.5.8.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

No impact as the Fritchie site has no significant visual attributes.

4.2.5.9 Air Quality

4.2.5.9.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new

direct, indirect or cumulative air quality impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.9.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected. These emissions could include 1) exhaust emissions from operations of material delivery/dump trucks and various types of non-road construction equipment such as loaders, excavators, dredges, etc. and 2) fugitive dust due to earth disturbance. The principal air quality concern associated with the proposed activities is emission of fugitive dust near demolition and construction areas. The on-road trucks and private autos used to access the work area would also contribute to construction phase air pollution in the project neighborhood when traveling along local roads.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Construction activities related to the proposed action would not occur all at once, but would occur in increments through the estimated construction period. Construction activities would be similar to those activities that regularly occur within the Bonnet Carré Spillway, namely borrow procurement, recreational, and spillway maintenance activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Construction activities would be similar to those activities that have occurred and are occuring within the Bonnet Carré, namely borrow procurement and spillway maintenance activities. Cumulative impacts to air quality in the project area due to this project in addition to the other construction activities within the area would be temporary and could be minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.5.9.3 Frenier BLH-Dry and BLH-Wet Restoration Project

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include 1) exhaust emissions from operations of various types of non-road construction equipment such as a bulldozer, backhoe, etc. and 2) fugitive dust due to earth disturbance. Emission of fugitive dust near the construction area is not anticipated to be a problem as the site is small and remote, and the majority of the work is anticipated to be completed by hand.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.5.9.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include 1) exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, hydro axe, skidder, ATV etc. and 2) fugitive dust due to earth disturbance. Emission of fugitive dust near the construction area is not anticipated to be a problem as the site is small and remote, and the majority of the work is anticipated to be completed by hand.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal. After the construction period,

there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.5.10 Noise

4.2.5.10.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, there would be no new direct, indirect or cumulative noise impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.10.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct and Indirect Impacts

Although construction of this project would temporarily exceed a DNL of 55 dBA, other projects within the spillway routinely exceed this noise level. Bulldozers (82 dBA) and backhoes (80 dBA) would be the primary pieces of equipment used for construction of this project. Recreational users would likely avoid these areas due to the construction activity. Open water areas in the vicinity of this project that may have been used for fishing are within the construction area. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent forests should be largely undisturbed by the additional noise from this project's construction. There are no residences or businesses in the project vicinity that could be disturbed by project construction.

Cumulative Impacts

The Bonnet Carré project area is remote and uninhabited. Noise generated from this project would insignificantly increase negative noise impacts associated with construction of the past, present or reasonably foreseeable projects. The same type of machinery would be used for construction of this project as is used for sand and clay mining that regularly occurs in the Bonnet Carré . The noise experienced by the use of one bulldozer at 82 dBA increases to 85 dBA with the use of an additional bulldozer. Similar increases are experienced with other machinery. As such, the additive noise associated with construction of the mitigation project would be minimal. Noise associated with construction of the project would occur in concert with other mining activities and is not anticipated to prolong noise exposure. Construction of this project would result in a site producing additional disturbance in the spillway however, construction activities would be temporary, avoidance of the project area would occur due to machinery movement in the area and noise levels would be buffered by adjacent vegetation.

4.2.5.10.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct and Indirect Impacts

Bulldozers and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is remote, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.5.10.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct and Indirect Impacts

A hydro ax and ATVs would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. Residences could experience higher than ambient noise levels during construction, however these levels would be temporary during the period of construction and would be limited to daylight hours.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary during the period of construction, restricted to daylight hours and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.5.11 Hazardous, Toxic, and Radioactive Waste

4.2.5.11.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect, or cumulative HTRW impacts to would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.5.11.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

None of the studies referenced in section 3.2.5.11.2 identified a high probability of encountering HTRW during the course of the mitigation projects being considered for the Bonnet Carré Spillway area. The areas proposed for mitigation are now borrow pits, from which material for levee repairs has been excavated in the recent past. They would be filled with material dredged from Lake Pontchartrain to restore swamp habitat. USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) for Civil Works Projects, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under CERCLA, or if they are a part of a National Priority List (NPL) site under CERCLA (NPL is also known as "Superfund"). None of the reaches proposed for dredging is included in the National Priority List or within the boundaries of a CERCLA site.

There is a very low probability that the proposed restoration of habitat within Bonnet Carré Spillway using material from Lake Pontchartrain would encounter HTRW or introduce toxic materials into the Bonnet Carré mitigation areas. The project may proceed without further investigation of HTRW. If the project location or methods change the probability of HTRW may need to be re-investigated.

4.2.5.11.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

There are several abandoned wells and waste pits within and near the proposed mitigation area; there would be a moderate probability of encountering substances of concern or petroleum products in the soil near these wells and pits. At this time, no excavation is planned around these sites. As such, no impacts are anticipated.

4.2.5.11.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.5.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.5.12.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to socioeconomics/land use, environmental justice, transportation, navigation and commercial fisheries would be incurred from the purchase of these credits for the HSDRRS mitigation. However, depending on the amount of BLH-Wet mitigation bank credits available in the basin at the time of credit purchase for the HSDRRS mitigation, use of mitigation bank credits to offset HSDRRS BLH-Dry and BLH-Wet impacts may significantly reduce the number of credits available to permittees to compensate for BLH impacts authorized by Department of the Army Section 10/404 permits. In the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate permittee responsible compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

4.2.5.12.2 Bonnet Carré BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Bonnet Carré BLH-Dry and BLH-Wet Restoration project and therefore no impacts to population, housing, or minority or low-income populations are expected to occur. Additionally, there are no commercial/industrial properties, public facilities, transportation infrastructure or commercial fishing within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur under this project. The proposed project does not require any acres of agricultural land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Bonnet Carré BLH-Dry and BLH-Wet Restoration project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the Bonnet Carré Spillway.

The nearest navigable waterway to the Bonnet Carré BLH-Dry and BLH-Wet Restoration project is Lake Pontchartrain. There is no direct impact to navigation from implementation of the Bonnet Carré BLH-Dry and BLH-Wet Restoration project. Potential indirect impacts could be avoided with minor course corrections. There would be no direct and only indirect impacts to commercial fisheries within the project area because commercial species are not found in significant quantity in the borrow pits that will be converted to BLH due to their shallow depth and resulting water quality extremes (temperature and dissolved oxygen). Minimal indirect impacts to commercial fisheries from implementation of the Bonnet Carré BLH-Dry and BLH-Wet Restoration project may occur due to borrow dredging. Any indirect impacts would be a result of increased silt disruption around the adjacent LPV area. Commercial fishery species found in the lake include blue crab, white shrimp, brown shrimp, (NMFS 1998), speckled seatrout, black drum, red drum, sheepshead, and flounder (USACE 1986). Lake Pontchartrain and its adjacent wetlands function as a typical estuary where marine-spawned and estuary dependent fish and shellfish species utilize different regions of the estuary for various life stages. The impacts would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain (403,200 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Bayou Des Mats project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects would occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

4.2.5.12.3 Frenier BLH-Dry and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Frenier BLH-Dry and BLH-Wet Restoration project and therefore no impacts to population, housing, or minority or low-income populations are expected to occur.
The proposed project would convert 110 acres of agricultural land being used for crop production into BLH habitat. There would be minimal indirect business impacts from conversion of this land consisting of decreased available business farm land and associated revenue, which is estimated to be less than one percent of total parish agricultural land use, and an inconsequential loss of revenue to the state.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Frenier BLH-Dry and BLH-Wet Restoration project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow is not required for construction.

The nearest navigable waterway to the Frenier project is Lake Pontchartrain. There would be no direct, indirect, or cumulative impacts to navigation or commercial fisheries from implementation of the Frenier project since borrow from the lake is not necessary for project construction nor is any part of the construction occurring in the water.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Impacts from restoration projects can temporarily disrupt transportation. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents.

4.2.5.12.4 Fritchie BLH-Dry and BLH-Wet Enhancement and BLH-Wet Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Fritchie BLH enhancement/restoration project and therefore impacts to population or housing are not expected to occur. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. No impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this

project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation during project construction from heavy vehicle traffic in the vicinity of the restoration site. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the project site.

The nearest navigable waterway to the Fritchie project is Lake Pontchartrain. There would be no direct impacts to navigation from implementation of the Fritchie project. Potential indirect impacts to navigation would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Fritchie project due to borrow dredging. Indirect impacts would be a result of increased silt disruption around the adjacent LPV area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake. Positive indirect impacts from Fritchie BLH enhancement/restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain (403,200 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Fritchie project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents.

4.2.6 MITIGATION FOR IMPACTS TO NON-REFUGE SWAMP

4.2.6.1 Wetlands and Other Surface Waters

4.2.6.1.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

As the proposed action, CEMVN would purchase sufficient swamp credits from a bank within the LPV basin to mitigate 108.01 AAHUs. The particular bank to be utilized is unknown at this time. Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to wetlands and other surface waters would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.1.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

Approximately 250 acres of shallow open water and early successional wetland plant species would be replaced with high quality swamp species.

Indirect Impacts

As a result of borrow placement and the type of containment utilized for this project, land adjacent to the mitigation project may receive material suspended in the dredge effluent. This would nourish adjacent forested habitat and may cause adjacent shallow open water to become shallower or be filled, possibly increasing the forested wetland acreage adjacent to the project area.

Cumulative Impacts

This project would prevent an overall loss in the basin of swamp habitat from construction of the HSDRRS system. This project when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the overall loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.6.1.3 Caernarvon Swamp Restoration Project

Direct Impacts

Approximately 656 acres of shallow open water containing SAVs would be replaced with high quality swamp species. The continued operation of the Caernarvon Freshwater Diversion structure should prevent growing season salinities from exceeding the 0.5 ppt used in the analysis regardless of SLR. Impacts to SAVs would be mitigated as intermediate marsh.

Indirect Impacts

As a result of the borrow placement and swamp creation, there may be a reduction in the retention capabilities of Big Mar resulting in more freshwater being pushed into and nourishing adjacent marshes.

Cumulative Impacts

This project would prevent an overall loss in the basin of swamp habitat from construction of the HSDRRS system. This project when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the overall loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.6.1.4 Milton Island Swamp Restoration Project

Direct Impacts

Approximately 291 acres of shallow open water containing SAVs would be replaced with high quality swamp species. An additional 69 acres of cypress would be nourished via receipt of dredged material/effluent. Hydrologic connection with adjacent swamp habitat would be restored. Impacts to SAVs would be mitigated as intermediate marsh.

Indirect Impacts

Adjacent swamp habitat my experience additional detrital input once hydrologic connections are restored with the restoration site.

Cumulative Impacts

This project would prevent an overall loss in the basin of swamp habitat from construction of the HSDRRS system. This project when added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the overall loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

4.2.6.2 Wildlife

4.2.6.2.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to wildlife would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.2.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

Approximately 250 acres of shallow open water and early successional wetland plant species would be replaced with high quality swamp species. Some more immobile wildlife species may experience demise during construction. Species that utilize early successional habitats such as low nesting wading birds (ex. yellow-crown night-heron), may be permanently displaced from the habitat conversion while other species would be temporarily displaced by construction activity. However, the creation of high quality habitat and a corridor for transient wildlife species, such as deer and bobcat, on either side of the proposed project to utilize greatly outweighs the loss of an early successional habitat type that exists in abundance throughout the basin. Water bodies in the restoration site are not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor is there sufficient access 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 restoration site.

Indirect Impacts

Species that utilize early successional habitats may be forced into nearby early successional habitat. Competition with resident species may occur. Since this type of habitat is abundant throughout the basin, indirect impacts from the habitat conversion would be minimal. Many species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create. Additionally, the new swamp habitat would attract new species to the project area such as raptors, resident and migrant birds, bobcat, squirrel and deer, as well as improve habitat quality for nutria, mink, otter, raccoon, and alligator (LCWCRTF and WCRA, 1999). 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 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.

Cumulative Impacts

This project would prevent an overall loss in the basin to swamp habitat necessary for many wildlife species. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species experienced with the loss of their habitat within the basin.

4.2.6.2.3 Caernarvon Swamp Restoration Project

Direct Impacts

Approximately 656 acres of shallow open water would be replaced with high quality swamp species. Species utilizing the open water in Big Mar (Wading birds, shore birds, sea birds,

nutria, and alligator), may be temporarily displaced by construction activity. However, these species would return to the project area once construction is complete.

Indirect Impacts

Many species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create. A greater diversity of bird species would result with the creation of transitional habitat between forested and marsh systems. The new swamp habitat would attract new species to the project area such as owls, resident and migrant birds, raccoon, mink, squirrel and deer, and would improve existing habitat quality for nutria, otter, and alligator (LCWCRTF and WCRA, 1999).

Cumulative Impacts

This project would prevent an overall loss in the basin to swamp habitat necessary for many wildlife species. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species experienced with the loss of their habitat within the basin.

4.2.6.2.4 Milton Island Swamp Restoration Project

Direct Impacts
Approximately 291 acres of shallow open water containing SAVs would be replaced with high quality swamp species. An additional 69 acres of cypress would be nourished via receipt of dredged material/effluent. Species utilizing the current habitat (wading birds, shore birds, colonial nesting birds) may be temporarily displaced during construction, but would return to the project area once construction is complete. The restoration site does not have sufficient access available to anticipate the use of it by bottlenose dolphins. As such construction of the project should not result in entrapment of this species within the restoration site.

Indirect Impacts

Species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create.

Cumulative Impacts

This project would prevent an overall loss in the basin to swamp habitat necessary for many wildlife species. This project added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species experienced with the loss of their habitat within the basin.

4.2.6.3 Threatened and Endangered Species

4.2.6.3.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to threatened and endangered species would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.3.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

No direct impacts to the West Indian Manatee, Gulf sturgeon or the Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of the Bonnet Carré project. The borrow pits within the spillway to be filled for swamp restoration are not of sufficient depth to be utilized by any of these species, nor is access such that it is likely that any of these species would find their way to these borrow pits. If for some reason any of these species were to find their way to these borrow pits the depth and resulting temperature extremes and low dissolved oxygen would either induce the species to move or result in their expiration.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via cutterhead dredge. Since Gulf sturgeon and sea turtles have the ability to out swim slow moving cutterhead dredges, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim.

As such, the CEMVN has made a 'no effect' determination for this project's impacts to manatee, Gulf sturgeon, and sea turtles.

Indirect Impacts

Indirect impacts on endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect

impacts from the proposed action would primarily consist of effects from increased turbidity from dredging operations which could immediately reduce water quality in the project area. However, the rise in turbidity would be temporary and would be reduced from the movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the borrow area in Lake Pontchartrain (95 acres) encompasses only a small section of a 403,200 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim. As such, no indirect impacts to manatee, Gulf sturgeon, or sea turtles are anticipated.

Cumulative Impacts

Potential cumulative impacts the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Bonnet Carré project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the small size of the borrow area (95 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Bonnet Carré project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.6.3.3 Caernarvon Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

No direct impacts to Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The Kemp's ridley, loggerhead, and green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

Dredging in Lake Lery for borrow would occur via hydraulic cutterhead dredge. Entrainment of sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to sea turtles are anticipated.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity. However, although the rise in turbidity could immediately reduce water

quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of a 5,000 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for sea turtles to utilize throughout Lake Lery in the interim. As such, no impacts to sea turtles are anticipated from temporary minor impacts to water quality.

Cumulative Impacts

Potential cumulative impacts to the threatened or endangered species (sea turtles) that could occur in the vicinity of the project area from construction of the Caernarvon project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Lery (5,000 acres), the relatively small size of the borrow area (290 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Caernarvon project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.6.3.4 Milton Island Swamp Restoration Project

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of this project. Access is not available for these species to enter the restoration site.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the project area encompasses only a small section of a 403,200 acre estuarine/brackish lake. Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain in the interim. As such, no impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor impacts to water quality and benthic species from construction of the project.

Cumulative Impacts

Potential cumulative impacts to the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the Milton Island project would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the relatively small size of the borrow area (106 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, and the ability of these species to avoid the project area during the construction period, the Milton Island project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

4.2.6.4 Fisheries, Aquatic Resources, and Water Quality

4.2.6.4.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to fisheries, aquatic resources and water quality would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.4.2 Bonnet Carré Swamp Restoration Project

Direct and Indirect Cumulative Impacts

With implementation of this project, there would be some direct and indirect impacts to fisheries in the form of physically altered open water bottoms, and temporary increases in turbidity during construction activities. Approximately 103 acres of existing borrow pit ponds in the spill way

would be converted to swamp habitat. Approximately 95 acres of lake water bottoms would be deepened by an average of 12 feet. It is anticipated that anoxic conditions would be avoided with this depth of dredging and that mobile fishery species would avoid proposed borrow site, thereby minimizing direct and indirect impacts to those species. Sediment particles suspended due to construction activities may impact filter feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high at the dredge site and adjacent to the placement site. However, the benthic community is expected to rebound once project construction is complete. Due to the lack of escape routes, most fish species in the restoration area would experience demise during borrow material placement. There would also be direct impact to the benthic community due to burial and conversion from manmade ponds to swamp habitat. These species are commonly found throughout the basin in similar shallow water environments that exist in abundance. As such, impacts to the overall population of these species in the basin from the borrow placement is expected to be negligible. Direct impacts caused by increases in suspended sediments during placement of borrow material would be minimal, localized, and short-lived. Although construction of this project would fill approximately 103 acres of existing borrow pit ponds in the spill way, the Bonnet Carré is regularly mined for borrow material by the government and commercial interests. As such, similar shallow water ponds are regularly created via these operations which would provide similar habitat for the same species currently utilizing the mitigation site. Temporary impacts to Lake Pontchartrain from borrow excavation 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. Impacts in the fill area would temporarily add to the water quality impairment of this subsegment through increased turbidity, but these impacts would be minimized through BMPs and would cease after construction.

Cumulative Impacts

Though construction of this project would result in the loss of marginal fisheries and benthic habitat, some fish, and temporary impacts to water quality; marginal fisheries and benthic habitat is abundant throughout the basin, impacts to existing fisheries would be minimal, and water quality would rebound once project construction is complete. As such, construction of this project would result in minimal increased loss to fisheries, aquatic resources, and water quality experienced in the basin from the past, present, and reasonably foreseeable projects in the basin. The reinstitution of swamp in areas that are currently manmade ponds in the spillway could provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus. Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include wetlands restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.6.4.3 Caernarvon Swamp Restoration Project

Direct and Indirect Impacts

With implementation of this project, there would be some direct and indirect impacts to fisheries in the form of physically altered open water bottoms, and temporary increases in turbidity during construction activities. Approximately 667 acres of open water in the area of Big Mar would be converted to swamp habitat. Approximately 290 acres of lake water bottoms would be deepened by an average of 12 feet. It is anticipated that anoxic conditions would be avoided with this depth of dredging and that mobile fishery species would avoid proposed borrow site, thereby minimizing direct and indirect impacts to those species. Sediment particles suspended due to construction activities may impact filter feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high at the dredge site and adjacent to the placement site. However, the benthic community is expected to rebound once project construction is complete. Mobile fish species in the placement area would avoid the area during borrow material placement. There would also be direct impact to the benthic community due to burial and conversion the water substrate to swamp. These species are commonly found throughout the basin in similar shallow water environments that exist in abundance. As such, impacts to the overall population of these species in the basin from the borrow placement is expected to be negligible. Direct impacts caused by increases in suspended sediments during excavation and placement of borrow material would be minimized through use of BMPs, localized, and short-lived. Once constructed, the swamp, during wet years, would provide habitat for the freshwater species. The temporary impacts to Lake Lery and the fill area are not anticipated to be substantial enough to cause water quality impairment under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11.

Cumulative Impacts

The construction of this project would result in the conversion of fisheries habitat from open water to swamp and minimal impacts to existing fisheries and benthic species. As such, construction of this project would result in no measurable increased loss to fisheries, and aquatic resources, experienced in the basin from the past, present, and reasonably foreseeable projects in the basin. The reinstitution of swamp in areas could provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus. Temporary impacts to water quality in Lake Ponchartrain from construction of this project when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include wetlands restoration as well as the proposed action could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

4.2.6.4.4 Milton Island Swamp Restoration Project

Direct, Indirect and Cumulative Impacts

Approximately 347 acres of open water in the area of Milton Island would be converted to swamp habitat. Approximately 106 acres of lake water substrate would be deepened by an

average of 12 feet. The impacts would similar to those found at the Caernarvon Swamp restoration site but on a smaller scale.

4.2.6.5 Essential Fish Habitat

4.2.6.5.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to essential fish habitat would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.5.2 Bonnet Carré Swamp Restoration Project

Direct and Indirect Impacts

With implementation of this project, there would some direct and indirect impacts to EFH (silt, silt sand, muddy sand, soft mud, and SAV), in the form of physically altered bottom substrates in the borrow site. Approximately 95 acres of estuarine water column in Lake Pontchartrain would be made deeper. However, with the periodic opening of the Bonnet Carré Spillway during flood stage levels in the Mississippi River, the borrow pit is expected to refill and existing conditions to return in the future. The borrow site used for the CWPPRA PO-17 project in the vicinity of the proposed borrow site has refilled with the periodic opening of the Bonnet Carré Spillway.

Cumulative Impacts

Although there would be impacts to EFH in Lake Ponchartrain from borrow dredging for this project, these impacts are expected to be minimal and reversed over time with the periodic opening of the Bonnet Carré Spillway. When added to the impacts from the past, present and reasonably foreseeable projects in the basin, construction of this project results in a minimal addition of impacts to EFH in the basin.

4.2.6.5.3 Caernarvon Swamp Restoration Project

Direct and Indirect Impacts

There are would be long term direct impacts to EFH caused by this project at the placement site with the conversion of areas of mud substrate, SAV, and estuarine water column to swamp habitat that may require mitigation. There would be short term direct and indirect impacts to EFH at the borrow site during the dredging process as the mud substrate is disturbed and elevations lowered.

Cumulative Impacts

The project could contribute significantly to overall EFH impacts in the basin from projects in the FWOP conditions. Between this project's conversation from EFH to swamp habitat and the anticipated future increase in fresh water from increased operation of the Caernarvon Freshwater Diversion structure, the area of Big Mar may in the future no longer be categorized as EFH. If necessary, mitigation for direct impacts to EFH from construction of this project could be constructed so as to avoid adding to the overall cumulative impacts to EFH in the basin. There are no long term cumulative impacts to EFH caused by this project at the borrow site, since the area will continue to be categorized as the same type EFH after construction, just at a different depth.

4.2.6.5.4 Milton Island Swamp Restoration Project

Direct and Indirect Impacts

No EFH has been designated in the restoration site. Excavation of borrow from Lake Pontchartrain would deepen estuarine water column and may expose a different substrate, which could impact postlarval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

Cumulative Impacts

Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat. The borrow area will continue to be categorized as EFH after construction, just at a different depth.

4.2.6.6 Cultural Resources

4.2.6.6.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to cultural resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.6.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous

research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural. As individual project features are developed, survey strategies and the Area of Potential Effect would be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies would be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.6.6.3 Caernarvon Swamp Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the State of LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could

work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this project would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.6.6.4 Milton Island Swamp Restoration Project

Direct Impacts

Activities associated with this project have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the State of LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect and Cumulative Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Implementation of this alternative would work synergistically with other ecosystem restoration projects in coastal Louisiana. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

4.2.6.7 Recreational Resources

4.2.6.7.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to recreational resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.7.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

The site proposed for swamp restoration currently consists of 250 acres of scrub shrub interspersed with fishing, crawfishing and crabbing ponds, which are used seasonally by recreational fisherman. The proposed swamp restoration could enhance the habitat for crawfish and crabs. Fishing opportunities may become more limited at the site but would still be possible. However, new recreational opportunities would exist on the planted site, such as birding or other activities.

Borrow material needed for swamp restoration would come from Lake Pontchartrain via an existing canal in the spillway. Impacts associated with excavation of borrow material from the Lake are expected to be minimal and consist of disruption in fishing in the immediate project vicinity due to increases in turbidity. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

There are no indirect impacts. Cumulative impacts on recreational resources are positive and result from the LPV mitigation projects improving swamp, marsh and BLH-Dry and BLH-Wet habitat and ultimately better fishing, hunting, and birding opportunities.

4.2.6.7.3 Caernarvon Swamp Restoration Project

Direct Impacts

Since much of the recreational activities in the area take place further out from Big Mar, impacts to recreational fishing and hunting are expected to be minimal within the site. The project would improve habitat within the project area for hunting but, by converting open water to swamp, could change the duck species frequenting the area and reduce fishing opportunities. Duck hunting should improve in the area as the habitat created from the restoration should attract a greater diversity of waterfowl species both within Big Mar and in adjacent areas that are more frequented by recreational hunters.

Borrow material needed for the swamp restoration will come from Lake Lery, approximately 1,500 feet offshore, via a floating pipeline along Bayou Mandeville. Impacts associated with excavation of the borrow material from the Lake are expected to be minimal and consist of disruption in fishing in the immediate vicinity due to increases in turbidity and to boaters using Bayou Mandeville. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

Improved swamp habitat could attract more wildlife to adjacent areas which could improve recreational hunting. Cumulative impacts include better hunting opportunities as more habitat suitable to waterfowl is improved at other LPV mitigation sites.

4.2.6.7.4 Milton Island Swamp Restoration Project

Direct Impacts

Under the future with project condition, fishing opportunities would be greatly diminished if the ponds are drained and converted to swamp habitat. The bird rookery located between the two restoration sites could be positively impacted by the conversion of the open water to a more productive feeding ground. Once the swamp restoration is completed, lands could be used for other recreational activities, such as some limited fishing and improved hunting, crawfishing and crabbing depending on how the State wishes to use the land.

Borrow material needed for the swamp restoration will come from Lake Pontchartrain via a floating pipeline from a site approximately 2,000 feet offshore. Impacts associated with excavation of the borrow material from the Lake are expected to be minimal and include a disruption in fishing in the immediate vicinity due to increases in turbidity and to boaters from the floating pipeline. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed.

Indirect and Cumulative Impacts

An adjacent 69 acres of swamp in varying degrees of health would be enhanced by the adjacent swamp restoration thereby providing improved opportunities for fishing and hunting. Cumulative impacts from the swamp restoration and other LPV mitigation projects in the area should improve recreational opportunities as other lands are restored that should provide better habitat for fish and wildlife.

4.2.6.8 Aesthetic Resources

4.2.6.8.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to aesthetic resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.8.2 Bonnet Carré Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

The Bonnet Carré Spillway's flood control structure would continue to periodically be operated to divert Mississippi River floodwaters into Lake Ponchartrain; the event would continue to attract thousands of visitors. Construction of this project would not alter operation of the spillway nor result in any direct, indirect or cumulative impacts to visual resources in the area.

4.2.6.9.3 Caernarvon Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

No impact as the Caernarvon site has no significant visual attributes.

4.2.6.9.4 Milton Island Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

No impact as the Milton Island site has no significant visual attributes.

4.2.6.9 Air Quality

4.2.6.9.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative air quality impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.9.2 Bonnet Carré Swamp Restoration Project

Direct Impacts

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include 1) exhaust emissions from operations of material delivery/dump trucks and various types of non-road construction equipment such as loaders, excavators, dredges, etc. and 2) fugitive dust due to earth disturbance. The principal air quality concern associated with the proposed activities is emission of fugitive dust near demolition and construction areas. The on-road trucks and private autos used to access the work area would also contribute to construction phase air pollution in the project neighborhood when traveling along local roads.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required. Construction activities related to the proposed action would not occur all at once, but would occur in increments through the estimated construction period. Construction activities would be similar to those activities that regularly occur within the Bonnet Carré Spillway. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Construction activities would be similar to those activities that have occurred and are occuring within the Bonnet Carré, namely borrow procurement and spillway maintenance activities. Cumulative impacts to air quality in the project area due to this project in addition to the other construction activities within the area would be temporary and could be minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.6.9.3 Caernarvon Swamp Restoration Project

During construction of this project, an increase in air emissions could be expected during construction. These emissions could include exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, tender boats, marsh buggies, etc. and from vehicles used to access the project area. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities.

Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

Cumulative Impacts

Cumulative impacts to air quality in the project area due to construction of this project in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal, especially considering that placement of dredged material would not create fugitive dust. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

4.2.6.9.4 Milton Island Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Caernarvon Swamp Restoration Project.

4.2.6.10 Noise

4.2.6.10.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative noise impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.10.2 Bonnet Carré Swamp Restoration Project

Direct and Indirect Impacts

Although construction of this project would temporarily exceed a DNL of 55 dBA, other projects within the spillway routinely exceed this noise level. Bulldozers (82 dBA) and backhoes (80 dBA) would be the primary pieces of equipment used for construction of this project. Recreational users would likely avoid these areas due to the construction. Open water areas in the vicinity of this project that may have been used for fishing are within the construction area. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between

the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent forests should be largely undisturbed by the additional noise from this project's construction. There are no residences or businesses in the project vicinity that could be disturbed by project construction.

Cumulative Impacts

The Bonnet Carré project area is remote and uninhabited. Noise generated from this project would insignificantly increase negative noise impacts associated with construction of the past, present or reasonably foreseeable projects. The same type of machinery would be used for construction of this project as is used for sand and clay mining that regularly occurs in the Bonnet Carré. The noise experienced by the use of one bulldozer at 82 dBA increases to 85 dBA with the use of an additional bulldozer. Similar increases are experienced with other machinery. As such, the additive noise associated with construction of the mitigation project would be minimal. Noise associated with construction of the project would occur in concert with other mining activities and is not anticipated to prolong noise exposure. Construction of this project would result in a site producing additional disturbance in the spillway however, construction activities would be temporary, avoidance of the project area would occur due to machinery movement in the area and noise levels would be buffered by adjacent vegetation.

4.2.6.10.3 Caernarvon Swamp Restoration Project

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of this project. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. No impact to human populations is anticipated as this project area is remote and uninhabited.

Cumulative Impacts

Construction of this project is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary, the area is remote, and avoidance of the project area by wildlife would occur due to the movement of machinery in the area even without the additional noise.

4.2.6.10.4 Milton Island Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

Impacts would be similar to the Caernarvon Swamp Restoration Project.

4.2.6.11 Hazardous, Toxic, and Radioactive Waste

4.2.6.11.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative HTRW impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

4.2.6.11.2 Bonnet Carré Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

None of the studies referenced in section 3.2.5.11.1.2 identified a high probability of encountering HTRW during the course of the mitigation projects being considered for the Bonnet Carré Spillway area. The areas proposed for mitigation are now borrow pits, from which material for levee repairs has been excavated in the recent past. They would be filled with material dredged from Lake Pontchartrain to restore swamp habitat. USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) for Civil Works Projects, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under CERCLA, or if they are a part of a National Priority List (NPL) site under CERCLA. (NPL is also known as "Superfund.") None of the reaches proposed for dredging is included in the National Priority List or within the boundaries of a CERCLA site.

There is a very low probability that the proposed restoration of habitat within Bonnet Carré Spillway using material from Lake Pontchartrain would encounter HTRW or introduce toxic materials into the Bonnet Carré mitigation areas. The project may proceed without further investigation of HTRW. If the project location or methods change the probability of HTRW may need to be re-investigated.

4.2.6.11.3 Caernarvon Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.6.11.4 Milton Island Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

No impacts anticipated.

4.2.6.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

4.2.6.12.1 Mitigation Bank Project (TSMP)

Direct, Indirect, and Cumulative Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to socioeconomics/land use, environmental justice, transportation, navigation and commercial fisheries would be incurred from the purchase of these credits for the HSDRRS mitigation. However, depending on the amount of swamp mitigation bank credits available in the basin at the time of credit purchase for the HSDRRS mitigation, use of mitigation bank credits to offset HSDRRS swamp impacts may significantly reduce the number of credits available to permittees to compensate for swamp impacts authorized by Department of the Army section 10 permits. In the event sufficient credits are not available to offset impacts associated with a proposed permit, the district engineer would determine appropriate compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

4.2.6.12.2 Bonnet Carré Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

Direct and cumulative impacts to the Bonnet Carré swamp restoration project would be similar to those described in Section 3.2.5.12.2.3, Bonnet Carré BLH-Dry and BLH-Wet Restoration project. Indirect impacts to commercial fishing at the Bonnet Carré Swamp restoration site will be temporary and result from disruption of use during construction activities which include placement of dredge material.

4.2.6.12.3 Caernarvon Swamp Restoration Project

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Caernarvon swamp restoration project and therefore no impacts to population or housing are expected to occur. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Caernarvon project including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete

since borrow would be obtained from Lake Lery and all construction activities would be within the project site.

The nearest navigable waterways to the Caernarvon project are the Mississippi River and Big Mar Lake. There would be no direct and only a potential of indirect impacts to navigation from implementation of the Caernarvon project. The project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Caernarvon project due to borrow dredging in nearby Lake Lery. Indirect impacts would be a result of increased silt disruption in the vicinity of the borrow area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 5,000 acre lake. Positive indirect impacts from the Caernarvon swamp restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Lery (5,000 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Caernarvon project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

4.2.6.12.4 Milton Island Swamp Restoration Project

Direct, Indirect, and Cumulative Impacts

According to 2010 U.S. Census data, there are no residents located within the boundaries of the Milton Island swamp restoration project and therefore impacts to population or housing are not expected to occur. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries. No impacts to employment,

businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur with construction of this project. The proposed project does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation during project construction from heavy vehicle traffic in the vicinity of the restoration site. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the project site.

The nearest navigable waterway to the Milton Island project is Lake Pontchartrain. There would be no direct impacts to navigation from implementation of the Milton Island project. Potential indirect impacts to navigation would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of the Milton Island project due to borrow dredging. Indirect impacts would be a result of increased silt disruption around the adjacent LPV area. These would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake. Positive indirect impacts from Milton Island swamp restoration include increasing spawning, nursery, forage and cover habitat for commercial fishery resources once connection with adjacent swamp habitat is restored.

The cumulative impacts of this project, when added to other past, present, and reasonably foreseeable ecosystem restoration, mitigation or other type projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain (403,200 acres), the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the Milton Island project would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because the mitigation projects replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replace those lost during levee construction and therefore no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land uses such as commercial/industrial properties and public facilities are not normally impacted as restoration projects are typically located in unpopulated areas. Additionally, Environmental Justice issues do not typically arise from the construction of the restoration projects as the mitigation sites are uninhabited. However, as this is a Programmatic IER, additional Environmental Justice analysis, if necessary, would be conducted and documented in supplemental NEPA documents.

5. ENVIRONMENTAL CONSEQUENCES OF MITIGATION PLAN ALTERNATIVES

5.1 INTRODUCTION

This section describes the direct and indirect effects of mitigation plans as they have been modified after the impacts of the HSDRRS construction were reassessed. For more details on how the projects were modified and the transition from multiple mitigation projects to mitigation plans see section 2.5. No natural and scenic rivers or upland resources would be impacted with implementation of any of the projects in the proposed plan or its alternative.

Although this PIER is programmatic in nature, some of the individual mitigation projects that make up the mitigation plan alternatives have sufficiently detailed designs as to be fully assessed in this PIER and would not require additional NEPA documentation. These mitigation projects, termed "Constructible Features", are identified in following action alternatives.

The Programmatic Features of the mitigation plan alternatives require further design at a feasibility level for which the details and impacts would be released in subsequent NEPA documents that would tier off of this programmatic NEPA document (TIER). These features would not be considered constructible until the TIER is complete. The impact analysis completed for the TIERs would include completion of a biological assessment and ESA Section 7 consultation for projects with actions occurring in Gulf sturgeon critical habitat.

5.2 ALTERNATIVES

5.2.1 NO ACTION ALTERNATIVE

Direct Impacts

Under the No Action alternative, wetlands and other surface waters, wildlife, threatened and endangered species, fisheries, aquatic resources, water quality, EFH, cultural resources, recreational resources, aesthetic resources, air quality, noise, HTRW, socioeconomics/land use, environmental justice, transportation, navigation, commercial fisheries, and prime and unique farmlands within the basin would not be directly impacted from construction of any of the action alternatives. Without construction of an action alternative, there would be an overall loss of fresh, intermediate, and brackish marsh; BLH; and swamp habitat within the system. Intertidal marshes are designated EFH. Loss of marsh habitat in the basin would equate to a loss of EFH in the basin. CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied. This includes specific obligation for mitigation on the protected and flood sides of the levees in the Bayou Sauvage NWR.

Recreational use of the Bonnet Carré Spillway would continue under the no action plan as it has in the past with high day use during non-flood event years and limited use during flood periods. Future recreation land uses could change as the Bonnet Carré Spillway Master Plan is implemented. A master plan of the Bonnet Carré Spillway is currently in development which proposes additional horseback riding and ATV paths and a project road and access plan.

Indirect Impacts

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

5.2.2 TENTATIVELY SELECTED MITIGATION PLAN ALTERNATIVE (TSMPA)

The TSMPA (Table 5-1) is a combination of the TSMPs discussed in Section 4. Although this is a programmatic NEPA document, some of the TSMPs that make up the overall LPV TSMPA are fully assessed in this PIER and are recommended for implementation. These TSMPs, termed "Constructible Features" (or "constructible portions"), mitigate general (e.g. non-refuge) BLH-Wet, BLH-Dry, and swamp impacts and would involve the purchase of BLH-Wet and swamp mitigation bank credits in the LPV basin. The TSMPs that comprise the remainder of the LPV HSDRRS TSMPA are termed "Programmatic Features". These programmatic features require further design at a feasibility level for which the details and impacts would be released in subsequent NEPA documents that would tier off of this programmatic NEPA document (TIER). These features would not be considered constructible until the TIER is complete.

Table 5-1: Tentatively Selected Mitigation Plan Alternative

Projects	Habitat	Status
Mitigation Bank	Non-Refuge BLH-wet/Dry	Constructible
Mitigation Bank	Non Refuge Swamp	Constructible
Milton Island Marsh Restoration (MI)	Non-Refuge Fresh/Intermediate Marsh	Programmatic
Bayou Sauvage Marsh Restoration and Enhancement (BSFS)	Refuge and Non-Refuge Brackish Marsh	Programmatic
Bayou Sauvage Refuge BLH-Wet/Intermediate Marsh Restoration (BSPS)	Protected Side Refuge BLH-Wet/Intermediate Marsh	Programmatic
Fritchie Refuge BLH-Wet Enhancement (FR)	Flood Side Refuge BLH-W	Programmatic

<u>5.2.2.1 Wetlands and other Surface Waters</u>

5.2.2.1.1 Programmatic Features

Direct and Indirect Impacts

Approximately 113 acres of open water would be converted to intermediate emergent marsh at the Milton Island Marsh Restoration project (MI) site. Approximately 223 acres of open water habitat containing SAVs and 104 acres of existing broken marsh would be converted to brackish emergent marsh at the Bayou Sauvage Marsh Restoration and Enhancement project (BSFS) site.

An additional 297 acres of open water habitat at the Bayou Sauvage Refuge BLH-Wet/Intermediate Marsh Restoration project (BSPS) site would be converted to BLH-Wet and intermediate emergent marsh. While at the Fritchie Refuge BLH-Wet Enhancement project (FR) site 51 acres of existing early successional BLH-Wet species would be replaced with high quality BLH-Wet species. Impacts to SAVs would be mitigated as intermediate and brackish marsh. There are no indirect impacts to wetlands and surface waters.

5.2.2.1.2 Constructible Features

Direct and Indirect Impacts

As the proposed action, the CEMVN would purchase from a Mitigation Bank sufficient BLH-Wet credits from a bank within the LPV basin to mitigate 93.85 AAHUs. Additionally sufficient swamp credits from a bank within the LPV basin to mitigate 108.01 AAHUs. The particular bank to be utilized is unknown at this time. Since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to wetlands and other surface waters would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.2 Wildlife

5.2.2.2.1 Programmatic Features

Direct Impacts

Approximately 113 acres of open water would be converted to intermediate emergent marsh at MI site. Approximately 223 acres of open water habitat containing SAVs and 104 acres of existing broken marsh would be converted to brackish emergent marsh at BSFS site. In addition 297 acres of open water would be converted to 142 acres of intermediate marsh and 155 acres of BLH-W habitat at BSPS site. This conversion would eliminate wintering habitat for brown pelican, and increase habitat for wading birds, shorebirds, and raptors (LCWCRTF and WCRA, 1999) as well nutria, muskrat, mink, river otter, raccoon, reptiles and amphibians. Species that utilize transition zones (i.e. raccoon, bobcat, fox) would benefit from the BLH-W and intermediate marsh habitat creation at the BSPS. The loss of open water habitat would not be expected to adversely affect species that utilize this habitat currently as there is ample open water habitat in the basin. Approximately 51 acres of existing early successional BLH-Wet species would be replaced with high quality BLH-Wet species at FR site. Some more immobile wildlife species (e.g. salamanders, frogs, turtles, mice) at all sites may experience demise during construction. The project areas are not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor are sufficient access available to anticipate the use of them by this species. As such construction of these projects should not result in entrapment of this species within any of the restoration sites.

Indirect Impacts

Species that utilize shallow open water habitats may be displaced from the habitat conversion. However, these impacts would be temporary. Species that utilize the current low quality BLH habitat or broken marsh may be forced into adjacent habitat during project construction. Competition with resident species may occur. However, these impacts would be temporary. Many species utilizing the current habitat types would thrive with the improved foraging, cover and resting habitat the project would create. A rise in turbidity at the borrow sites 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 area would be free to relocate during construction since the borrow areas (55 acres and 184 acres in Lake Pontchartrain and 220 acres in Lake Borgne) encompass only a small section of 2 estuarine/brackish lakes (Lake Ponchartrain - 403,200 acres and Lake Borgne - 162,505 acres).

5.2.2.2.2 Constructible Features

Direct and Indirect Impacts

Since the purchase of mitigation bank credits for BLH-W, BLH-D and Swamp would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct or indirect impacts to wildlife would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.3 Threatened and Endangered Species

5.2.2.3.1 Programmatic Features

Direct Impacts

No direct impacts to West Indian Manatee; Gulf sturgeon; or Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of these features. The shallow open water areas to be filled are not of sufficient depth to be utilized by any of these species.

The manatee; the Gulf sturgeon; or the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction.

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain and Lake Borgne for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species. As such, no direct impacts to Gulf sturgeon or sea turtles are anticipated. Approximately 184 acres of Gulf

sturgeon critical habitat in Lake Pontchartrain for the BSFS project and approximately 220 acres of Gulf sturgeon critical habitat in Lake Borgne for the BSPS project would be deepened to obtain the borrow necessary for project construction. Depth of excavation (-10 ft below the existing lake bottom) is not anticipated to result in exposure of a different substrate and re-colonization of benthic species Gulf sturgeon prey upon is anticipated within a couple growing seasons. No migratory pathways would be blocked by the proposed borrow activities.

Indirect Impacts

Indirect impacts to endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those effects would be temporary and would be reduced by movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the borrow areas (55 acres and 184 acres in Lake Pontchartrain and 220 acres in Lake Borgne) encompass only a small section of 2 estuarine/brackish lakes (Lake Ponchartrain - 403,200 acres and Lake Borgne - 162,505 acres). Impacts to prey species are expected to be temporary in the borrow area and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake Pontchartrain and Lake Borgne in the interim. As such, no indirect impacts to manatees, Gulf sturgeon or sea turtles are anticipated from temporary minor direct impacts

5.2.2.3.2 Constructible Features

Direct and Indirect Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to threatened and endangered species would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.4 Fisheries, Aquatic Resources and Water Quality

5.2.2.4.1 Programmatic Features

Direct and Indirect Impacts

Approximately 115 acres of open water and mud bottom would be replaced with intermediate marsh at the MI site and approximately 223 acres of open water habitat containing SAVs and 104 acres of existing broken marsh would be converted to brackish emergent marsh at the BSFS site; increasing the available spawning, nursery, forage and cover habitat for fisheries resources in these areas. Approximately 297 acres of open water in the BSPS would be converted to 142 acres of intermediate marsh and 155 acres of BLH-W habitat, reducing habitat for blue crab, largemouth bass and catfish in the portion of the project area being converted to BLH-W. These species may continue to use the 142 acres that is converted to intermediate marsh (LCWCRTF

and WCRA, 1999) as spawning, nursery, forage and cover habitat. During borrow site excavation, it is anticipated that anoxic conditions would be avoided with the depth of dredging and that mobile fishery species would avoid the proposed borrow and fill sites during construction, thereby minimizing direct and indirect impacts to those species. Turbidity during borrow excavation and fill placement could temporarily impair visual predators and impact filter feeders, but this impact is expected to cease and benthic species in the marsh sites rebound once construction is complete. Benthic habitat in the BSPS BLH-Wet restoration site would be permanently lost with the conversion from open water to BLH-Wet. Temporary impacts to Lake Pontchartrain and Lake Borgne from borrow excavation is not anticipated to be substantial enough to cause impairment of those water body's designated uses as defined under the standards of Louisiana Administrative Code, Title 33, Part IX, Chapter 11. Turbidity impacts at the restoration sites would temporarily add to the water quality impairment of those associated hydrologic units through increased turbidity which could cause localized dissolved oxygen depletion, but these impacts would be minimized through BMPs and would cease after construction. The FR site is existing low quality bottomland hardwood habitat and does not currently contain fisheries or aquatic resources. Additionally, no impacts to the water quality of water bodies adjacent to the FR site are anticipated as the project construction does not require the movement of soils and runoff into adjacent water bodies is not anticipated.

5.2.2.4.2 Constructible Features

Direct and Indirect Impacts

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to fisheries, aquatic resources and water quality would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.5 Essential Fish Habitat

5.2.2.5.1 Programmatic Features

Direct and Indirect Impacts

Estuarine water column, mud substrate, and SAV would be permanently replaced with estuarine emergent marsh at the MI and BSFS sites. Negative impacts to estuarine water column, mud substrate, and SAV would be offset by the creation estuarine emergent wetlands since the support functions of the created marsh are greater than the support functions of the existing water habitats. No EFH exists in the BSPS and FR project boundaries. Excavation of borrow from Lake Pontchartrain and Lake Borgne would deepen estuarine water column and may expose a different bottom substrate, which could impact post larval and juvenile brown shrimp, white shrimp and red drum by reducing available cover and foraging habitat for shrimp species and foraging habitat for drum.

5.2.2.5.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to EFH would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.6 Cultural Resources

5.2.2.6.1 Programmatic Features

Direct Impacts

Activities associated with these projects have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project areas did not identify any significant cultural resources that could be impacted. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual projects are developed, survey strategies and the Area of Potential Effect will be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within any of the project areas, strategies will be developed to avoid those resources or mitigate adverse impacts.

Indirect Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project areas. The loss of land within the project areas threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project areas.

5.2.2.6.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to cultural resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.7 Recreational Resources

5.2.2.7.1 Programmatic Features

Direct Impacts

The 113 acre intermediate marsh restoration at MI, 325 acres of brackish creation and enhancement at BSFS and the 111 acres of intermediate marsh restoration at BSPS would improve the fishery and waterfowl habitat in the area which could attract more fish, ducks and wildlife as the site develops over time. Positive benefits would accrue to recreational fishing and hunting at these sites and in nearby waters. Through the establishment of wet, bottomland hardwoods in the BSPS, the 242 acre site could once again attract migratory birds providing excellent recreational birding opportunities. The adjacent 111 acres of intermediate marsh restoration could also benefit migratory birds by providing foraging habitat. The privately-owned, 51 acre FR BLH-W enhancement project could become public-use lands if the mitigation areas are brought into the Big Branch National Wildlife Refuge boundaries, which are nearby. The refuge could manage the site for improved hunting opportunities or other recreational activities as yet undetermined once the BLH-W enhancement is complete.

Temporary, direct impacts to recreational fishing could occur at the borrow sites in Lake Pontchartain and Lake Borgne from dredging activities. Similar affects could be seen at the marsh restoration sites. Additionally, 500 foot wide floating pipeline corridors in Lake Pontchartrain and Lake Borgne that connect the borrow sites to the restoration sites will temporarily affect boaters in these parts of Lake Pontchartain and Lake Borgne and in the vicinity of Bayou Suavage NWR.

Indirect Impacts

Fishing in waters adjacent to the borrow site and receiving areas may be impacted by increased turbidity caused by dredging and placement activities. These impacts would cease once construction is complete. Recreational opportunities should improve in the basin once all of the LPV mitigation sites are restored as these areas will provide valuable habitat to both fisheries and wildlife using the Lakes and surrounding marshes.

5.2.2.7.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to recreational resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.8 Aesthetic Resources

5.2.2.8.1 Programmatic Features

Direct and Indirect Impacts

No impacts would be expected as none of the sites have significant visual attributes.

5.2.2.8.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to aesthetic resources would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.1.9 Air Quality

5.2.2.9.1 Programmatic Features

Direct Impacts

During construction of these features, an increase in air emissions could be expected during construction. These emissions could include exhaust emissions from operations of various types of non-road construction equipment such as a cutterhead dredge, back hoe, etc. and from vehicles used to access the project area. Fugitive dust emissions are not anticipated during construction.

Any site-specific construction effects to air quality would be temporary, and air quality would return to pre-construction conditions shortly after the completion of construction activities. Because the project area is in parishes in attainment of NAAQS, a conformity analysis is not required.

Indirect Impacts

There would be no adverse indirect impacts to air quality in the parish with construction of the proposed action.

5.2.2.9.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative air quality impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.10 Noise

5.2.2.10.1 Programmatic Features

Direct and Indirect Impacts

Cutterhead dredges and backhoes would be the primary pieces of equipment used for construction of most of the alternatives. At the FR site a hydro ax and ATVs would be the primary pieces of equipment used for construction of these features. These pieces of equipment exceed noise levels above 55 dBA. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent habitats should be largely undisturbed by the additional noise from construction of these features. Residences near the MI project and commercial facilities near the BSPS project could experience higher than ambient noise levels during construction, however these levels would be temporary during the period of construction and would be limited to daylight hours. No impacts to nearby subdivision residents or human populations at the FR project are anticipated as noise levels would quickly drop off due to the vegetative buffer along the road. No impact to the human population from noise is anticipated at the BSFS project as the site is remote and uninhabited.

5.2.2.10.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative noise impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.11 Hazardous, Toxic, and Radioactive Waste

5.2.2.11.1 Programmatic Features

Direct, and Indirect

No impacts anticipated.

5.2.2.11.2 Constructible Features

Direct, and Indirect

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative HTRW impacts would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.2.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

5.2.2.12.1 Programmatic Features

Direct and Indirect Impacts

According to 2010 U.S. Census data, there is a subdivision near the boundaries of the MI project, but not within the project area. There may be some noise disruption to the subdivision as a result of the increased construction activity, however this disturbance would be temporary during the period of construction and would be limited to daylight hours. There are no anticipated impacts to population, housing, or minority or low-income areas other than the aforementioned noise. According to 2010 U.S. Census data, there are no residents located within the boundaries of the BSFS or BSPS marsh restoration projects or the FR BLH-Wet enhancement project and therefore impacts to population or housing are not expected to occur. As this is a Programmatic IER, additional Environmental Justice analysis would be conducted and documented in supplemental NEPA documents. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur under these features. The proposed alternative does not require any acres of agricultural or forestry land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of these features including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and Lake Borgne and all construction activities would be within the project site.

The navigable waterways nearest to the mitigation projects are Lake Pontchartrain, GIWW, and Lake Borgne. There would be no direct impact to navigation from implementation of these features. Potential indirect impacts would be minimal as the project area could be avoided with minor course corrections. There would be no direct and only minimal indirect impacts to commercial fisheries from implementation of these features due to borrow dredging. Indirect impacts would be a result of increased silt disruption in the LPV area. These would be temporary during the period of construction and minimal as the MI and BSFS borrow areas make up a small percentage of a 403,200 acre lake and the BSPS borrow area makes up a small percentage of a 162,505 acre lake. Positive indirect impacts from the MI intermediate marsh and BSFS brackish marsh restoration projects include increasing spawning, nursery, forage and cover habitat for commercial fishery resources.

5.2.2.12.2 Constructible Features

Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, no new direct, indirect or cumulative impacts to socioeconomics/landuse, environmental justice, transportation, navigation and commercial fisheries would be incurred from the purchase of these credits for the HSDRRS mitigation.

5.2.3 MITIGATION PROJECT ALTERNATIVE 2 (MPA2)

MPA2 (Table 5-2) is a combination of the TSMPs discussed in Section 5.2 with the exception of the constructible TSMPs identified for BLH-Dry, BLH-Wet and swamp general impacts (mitigation banks). These projects are replaced with the second ranked projects for the same habitat types. This document has identified the status of projects in this plan as constructible at this time and others that are programmatic and will need additional NEPA documentation during their detail design phase.

Table 5-2: Mitigation Project Alternative 2

Features	Habitat Mitigated For	Status
Bonnet Carré BLH-Wet Restoration	Non-Refuge BLH-Wet/Dry	Constructible
Bonnet Carré Swamp Restoration	Non Refuge Swamp	Constructible
Milton Island Marsh Restoration (MI)	Non-Refuge Fresh/Intermediate Marsh	Programmatic
Bayou Sauvage Marsh Restoration (BSFS)	Flood side Non-Refuge Brackish Marsh	Programmatic
Bayou Sauvage Refuge BLH-Wet/Intermediate Marsh Restoration (BSPS)	Protected Side Refuge BLH-Wet/Intermediate Marsh	Programmatic
Fritchie Refuge BLH-Wet Enhancement (FR)	Flood Side BLH-Wet	Programmatic

<u>5.2.3.1 Wetlands and other Surface Waters</u>

5.2.3.1.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.1.1.

5.2.3.1.2 Constructible Features

Direct Impacts

Approximately 466 acres of shallow open water and early successional wetland plant species would be replaced with high quality BLH-Wet and swamp species at the Bonnet Carré Restoration site. This area has been repeatedly disturbed for sand mining operations.

Indirect Impacts

As a result of borrow placement and the type of containment utilized for this project, land adjacent to the mitigation project may receive material suspended in the dredge effluent. This would nourish adjacent forested habitat and may cause adjacent shallow open water to become shallower or be filled; encouraging the existing habitat to move through early successional phases faster possibly increasing the forested wetland acreage adjacent to the project area.

5.2.3.2 Wildlife

5.2.3.2.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.2.1.

5.2.3.2.2 Constructible Features

Direct Impacts

Shallow open water and early successional wetland plant species would be replaced with approximately 466 acres of high quality BLH-Wet and swamp species. Some more immobile wildlife species (e.g. salamanders, frogs, turtles, mice) may experience demise during construction. Species that utilize early successional habitats such as low nesting wading birds (ex. yellow-crown night-heron), may be permanently displaced from the habitat conversion while other species would be temporarily displaced by construction activity. However, the creation of high quality habitat and a corridor for transient wildlife species, such as deer and bobcat, on either side of the proposed project greatly outweighs the loss of an early successional habitat type that exists in abundance throughout the basin. Many species utilizing the current habitat type would thrive with the additional forage, cover and resting habitat the project would create. Additionally, the new BLH habitat would attract new species to the project area such as raptors, resident and migrant birds, rabbit, squirrel and deer, and would improve habitat quality for nutria, muskrat, mink, otter, and raccoon (LCWCRTF and WCRA, 1999). The project areas are not anticipated to be of sufficient depth to be utilized by bottlenose dolphins nor are sufficient access available to anticipate the use of them by this species. As such construction of these projects should not result in entrapment of this species within any of the restoration sites.

Indirect Impacts

Species that utilize early successional habitats may be forced into nearby early successional habitat. Competition with resident species may occur. Since this type of habitat is abundant throughout the basin, indirect impacts from the habitat conversion would be minimal. Restored BLH and swamp habitat would provide more forage, cover and resting opportunities for wildlife species than would open water or early successional habitat. A rise in turbidity at the borrow sites 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 area would be free to relocate during construction since the borrow area (60 acres) encompass only a small section of Lake Ponchartrain (403,200 acres).

5.2.3.3 Threatened and Endangered Species

5.2.3.3.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.3.1.

5.2.3.3.2 Constructible Features

Direct Impacts

No direct impacts to the West Indian Manatee, Gulf sturgeon or the Kemp's ridley, loggerhead or green sea turtles are anticipated from construction of the Bonnet Carré BLH-Wet and swamp projects. The borrow pits within the spillway to be filled for BLH-Wet and swamp restoration are not of sufficient depth to be utilized by any of these species, nor is access such that it is likely that any of these species would find their way to these borrow pits. If for some reason any of these species were to find their way to these borrow pits the depth and resulting temperature extremes and low dissolved oxygen would either induce the species to move or result in their expiration.

The manatee; the Gulf sturgeon; and the Kemp's ridley, loggerhead, or green sea turtles have the potential to forage or swim in aquatic habitats where borrow dredging for the project is located. The presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction period (approximately 1-2 months).

However, in order to minimize the potential for dredging activities under the proposed action to cause adverse impacts to manatees during the construction period, the standard manatee protection measures found in section 3.2.1.3.2 would be implemented.

Dredging in Lake Pontchartrain for borrow would occur via hydraulic cutterhead dredge. Entrainment of Gulf sturgeon and sea turtles is not expected since hydraulic dredges are slow moving and use of them is not known to impact these species.

As such, the CEMVN has made a 'no effect' determination for this project's impacts to manatee, Gulf sturgeon, and sea turtles.

Indirect Impacts

Indirect impacts on endangered or threatened species are effects that could occur later in time than direct impacts but still are reasonably certain to occur (NMFS 2006). Potential indirect impacts from the proposed action would primarily consist of effects from dredging operations, increased turbidity and benthic species removal. However, although the rise in turbidity could immediately reduce water quality in the project area, those affects would be temporary and would be reduced from the movement of the tides. Any manatees, Gulf sturgeon or sea turtles in the area would be free to relocate during construction since the borrow areas (60 and 95 acres) encompass only a small section of Lake Ponchartrain (403,200 acres). Impacts to prey species are expected to be temporary in the borrow areas and additional foraging areas are available for manatee, Gulf sturgeon, and sea turtles to utilize throughout Lake in the interim. As such, no impacts to Gulf sturgeon or sea turtles are anticipated from temporary minor impacts.

5.2.3.4 Fisheries, Aquatic Resources, and Water Quality

5.2.3.4.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.4.1.

5.2.3.4.2 Constructible Features

Direct and Indirect Impacts

With implementation of these features, there would be some direct and indirect impacts to fisheries in the form of physically altered open water bottoms, and temporary increases in turbidity during construction activities. Approximately 206 acres of existing borrow pit ponds in the spill way would be converted to BLH-Wet or Swamp habitat. Approximately 155 acres of lake water bottom would be deepened by an average of 12 feet. It is anticipated that anoxic conditions would be avoided with this depth of dredging and that mobile fishery species would avoid the proposed borrow site during construction, thereby minimizing direct and indirect impacts to those species. Sediment particles suspended due to construction activities may impact filter feeding benthic invertebrates by fouling feeding apparatus if the concentration of such particles is excessively high at the dredge site and adjacent to the placement site. Due to the lack of escape routes, most fish species in the placement area would be experience demise during borrow material placement. There would also be direct impact to the benthic community due to burial and conversion from manmade ponds to BLH habitat and swamp. These species are commonly found throughout the basin in similar shallow water environments that exist in abundance. As such, impacts to the overall population of these species in the basin from the borrow placement is expected to be negligible. Direct impacts caused by increases in suspended

sediments during placement of borrow material would be minimal, localized, and short-lived. Although construction of this project would fill approximately 206 acres of existing borrow pit ponds in the spill way, the Bonnet Carré is regularly mined for borrow material by the government and commercial interests. As such, similar shallow water ponds are regularly created via these operations that would provide similar habitat for the same species currently utilizing the mitigation site. The temporary impacts to Lake Pontchartrain from borrow excavation 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. Impacts to the fill area would temporarily add to the water quality impairment of this subsegment through increased turbidity, but these impacts would be minimized through BMPs and would cease after construction.

5.2.3.5 Essential Fish Habitat

5.2.3.5.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.5.1.

5.2.3.5.2 Constructible Features

Direct and Indirect Impacts

With implementation of this project alternative, there would some direct and indirect impacts to EFH (silt, silt sand, muddy sand, soft mud, and SAV), in the form of physically altered bottom substrates in the borrow site. Approximately 155 acres of estuarine water column in Lake Pontchartrain would be made deeper. However, with the periodic opening of the Bonnet Carré Spillway during flood stage levels in the Mississippi River, the borrow pit is expected to refill and return to pre-project conditions in the future. The borrow site used for the CWPPRA PO-17 project in the vicinity of the proposed borrow site has refilled with the periodic opening of the Bonnet Carré Spillway.

5.2.3.6 Cultural Resources

5.2.3.6.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.6.1.

5.2.3.6.2 Constructible Features

Direct Impacts

Activities associated with these features have the potential to directly impact previously undocumented cultural resources that may exist within the project area. A review of previous research in the project area did not identify any significant cultural resources. The CEMVN has developed a Programmatic Agreement with the LA SHPO, the Advisory Council on Historic Preservation, Federally recognized Indian Tribes, and other interested parties outlining the steps needed to identify cultural resources. As individual project features are developed, survey strategies and the Area of Potential Effect would be coordinated with the LA SHPO, tribes, and other interested parties as required by the Programmatic Agreement. If significant cultural resources are identified within the project area, strategies would be developed to avoid those resources or mitigate adverse impacts.

Indirect Impacts

The erosion caused by natural forces and human activity would continue to impact cultural resources in the project area. The loss of land within the project area threatens the existence and integrity of these sites. The implementation of measures to restore ecosystems and habitat could work to reduce continued land loss and erosion, and prevent exposure and impact to significant cultural resources that may exist in the project area.

Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

5.2.3.7 Recreation Resources

5.2.3.7.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.7.1.

5.2.3.7.2 Constructible Features

Direct and Indirect Impacts

The BLH-Wet and swamp restoration proposed for the Bonnet Carré Spillway would eliminate approximately 466 acres of scrub shrub interspersed with fishing/crawfishing/crabbing ponds, which are used seasonally by recreational fisherman. Once restored, 466 acres of hiking/birding and limited crawfishing would be available at the project site. However, other fishing/crawfishing/crabbing ponds are available at the Spillway.

Borrow material needed for creating the wet habitat would come from Lake Pontchartrain via an existing canal in the spillway. Impacts associated with excavation of the borrow material from the Lake are expected to be minimal and consist of disruption in fishing in the immediate vicinity due to increases in turbidity. Impacts are expected to be short-term with conditions returning to normal shortly after dredging is completed. There are no indirect recreational impacts associated with implementation of this project alternative.

5.2.3.8 Aesthetic Resources

5.2.3.8.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.8.1.

5.2.3.8.2 Constructible Features

The Bonnet Carré Spillway's flood control structure would continue to periodically be operated to divert Mississippi River floodwaters into Lake Ponchartrain; the event would continue to attract thousands of visitors. Construction of this project alternative would not alter operation of the spillway nor result in any direct or indirect impacts to visual resources in the area.

5.2.3.9 Air Quality

5.2.3.9.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.9.1.

5.2.3.9.2 Constructible Features

Direct and Indirect Impacts

During construction of this project alternative, an increase in air emissions could be expected. These emissions could include 1) exhaust emissions from operations of material delivery/dump trucks and various types of non-road construction equipment such as loaders, excavators, dredges, etc. and 2) fugitive dust due to earth disturbance. The principal air quality concern associated with the proposed activities is emission of fugitive dust near demolition and construction areas. The on-road trucks and private autos used to access the work area would also contribute to construction phase air pollution in the project neighborhood when traveling along local roads.

Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs. Air quality would return to pre-construction conditions shortly after the completion of construction activities. Construction activities related to the proposed

action would not occur all at once, but would occur in increments through the estimated construction period. Construction activities would be similar to those activities that regularly occur within the Bonnet Carré Spillway, namely borrow procurement, recreational, and spillway maintenance activities. Because the project area is in a parish in attainment of NAAQS, a conformity analysis is not required. There would be no adverse indirect impacts to air quality within the project area under the proposed action.

5.2.3.10 Noise

5.2.3.10.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.10.1.

5.2.3.10.2 Constructible Features

Direct and Indirect Impacts

Although construction of this project alternative would temporarily exceed a DNL of 55 dBA, other projects within the spillway routinely exceed this noise level. Bulldozers (82 dBA) and backhoes (80 dBA) would be the primary pieces of equipment used for construction of this project alternative. Recreational users would likely avoid these areas due to the construction activity. Open water areas in the vicinity of this project alternative that may have been used for fishing are within the construction area. Noise levels may result in wildlife avoiding the project area during construction; however, movement of equipment during construction would result in the same avoidance behaviors from wildlife species. In addition, noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. vegetation). As such, any wildlife in the adjacent forests should be largely undisturbed by the additional noise from this project alternative's construction. There are no residences or businesses in the project vicinity that could be disturbed by project construction.

5.2.3.11 Hazardous, Toxic, and Radioactive Waste

5.2.3.11.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.11.1.

5.2.3.11.2 Constructible Features

Direct and Indirect Impacts

None of the studies referenced in section 3.2.5.11.2 identified a high probability of encountering HTRW during the course of the mitigation projects being considered for the Bonnet Carré

Spillway area. The areas proposed for mitigation are now borrow pits, from which material for levee repairs has been excavated in the recent past. They would be filled with material dredged from Lake Pontchartrain to restore swamp habitat. USACE Engineer Regulation, ER 1165-2-132, Hazardous, Toxic, and Radioactive Waste (HTRW) for Civil Works Projects, states that dredged material and sediments beneath navigable waters proposed for dredging qualify as HTRW only if they are within the boundaries of a site designated by the EPA or a state for a response action (either a removal or a remedial action) under CERCLA, or if they are a part of a National Priority List (NPL) site under CERCLA. (NPL is also known as "Superfund.") None of the reaches proposed for dredging is included in the National Priority List or within the boundaries of a CERCLA site.

There is a very low probability that the proposed restoration of habitat within Bonnet Carré Spillway using material from Lake Pontchartrain would encounter HTRW or introduce toxic materials into the Bonnet Carré mitigation areas. The project may proceed without further investigation of HTRW. If the project location or methods change the probability of HTRW may need to be re-investigated.

5.2.3.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

5.2.3.12.1 Programmatic Features

Since the projects identified as programmatic features for this alternative are the same as the TSMPA, the impacts to this significant resource from their implementation are the same as identified under the TSMPA in section 5.2.2.12.1.

5.2.3.12.2 Constructible Features

Direct and Indirect Impacts

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the Bonnet Carré BLH-Wet and swamp restoration projects and therefore no impacts to population, housing, or minority or low-income populations are expected to occur. Additionally, there are no commercial/industrial properties, public facilities, transportation infrastructure or commercial fishing within the project boundaries and therefore no impacts to employment, businesses, industry, public facilities and services, community and regional growth, community cohesion, or tax revenues and property values are anticipated to occur under this project alternative. The proposed projects do not require any acres of agricultural land to be converted.

There would be no direct and only minimal indirect impacts to transportation from implementation of the Bonnet Carré BLH-Wet and swamp restoration projects including increased heavy vehicle traffic during the period of construction. It is expected that once the necessary construction equipment is on site that no additional transportation impacts would occur until the project construction is complete since borrow would be obtained from Lake Pontchartrain and all construction activities would be within the Bonnet Carré Spillway.

The nearest navigable waterway to the Bonnet Carré BLH-Wet and swamp restoration projects is Lake Pontchartrain. There is no direct impact to navigation from implementation of the Bonnet Carré BLH-Wet and swamp restoration projects. Potential indirect impacts could be avoided with minor course corrections. There would be no direct or only indirect impacts to commercial fisheries within the project area because commercial species are not found in the borrow pits that will be converted to BLH-Wet and swamp due to their shallow depth and resulting water quality extremes (temperature and dissolved oxygen). Minimal indirect impacts to commercial fisheries from implementation of the Bonnet Carré BLH-Wet and swamp restoration projects may occur due to borrow dredging. Any indirect impacts would be a result of increased silt disruption around the adjacent LPV area. Commercial fishery species found in the lake include blue crab, white shrimp, brown shrimp, (NMFS 1998), speckled seatrout, black drum, red drum, sheepshead, and flounder (USACE 1986). Lake Pontchartrain and its adjacent wetlands function as a typical estuary where marine-spawned and estuary dependent fish and shellfish species utilize different regions of the estuary for various life stages. The impacts would be temporary during the period of construction and minimal as the borrow area makes up a small percentage of a 403,200 acre lake.

6.0 CUMULATIVE IMPACTS

NEPA requires a Federal agency to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impacts of the action. Cumulative impact is defined as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions (40 CFR 1508.7)." Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Cumulative impacts were addressed for each project and resource in the preceding sections and include both beneficial and adverse impacts depending on the resource. This section provides an overview of other actions, projects, and occurrences that may contribute to the cumulative impacts previously discussed.

Appendix B, table 19 shows the impact of the other past, present and reasonably foreseeable projects in the LPV basin on the significant resources documented in this PIER. The ecosystem restoration type projects in the basin, made up of diversions; hydrologic restoration projects; habitat enhancement/preservation/restoration projects; and marsh creation, work to enhance and restore historic ecosystem processes within the basin. Although these projects may result in temporal impacts and tradeoffs among the species within the significant resources, their overall effects on the system from a human and natural environmental perspective would be wholly positive. The structural projects, to a large degree, produce socioeconomic benefits (primarily in the form of navigation or flood control) that are the impetus for their construction. Though impacts to the natural environment from construction of these projects have been avoided to the maximum extent practicable, remaining unavoidable impacts would require mitigation. Environmental Justice impacts have been avoided during design of these projects however, these projects have resulted in impacts to the aesthetics and recreational opportunities within the system. Some of these projects have had impacts to cultural resources in the basin; however, those impacts have been mitigated by excavating the site, removing the cultural pieces, and documenting the site. In the same vein, construction of many of the structural features (e.g. levee systems) in the FWOP has resulted in the protection of cultural sites found within the protection of the levee system. Ecosystem restoration plans in the LPV basin and in the region that improve estuarine habitat also provide benefits to the commercial fishing industry.

Overall cumulative impacts from implementation of all features in the TSP will be presented in the phase of the CED completed after all TIERs for LPV HSDRRS mitigation are complete.

6.1 NO ACTION

The overall loss of intermediate, brackish marsh, BLH, and swamp within the system combined with other habitat loss incurred from implementation of projects in the FWOP conditions could have cumulative adverse impacts to wildlife, fisheries, aquatic resources, water quality, EFH and recreational resources.

6.2 TSMPA

6.2.1 CONSTRUCTIBLE FEATURES

No new cumulative impacts to any resource would be incurred from the purchase of credits from a previously approved mitigation bank for the HSDRRS mitigation under the TSMPA. Since the purchase of mitigation bank credits would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions, the constructible features would only have new potential impacts on the availability of mitigation bank credits for BLH-Wet and swamp in the basin. In the event sufficient credits are not available for these habitat types to offset impacts associated with a proposed permit, the district engineer would determine appropriate compensatory mitigation based on the factors described in 33 CFR Part 332.3(b).

Implementation of the proposed action in consideration of the impacts of all other past, present, and reasonably foreseeable projects have on the significant resources in the basin would be cumulatively neutral as it would offset the loss of 93.55 AAHUs of BLH habitat and 108.01 AAHUs of swamp habitat within the LPV basin without incurring any new adverse impacts.

6.2.2 PROGRAMMATIC FEATURES

6.2.2.1 Wetlands and other Surface Waters

The TSMPA would prevent an overall loss in the basin of intermediate, brackish marsh as well as BLH-Wet, BLH-dry and swamp 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 open water habitat in the LPV basin, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin. Impacts to SAVs would be mitigated as intermediate and brackish marsh.

6.2.2.2 Wildlife

The TSMPA would prevent an overall loss in the basin of wetland habitat necessary for many wildlife species. This project, in conjunction with other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the overall decline of wildlife species within the basin and would be beneficial in preserving species bio-diversity.

6.2.2.3 Threatened and Endangered Species

Potential cumulative impacts to the threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project area from construction of the TSMPA would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lakes (Lake Borgne - 162,505 acres and Lake Ponchartrain - 403,200 acres), the size of the designated Gulf sturgeon critical habitat in Lake Pontchartrain (approximately half of the lake) and Lake Borgne (all of it), the relatively small size of the borrow areas (55 acres and 184 acres in Lake

Pontchartrain and 220 acres in Lake Borgne), the temporary nature of the borrow activities, the sediments in the borrow area, the depth of excavation, the use of cutterhead dredges for borrow procurement, the duration of dredging, the ability of benthic species to quickly re-colonize the borrow areas, the ability of T&E species to avoid the project area during the construction period, and the use of protection measures the TSMPA would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species or their habitat in the basin.

6.2.2.4 Fisheries, Aquatic Resources and Water Quality

Although there would be a loss of open water from construction of this project, these habitats are found in abundance throughout the LPV basin. 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.

The temporary impacts to water quality from construction of these projects when added to similar impacts produced by other projects found in the FWOP conditions could result in temporary decreases in water quality throughout the LPV basin. However, those projects in the FWOP conditions which include wetlands restoration as well as the proposed actions could have the long-term beneficial impact of increased dissolved oxygen and increased filtration which helps control local turbidity.

6.2.2.5 Essential Fish Habitat

These projects would cause one type of EFH in the LPV basin to be replaced by another type of EFH. The switching of EFH types from construction of the proposed projects is not anticipated to have a significant impact to the overall EFH in the LPV basin. Impacts to cover and foraging for EFH species are not anticipated to cause significant increases in cumulative impacts to EFH species experienced from the implementation of FWOP condition projects as the borrow area is small in size compared to the available EFH habitat in the basin providing similar habitat.

6.2.2.6 Cultural Resources

Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by a proposed action.

6.2.2.7 Recreational Resources

Restoration/enhancement of fish and wildlife habitat would increase use of the project sites by desirable species which would consequently provide a better recreational experience. Recreational impacts could be considered cumulatively beneficial when added to the recreational opportunities provided at adjacent refuges and other existing recreational areas in the basin. However, since this is mitigation, which

replaces impacted habitats, recreational resources dependant on these habitats would merely shift from the area of impact to the area of mitigation, preventing the loss of recreational resources in the basin. The impacts associated with utilization of the borrow sites for construction of the mitigation projects would be short term and not result in a significant increase in cumulative impacts to recreational resources in the basin.

6.2.2.8 Aesthetic Resources

No cumulative impacts would be expected as most of the TSMPA is visually inaccessible and has no significant visual attributes.

6.2.2.9 Air Quality

Cumulative impacts to air quality in the project area due to construction of TSMPA in addition to the other construction activities within the LPV basin that may be occurring concurrently would be temporary and would be very minimal, especially considering that placement of dredged material would not create fugitive dust. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action. All project areas are located in parishes in attainment of NAAQS.

6.2.2.10 Noise

Construction of the TSMPA is not anticipated to add significantly to the cumulative effect of noise in the LPV basin as the construction activities would be temporary and restricted to daylight hours. Most of the projects are situated in remote areas and noise from construction activities buffered by vegetation. Avoidance of the project areas by wildlife during construction is anticipated despite construction noise due to the movement of machinery in the area.

6.2.2.11 Hazardous, Toxic, and Radioactive Waste

No cumulative impacts are anticipated.

6.2.2.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

The cumulative impacts of the mitigation plan, when added to other past, present, and reasonably foreseeable projects in the basin would minimally and temporarily affect socio-economic resources. Due to the size of Lake Pontchartrain and Lake Borgne, the relatively small size of the borrow areas, the temporary nature of the borrow activities and the duration of dredging, the TSMPA would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to socio-economic resources in the basin. Minimal, positive impacts to commercial fishing from the LPV mitigation projects will occur as a result of marsh and wetland restoration improving spawning, nursery, forage and cover habitat of important commercial fish species in the LPV basin. However the positive benefits cannot be considered part of a cumulative impact on this socio-economic resource because

implementation of the mitigation plan replaces habitat lost as a result of construction of HSDDRS. Any resulting benefits to the commercial fishing industry from the LPV mitigation projects, in theory, replaces those lost during levee construction and therefore results in no net cumulative impact.

Impacts from restoration projects can temporarily disrupt transportation, navigation and commercial fishing in project areas during construction activities including dredging and material placement in the restoration areas. Land use impacts, such as impacts to commercial/industrial properties and public facilities, and environmental justice impacts are not anticipated as TSMPs are typically located in unpopulated areas.

6.2.2.13 Prime and Unique Farmlands

There are 15,463.7 acres of Abita silt loam in St. Tammany parish. The TSMPA would result in 51 acres of Abita silt loam, which is less than .3% of the Abita silt loam currently found in St. Tammany parish, being removed from future potential agricultural development. Since the project area is presently not being farmed, current agricultural production in the parish would not be affected. Though the project area could potentially be developed for agricultural purposes in the future, implementation of a project that affects such a small amount of prime farmland would have negligible effect on agricultural production in the parish.

6.3 MPA2

6.3.1 CONSTRUCTIBLE FEATURES

Constructible features of MPA2 consist of the construction of the Bonnet Carré projects mitigating for general impacts to BLH-Dry, BLH-Wet, and swamp.

6.3.1.1 Wetlands and other Surface Waters

Construction of the Bonnet Carré projects would prevent an overall loss in the basin to BLH from construction of the HSDRRS system. These projects added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands within the basin and, when combined with other HSDRRS mitigation projects, would offset the habitat losses caused by construction of the HSDRRS.

6.3.1.2 Wildlife

Construction of the Bonnet Carré projects would prevent an overall loss in the basin to BLH and swamp habitat necessary for many wildlife species. These projects added to other past, present, and reasonably foreseeable ecosystem restoration and mitigation projects in the basin would help retard the loss of wetlands and overall decline of wildlife species within the basin.

6.3.1.3 Threatened and Endangered Species

Potential cumulative impacts to threatened or endangered species (manatee, Gulf sturgeon, and sea turtles) that could occur in the vicinity of the project areas from construction of the Bonnet Carré projects would involve the combined adverse effects on each species from the other projects within the LPV basin. Due to the size of Lake Ponchartrain (403,200 acres), the small size of the borrow areas (155 acres), the temporary nature of the borrow activities, the use of a cutterhead dredge for borrow procurement, the duration of dredging, the use of avoidance procedures, and the ability of these species to avoid the project area during the construction period, construction of the Bonnet Carré projects would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the basin and would not contribute significantly to cumulative impacts to threatened and endangered species in the basin.

6.3.1.4 Fisheries, Aquatic Resources and Water Quality

Although construction of the Bonnet Carré projects would result in the loss of marginal fisheries habitat, some fish, and temporary impacts to water quality and benthic habitat; this habitat is abundant throughout the basin, impacts to existing fisheries are minimal, and water quality and benthic species would rebound once project construction is complete. As such, construction of these projects would result in minimal increased loss to fisheries, aquatic resources, and water quality experienced in the basin from the past, present and reasonably foreseeable projects in the basin. The reinstitution of BLH and swamp in areas that are currently manmade ponds in the spillway could provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus.

6.3.1.5 Essential Fish Habitat

Although there would be impacts to EFH in Lake Ponchartrain from borrow dredging for these projects, these impacts are expected to be minimal and reversed over time with the periodic opening of the Bonnet Carré Spillway. When added to the impacts of from the past, present and reasonably foreseeable projects in the basin, construction of the Bonnet Carré projects would result in a minimal addition of impacts to EFH in the basin.

6.3.1.6 Cultural Resources

Implementation of the Bonnet Carré projects would work synergistically with other ecosystem restoration projects in coastal Louisiana and to reduce continued land loss and erosion, and could prevent exposure of and impact to significant cultural resources in the basin. Cumulative impacts to cultural resources would be the additive combination of impacts by this and other Federal, state, local, and private restoration efforts, and would be further developed on a project-by-project basis. Any additional evaluations would include examination of records of known sites and an intensive cultural resources inventory in areas determined to have a high probability of historic and cultural resources. Mitigation, usually in the form of avoidance, would be necessary if a determination was made that significant cultural resources would be impacted by the proposed actions.

6.3.1.7 Recreational Resources

Cumulative impacts from the loss of fishing areas with construction of the Bonnet Carré projects is expected to be very minimal as there are many other lands and water available for recreational crawfishing and line fishing in the spillway and in the vicinity of the project. Additionally, other LPV mitigation and ecosystem restoration projects would improve recreation opportunities by restoring habitat suitable for fish and wildlife.

6.3.1.8 Aesthetic Resources

No cumulative impacts are anticipated.

6.3.1.9 Air Quality

Construction activities would be similar to those activities that have occurred and are occurring within the Bonnet Carré, namely borrow procurement and spillway maintenance activities. Cumulative impacts to air quality due to construction of these projects in addition to the past, present and reasonably foreseeable projects in the basin would be temporary and could be minimal. After the construction period, there would be no incremental contribution to cumulative air quality impacts due to the proposed action.

6.3.1.10 Noise

The Bonnet Carré project areas are remote and uninhabited. Noise generated from these projects would insignificantly increase negative noise impacts associated with construction of the past, present or reasonably foreseeable projects. The same type of machinery would be used for construction of these projects as is used for sand and clay mining that regularly occurs in the Bonnet Carré. The noise experienced by the use of one bulldozer at 82 dBA increases to 85 dBA with the use of an additional bulldozer. Similar increases are experienced with other machinery. As such, the additive noise associated with construction of the Bonnet Carré projects would be minimal. Noise associated with construction of these projects would occur in concert with other mining activities and is not anticipated to prolong noise exposure. Construction of these projects would result in a site producing additional disturbance in the spillway however, construction activities would be temporary, avoidance of the project area would occur due to machinery movement in the area and noise levels would be buffered by adjacent vegetation.

6.3.1.11 Hazardous, Toxic, and Radioactive Waste

No cumulative impacts are anticipated.

6.3.1.12 Socioeconomics/Land Use, Environmental Justice, Transportation, Navigation, and Commercial Fisheries

The minimal and temporary indirect impacts to transportation, commercial fisheries and navigation from construction of the Bonnet Carré projects is not anticipated to add significantly to the cumulative

impacts experienced from construction of the past, present and reasonably foreseeable projects in the basin.

6.3.2 PROGRAMMATIC FEATURES

Since the MPA2 utilizes the same programmatic features as the TSMPA, cumulative impacts for the programmatic features of MPA2 would be the same as those for the TSMPA as found in section 6.1.2.

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

General success criteria and monitoring including planting guidelines for the mitigation projects can be found in appendix J. Specific success criteria and monitoring for the Bonnet Carré projects can be found in appendix K and L.

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 (AM) 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 AM 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. See appendix N for the AM Plan.

Each Corps constructed TSMP would have a contingency plan for taking corrective actions in cases where monitoring demonstrates that the mitigation feature is not achieving ecological success in accordance with its success criteria. For the TSMP projects where credits would be purchased from a mitigation bank, the mitigation bank must be in compliance with the requirements of the USACE Regulatory Program and its MBI, which specifies the management, monitoring, and reporting required to be performed by the bank. Purchase of mitigation bank credits relieves the CEMVN and NFS of the responsibility for monitoring and of demonstrating mitigation success.

An effective monitoring program is required (WRDA 2007, Section 2036) to determine if the project outcomes are consistent with the identified success criteria. A Monitoring Plan has been developed for each habitat type within the TSMP. See appendix J for the Monitoring Plan. The plan identifies success criteria and targets, a general schedule for the monitoring events and the specific content for the monitoring reports that measure progress towards meeting the success criteria. A detailed monitoring plan including the transect, sampling plot and gage locations, and monitoring frequency would be developed in coordination for the TSMP projects with the local Sponsor and the Interagency Mitigation Team following completion of the design of the TSMP projects. In the case that the constructible features of the TSMPA (purchase of BLH and swamp mitigation bank credits) are not implemented, detailed monitoring plans for the constructible features of MPA2 (Bonnet Carré BLH and swamp projects) have been developed and can be found in appendix K and L. Please note that if it is determined that either or both of the Bonnet Carré projects for non-refuge BLH and swamp would implemented versus the TSMPs for those same habitat types (mitigation banks), an AM (contingency) for those projects would also be needed.

The proposed mitigation actions could include construction, with the Non-Federal Sponsor responsible for operation and maintenance of functional portions of work as they are completed. On a cost shared basis, USACE will monitor completed mitigation to determine whether additional construction, invasive species control and/or planting are necessary to achieve mitigation success. USACE will undertake additional actions necessary to achieve mitigation success in accordance with cost sharing applicable to the project and subject to the availability of funds. Once USACE determines that the mitigation has achieved initial success criteria, monitoring will be performed by the Non-Federal Sponsor as part of its

OMRR&R obligations. If, after meeting initial success criteria, the mitigation fails to meet its intermediate and/or long-term ecological success criteria, USACE will consult with other agencies and the Non-Federal Sponsor to determine whether operational changes would be sufficient to achieve ecological success criteria. If, instead, structural changes are deemed necessary to achieve ecological success, USACE will implement appropriate adaptive management measures in accordance with the contingency plan and subject to cost sharing requirements, availability of funding, and current budgetary and other guidance.

8. COORDINATION AND CONSULTATION

8.1 PUBLIC INVOLVEMENT

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

The following public meetings were held to obtain public input on the planning process for LPV HSDRRS mitigation, to obtain any suggestions on potential projects to mitigate LPV HSDRRS impacts, and to update the public on the project status:

1. August 31, 2009 at U.S. Army Corps of Engineers Office in New Orleans, LA
2. May 19, 2010 at NP Trist Middle School in Meraux, LA
3. May 24, 2010 at Resurrection of Our Lord Elementary in New Orleans, LA
4. May 26, 2010 at American Legion Post 366 in St. Rose, LA
5. December 7, 2010 at the American Legion Post 366 in St. Rose, LA
6. March 15, 2012 at the Church of New Orleans in New Orleans, LA

Public notices for each meeting ran in local newspapers and press releases were disseminated to the media in advance of each meeting. The public was able to provide verbal comments during the meetings, written comments after each meeting in person, by mail, and via www.nolaenvironmental.gov. Additional, public comments are accepted anytime during the IER process via www.nolaenvironmental.gov. The presentations given at all of these meetings can be found at www.nolaenvironmental.gov.

The Draft PIER is being distributed for a 30-day public review and comment period.

8.2 AGENCY COORDINATION

Preparation of this PIER 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 for this project in which Federal and state agency staff played an integral part in the project planning and alternative project analysis phases of the project (members of this team are listed in appendix O). This interagency environmental team was integrated with the CEMVN PDT to assist in the planning of this project and to complete a determination of the potential direct and indirect impacts of the proposed action. Monthly meetings with resource agencies were also held concerning this and other CEMVN IER projects. The following agencies, as well as other interested parties, are receiving copies of this draft IER:

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, National Oceanic and Atmospheric Administration, NMFS

U.S. Natural Resources Conservation Service
Louisiana Advisory Council on Historic Preservation
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
Coastal Protection and Restoration Authority Board

Since the purchase of mitigation bank BLH and swamp credits (constructible feature of the TSMPA) would occur at an existing approved bank and since permitted banks exist as reasonably foreseeable projects in the FWOP conditions; no new direct, indirect or cumulative impacts to threatened and endangered species or their critical habitat would occur that would require coordination with USFWS or NOAA, NMFS. In addition, a Water Quality Certificate from the State of Louisiana; public review of a Section 404(b)(1) Public Notice and signature of a Section 404(b)(1) Evaluation; receipt and acceptance or resolution of LDEQ comments on the air quality impact analysis; and receipt and acceptance or resolution of EFH recommendations would not be necessary for implementation of the constructible features of the TSMPA. However, if acceptable bids for the sale of bank credits are not received and the USACE determines that MPA2 containing the Bonnet Carré projects for BLH and swamp as constructible features would be implemented instead of the TSMPA, the aforementioned coordination with the resource agencies and evaluations, including consistency with the Louisiana Coastal Resources Program (LCRP) and completion of Section 106 consultation, would occur for those projects at that time.

The LDNR reviewed the proposed action for consistency with the LCRP. The proposed action was found to be consistent with the LCRP, as per a letter dated 3 June 2013 (Appendix Q).

Section 106 of the NHPA, as amended, requires consultation with the LA SHPO and Native American tribes. Eleven Federally-recognized tribes that have an interest in the region have been given the opportunity to review the proposed action. A programmatic agreement has been developed through coordination with the LA SHPO, Advisory Council on Historic Preservation, Federally recognized Indian tribes and other interested parties for the HSDRRS Mitigation. The programmatic agreement was executed 18 June 2013 (Appendix Q) and CEMVN will comply with stipulations agreed to in the programmatic agreement. As a result, Section 106 consultations are complete for the TSMPs and the Bonnet Carré projects.

Coordination with the USFWS on the Alternative Arrangements process was initiated by letter on 13 March 2007, and concluded on 6 August 2007. A draft Fish and Wildlife CAR for the PIER was provided by the USFWS on November 21, 2012. The draft CAR concluded that the USFWS does not object to the construction of the proposed project provided that fish and wildlife conservation recommendations are implemented concurrently with project implementation. A copy of the draft report is provided in appendix Q. The USFWS project-specific recommendations for the PIER #36 proposed action are listed below:

Recommendation 1: Avoid adverse impacts to bald eagle and osprey nesting locations and wading bird colonies through careful design project features and timing of construction. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

CEMVN Response 1: The clearing of forested wetlands would be conducted in the fall or winter, if practicable, to avoid and minimize impacts to nesting migratory birds. If colonial-nesting wading birds (CNWBs) are anticipated to nest in forested areas slated for clearing during the nesting season, the USACE would likely employ other measures to avoid impacts to active CNWB nests, viable eggs in such nests, and nesting young, such as implementation of a CNWB nesting prevention/abatement plan. Any such plan would first be coordinated with USFWS.

Recommendation 2: We recommend that the Corps initiate ESA consultation with this office to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat. Subsequently, ESA consultation should be reinitiated should the proposed project features change significantly or are not implemented within one year of the last ESA consultation with this office to ensure that the proposed project does not adversely affect any Federally listed threatened or endangered species or their habitat.

CEMVN Response 2: Concur. The USACE would fulfill its consultation responsibilities as required under the ESA.

Recommendation 3: Impacts to wetland habitat (including submerged aquatic vegetation habitat) and non-wet BLH associated with the construction of the mitigation features should be avoided and minimized to the greatest extent possible. The Corps shall fully compensate for any unavoidable losses of wetland habitat or non-wet BLH caused by project features preferably through resizing of the mitigation features and in close coordination with the natural resource agencies.

CEMVN Response 3: Concur.

Recommendation 4: Impacts to Essential Fish Habitat (EFH) should be avoided and minimized to the greatest extent possible. For proposed project areas that impact designated EFH habitat, coordination with the NMFS should be conducted.

CEMVN Response 4: Concur. The USACE would seek to avoid impacts to EFH and would coordinate with NMFS on any unavoidable impacts.

Recommendation 5: Sediment borrow sites for the marsh creation areas should be designed to avoid and minimize impacts to water quality. The general guidelines for borrow design is found in Appendix C should be incorporated into project design, and close coordination with the natural resource agencies should continue since borrow design can be case specific and influenced by a number of factors.

CEMVN Response 5: Concur. Best management practices would be employed to minimize impacts to water quality from borrow dredging activities. The general guidelines for borrow pit design would be incorporated into the design to the maximum extent practicable. Close coordination with the natural resource agencies would continue on the mitigation project designs.

Recommendation 6: Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, Water Control Plans, or other similar documents) should be coordinated with the Service, NMFS, LDWF, EPA, and LDNR. The Service shall be provided an opportunity to review and submit recommendations on the all work addressed in those reports.

CEMVN Response 6: The USFWS and other resource agencies would be provided an opportunity to review and comment on the proposed HSDRRS mitigation plans during the project feasibility study and Pre-Construction Engineering and Design.

Recommendation 7: If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

CEMVN Response 7: Concur

Recommendation 8: If mitigation lands are purchased for inclusion within a NWR those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A. Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore, if they are proposed as a manager of a mitigation site they should be contacted early in the planning phase regarding such requirements.

CEMVN Response 8: If mitigation lands are purchased for inclusion within a NWR, the CEMVN would work to meet the basic mitigation land requirements in Appendix A to the maximum extent possible. The Non-Federal Sponsor is responsible for operation and maintenance of the HSDRRS project, including the mitigation features. Where mitigation features are located on Federal lands, the appropriate agency and the Non-Federal Sponsor would need to coordinate management of the mitigation project. Where mitigation projects are to be constructed on lands within a Federal agency's jurisdiction, that agency will be consulted regarding any requirements that will be applicable to those lands.

Recommendation 9: The Corps should continue to coordinate with refuge personnel during planning and compatibility determination processes. A Special-Use Permit should be obtained prior to any entrance onto the refuge. Coordination should continue until construction of the flood protection project and restoration projects are complete and prior to any subsequent maintenance. Points of contacts for that refuge are Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Neil Lalonde (985) 822-2000, Refuge Manager for the Bayou Sauvage NWR. The Corps should not sign the Decision of Record until a Compatibility Determination is complete.

CEMVN Response 9: Concur

Recommendation 10: The local sponsor should also be made aware of the above requirements should it be their responsibility to transfer mitigation lands to the Service or other land-managing natural resource agency.

CEMVN Response 10: Concur

Recommendation 11: If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation and/or maintenance of mitigation lands, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

CEMVN Response 11: Project Partnership Agreements (PPAs) between the Federal government and the Non-Federal Sponsor (CPRA in this case) have been executed for the LPV and WBV HSDRRS projects, and these PPAs provide the requisite high level of confidence that the Non-Federal Sponsor will fulfill its obligations to operate and to maintain the HSDRRS mitigation projects. In the event that the Non-Federal Sponsor fails to perform, CEMVN has the right to complete, operate, maintain, repair, rehabilitate, or replace any project feature, including mitigation features. However, such an action would not relieve the Non-Federal Sponsor of its responsibility to meet its obligations and would not preclude the Federal government from pursuing any remedy at law or equity to ensure the Non-Federal sponsor's performance.

Recommendation 12: Any proposed change in mitigation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

CEMVN Response 12: Concur

Recommendation 13: The Service encourages the Corps to finalize mitigation plans and proceed to mitigation construction so that it would be concurrent with project construction and revising the impact and mitigation period-of-analysis to reflect additional temporal losses would not be required.

CEMVN Response 13: The USACE shares your goal of implementing mitigation as quickly as possible. If delays are experienced such that mitigation project implementation takes longer than what was previously estimated, the USACE would work with the resource agencies to determine whether such delays could necessitate extending the current period of analysis associated with the habitat impacts and whether additional temporal loss to the habitats in question would result in a larger mitigation requirement.

Recommendation 14: For on-refuge impacts the Service prefers and recommends implementation of the proposed TSP, including the Bayou Sauvage brackish marsh alternative, because this alternative ranks higher in long-term sustainability and property management feasibility over other brackish marsh alternatives. Further, the Service does not support the selection of the Golden Triangle mitigation alternative for on-refuge impacts; however, we would not object to that alternative should it be selected for non-refuge impacts.

CEMVN Response 14: The Service's position concerning the Bayou Sauvage Marsh Restoration project alternative and the Golden Triangle Marsh Restoration project alternative is noted. Currently, the Bayou Sauvage Marsh Restoration project for mitigating LPV HSDRRS impacts to brackish marsh habitats is the TSMP for that habitat type in the TSMPA. The USACE would continue to coordinate with USFWS and other resource agencies in developing mitigation plans for LPV HSDDRS impacts to on-refuge flood side bottomland hardwood impacts.

Recommendation 15: The Service supports the mitigation of on-refuge flood-side BLH impacts on either side of the levee (flood or protected) and recommends that the Corps, in consultation with the Service, develop acceptable mitigation for such impacts should the proposed tentatively selected plan mitigation feature (i.e., Fritchie alternative) not be feasible.

CEMVN Response 15: Concur. If implementation of the Fritchie Refuge BLH-Wet Enhancement project becomes infeasible as per information obtained during investigations necessary for project design, then all reasonable project alternatives would be explored to ensure the CEMVN satisfies its compensatory mitigation requirement for refuge impacts. These project alternatives would be evaluated in an additional NEPA document that would be released for public comment.

Recommendation 16: The habitat assessment for the Fritchie BLH alternative is based on a surrogate BLH habitat located in the vicinity of the project area. Once access is granted to the proposed restoration area, a reassessment should be conducted. Should further development of feature designs result in a lower mitigation potential, a supplemental FWCA report may be necessary.

CEMVN Response 16: Concur. Once ROE is obtained on-site data would be obtained in coordination with USFWS for WVA analysis.

Recommendation 17: The Service recommends that the Corps work with the natural resource agencies to incorporate proposed modifications (Appendix G) and finalize the "GUIDELINES – WET BLH HABITAT ENHANCEMENT, SWAMP HABITAT RESTORATION, AND SWAMP HABITAT ENHANCEMENT" and the untitled document for marsh mitigation (Appendix F).

CEMVN Response 17: The guidelines cited by USFWS, which actually now include guidelines for fresh marsh and intermediate marsh mitigation, were originally developed as very generalized guidelines for use in developing and evaluating potential LPV and WBV HSDRRS mitigation projects that would be Corps-constructed. The main objective for these guidelines was to help ensure consistency between LPV and WBV mitigation projects as regards things such as future with project WVA models, mitigation design concepts, and estimated mitigation costs (construction, implementation, maintenance, monitoring and reporting, etc.).

Programmatic Individual Environmental Reports (PIERs) and Tiered Individual Environmental Reports (TIERs) are being prepared for the LPV HSDRRS mitigation and for the WBV HSDRRS mitigation. In cases involving Corps-constructed mitigation projects, these documents (PIERs or TIERs) would contain project-specific information pertaining to the proposed mitigation work plan, mitigation success criteria, mitigation monitoring and reporting, mitigation management/maintenance, and, if necessary, proposed adaptive management plan for each TSMP. In cases where the TSMP is to purchase credits from a mitigation bank, the PIERs or TIERs would also provide similar project-specific information for the highest ranked Corps-constructed mitigation project that would likely be used if it were ultimately determined that purchase of mitigation bank credits is no longer the best project to mitigate for that habitat type. The project-specific mitigation information developed would supersede the cited general guidelines. The USACE would continue to coordinate with USFWS, other resource agencies, and other members of the PDT in preparing components of the project-specific mitigation programs.

Recommendation 18: The Service recommends that the Corps maintain full responsibility for any BLH mitigation project for a minimum of 4-years post planting. The Corps should maintain full responsibility for all marsh mitigation projects until monitoring guidelines to be developed are completed and demonstrate the projects are fully compliant with success and performance requirements.

CEMVN Response 18: Presently, the USACE intends to issue a Notice of Construction Completion (NCC) for authorized Corps-constructed mitigation projects to the Non-Federal Sponsor (NFS) for functional portions of the mitigation as they are complete (e.g. project would shift from the "construction" phase to the "operation, maintenance, repair, replacement, and rehabilitation" or OMRR&R phase at this point). However, the USACE would retain the primary responsibility for the completion of certain mitigation activities necessary to meet the project's initial success criteria. These activities would vary depending on the specifics of the mitigation plan and its associated success criteria. Note that while the USACE would be responsible for completion of mitigation construction and certain activities after the project is transferred to the NFS, all these activities would be subject to standard cost-sharing provisions and the availability of funds.

After initial success criteria are reached, USACE would continue to support the NFS's operation and maintenance of the mitigation project features as follows; if the project is not achieving its performance milestones, USACE would consult with the NFS and other agencies to consider operational changes to the mitigation plan and/or adaptive management measures to be implemented in accordance with relevant guidance, cost-sharing requirements and subject to availability of funds.

Recommendation 19: At this time none of the mitigation planning documents describe in detail actions needed by the Corps and/or the local sponsor if mitigation is not succeeding as planned. The Service recommends that this important component of the mitigation plan be developed.

CEMVN Response 19: Future specific mitigation plans, such as those found in appendix K and L, would include relatively detailed adaptive management plans (AM) in cases where an AM is anticipated. Mitigation plans would incorporate language regarding the general approach to developing action plans should unanticipated problems arise.

9. COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Construction of the proposed action would not commence until the proposed action achieves environmental compliance with all applicable laws and regulations, as described in this section.

Environmental compliance for the proposed action would be achieved upon coordination of this PIER with appropriate agencies, organizations, and individuals for their review and comments; resolution of all Fish and Wildlife Coordination Act recommendations and LDNR concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the LCRP. Since the proposed action consists of purchasing mitigation bank credits no new direct, indirect or cumulative impacts to any significant resources would require further coordination.

If the purchase of mitigation bank BLH and swamp credits (constructible feature of the TSMPA) were determined not appropriate, not cost effective, or for other reasons not feasible (including lack of satisfactory bids), then Mitigation Plan Alternative 2 containing the Bonnet Carré projects for BLH and swamp as constructible features would likely be implemented instead of the TSMPA. If this occurs then the following coordination and analysis would be necessary: USFWS and NMFS concurrence that the Bonnet Carré BLH-Wet and swamp projects would not be likely to adversely affect any endangered or threatened species or completion of ESA section 7 consultation; LDNR concurrence with the determination that the Bonnet Carré BLH-Wet and swamp projects are consistent, to the maximum extent practicable, with the LCRP; receipt of a Water Quality Certificate from the State of Louisiana; public review of the Section 404(b)(1) Public Notice and signature of the Section 404(b)(1) Evaluation; receipt and acceptance or resolution of all LDEQ comments on the air quality impact analysis as documented in the IER; and receipt and acceptance or resolution of all EFH recommendations. A programmatic agreement has been developed through coordination with the LA SHPO, Advisory Council on Historic Preservation, Federally recognized Indian tribes and other interested parties for the HSDRRS Mitigation. The programmatic agreement was executed 18 June 2013 and CEMVN will comply with stipulations agreed to in the programmatic agreement. As a result, Section 106 consultations are complete for the TSMPs and the Bonnet Carré projects.

10. FUTURE MITIGATION NEEDS

As plans and specifications are completed for the marsh mitigation TSMPs, an assessment of open water impacts from construction of any forested TSMP would be completed. Open water impacts are automatically assessed in marsh WVA model, but not automatically assessed in the forested WVA model. If open water impacts from construction of the forested TSMPs are discovered that would require mitigation, those impacts would be mitigated along with the marsh TSMP similar in type to the closest marsh type in the vicinity of the forested mitigation project incurring the impacts.

Once As-Builts (final plans documenting what was actually built) for all HSDRRS contracts are complete, the mitigation PDT, along with the resource agencies, would once again revisit the impacts to all habitat types from the HSDRRS construction (including open water). Completion of this effort would result in a final computation of impacts and may necessitate the expansion of the proposed HSDRRS mitigation projects in order to fully mitigate all HSDRRS impacts. For any habitat type where mitigation has already been constructed, an expansion of that mitigation project would be considered. Other options to that expansion providing adequate compensatory mitigation would also be analyzed. Any expansion and option to that expansion would be presented to the public in an additional NEPA document.

11. CONCLUSION

11.1 RECOMMENDED DECISION

Recommend approval of the constructible portions of the LPV HSDRRS Mitigation TSMPA: the purchase of mitigation bank credits to fulfill the BLH-Dry/Wet and swamp general impact mitigation requirements.

Additionally, CEMVN recommends further evaluation and agency coordination for the programmatic features of the TSMPA. Future TIER(s) will be produced to complete the evaluation of those features.

11.2 PREPARED BY

The point of contact for this PIER is Elizabeth Behrens, USACE New Orleans District CEMVN-PDN-CEP. Table 11-1 lists the preparers of relevant sections of this report. Ms. Behrens can be reached at the U.S. Army Corps of Engineers, New Orleans District; Coastal Environmental Planning Section, P.O. Box P.O. Box 60267, 7400 Leake Avenue; New Orleans, LA 70118.

Table 11-1
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Position/PIER Section	Team Member
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Fisheries, Aquatic Resources, EFH, and Water Quality	Nathan Dayan, USACE and Lee Walker, Contractor
Wetlands and other surface waters, Wildlife, and Threatened and Endangered Species	Bill Klein and Elizabeth Behrens, USACE
Socioeconomics/Land Use/Environmental Justice, Transportation, Navigation, and Commercial Fisheries	Andrew Perez and Joseph Mann, USACE
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Mitigation Plan, Success Criteria, Planting Plan	Clay Carithers, USACE
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12. REFERENCES

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.

Barras, J.A. 2006. Land area change in coastal Louisiana after the 2005 hurricanes-a series of three maps: U.S. Geological Survey Open-File Report 06-1247.

Chabreck, R. H. and G. Linscombe. 1997. Vegetation type map of the Louisiana coastal marshes. Baton Rouge, LA. Louisiana Department of Wildlife and Fisheries.

Chabreck, R.H., Linscombe G, Hartley S, Johnston JB, Martucci A. 2001. Coastal Louisiana (interactive multimedia): marsh-vegetation types. USGS-National Wetlands Research Center, Lafayette, LA

del Hoyo, J., Elliott, A., & Sargatal, J., eds. 1994. Handbook of the Birds of the World Vol. 2. Lynx Edicions, Barcelona.

Kryter, K. D. 1994. The Handbook of Hearing and the Effects of Noise: Physiology, and Public Health. McGraw Hill, New York.

Louisiana Coastal Wetlands Conservation and Restoration Task Force (LCWCRTW) & 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. 2005. Louisiana Department of Wildlife and Fisheries (LDWF) 2004-2005 Annual Report. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA. 58 pp.

Martin, P.M. and G.D. Lester. 1990. Atlas and census of wading bird and seabird nesting colonies in Louisiana. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA.

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

National Oceanic and Atmospheric Administration (NOAA) NMFS). 2006. "Recommendations for the Contents of Biological Assessments and Biological Evaluations." Protected Resources Division, St. Petersburg, FL. January.

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 pp.

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

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

Sasser, C.E., Visser, J.M., Mouton, Edmond, Linscombe, Jeb, and Hartley, S.B., 2008, Vegetation types in coastal Louisiana in 2007: U.S. Geological Survey Open-File Report 2008–1224, 1 sheet, scale 1:550,000.

Shaffer, Gary P. Thais E. Perkins, Susanne Hoeppner, Susan Howel, Heath Bernard and Carol Parsons. 2003. Ecosystem Health of the Maurepas Swamp: Feasibility and Projected Benefits of a Freshwater Diversion, Prepared for EPA Region 6.

O'Connell MT, Cashner RC, Schieble CS. 2004. Fish assemblage stability over fifty years in the Lake Ponchartrain Estuary: comparisons among habitats using canonical correspondence analysis. Estuaries 27:807-817.

O'Neil, T. 1949. The muskrat in Louisiana coastal marshes: New Orleans, Louisiana Wildlife and Fisheries Commission, 28 p.

Sasser, C.E., J.M. Visser, E. Mouton, J. Linscombe, and S.B. Hartley. 2008. Vegetation types in coastal Louisiana in 2007: U.S. Geological Survey Open-File Report 2008–1224, 1 sheet, scale 1:550,000.

U.S. Army Corps of Engineers (USACE). 1986. Larose to Golden Meadow, Louisiana, Hurricane Protection Project, Mitigation: Environmental Assessment. USACE, Mississippi Valley Division, New Orleans District.

---. 2010. Commander's Intent for HSDRRS Environmental Mitigation Provided by Col Lee on 24 June 2010. USACE, Mississippi Valley Division, New Orleans District.

---. 2005. "Standard Manatee Conditions for In-Water Work." Jacksonville District, Florida. July. http://www.fws.gov/northflorida/Manatee/Documents/PermitGuidance/standard-conditions-for-in-water-work-2005_final.pdf

---. 2006a. Draft Biological Assessment: Impacts of USACE Navigational Projects on the Gulf Sturgeon in Louisiana. Mississippi Valley Division, New Orleans District. 45 pp.

U.S. Environmental Protection Agency (USEPA). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. Office of Noise Abatement and Control. USEPA Report No. 550/9-74-004. Washington, D.C.

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. September 22.

---. 1999. South Florida Multi-Species Recovery Plan. Southeast Region, Atlanta, GA.

---. 2001. Florida Manatee Recovery Plan (*Trichechus manatus latirostris)*, third revision. USFWS Southeast Region. October 30.

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

USFWS and 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.

USFWS and Gulf States Marine Fisheries Commission (GSMFC). 1995. Gulf Sturgeon Recovery Plan. Atlanta, GA. 170 pp.