



REPLY TO  
ATTENTION OF

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

**Regional Planning and  
Environment Division South  
Environmental Planning Branch**

**FINDING OF NO SIGNIFICANT IMPACT  
(FONSI)**

**Tiered Environmental Assessment to  
Programmatic Individual Environmental Report (PIER) 37  
Jean Lafitte National Historical Park and Preserve Mitigation Features, West Bank and  
Vicinity, Hurricane and Storm Damage Risk Reduction System Mitigation  
Jefferson Parish, Louisiana**

**PIER 37, TIER 1 EA**

**Description of Proposed Action.** The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN) and the U.S. National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA or Park) have prepared an Environmental Assessment (EA) as a tier to the PIER # 37 entitled West Bank and Vicinity (WBV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, Jefferson, Lafourche, Plaquemines, and St. Charles Parishes, Louisiana to evaluate the potential impacts associated with implementing the proposed projects of the approved mitigation plan in PIER 37 situated within JELA. These projects would mitigate for impacts incurred through construction of the WBV HSDRRS to: general fresh marsh (i.e., fresh marsh that was not located in the Park or in the Environmental Protection Agency- (EPA) designated Clean Water Act (CWA) Section 404(c) area); fresh marsh located within the Park; swamp located within the Park; BLH-Wet located within the Park; and BLH-Wet and swamp located within the 404(c) area through the restoration of said habitat types on JELA. The EA is attached hereto and is incorporated by reference herein.

The proposed projects evaluated in the EA mitigate for the following flood-side (FS) impacts from construction of the WBV portion of the HSDRRS construction:

<b>Habitat Type</b>	<b>Average Annual Habitat Units (AAHU) Impacted</b>	<b>Mitigation Project</b>
General FS Fresh Marsh	65.92 AAHUs	JL1B5 & JL15
Park/404c FS BLH-Wet	3.12 AAHUs	JL14A
Park/404c FS Swamp	7.19 AAHUs	JL7
Park/404c FS Fresh Marsh	3.03 AAHUs	JL1B4

### **JL1B5 and JL15 General Fresh Marsh Projects**

This mitigation project would involve the restoration of fresh marsh habitats at two locations on JELA in Jefferson Parish.

Feature JL1B5 would be built in an open water portion of Yankee pond, would occupy approximately 91.2 acres (87.6 acres of marsh restoration + 3.6 acres of dikes), and would produce approximately 49 AAHUs of fresh marsh benefits.

Approximately 8,400 linear feet (ft) of retention dike would be required for this feature. Of the total 8,400 linear ft of dikes, approximately 3,100 linear ft would be armored/capped with stone during the second construction phase. This armored dike segment would be located along the eastern boundary of the feature adjacent to Bayou Segnette.

Retention dikes would be constructed to maintain a minimum of one foot of freeboard during dredging operations. The retention dikes would be built to elevation +5.0 ft, with a 5 ft crown width to assure dike integrity. Borrow for these retention dikes would be excavated with a marsh buggy from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. For initial quantity estimates, the dikes were assumed to have 1V:4H side slopes. A low level weir or spill boxes would be constructed in the western retention dike where it borders existing marsh habitats to allow for effluent water release from within the marsh restoration area which would potentially nourish the adjacent existing marsh. If deemed necessary by the construction contractor, a low level interior weir could be constructed to assist in vertical stacking of dredged material.

Marsh restoration at this feature would require approximately 600,000 cubic yards (cy) of material hydraulically dredged from Lake Cataouatche. It is anticipated that the proposed borrow source would contain approximately 10 percent sand. The borrow site would be situated a minimum 2,000 ft from the lake shoreline and borrow would be removed by a hydraulic cutter-head dredge. The borrow site would be approximately 1,200 ft X 1,500 ft (roughly 42 acres) with a maximum depth of 10 ft. The material would be hydraulically pumped from the borrow site to the mitigation feature via 18,000 linear ft of pipeline routed through Lake Cataouatche to the western bank of Bayou Segnette Waterway (BSWW), then along the BSWW to Yankee Pond. Floating pipeline (discharge pipe on pontoons) would be used in the BSWW. The main navigation channel in the BSSW ranges from 300 to 450 ft wide. The portion of the slurry pipeline routed adjacent to the west bank of the BSWW would have a pipeline corridor width of 100 ft. This corridor would not extend into the limits of or cross the main BSSW navigation channel. The corridor would be marked on 150 foot centers to prevent boat hazards in the lake and along the bayou. Markers would include lighted and reflective buoys. As the pipeline would need to cross a portion of Lake Cataouatche from the borrow site to the BSSW, a small segment of submerged pipeline would be utilized with appropriate signage to ensure safe passage of vessels over the line. Throughout the placement and positioning of the pipeline in the navigable waterways and the pumping of the slurry through the pipeline, project construction would be coordinated with the US Coast Guard.

The initial target marsh elevation (elevation of slurry fill) for this feature would be +3.5 ft. It is estimated that the initial project construction activities discussed above would require approximately 5 to 6 months. Once these activities are completed there would be an idle period of approximately 1 year to allow the marsh platform to settle to the desired final target elevation of approximately +1.0 to +1.5 ft. The final construction phase would begin following settlement and dewatering of the created marsh platform.

In the final construction phase, all perimeter dikes except for the one bordering Bayou Segnette (e.g. the eastern dike) would be degraded with a marsh buggy such that the crest of the dikes would be the same as the final target elevation of the marsh platform. Approximately 2-ft of dike degrading is anticipated after the initial year of settlement to revert the dike footprint to desired marsh elevation. The dike segment along the eastern edge of feature JL1B5 would first be reshaped, then armored with a 2-foot stone cap to elevation +3.0 ft. During this process, fish dips” (essentially armored gaps) would be constructed in the armored dike segment. The fish dips would allow water exchange and provide aquatic organism access to the marsh feature. Each fish dip would have a bottom width of approximately 25 ft, a bottom elevation no greater than 0 ft NAVD88, and 1V:3H side slopes. At this phase of design, it was assumed that there would be one fish dip established for every 500 ft of armored dike (i.e. 500-foot spacing). Sediment generated during the dike degrading process would be placed back into the depression that may result from incomplete filling of the interior borrow ditch within the restoration feature.

In conjunction with the dike degrading efforts, trenasses would be constructed as necessary to serve as tidal creeks to facilitate water exchange and create shallow water interspersion features within JL1B5. The trenasses would be rutted to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The acceptable trenasse width, if constructed in this fashion, would be the width of marsh buggy (approximately 10-12 ft). If the resulting depression is not adequate for minimal water flow, the material may be excavated along the proposed alignment, not to exceed a 5-foot bottom width by 1-foot deep channel. It is anticipated that the final phase of construction activities (degrading dikes, constructing trenasses and fish dips, installation of dike armoring) would take approximately 3 to 4 months.

Once constructed, the marsh platform is expected to vegetate naturally. Consequently, no planting is planned. If the platform does not naturally vegetate within 3 years, the platform would be planted with native marsh grasses in accordance with the mitigation work plan in Appendix D of the EA.

Feature JL15 would be situated in an area along the shoreline of Lake Salvador where prior work has already largely established a marsh platform that was previously an open water portion of the lake. Feature JL15 would encompass a total of approximately 55.5 acres (50.4 acres of marsh + 5.1 acres of dikes), and produce approximately 26.7 AAHUs of fresh marsh benefits. Portions of this feature would occur on federally-owned property within the Park, while the remaining portions would occur lands not currently owned by the federal government.

As part of the proposed project, existing low quality BLH species (black willow) would be eradicated, existing rock armament of the lakeside dike would be augmented, and several fish dips would be constructed in the dike. Low quality BLH species on the dike itself would not be removed. The new fish dips would be designed to prevent interior erosion from lake wave action and would provide water exchange and aquatic organism access to the marsh feature. During refurbishment of the rock dike, the two existing fish dips would be improved so as to prevent further interior erosion resulting from lake wave action. It is anticipated that the JL15 construction activities (herbicide application, refurbishment of rock dike, constructing fish dips) would require approximately 4 to 5 months. As with JL1B5, the platform is expected to vegetate naturally. If that does not occur, planting would be handled as discussed in the mitigation work plan in Appendix D.

### **JL1B4 Park Fresh Marsh Project**

The JL1B4 project would involve restoring 20.4 acres of fresh marsh habitat from open water in the southwest corner of Yankee Pond and would produce approximately 11.4 AAHUs of fresh marsh benefits on JELA. Although this project produces more AAHUs than necessary to mitigate the AAHUs of marsh impacted within the Park (3.03), the number of acres impacted versus the number of acres restored is also a consideration. NPS policy requires at least a 1 acre to 1 acre ratio when mitigating impacts to NPS lands. Since 14.5 acres of impact to JELA fresh marsh occurred during construction of the WBV HSDRRS, this 20.4 acre project is more than sufficient to meet the 1:1 ratio required for mitigation by the NPS.

This project is adjacent to and would merge with the JL1B5 feature to create one overall marsh restoration project occupying approximately 108 acres. Consequently, the armored dike that will be constructed along the eastern edge of JL1B5 would provide protection to both the JL1B5 and JL1B4 features. If constructed together, JL1B5's southern earthen perimeter retention dike would be moved to the southern boundary of JL1B4 and the western boundary of JL1B5 extended to encompass both JL1B4 and JL1B5. Approximately 2,000 linear ft of retention dike would be required for JL1B4. Retention dikes would be constructed in the same manner as those for the JL1B5 feature. A low level weir would be constructed in the southwest corner of the restoration project to allow for effluent water release from within the marsh restoration area and potentially nourish the existing marsh adjacent to the west side of JL1B4.

Marsh restoration would require approximately 150,000 cy of borrow material which would be hydraulically dredged from Lake Cataouatche. The borrow site would be adjacent to the borrow site for the JL1B5 feature and would be approximately 1,500 ft X 300 ft (roughly 10.3 acres) with a maximum depth of 10 ft. All other construction details would be the same as those specified for the JL1B5 feature. Once constructed, the marsh platform is expected to vegetate naturally. Consequently, no planting is planned. If the platform does not naturally vegetate within 3 years, the platform would be planted with native marsh grasses in accordance with the mitigation work plan in Appendix D of the EA.

### **JL7 Park/404c Swamp Project**

The JL7 project would involve restoring hydrologic connection and natural sheet flow across existing impounded swamp habitat to compensate for Park/404c swamp impacts. The project would produce approximately 8.4 AAHUs of swamp benefits on JELA, but would incur an additional .97 AAHUs of BLH impacts through construction of the project that would be mitigated at the JL14A site.

Existing spoil berms along the north side of the Millaudon and Horseshoe Canals will be gapped to improve exchange of surface water between swamp habitats in the area. Spoil berm gaps would be excavated at 3 locations along Millaudon Canal and 3 locations along Horseshoe Canal. The spoil berms would be degraded approximately 4.5 ft, to elevation -1.5 NAVD88 which is below the typical elevations found in existing swamp habitats near this project. This bottom elevation would allow water movement in the adjacent swamp to mimic the tidal range experienced in the adjacent canals and would discourage re-growth of woody plant species in the gaps. Gaps constructed on Millaudon Canal would be excavated to a bottom width of 25 ft, approximately 60 ft long with 1:3 side slopes. Gaps constructed on Horseshoe Canal would be excavated to a bottom width of 100 ft and would extend approximately 60 ft into the project area with 1:3 side slopes. The proposed project would require excavation of approximately 470 cy for each cut along Horseshoe Canal and 140 cy for each cut along the Millaudon Canal.

Materials and vegetative debris excavated by gapping canal spoil berms shall be placed immediately south of the gaps in the adjacent canals using marsh tracked excavators or excavators on small modular barges to stay within the canal and avoid additional impacts to spoil bank habitat. The placement of material in the canals will not affect navigation.

Construction equipment would access the project site via an access roadway along an existing levee from Tusa Drive off of Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to Horseshoe Canal or north to Millaudon Canal. The proposed construction access route would require building temporary earthen access ramps on either side of the levees within the existing levee ROW for equipment movement over the existing levee. Construction equipment, consisting of long reach marsh buggies, would then access the gap locations by traveling adjacent to the spoil berm, within the banks of the canal, on the north side of the canals. If modular barges are used instead of marsh buggies, the barges would be brought in by trailer from Barataria Blvd. and would be connected to form a work platform in the canal. Equipment would then construct the gaps from the barges.

#### **JL14A Park/404c BLH-Wet Project**

The JL14A project would involve restoring BLH-Wet habitat from open water areas on JELA and would produce approximately 5.2 AAHUs of BLH-Wet benefits. This would satisfy the 3.12 AAHUs of WBV HSDRRS construction impacts, the .97 AAHUs of impact from construction of the JL7 mitigation feature, and the 1.06 AAHUs of impact from the 2007 encroachments discussed in Section 1 of the EA.

This project would require filling 8.1 acres of an existing borrow pit to elevations conducive to BLH establishment. The existing bottom elevation of the borrow pit is likely around -20.0 ft. The pit would first be filled with 15 ft of sand to elevation -5 ft. A 5- 6 ft clay cap would then be placed on top of the sand fill, followed by 1.5 – 2 ft of topsoil to the initial target elevation of 2.5 - 3 ft. Clearing of vegetation and debris from within the pits, and trimming of overhanging trees along the edge of the mitigation project may be required prior to placement of fill.

The proposed project would require approximately 210,000 cy of sand, 80,000 cy of clay, and 30,000 cy of topsoil hauled from off-site commercial, contractor furnished, and/or government furnished borrow pits. The potential government-furnished and contractor-furnished sites were evaluated pursuant to NEPA and other laws in Individual Environmental Reports (IERs) Nos. 18, 19, 22-26, 28-32 and 35. Those IER's and their Decision Records are incorporated herein by reference.

Construction equipment, including dump trucks, would access the project site via an existing levee access roadway situated about 0.3 miles south of Tusa Drive off Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to JL14. A temporary road would be required along the floodside berm of the levee. Approximately 100 – 20 cy dump trucks would access the site per day during the estimated 210 day construction duration for this project.

The initial construction phase is estimated to be less than 2 years. Once the mitigation project has reached the desired target grade, the project would be planted with native canopy and midstory BLH species as discussed in the mitigation work plan contained in Appendix D of the EA.

**Agency & Public Involvement.** The proposed action has been coordinated with appropriate Federal, state, and local agencies; businesses, organizations, and individuals through distribution of the PIER 37, TIER 1 EA for 30-day review and comment period from October 13, 2015 through November 12, 2015. The PIER 37, TIER 1 EA is attached hereto and made a part of this FONSI.

1. Public Comments
  - a. Three comment letters were received from members of the public.

There were 12 separate comments made by members of the public. The majority of these comments involved the design of the mitigation projects and the desire of a proposed, yet currently unapproved mitigation bank to sell credits to mitigate for the WBV HSDRRS impacts.

2. Agency Comments and Responses
  - a. National Marine Fisheries Service (NMFS) - Comment letter dated Nov. 6, 2015  
3 general comments
  - b. United States Environmental Protection Agency (EPA) – Comment letter dated Nov. 10, 2015  
7 general comments
  - c. Coastal Protection and Restoration Authority Board (CPRAB) – Comment letter dated Nov. 12, 2015  
18 specific comments

There were 28 separate comments made by the Federal and State agencies. The majority of the comments from NMFS and CPRA involved the design of the mitigation projects. The majority of the comments from EPA pertained to the CEMVN’s plans to fulfill its commitments set forth in its July 27, 2009 letter regarding EPA’s "Modification to the 1985 Clean Water Act Section 404(c) Final Determination for Bayou aux Carpes."

CEMVN responses to public and agency comments are included in Appendix I of the Final PIER 37, TIER 1 EA.

**Factors Considered in Determination.** CEMVN considered the comments received during the 30-day public review and comment period. CEMVN also has evaluated the “no action” alternative and has assessed the impacts of the proposed action on important resources including geologic resources, wetlands and other surface waters, wildlife, special status species, fisheries, aquatic resources, water quality, essential fish habitat, hydrology, cultural resources, and recreation, air quality, noise and soundscapes, socioeconomics, environmental justice, transportation, commercial fisheries, and the potential of the project to encounter HTRW. Environmental compliance for the Federal action was achieved based upon the following actions:

**Clean Water Act Section 404(b)(1):** Clean Water Act Section 404(b)(1) evaluation was completed and released for public review on October 13, 2015. No comments were received on the evaluation and it was signed on Dec 3, 2015.

**Clean Water Act Section 401:** State Water Quality Certification 151207-02 was issued Dec. 8, 2015.

**Clean Water Act Section 404(c)**: In compliance with conditions stipulated in the May 28, 2009, EPA Modification to the Bayou aux Carpes CWA Section 404 (c) Final Determination, CEMVN obtained approval on the proposed mitigation plan in the PIER 37, TIER 1 EA from EPA on December 16, 2015.

**Endangered Species Act**: On July 7, 2015, USFWS concurred with CEMVN's determination that the proposed action would not likely adversely affect the West Indian Manatee.

**Fish and Wildlife Coordination Act**: The USFWS reviewed the proposed action in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 USC 661 et seq.). This office has concurred with, or resolved, all Fish and Wildlife Coordination Act recommendations contained in a letter dated December 14, 2015 from the USFWS. All USFWS project-specific recommendations have been addressed in the PIER 37, TIER 1 EA and are incorporated into this FONSI.

**Migratory Bird Treaty Act**: Bald eagles and migratory birds may be present within the project areas; however, no known nests or rookeries exist at this time. Surveys will be conducted prior to construction to determine if any nest becomes active within the project area. If nests are found, construction would not take place within 660 ft of active bald eagles nests or within 1,000 ft of colonial nesting bird nests.

**Coastal Zone Consistency**: The Louisiana Department of Natural Resources, Office of Coastal Management, in a letter dated August 21, 2015, determined that the proposed project was consistent with the Louisiana Coastal Resources Plan.

**National Historic Preservation Act**:

National Historic Preservation Act: The CEMVN has adopted Section 106 consultation conducted pursuant to the National Historic Preservation Act of 1966, as amended, by the National Park Service (NPS), Jean Lafitte National Historical Park and Preserve and New Orleans Jazz National Historical Park. The Louisiana State Historic Preservation Officer determined by letter dated Nov 2, 2015 that no known historic properties would be affected by the proposed action. In partial fulfillment of responsibilities under Executive Order 13175, the National Environmental Policy Act, and Section 106 of the National Historic Preservation Act, on June 3, 2015 the NPS offered federally-recognized Tribes the opportunity to review and comment on the potential of the proposed action to significantly affect protected tribal resources, tribal rights, or Indian lands. Additional consultation with the Caddo Nation was conducted on October 13, 2015 and November 6, 2015, and with the Jena Band of Choctaw Indians on October 13, 2015. The Caddo Nation concurred with the finding of no adverse effect in an email dated November 9, 2015, and the Jena Band of Choctaw Indians concurred in an email dated November 24, 2015. The Choctaw Nation of Oklahoma has requested that the NPS keep them informed of any archaeological sites that might be discovered during the project. In a letter dated December 3, 2015 the SHPO concurred with the NPS finding of no adverse effect to historic properties.

**Environmental Design Commitments**: The following commitments are an integral part of the proposed action:

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

- 2) If any unrecorded cultural resources are determined to exist within the proposed project site, then work will not proceed in the area containing these cultural resources until a CEMVN staff archeologist has been notified and final coordination with the Louisiana State Historic Preservation Officer (SHPO) and Tribal Historic Preservation Officer has been completed.
- 3) All contract personnel associated with the project will be informed of the potential presence of the West Indian manatees and the need to avoid collisions with manatees. Standard manatee protection measures, found in section 3.2.2 of PIER 37, TIER 1 EA will be implemented when construction activities take place in areas where manatees could occur.
- 4) A survey will be performed prior to construction to identify the presence of colonial nesting wading birds or nesting bald eagles. If colonial nesting water birds are present, best management practices, developed in coordination with USFWS, would be implemented to avoid potential impacts. This could include using bird abatement procedures before nesting begins in February to avoid impacting the nesting population. If, despite use of these measures, nesting still occurs, work will be required to take place outside of the USFWS and LDWF declared buffer zone of 1,000 ft during nesting season. Work within the buffer zone could only take place during non-nesting season (September 1 to February 15). If nesting bald eagles are present, the National Bald Eagle Management Guidelines would be followed.
- 5) The JL1B5 project would be constructed to address the mitigation required for impacts on the Commercial Investment Trust (CIT) tract as committed to in CEMVN's October 16, 2014 letter to the NPS (Appendix H of the EA).
- 6) CEMVN will continue to coordinate and collaborate with the EPA, NPS, and resource agencies as CEMVN works to "plan, design, ensure full funding, implement, and monitor all mitigation, augmentation and monitoring measures described in the May 28, 2009, Modification to the 1985 Clean Water Action Section 404(c) Final Determination for the Bayou aux Carpes, subject to the availability of appropriated funds."

Based on CEMVN's evaluation of the projects as set forth in the PIER 37, TIER 1 EA to compensate for impacts to each respective habitat type caused by construction of the WBV HSDRRS, CEMVN determined that the above-described projects adequately compensate for WBV HSDRRS habitat losses while minimizing additional impacts.

**Decision.** The CEMVN Environmental Planning Branch has assessed the potential environmental impacts of the proposed action described in the Final PIER 37, TIER 1 EA and has reviewed the comments received during the public review period for the Draft PIER 37, TIER 1 EA.

In accordance with the environmental considerations discussed above, the public interest will be best served by implementing the proposed action mitigating WBV HSDRRS construction impacts as evaluated in the PIER 37, TIER 1 EA, namely the construction of the JL1B5 and JL15 projects mitigating general fresh marsh impacts, the JL1B4 project mitigating Park fresh marsh impacts, the JL7 project mitigating Park/404c swamp impacts, and the JL14A project mitigating Park/404c BLH-Wet impacts.



I have reviewed the WBV HSDRRS PIER 37, TIER 1 EA and have considered public and agency comments and recommendations. I find the proposed mitigation plan will allow CEMVN to fully offset the habitat losses caused by the construction of the WBV HSDRRS to NPS lands and to fresh marsh that was not on NPS lands as directed by the Water Resources Development Acts of 1986 and 2007 (Public Law 99-662 §906 and Public Law 110-114 §2036) and other laws.

The plan is justified and in accordance with environmental statutes. It is in the public interest to implement the recommended projects in the PIER 37, TIER 1 EA.

17 December 2015

Date



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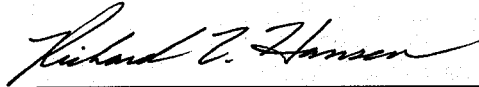
Richard L. Hansen  
Colonel, U.S. Army  
District Commander

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17 Dec 2015

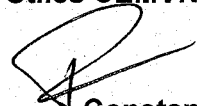
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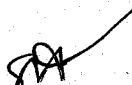
Richard L. Hansen  
Colonel, U.S. Army  
District Commander



Stiles CEMVN PDN (Acting)



Constance CEMVN-PD



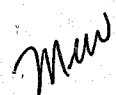
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Podany CEMVN-PM



Bruser CEMVN-OC



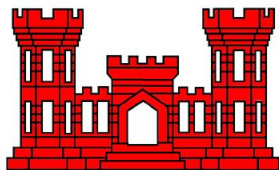
Executive Office CEMVN

**JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE  
MITIGATION FEATURES  
FINAL ENVIRONMENTAL ASSESSMENT AND  
NATIONAL HISTORIC PRESERVATION ACT  
ASSESSMENT OF EFFECTS**

**WEST BANK AND VICINITY HURRICANE AND STORM DAMAGE RISK  
REDUCTION SYSTEM MITIGATION**

**JEFFERSON PARISH, LOUISIANA**

**PIER #37, TIER 1**



**U.S. Army Corps of Engineers  
Mississippi Valley Division**

**Regional Planning and Environmental Division South**



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- Appendix I: Comments and Responses

## 1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN) and the U.S. National Park Service (NPS), Jean Lafitte National Historical Park and Preserve (JELA, Park) have prepared this Environmental Assessment (EA) as a tier to Programmatic Individual Environmental Report # 37 (PIER # 37) entitled West Bank and Vicinity (WBV) Hurricane and Storm Damage Risk Reduction System (HSDRRS) Mitigation, Jefferson, Lafourche, Plaquemines, and St. Charles Parishes, Louisiana. PIER #37 identified the overall plan for mitigating impacts to fresh marsh, swamp, dry bottomland hardwoods (BLH-Dry) and wet bottomland hardwoods (BLH-Wet) incurred as a result of construction of the WBV HSDRRS. Properties impacted included JELA and the Environmental Protection Agency's (EPA) Bayou aux Carpes Clean Water Act Section 404c area (404c). Impacts to these habitats occurred on both the protected side (PS) and flood side (FS) of the levees. This tier to PIER #37 evaluates the potential impacts associated with implementing the features (projects) of the approved mitigation plan for impacts to general fresh marsh; to Park fresh marsh, swamp and BLH-Wet; and to 404c BLH-Wet and swamp through the restoration of said habitat types on JELA. The other features of the approved mitigation plan mitigating impacts to general protected side BLH-Dry and general flood side swamp and BLH-Wet are being addressed in upcoming supplemental PIER(s). The WBV HSDRRS work consisted of upgrading the existing system of levees, floodwalls and gates around the New Orleans Metropolitan Area on the West bank of the Mississippi River to provide the 100-year level of risk reduction. The term "100-year level of risk reduction," 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.

Compensatory mitigation is an integral feature of the HSDRRS work. The CEMVN is required by the Water Resources Development Acts (WRDAs) of 1986 and 2007 to offset unavoidable habitat impacts through compensatory mitigation by replacing the lost habitat's functions and services in-kind to the extent possible. WRDA 1986, Section 906(d)(1), as amended by WRDA 2007, Section 2036(a), provides additional requirements of the Secretary to include in their records to Congress a recommendation with a specific mitigation plan to mitigate fish and wildlife losses or a determination that such project will have negligible adverse impact on fish and wildlife. Specific mitigation plans shall ensure that impacts to bottomland hardwood forests are mitigated in-kind and other habitat types are mitigated to not less than in kind conditions to the extent possible." Pursuant to the Corps' Implementation Guidance for Section 2036(a) of the Water Resources Development Act (WRDA) of 2007, compensatory mitigation should be located within the same hydrologic basin (watershed) as where the impacts occurred. WRDA 2007, Section 2036(a), as amended by WRDA 2014, Section 1040, requires the use of a watershed approach when designing mitigation projects. The Clean Water Act (CWA) Section 404(b)(1) Guidelines also require compensatory mitigation for unavoidable habitat losses.

The approved WBV HSDRRS mitigation plan set forth in PIER #37 was comprised of both constructible and programmatic features. The programmatic features in the plan required further analysis and agency coordination before National Environmental Policy Act (NEPA) compliance was considered complete and the projects therefore constructible. Such analysis and coordination would occur during completion of NEPA documents that 'tier' off the PIER. PIER #37 Tier 1 (TIER 1 EA) is the first document to tier off of PIER #37.

This TIER 1 EA has been prepared in accordance with the National Environmental Policy Act of 1969 and the Council on Environmental Quality's (CEQ) Regulations [40 Code of Federal Regulations (CFR) 1500-1508], as reflected in the USACE Engineering Regulation, ER 200-2-2 and the NPS Director's Order 12 and accompanying Handbook (2001). The TIER 1 EA provides sufficient information on the potential adverse and beneficial environmental effects to allow the CEMVN District Commander and NPS Southeast Regional Director to make informed decisions on the appropriateness of an Environmental Impact Statement (EIS) or a Finding of No Significant Impact (FONSI).

This draft TIER 1 EA 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 during the review period. Any comments received during that review period and public meeting would be considered part of the official record. After the 30-day comment period, and public meeting (if requested), the CEMVN Commander and the NPS Southeast Regional Director would review all comments received and make a determination on whether they rise to the level of being substantive. If no substantive comments are received the CEMVN Commander and the NPS Southeast Regional Director would make a decision on the proposed action. Each agency would document their decision in a Finding of No Significant Impact (FONSI). If a comment(s) is(are) determined to be substantive, either the TIER 1 EA would be revised responding to the comment(s) and would be published for an additional 30-day public review and comment period or a Notice of Intent (NOI) to prepare an EIS would be prepared. If a revised EA is prepared, the CEMVN Commander and the NPS Southeast Regional Director would, after the expiration of the public comment period, make a decision on the proposed action that would be documented in a FONSI.

A list of the abbreviations used in the Tier 1 EA is provided in Appendix F. Unless otherwise indicated, all figures cited can be found in Appendix A, and all tables in Appendix B.

The WBV HSDRRS mitigation plan provides compensatory mitigation for the following impacted habitat types:

**Table 1: WBV Mitigation Requirement**

<b>Habitat Type</b>	<b>AAHUs Impacted</b>
General PS BLH-Wet/Dry	261.96 AAHUs
General FS BLH-Wet	121.78 AAHUs
General FS Swamp	134.52 AAHUs
General FS Fresh Marsh	65.92 AAHUs
Park/404c FS BLH-Wet	3.12 AAHUs
Park/404c FS Swamp	7.19 AAHUs
Park/404c FS Fresh Marsh	3.03 AAHUs

Average annual habitat units (AAHUs) are a measure of the quality of the habitat that was impacted. Mitigation seeks to replace the assessed quality of the habitat impacted. The amount of mitigation required for the Park/404c BLH-Wet and fresh marsh impacts has changed slightly since completion of PIER 37 based off of review of some recently completed As-Builts. The Park/404c BLH-Wet mitigation requirement was 3.08 AAHUs and the Park/404c fresh marsh mitigation requirement was 3.2 AAHUs in PIER 37.

Additionally, 1.3 acres and 1.06 AAHUs of impacts to NPS BLH-Wet occurred in 2007 when a boring site located on NPS land was inadvertently utilized, and when a construction contractor

working in the Hwy 45 borrow pit cleared beyond the designated boundaries of the pit and intruded onto NPS land. These impacts will be mitigated along with the WBV HSDRRS Park/404c BLH-Wet impacts.

The WBV HSDRRS mitigation plan is summarized in Table 1-2 as follows:

**Table 2: PIER #37 WBV HSDRRS Mitigation Plan**

<b>Constructible/ Programmatic</b>	<b>Habitat Type Impacted</b>	<b>Plan Features (Projects)</b>
Constructible	General PS BLH-Wet/Dry	General Mitigation Bank
Programmatic	General FS BLH-Wet	Lake Boeuf FS BLH-Wet Restoration
Programmatic	General FS Swamp	Lake Boeuf FS Swamp Restoration
<b>Programmatic</b>	<b>General FS Fresh Marsh</b>	<b>Jean Lafitte FS Marsh Restoration*</b>
<b>Programmatic</b>	<b>Park/404c FS BLH-Wet</b>	<b>Jean Lafitte FS BLH-Wet Restoration*</b>
<b>Programmatic</b>	<b>Park/404c FS Swamp</b>	<b>Jean Lafitte FS Swamp Restoration*</b>
<b>Programmatic</b>	<b>Park/404c FS Fresh Marsh</b>	<b>Jean Lafitte FS Marsh Restoration*</b>

\* Projects are the subject of TIER 1 EA.

The features of the WBV HSDRRS Mitigation Plan evaluated in this TIER 1 EA are all situated on JELA in Jefferson Parish, Louisiana (highlighted in red text and starred) and consist of restoration of habitat from open water or enhancement of existing habitat. The other features of the approved mitigation plan are being addressed in a soon to be released supplemental PIER.

**1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION**

The purpose of the proposed action is to compensate for habitat losses incurred on JELA and the 404c during construction of the WBV HSDRRS to three specific types of habitat: fresh marsh, swamp, and BLH-Wet. The proposed action also includes compensating for general fresh marsh losses from the WBV HSDRRS work. These habitat types are described in Section 2.1. The proposed compensatory 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 the specific mitigation sites.

**1.2 AUTHORITY FOR THE PROPOSED ACTION**

The authority for the proposed action was provided as part of a number of HSDRR projects spanning southeastern LA, including the Lake Pontchartrain and Vicinity (LPV) project and the 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 WBV project was authorized by the WRDA of 1986 (P.L. [Public Law] 99-662, Section 401(b)). The WRDA of 1996 modified the project and added the Lake Cataouatche Project and the East of Harvey Canal Project (P.L. 104-303, 101(b)(11) & P.L. 104-303, Section 101(a)(17)). The WRDA 1999 (P.L. 106-53, Section 328) combined the three projects into one project as the West Bank and Vicinity Hurricane Protection Project.

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 WBV 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 WBV 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 WBV basin, the public has expressed concern that sufficient funding be allocated for the HSDRRS mitigation efforts, that the HSDRRS mitigation is completed in a timely manner, and that those impacts to JELA and the 404c are sufficiently mitigated on JELA.

### **1.4 PRIOR REPORTS**

A number of studies and reports on water resources development in the WBV basin have been prepared by CEMVN, other Federal, state, and local agencies, research institutes, and individuals.

#### **1.4.1 USACE NEPA DOCUMENTS**

Pertinent USACE studies, reports, and projects are discussed in PIER #37, Section 1.4 and are incorporated into this tier by reference.

#### **1.4.2 NPS NEPA DOCUMENTS**

- On August 30, 2011, the NPS Southeast Regional Director signed a FONSI and a Wetland Statement of Findings on an EA and Draft WSOF entitled Relocation of an Existing 24-inch Pipeline by Chevron Pipe Line Company. The documents were prepared to address infrastructure relocation needed as a result of the WBV HSDRRS, and to evaluate the likely impacts on wetlands, including a discussion of mitigation.
- On March 4, 2010, the NPS Southeast Regional Director signed a FONSI on an EA entitled Canal Reclamation at Barataria Preserve Jean Lafitte National Park and Preserve, Louisiana. The document was prepared to address the restoration of disturbed wetlands through canal backfilling and spoilbank gapping.
- On April 23, 2004, NPS Southeast Regional Director signed a FONSI on EA 395 entitled Lake Salvador Shoreline Protection Project Jean Lafitte National Historical Park and Preserve. The document was prepared to evaluate the impacts associated with building erosion protection for the marshy shoreline of the Preserve (eastern shore of Lake Salvador, now known as the "Geocrib").

## **2. FEATURES**

### **2.1 FEATURE DEVELOPMENT AND SELECTION**

In accordance with the USACE Implementation Guidance for Section 2036 of the WRDA 2007, Mitigation for Fish and Wildlife and Wetlands Losses, as well as 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 in kind. Impacts to JELA would be mitigated within the boundaries of JELA as per NPS Director's Order 77-1 requiring impacts occurring on a National Park (Park) to be mitigated on lands managed by the NPS, with the following recommended priority order: 1) within the same wetland system as the impacted wetland; 2) within the same watershed; or 3) in another watershed within the same NPS unit." Additionally, all unavoidable adverse impacts to the 404c would be mitigated within that area and/or on JELA as committed to by the CEMVN District Commander in his July 27, 2009 letter to the Regional Administrator for EPA Region 6 (see Appendix H). This commitment was also cited in EPA's May 27, 2009 Final Determination for the modification of the Section 404c determination for Bayou aux Carpes.

The CEMVN is compensating for impacts to the three habitat types: fresh marsh, swamp and BLH-Wet.

Fresh 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).

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 and are not USACE jurisdictional wetlands.

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 by the United States Fish and Wildlife Service (USFWS) 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 bald cypress, tupelo gum, red maple, buttonbush, and/or planer tree.

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 lower quality habitat. Restoration would involve creating a habitat type from open water where none currently exists but which historically occurred within or in the vicinity of the project area.

### **Features Mitigating Park/404c Impacts**

Since mitigation for Park/404c impacts is required to occur on JELA, the project delivery team (PDT) worked closely with NPS staff to identify potential mitigation projects on JELA that were a priority to the NPS while minimizing impacts from construction of the projects. Options to

accomplish the mitigation within JELA were limited because much of the area is already high quality marsh, swamp and BLH-Wet. As such, in coordination with the resource agencies, the best sites to satisfy the mitigation requirement were selected and all other optional areas dropped from further consideration.

### BLH-Wet and Swamp

As final modeling was completed and the benefits of the projects refined, the design of the projects considered for mitigating the swamp and BLH-Wet Park/404c impacts presented in PIER #37 were modified. The modeling showed that gapping the northern Millaudon Canal berm, and gapping, instead of degrading, the original JL7 berm (adjacent to Horseshoe Canal) produced sufficient hydrologic benefits so as to mitigate all of the WBV HSDRRS Park/404c swamp impacts. As such, the filling of Horseshoe Canal (part of JL7) and the filling of the keyhole canals off of Bayou Barataria (JL8 and JL9) that were features of the recommended Park/404c swamp mitigation project in PIER #37 were dropped. Since the filling of Horseshoe Canal was dropped, degradation of the JL7 berm for borrow was un-necessary, which greatly reduced the impacts to BLH. Accordingly, the size of the Park/404c BLH-Wet mitigation project (JL14A) was also significantly reduced. Please see figures 6 and 7 in Appendix A for what the swamp and BLH-Wet projects looked like in PIER #37's recommended plan and Figure 8 for what the current swamp and BLH-Wet projects look like.

### Fresh Marsh

The design of the JL1B4 project has not changed since completion of the PIER #37.

### **Feature Mitigating General Marsh Impacts**

A number of projects that met the requirements for mitigating the WBV HSDRRS general fresh marsh impacts were evaluated in PIER #37. The Jean Lafitte FS Marsh Restoration project (JL1B5 and JL15) performed better than all other projects in terms of Environmental Impacts, Cost Effectiveness and other Cost Considerations; and the same or slightly better than the other projects in terms of Watershed and Ecological Considerations, and Time (see PIER 37, Appendix B). As such, the Jean Lafitte FS Marsh Restoration project became the general fresh marsh feature of the WBV HSDRRS recommended mitigation plan.

Since selection of this project as the general fresh marsh feature of the WBV HSDRRS mitigation plan, the PDT including the resource agencies agreed that trying to modify the existing elevations at the geocrib (JL15) would likely cause more damage to the habitat than benefit. As such, the model assessing the benefits at JL15 was modified to take into account leaving the existing elevations as they are and providing invasive/nuisance species control on the higher elevations. The result was a small reduction (approximately 1 AAHU) in marsh benefits for the area.

## **2.2 PROPOSED ACTION (PREFERRED ALTERNATIVE)**

The proposed action is the preferred alternative and would consist of building the JL7 project for Park/404c swamp impacts, the JL14A project for Park/404c BLH-Wet impacts, the JL1B4 project for Park fresh marsh impacts, and the JL1B5 and JL15 projects for general fresh marsh impacts incurred during construction of the WBV HSDRRS improvements (see Appendix A, figures 2-5 and 8). All of these projects would be constructed within or directly adjacent to JELA. Since finalization of the modeling to determine the benefits produced by the JL1B5 and JL15 projects has not been completed, there is a possibility that these projects would not fully

satisfy the general fresh marsh mitigation requirement. If finalization of the modeling effort for these projects concludes that they do not meet the whole general fresh marsh mitigation requirement, then any outstanding portion of that requirement would be fulfilled at a mitigation bank through purchase of in kind credits.

## **2.2.1 PROJECT DESCRIPTIONS**

### **2.2.1.1 JL1B5 and JL15 General Fresh Marsh Projects**

This mitigation project would involve the restoration of fresh marsh habitats at two locations (Appendix A, Figures 3 and 4) on JELA. Both of the marsh restoration features are located in Jefferson Parish.

Feature JL1B5 would be built in an open water portion of Yankee pond, would occupy approximately 91.2 acres (87.6 acres of marsh restoration + 3.6 acres of dikes), and would produce approximately 49 AAHUs of fresh marsh benefits.

Approximately 8,400 linear feet (ft) of retention dike would be required for this feature. Of the total 8,400 linear ft of dikes, approximately 3,100 linear ft would be armored/capped with stone (well graded riprap with a proposed top size stone of 650 pounds) during the second construction phase. This armored dike segment would be located along the eastern boundary of the feature adjacent to Bayou Segnette.

Retention dikes would be constructed to maintain a minimum of one foot of freeboard during dredging operations. The retention dikes would be built to elevation +5.0 ft, with a 5-ft crown width to assure dike integrity. Borrow for these retention dikes would be excavated with a marsh buggy from within the marsh creation footprint. The borrow ditch would be offset a minimum of 40 ft from the dike to assure dike stability. For initial quantity estimates, the dikes were assumed to have 1V:4H side slopes. A low level weir or spill boxes would be constructed in the western retention dike where it borders existing marsh habitats to allow for effluent water release from within the marsh restoration area which would potentially nourish the adjacent existing marsh. If deemed necessary by the construction contractor, a low level interior weir could be constructed to assist in vertical stacking of dredged material.

Marsh restoration at this feature would require approximately 600,000 cubic yards (cy) of material hydraulically dredged from Lake Cataouatche. It is anticipated that the proposed borrow source would contain approximately 10 percent sand. The borrow site would be situated a minimum 2,000 ft from the lake shoreline and borrow would be removed by a hydraulic cutter-head dredge. The borrow site would be approximately 1,200 ft X 1,500 ft (roughly 42.0 acres) with a maximum depth of 10 ft. The material would be hydraulically pumped from the borrow site to the mitigation feature via 18,000 linear ft of pipeline routed through Lake Cataouatche to the western bank of Bayou Segnette Waterway (BSWW), then along the BSWW to Yankee Pond. Floating pipeline (discharge pipe on pontoons) would be used in the BSWW. The main navigation channel in the BSWW ranges from 300 to 450 ft wide. The portion of the slurry pipeline routed adjacent to the west bank of the BSWW would have a pipeline corridor width of 100 ft. This corridor would not extend into the limits of or cross the main BSWW navigation channel. The corridor would be marked on 150 foot centers to prevent boat hazards in the lake and along the bayou. Markers would include lighted and reflective buoys. As the pipeline would need to cross a portion of Lake Cataouatche from the borrow site to the BSWW, a small segment of submerged pipeline would be utilized with appropriate signage to ensure safe passage of vessels over the line. Throughout the initial construction phase, project construction

would be coordinated with the US Coast Guard.

The initial target marsh elevation (elevation of slurry fill) for this feature would be +3.5 ft. It is estimated that the initial project construction activities discussed above would require approximately 5 to 6 months. Once these activities are completed there would be an idle period of approximately 1 year to allow the marsh platform to settle to the desired final target elevation of approximately +1.0 to +1.5 ft. The final construction phase would begin following settlement and dewatering of the created marsh platform.

In the final construction phase, all perimeter dikes except for the one bordering Bayou Segnette (e.g. the eastern dike) would be degraded with a marsh buggy such that the crest of the dikes would be the same as the final target elevation of the marsh platform. Approximately 2-ft of dike degrading is anticipated after the initial year of settlement to revert the dike footprint to desired marsh elevation. The dike segment along the eastern edge of feature JL1B5 would first be reshaped, then armoring with a 2-foot stone cap to elevation +3.0 ft. During this process, fish dips” (essentially armored gaps) would be constructed in the armored dike segment. The fish dips would allow water exchange and provide aquatic organism access to the marsh feature. Each fish dip would have a bottom width of approximately 25 ft, a bottom elevation no greater than 0 ft NAVD88, and 1V:3H side slopes. At this phase of design, it was assumed that there would be one fish dip established for every 500 ft of armored dike (i.e. 500-foot spacing). Sediment generated during the dike degrading process would be placed back into the depression that may result from incomplete filling of the interior borrow ditch within the restoration feature.

In conjunction with the dike degrading efforts, trenasses would be constructed as necessary to serve as tidal creeks to facilitate water exchange and create shallow water interspersed features within JL1B5. The trenasses would be rutted to a lower than marsh elevation by performing two passes of a marsh buggy along the desired alignment. The acceptable trenasse width, if constructed in this fashion, would be the width of marsh buggy (approximately 10-12 ft). If the resulting depression is not adequate for minimal water flow, material may be excavated along the proposed alignment, not to exceed a 5-foot bottom width by 1-foot deep channel. It is anticipated that the final phase of construction activities (degrading dikes, constructing trenasses and fish dips, installation of dike armoring) would take approximately 3 to 4 months.

Additional activities that would occur during the project construction phase would include periodic eradication of invasive/nuisance plant species within the mitigation feature as well as mitigation monitoring and reporting conducted in accordance with the applicable guidelines contained in Appendix D (i.e. monitoring and reporting necessary prior to transfer of monitoring responsibilities to the non-Federal sponsor). It is assumed that appropriate fresh marsh plant species would naturally colonize the marsh restoration feature; hence, no planting of the feature is proposed. Consistent with the success criteria in Appendix D, if 85% the site does not colonize with native herbaceous species vegetate within 3 years, planting would be initiated as specified in the planting guidelines in Appendix D.

Various activities would be necessary during the OMRR&R phase of the project. At a minimum, these would include periodic eradication of invasive/nuisance plants in the mitigation feature and mitigation monitoring and reporting as prescribed in Appendix D. Additional activities may need to be performed to ensure compliance with applicable mitigation success criteria (see Appendix D). The armored perimeter dike would likely need to be maintained once every 15

years through the additional of armoring (stone/rip-rap). Approximately 2,000 tons of stone may be required each 15 year maintenance cycle.

Feature JL15 would be situated in an area along the shoreline of Lake Salvador where prior work has already largely established a marsh platform that was previously an open water portion of the lake. Feature JL15 would encompass a total of approximately 55.5 acres (50.4 acres of marsh + 5.1 acres of dikes), and produce approximately 26.7 AAHUs of fresh marsh benefits. Portions of this feature would occur on federally owned property within the Park, while the remaining portions would occur lands not currently owned by the federal government.

As part of the proposed project, existing low quality BLH species (black willow) would be eradicated, existing rock armament of the lakeside dike would be augmented, and several fish dips would be constructed in the dike. Low quality BLH species on the dike itself would not be removed. The new fish dips would be designed to prevent interior erosion from lake wave action and would provide water exchange and aquatic organism access to the marsh feature. During refurbishment of the rock dike, the two existing fish dips would be improved so as to prevent further interior erosion resulting from lake wave action. It is anticipated that the JL15 construction activities (herbicide application, refurbishment of rock dike, constructing fish dips) would require approximately 4 to 5 months.

#### 2.2.1.2 JL1B4 Park Fresh Marsh Project

The JL1B4 project would involve restoring 20.4 acres of fresh marsh habitat from open water in the southwest corner of Yankee Pond (Appendix A, Figure 5) and would produce approximately 11.4 AAHUs of fresh marsh benefits on JELA. Although this project produces more AAHUs than necessary to mitigate the AAHUs of marsh impacted within the Park (3.03), the number of acres impacted versus the number of acres restored is also a consideration. NPS policy requires at least a 1:1 ratio when mitigating impacts to NPS lands. Since 14.5 acres of impact to JELA fresh marsh occurred during construction of the WBV HSDRRS, this 20.4 acre project is more than sufficient to meet the 1:1 ratio required for mitigation by the NPS.

This project is adjacent to and would merge with the JL1B5 feature to create one overall marsh restoration project occupying approximately 108 acres. Consequently, the armored dike that will be constructed along the eastern edge of JL1B5 would provide protection to both the JL1B5 and JL1B4 features. If constructed together, JL1B5's southern earthen perimeter retention dike would be moved to the southern boundary of JL1B4 and the western boundary of JL1B5 extended to encompass both JL1B4 and JL1B5. Approximately 2,000 linear ft of retention dike would be required for JL1B4. Retention dikes would be constructed in the same manner as those for the JL1B5 feature. A low level weir would be constructed in the southwest corner of the restoration project to allow for effluent water release from within the marsh restoration area and potentially nourish the existing marsh adjacent to the west side of JL1B4.

Marsh restoration would require approximately 150,000 cy of borrow material which would be hydraulically dredged from Lake Cataouatche. The borrow site would be adjacent to the borrow site for the JL1B5 feature and would be approximately 1,500 ft X 300ft (roughly 10.3 acres) with a maximum depth of 10 ft. All other construction details would be the same as those specified for the JL1B5 feature. Once constructed, the marsh platform is expected to vegetate naturally. Consequently, no planting is planned. If the platform does not naturally vegetate within 3 years, the platform would be planted with native marsh grasses in accordance with the mitigation work plan in Appendix D.

### 2.2.1.3 JL7 Park/404c Swamp Project

The JL7 project would involve restoring hydrologic connection and natural sheet flow across existing impounded swamp habitat to compensate for Park/404c swamp impacts. The project would produce approximately 8.4 AAHUs of swamp benefits on JELA, but would incur an additional .97 AAHUs of BLH impacts through construction of the project that would be mitigated at the JL14A site.

Existing spoil berms along the north side of the Millaudon and Horseshoe Canals will be gapped to improve exchange of surface water between swamp habitats in the area. Spoil berm gaps would be excavated at 3 locations along Millaudon Canal and 3 locations along Horseshoe Canal. The spoil berms would be degraded approximately 4.5 ft, to elevation -1.5 NAVD88 which is below the typical elevations found in existing swamp habitats near this project. This bottom elevation would allow water movement in the adjacent swamp to mimic the tidal range experienced in the adjacent canals and would discourage re-growth of woody plant species in the gaps. Gaps constructed on Millaudon Canal would be excavated to a bottom width of 25 ft, approximately 60 ft long with 1:3 side slopes. Gaps constructed on Horseshoe Canal would be excavated to a bottom width of 100 ft and would extend approximately 60 ft into the project area with 1:3 side slopes. The proposed project would require excavation of approximately 470 cy for each cut along Horseshoe Canal and 140 cy for each cut along the Millaudon Canal.

Materials and vegetative debris excavated by gapping canal spoil berms shall be placed immediately south of the gaps in the adjacent canals using marsh tracked excavators or excavators on small modular barges to stay within the canal and avoid additional impacts to spoil bank habitat. The placement of material in the canals will not affect navigation.

Construction equipment would access the project site via an access roadway along an existing levee from Tusa Drive off of Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to Horseshoe Canal or north to Millaudon Canal. The proposed construction access route would require building temporary earthen access ramps on either side of the levees within the existing levee ROW for equipment movement over the existing levee. Construction equipment, consisting of long reach marsh buggies, would then access the gap locations by traveling adjacent to the spoil berm, within the banks of the canal, on the north side of the canals. If modular barges are used instead of marsh buggies, the barges would be brought in by trailer from Barataria Blvd. and would be connected to form a work platform in the canal. Equipment would then construct the gaps from the barges.

### 2.2.1.4 JL14A Park/404c BLH-Wet Project

The JL14A project would involve restoring BLH-Wet habitat from open water areas on JELA and would produce approximately 5.2 AAHUs of BLH-Wet benefits. This would satisfy the 3.12 AAHUs of WBV HSDRRS construction impacts, the .97 ahhus of impact from construction of the JL7 mitigation feature, and the 1.06 AAHUs of impact from the 2007 encroachments discussed in Section 1.

This project would require filling 8.1 acres of an existing borrow pit to elevations conducive to BLH establishment. The existing bottom elevation of the borrow pit is likely around -20.0 ft. The pit would first be filled with 15 ft of sand to elevation -5 ft. A 5- 6 ft clay cap would then be

placed on top of the sand fill, followed by 1.5 – 2 ft of topsoil to the initial target elevation of 2.5 - 3 ft. Clearing of vegetation and debris from within the pits, and trimming of overhanging trees along the edge of the mitigation project may be required prior to placement of fill.

The proposed project would require approximately 210,000 cy of sand, 80,000 cy of clay, and 30,000 cy of topsoil hauled from off-site commercial, contractor furnished, and/or government furnished borrow pits. The potential government-furnished and contractor-furnished sites were evaluated pursuant to NEPA and other laws in Individual Environmental Reports (IERs) 18, 19, 22-26, 28-32 and 35. Those IER's and their Decision Records are incorporated herein by reference.

Construction equipment, including dump trucks, would access the project site via an existing levee access roadway situated about 0.3 miles south of Tusa Drive off Barataria Blvd. After reaching the levee, construction equipment would follow the West Bank Hurricane Protection Levee west to JL14. A temporary road would be required along the floodside berm of the levee. Approximately 100 – 20 cy dump trucks would be accessing the site per day during the estimated 210 day construction duration for this project.

The initial construction phase is estimated to be less than 2 years. Once the mitigation project has reached the desired target grade, the project would be planted with native canopy and midstory BLH species as discussed in the mitigation work plan contained in Appendix D.

### **2.3 WVA MODEL AND SEA LEVEL RISE ANALYSIS**

The wetland value assessment (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 WBV HSDRRS mitigation effort: 1) Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA), WVA Methodology, Bottomland Hardwood Community Model; 2) CWPPRA, WVA Methodology, Swamp Community Model; 3) and CWPPRA, WVA Methodology, Coastal Marsh Community Model for Fresh/Intermediate 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  $\leq$  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. WVA assumptions used for the proposed action located in Appendix C.

### **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 mitigation projects. 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.

## **2.4 DATA GAPS AND UNCERTAINTIES**

### **Impact Assessment**

The WBV mitigation requirement has been assessed for all the HSDRRS work through review of the 95-100 percent design plans and as-builts (if they were available). 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 proposed action (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.

If, during the mitigation projects' period of analysis, conditions arise that would affect the project's ability to produce the desired benefits, a reassessment and recalculation of the project's benefits would be conducted and remedial actions would occur to ensure the compensatory mitigation requirement is satisfied. This could include on-site remedial actions as detailed in appendices D and E, construction of additional restoration features adjacent to the existing project, construction of new restoration/enhancement features elsewhere, or the purchase of mitigation bank credits for the outstanding balance of the mitigation requirement.

## **2.5 ALTERNATIVES TO THE PROPOSED ACTION**

NEPA requires that in analyzing alternatives to a proposed action, a Federal agency consider an alternative of "No Action." The No Action alternative evaluates conditions if no alternative is implemented; it represents the future without project (FWOP) condition against which alternatives considered in detail are compared. It provides a baseline essential for impact assessment and alternative analysis. However, because compensatory mitigation for unavoidable habitat losses due to the construction of the HSDRRS is required by law (e.g. Clean Water Act, WRDAs of 1986 and 2007), the CEMVN does not consider the No Action Alternative to be a reasonable or legally viable alternative.

### **2.5.1 NO ACTION ALTERNATIVE**

Under the no action alternative, the Baratavia 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 activities, dredging, development, interruption of accretion processes, and oil and gas exploration. The No Action alternative would not provide compensatory mitigation for the unavoidable impacts incurred during the construction of the HSDRRS.

The analysis for the No Action alternative considers previous, current, and reasonably foreseeable future projects, which could impact the resources evaluated in the TIER 1 EA. The location of these projects is shown in Appendix A, Figure 9. For the purpose of this analysis, 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 a Tentatively Selected Plan;
- Augmentation and long term monitoring of the 404c area as specified in the May 28, 2009, EPA Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination and committed to by the USACE in their July 27, 2009 letter.
- 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;
- Louisiana Levee District permitted flood risk reduction project; or

- NPS authorized management actions or special park uses.

Table B-1 includes a list of 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 TIER 1 EA or whether the extended boundary of the project's wetland value assessment overlaps with one of the mitigation projects evaluated in this TIER 1 EA.

Construction of the WBV HSDRRS included significant new construction for storm surge and flood protection, a portion of which was adjacent to and within the 404c area. The EPA allowed modifications to the 404c area for construction of the HSDRRS provided certain conditions were met. These conditions included requirements for the mitigation of unavoidable impacts, the implementation of augmentation features to enhance the wetland functions and values of the site, and long term monitoring of the area (see appendix H for the Final Determination). This TIER 1 EA addresses the mitigation portion of these conditions. Analysis of the augmentation features is underway and identification of the features to be implemented as well as the long term monitoring plan will be presented in a joint EA with the NPS in the fall of 2016.

In addition to these ecosystem restoration projects and the 404c augmentation, a number of flood risk reduction and navigation projects are listed that have been built or would be built within the Barataria basin that would continue to influence the hydrodynamics within the basin. Previously constructed flood risk reduction and navigation projects include:

- Algiers Lock: The lock, constructed in 1956, provides a navigation passage between the Mississippi River and the Gulf Intracoastal Waterway via the Algiers Canal. The lock is operated and maintained by the USACE (American Canal Society, 2012a).
- Algiers Non-federal Levee (Donner Canal Levee): This segment of the non-federal levee was built prior to the construction of the Algiers Canal in 1956 near the southern boundary between the Orleans and Jefferson Parish line to provide flood protection to the communities in the vicinity of Algiers and Cutoff in Orleans Parish, Louisiana. The levee is owned and under the authority of the Algiers Levee District (SLFPWA, 2012).
- Bayou Gauche Ring Levee (Sunset Levee): The construction of levees and pumping stations in the 1970s to prevent tidal surges from flooding developed areas in near the community of Paradis in northern St. Charles Parish (Schiltz, 2011).
- Coastal Protection and Restoration Authority (CPRA) and North Lafourche Conservation, Levee and Drainage District, Valentine to Larose Levee, TE-111: To provide flood protection improvements to the current flood protection system along approximately 2,000 linear ft of levee along Bayou Lafourche, from the town of Valentine to the town of Larose. The project is part of the Lockport-to-Larose Levee Project. The project was constructed in 2014 (CPRA, 2015).
- Coastal Protection and Restoration Authority (CPRA) and North Lafourche Conservation, Levee and Drainage District, Valentine to Larose Levee, TE-111: Construction to provide flood protection improvements to the current flood protection system along approximately 2,000 linear ft of levee along Bayou Lafourche, from the town of Valentine to the town of Larose. The project is part of the Lockport-to-Larose Levee Project. Project construction was complete February 2014 (CPRA, 2013, Miller, 2014).

- Empire Lock: The lock is located on the west bank of the Mississippi River at Mississippi River mile 29.5 and was originally constructed prior to 1936 to provide navigation between the Mississippi River and the Gulf of Mexico through the Empire Canal. It is operated by the Louisiana Department of Transportation and Development (American Canal Society, 2012b).
- English Turn Non-Federal Levee (Donner Canal Levee): This segment of the non-federal levee was built prior to the construction of the Algiers Canal in 1956 to provide flood protection to the communities east of Algiers Canal on the west bank of Orleans Parish, Louisiana. The levee extends westerly along the southern Orleans Parish line from the west bank levee of the Mississippi River near Caernarvon and ties into the West Bank and Vicinity –East of Algiers federal levee near Highway 407. The levee is owned and under the authority of the Algiers Levee District (SLFPAW, 2012).
- Gulf Intracoastal Waterway (GIWW) Navigation System: A continuous waterway located inland and parallel to the Gulf of Mexico coast extending approximately 1,100 miles from Brownsville, Texas to Carrabelle, Florida. The federally authorized navigation project was designed to provide interstate commerce among the Gulf Coast States (Alperin; American Canal Society, 2012a).
- Harvey Canal Lock: The lock was constructed in the early 1930s by the USACE to provide a navigational passage between the Mississippi River and the GIWW via the Harvey Canal. The lock is operated and maintained by the USACE. (American Canal Society, 2012c)
- Mississippi River Levees: Mississippi River & Tributaries (MR&T) Project: The Flood Control Act of 1928 was enacted as a response to the 1927 flood and authorized the MR&T Project as a comprehensive flood control project. The purpose of the MR&T Project is to control riverine flooding in the alluvial valley of the lower Mississippi River below Cape Girardeau, Missouri. The four major elements of the MR&T Project are: (1) levees for containing flood flows; (2) floodways for the passage of excess flows past critical reaches of the Mississippi River; (3) channel improvement and stabilization in order to provide an efficient navigation alignment, increase the flood-carrying capacity of the River, and for protection of the levee system; and (4) tributary basin improvements for major drainage and flood control, such as dams, reservoirs, pumping plants, auxiliary channels. Due to the large spatial area of the Mississippi River, implementing the MRL Program is a joint effort of USACE Vicksburg District (CEMVK), the New Orleans District (CEMVN) and the Memphis District (CEMVM). The MRL system in the CEMVN extends along the Mississippi River west bank from the vicinity of Black Hawk, LA, generally southward to the vicinity of Venice, LA and on the east bank from Baton Rouge, LA to Bohemia, LA, encompassing over 500 miles of levee and associated infrastructure.
- Mississippi River Navigation Operations and Maintenance: Operations and maintenance of the Mississippi River by the USACE for navigational purposes.
- Oakville to La Reussite Non-federal Levee: The non-federal hurricane protection levee located in Plaquemines Parish was built in the late 1960s, early 1970s to reduce flood risk in the vicinity of the communities of Oakville, Jesuit Bend, Ollie, Naomi and La Reussite. The levee system is under the authority of the Plaquemines Parish Government and currently varies in elevation from 2 ft to 7 ft (USACE, 2011a).
- State of Louisiana-Surplus Fund 2007 project, East of Harvey Canal Interim Hurricane Protection – Phase 1: The project was designed and constructed by the Southeast Flood Protection Authority - West as an interim non-federal flood protection levee, prior to the WBV HSDRRS floodwall construction, along the east side of the Harvey Canal from the sector gate at Lapalco Boulevard to the existing WBV levee at Hero Pump

Station. The interim earthen flood protection levee was completed in July 2009. The second phase of the project involves a study to evaluate the feasibility of elevating the interim levee to a permanent flood protection structure. Phase 2 is currently on hold in the planning phase. (McMenis 2012; CPRA 2012)

- State of Louisiana-Surplus Fund 2007 project, Lafitte Tidal Protection, BA-75-3, 2007: The project is bordered by Bayou Baratavia on the west, Goose Bayou to the north, The Pen to the west and Reserve Canal to the south. This project involves the uplift of existing levee segments originally constructed by the West Jefferson Levee District on the western shore of The Pen near the community of Lafitte, Louisiana to provide flood risk reduction to the community of Lafitte, Louisiana. Construction was completed. The portion of the project constructed by West Jefferson Levee District consists of earthen levees reinforced with sheet pile along the northwestern shore of The Pen from Goose Bayou to Reserve Canal to provide limited flood risk reduction to the community of Lafitte, Louisiana. (Harper, 2012; CPRA 2012)
- West Plaquemines Non-federal Levee: The non-federal hurricane protection levee was largely constructed in the late 1960s, early 1970s by the Plaquemines Parish government and private entities to reduce flooding risk to the communities between La Reussite and Point Celeste, Louisiana. The levee system is under the authority of the Plaquemines Parish Government and currently varies in elevation from 2 ft to 7 ft (USACE, 2011a).

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

- HSDRRS, WBV: The federal HSDRRS is currently under construction by the USACE to provide flood protection against a storm which has a 1% chance of occurring in a given year (100-year level of protection). The 91-mile risk reduction system includes the construction, enhancement and/or replacement of levees, floodwalls, floodgates, closure structures, and pumping stations to provide storm damage risk reduction to the New Orleans Metropolitan Area on the west bank of the Mississippi River including portions of Jefferson, Orleans, Plaquemines, and St. Charles parishes. The project was originally authorized and modified by the Water Resources Development Acts of 1986, 1996, 1999 and became known as the West Bank and Vicinity, Louisiana Hurricane Protection Project (WBVHPP). Additional emergency supplemental appropriations aimed at improving the system were authorized by Congress following Hurricane Katrina and include 3rd Supplemental-2006 (PL 109-148, Title 1, Chapter 3, [119 STAT. 2761-2763]), 4<sup>th</sup> Supplemental-2006 (PL 109-234, Title II, Chapter 3, [120 STAT. 454-455]), 5<sup>th</sup> Supplemental-2007 (PL 110-28, Title IV, Chapter 3, [121 STAT. 153-154]), 6<sup>th</sup> Supplemental-2008 (PL 110-252, Title III, Chapter 3, [122 STAT. 2349-2350]), and 7<sup>th</sup> Supplemental-2009 (PL 110-329 Title I, Chapter 3 [122 STAT. 3589-3590]). Construction began in March 2007 and is over 92% complete. Anticipated completion date for the entire WBV HSDRRS system is December 2016 (USACE, 2012a; Salaam, 2015).
- Larose to Golden Meadow, Louisiana, Hurricane Protection Project (LGM): The project, originally authorized by the Flood Control Act of 1965 (PL-89-298), consists of approximately 48 miles of levees and floodwalls including two floodgates across Bayou Lafourche at the project's northern and southern ends. Eight (8) pumping stations were constructed in place of the authorized gravity drainage structures at the request and additional expense of the South Lafourche Levee District. The project is designed to protect the communities along the east and west banks of Bayou Lafourche, extending from Larose to just south of Golden Meadow in Lafourche Parish, Louisiana from tidal

and hurricane surge flooding. The majority of the original 1965 project has been constructed as authorized, however due to subsidence and datum changes the project is not currently at the 1965 authorized elevations. A Post-Authorization Study (PAS) was initiated in 2009 to assess potential modifications to the system given changes in conditions and post-Katrina design criteria, however, after further investigations, it was determined that additional authorization would be required to address modifications to constructed features. The additional guidance focused the scope of the study to unconstructed features in accordance with the 1965 authorization. The study efforts are complete and a final report is expected in the near future. The results of the investigation identified only one unconstructed feature of the project and it is expected to be complete by 2018. (Wilson-Prater, 2015; USACE, 1985).

- New Orleans to Venice (NOV) levee project, St Jude to Venice: The federal hurricane protection levee project, originally authorized by the Flood Control Act of 1962, was designed to reduce the risk of flooding to the communities between St. Jude to Venice, Louisiana located on the west bank of the Mississippi River including the back levee in Plaquemines Parish. The project was approximately 85 percent complete prior to Hurricane Katrina. Following Hurricane Katrina, a levee upgrade was authorized by Congress to restore, armor, and accelerate the completion of the levees through additional emergency supplemental appropriations 3rd Supplemental-2006 (PL 109-148, Title I, Chapter 3, [119 STAT. 2761-2763]), 4th Supplemental-2006 (PL 109-234, Title II, Chapter 3, [120 STAT. 454-455]), 6th Supplemental-2008 (PL 110-252, Title III, Chapter 3, [122 STAT. 2349-2350]), and 7th Supplemental-2009 (PL 110-329 Title I, Chapter 3 [122 STAT. 3589-3590]). Anticipated upgrades began in September 2012 and construction is expected to be completed by fall 2020 (USACE, 2011b; Harris 2015).
- NOV, Incorporation of Non-Federal Levees (NFL) into NOV: The NFL reduces the risk of flood inundation and protects evacuation routes for the communities between Oakville and St. Jude, Louisiana located on the west bank of the Mississippi River in upper Plaquemines Parish. The NFL connects to the West Bank and Vicinity HSDRRS levees at the Eastern Tie-In near Oakville, Louisiana. Proposed construction will heighten, strengthen and incorporate the NFL, into the federal NOV levee system. The levee components have been authorized by Congress following Hurricane Katrina to provide the authorized design grade of 50-year (2%) level of storm risk reduction through additional emergency supplemental appropriations 4th Supplemental-2006 (PL 109-234, Title II, Chapter 3, [120 STAT. 454-455]), 5th Supplemental-2007 (PL 110-28, Title IV, Chapter 3, [121 STAT. 153-154]), and 6th Supplemental-2008 (PL 110-252, Title III, Chapter 3, [122 STAT. 2349-2350]). Construction is anticipated to begin in early April 2012 and construction is expected to be completed by the summer of 2016. The Corps Risk Management Center (RMC) recently performed a risk analysis on certain reaches (reaches close to design completion and structures were omitted from the analysis) of the NFL and NOV levee systems. After evaluating the RMC risk assessment and recommendations, the USACE New Orleans/Vicksburg District (MVN/MVK) team determined that site adapting the HSDRRS design guidelines for NOV and NFL represented the best opportunity to fulfill the project authority and provide maximum risk reduction with available funds. MVN/MVK team has requested concurrence with the RMC's recommendations and path forward from USACEHQ via memorandum through Mississippi Valley Division (MVD). Anticipated upgrades began in September 2012 and construction is expected to be completed by Fall 2020. (USACE, 2011a; Harris, 2015).
- St. Charles Parish Levee – West Bank Magnolia Ridge Phase 1 (BA-85-1): The reduction to the risk of flooding to the communities near Boutte and Paradis, Louisiana on the west bank of Magnolia Ridge in St. Charles Parish by the construction of (Part 1)

Magnolia Ridge Pump Station, (Part 2) upgrade of the existing non-federal earthen levee to meet the USACE standards with an estimated crown elevation of seven ft, (Part 3) Paradis Canal Gates, and (Part 4) pipeline T-walls. Part 1 Engineering and Design (E&D) is currently 60% in, with anticipated start and end construction dates of June 2016 and December 2017 respectively pending funding being secured. Part 2 E&D is currently 5% complete with anticipated start and end construction dates of January 2017 and December 2017 respectively pending funding being secured. Part 3 E&D is currently 5% complete with anticipated start and end construction dates of July 2017 and December 2018 respectively pending funding being secured. Part 4 is pending E&D task order, with anticipated start and end construction dates of January 2018 and December 2018 respectively pending funding being secured. (Schiltz, 2012; St. Charles Parish, 2013; St. Charles Parish, 2015).

- St. Charles Parish Levee – West Bank Willowridge Phase 2 (BA-85-2): Construction of a non-federal levee with estimated crown elevation of seven ft, a pumping station and gates to reduce the risk of flooding in the vicinity of Willowridge in St. Charles Parish. The project is divided into three parts. Part 1 includes a seven ft levee lift between Peterson Canal and Willowridge Drive which is anticipated for completion in May 2015. Part 2 includes the construction of the Willowridge Pump Station and Part 3 includes the construction of tidal interchange structures and a seven foot levee lift from Willowridge Drive to Davis Diversion. The anticipated construction start dates for parts 2 and 3 are August 2015 and September 2015 respectively and construction end dates are December 2016 and September 2016 respectively (Schiltz, 2012; St Charles Parish, 2013; St. Charles Parish, 2015).
- St. Charles Parish Levee – West Bank Ellington Phase 3 (BA-85-3): The reduction to the risk of flooding in the vicinity of Ellington in St. Charles Parish, La but the construction of (Part 1) uplift non-federal levee with estimated crown elevation of seven ft, (Part 2) Ellington pump station, and (Part 3) pump stations and pipeline T-walls. Part 1 E&D is currently 70% complete in with anticipated begin and end construction dates of October 2015 and October 2017 respectively. Part 2 includes the construction of Ellington pump station which is currently 90% complete in E&D with anticipated begin and end construction dates of January 2017 and June 2018 respectively pending secured funding. Part 3 includes the construction of pump stations and pipeline T-walls which are currently 90% complete E&D in with anticipated begin and end construction dates of July 2018 and December 2019 respectively pending secured funding (Schiltz, 2012; St. Charles Parish, 2013; St. Charles Parish, 2015).
- State of Louisiana-Surplus Fund 2007 project, Jean Lafitte Tidal Protection, BA-75-1, 2007: This project involves the enhancement of existing levees originally constructed by the West Jefferson Levee District on the eastern and southern side of the community of Jean Lafitte, Louisiana. It also includes new levee construction and installation of floodwalls and floodgates along the eastern bank of Bayou Barataria and in gaps in the levee system on the eastern and southern side of Jean Lafitte, Louisiana to provide flood protection to the community within the Fischer School Basin. The project will be implemented by Jefferson Parish and the Lafitte Area Independent Levee District. Construction began in February 2014 with an anticipation completion date of September 2015. Funding for construction is also provided through Surplus Fund 2009 project, BA-75-4, Lafitte Levee Protection (Harper, 2012; CPRA, 2012; CPRA, 2015).



NPS projects currently under construction or reasonably foreseeable include:

**Table 3-1: NPS Projects Under Construction**

<b>Project Name</b>	<b>Lead Agency</b>	<b>Brief Description of Project</b>
Future land acquisitions	NPS	Congress authorized the acquisition of up to 8,900 acres to expand the Barataria Preserve, approximately 3,000 acres of which were added to the preserve upon enactment of the Omnibus Public Land Management Act of 2009.
Canal reclamation program	NPS	In 2009–2010, the NPS completed the NEPA process to reclaim approximately 20 miles of non-historic canals within Barataria Preserve. Implementation of the project is ongoing with approximately 4.3 miles of canals reclaimed to date.
Hunting Program	NPS	The NPS issues permits annually to hunters for white-tailed deer, wild pigs, squirrel, nutria, rabbit, and migratory game birds and waterfowl.
Nutria bounty program	State	The NPS issues permits annually for trappers to take nutria in the Barataria Preserve, and the state bounty program makes that more economically viable. Program participants also trap areas around the preserve.
Nutria trapping/direct reduction program	NPS	As above, the NPS issues permits to trappers and conducts direct invasive species reduction by shooting in areas inaccessible to trappers. Focal areas are waterways adjacent to marshes.
Wild pig management program	NPS, West Jefferson Levee District (WJLD)	After eradication from the park in the 1980s, wild pigs returned circa 2006. The park currently conducts small-scale management efforts and is currently working toward a management plan for the species. The WJLD engages in management activities that are focused on the levee system adjacent to the park.
Vegetation restoration programs	NPS, Coalition to Restore Coastal Louisiana, and others	Past vegetation management actions have generally included invasive exotic species treatments, native species restoration, and other plantings. These activities are expected to continue.
Fire Management	NPS	The NPS is currently completing a compliance/planning process to revise the park's current Fire Management Plan (FMP). The update would incorporate approximately 3,000 acres of land acquired in 2009 into the park's FMP and proposes to add the use of

Project Name	Lead Agency	Brief Description of Project
		prescribed fire to further research and resource management objectives within the Barataria Preserve and Chalmette Fire Management Units (FMUs).
Right-of-way maintenance	NPS, pipeline and electric transmission line companies	There are five electrical transmission lines and multiple distribution lines, as well as four natural gas pipelines and one crude oil pipeline that cross the Barataria Preserve. Effects associated with the operation and maintenance of these linear energy transmission features include regular vegetation maintenance and irregular structure replacement.
Research	NPS, government agencies including the NPS and the U.S. Geological Survey, and a variety of academic institutions	Research at the Barataria Preserve is primarily focused on its natural resources—biotic or abiotic—and is ongoing.

### 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

#### 3.1 ENVIRONMENTAL SETTING

##### WBV Basin

The WBV HSDRRS Mitigation Basin is bounded to the north by the Mississippi River starting east in Ascension Parish to west in Plaquemines Parish. In Plaquemines Parish, the boundary then proceeds south then north and west bordering the southern portion of Lake Salvador before turning south again to Golden Meadow. It then turns northwest to Assumption Parish (Appendix A, Figure 1). Major features in the WBV Mitigation basin include: Lakes Cataouatche and Salvador and their adjacent wetlands; Lac des Allemands and its adjacent wetlands and the Mississippi River.

##### Geomorphic and Physiographic Setting

Most of the present landmass of southeast LA was formed by deltaic processes of the Mississippi River. The WBV Basin is bounded on each side by a distributary ridge formed by the present and a former channel of the Mississippi River. Several large lakes occur between these ridges. The southern half of the basin consists of tidally influenced marshes. Freshwater and sediment input into the basin is limited by the flood protection levees along the Mississippi River and the closure of Bayou Lafourche at Donaldsonville. Riverine input into the basin's wetlands occurs through the Davis Pond diversion and the Naomi and West Pointe a la Hache siphons.

## **Climate**

The West Bank 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.

## **Wetlands and Other Surface Waters**

Extensive bottomland hardwood forests lie adjacent to the Mississippi River and Bayou Lafourche. Wet BLH forests in the WBV Basin are dominated by water oak, nuttall oak, green ash, red maple, and pignut hickory. Fresh marsh is dominated by cattail, water lily, iris, duckweed, cutgrass, wild rice, bullwhip and bulltongue. Swamps 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. See Appendix A, Figure 10 for the habitats and their quantity found in the WBV Basin and Table B-4 for a list of plant species referenced in this document and their scientific names.

## **Wildlife**

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 WBV Basin provide important 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 Lakes Salvador and Cataouatche provide wintering and multiple use functions for brown pelicans, seabirds, and other open water residents and migrants. Open water habitats 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).

The bald eagle is protected under the Bald and Golden Eagle Protection Act (BGEPA), and the Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.). In southeastern Louisiana parishes, eagles typically nest in mature trees (e.g., bald cypress, sycamore, willow, etc.) near fresh to intermediate marshes or open water.

Colonial nesting waterbirds are protected under the Migratory Bird Treaty Act (MBTA) 40 Stat. 755, as amended; 16 U.S.C. 703 et seq.). Colonial nesting waterbirds are generally considered all species of herons, egrets, night herons, ibis, roseate spoonbill, anhinga and cormorants. These birds typically nest and forage in wetlands and open water areas.

A list of common wildlife species found in the WBV basin and their scientific names are located in Table B-5.

### **Threatened and Endangered Species**

Within the State of Louisiana there are 33 animal and three plant species (some with critical habitat) under the jurisdiction of the USFWS and/or the National Marine Fisheries Service (NMFS), presently classified as endangered or threatened. 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 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.

### **Fisheries, Aquatic Resources, and Water Quality**

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 Lac des Allemands, Lake Boeuf, Bayou Gauche, Lake Salvador, Lake Cataouatche, and the Mississippi River. These water bodies and adjacent wetlands provide nursery and foraging habitats which support varieties of economically, recreationally, and ecologically important marine and freshwater fishery species, including shrimp, bay anchovy, gizzard shad, buffalo, yellow bass, largemouth bass, sunfish, catfish, spotted gar, bowfin, mosquitofish, least killifish, sailfin molly, striped mullet, Atlantic croaker, Gulf menhaden, spotted and sand sea trout, southern flounder, black drum, and blue crab. Some of these species also serve as prey for other fish species managed under the MSFCMA by the Gulf of Mexico Fishery Management Council (e.g., mackerel, snapper, and grouper) and highly migratory species managed by NMFS (e.g., billfish and shark).

The WBV Basin encompasses parts of three U.S. Geological Survey (USGS) Cataloging Units: 08090301 – East Central Louisiana Coastal Watershed, 08070100 - Lower Mississippi - Baton Rouge and 08090100 – Lower Mississippi-New Orleans. Within each of these Cataloging Units, the state has delineated hydrologic units, or sub-segments, 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 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 (sub-segments) 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. Appendix A, Figure 11 shows those hydrologic units or sub-segments in the WBV basin that contain water bodies considered “impaired” according to the 2010 Integrated Report.

**Essential Fish Habitat**

The MSFCMA (50 CFR 600) states that essential fish habitat (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 , 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 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), sub-tidal vegetation (sea grasses and algae), and adjacent intertidal vegetation (marshes and mangroves). The existing emergent wetlands and shallow open water within the WBV Basin provide important habitat that may be classified as 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

Table 3-1 lists the expected salinity zones in WBV region mitigation sites and the abundance of the managed species expected (NOAA Mapper: <http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html> or download of datasets at <http://www.habitat.noaa.gov/protection/efh/newInv/index.html>). Table 3-2 shows the EFH for the managed species expected in those areas.

**Table 4: Zones and Abundance for Federally Managed Species in WBV Basin**

Salinity Zone	Life Stage	Brown Shrimp	White Shrimp	Red Drum	Coastal Migratory Pelagic	Reef Fish
0 -0.5 ppt.	Adults		R	R		
	Eggs					
	Juveniles	C to HA	R to C	R		

	Larvae					
	Spawners					
<b>0.5 - 5 ppt.</b>	Adults	R	R	R to C		
	Eggs					
	Juveniles	C to HA	C to A	C	R	R
	Larvae					
	Spawners					
<b>Relative Abundance:</b> Blank - Not Present A – Abundant R – Rare HA - Highly Abundant C – Common (Variation in abundance due to seasonality) (NMFS, 1998)						

**Table 5: Essential Fish Habitat for Life Stages**

Species	Life Stage	Essential Fish Habitat
<b>Brown Shrimp</b>	Adults	Gulf of Mexico <110 m, Silt sand, muddy sand
	Juvenile	Marsh edge, submerged aquatic vegetation (SAV), tidal creeks, inner marsh
<b>White Shrimp</b>	Adults	Gulf of Mexico <33 m, Silt, soft mud
	Juvenile	Marsh edge, SAV, marsh ponds, inner marsh, oyster reefs
<b>Red Drum</b>	Adults	Gulf of Mexico & estuarine mud bottoms, oyster reef
	Juvenile	SAV, estuarine mud bottoms, marsh/water interface
<b>Coastal Migratory Pelagic</b>	Juvenile	Beaches, estuaries, inlets, Coastal & shelf, Gulf, pelagic
<b>Reef fish</b>	Juvenile	SAV, mangroves, sand, mud, reefs, hard bottom

### **Cultural Resources**

Historic and prehistoric sites in the WBV Basin tend to be located along the natural levees of waterways that were used as transportation routes. The Mississippi River was the main means of transportation and its natural levees were the choice location for settlement. The surrounding coastal lakes and areas were gradually explored for natural resources and utilized as well. As the population along the Mississippi River increased, land along its natural levees became scarce. Settlers began to move further outward following waterways such as Bayou Lafourche, Bayou Segnette, Bayou Verret, Bayou des Allemands, and other bayous and rivers in the coastal area. Borrow sources located in Lakes Salvador and Cataouatche also have the potential to contain submerged cultural resources.

Prehistoric sites include hunting and food processing camps, hamlets, and village sites. Native Americans relied on hunting, fishing, and gathering of plants. Discovered archeological sites in the basin represent the continuous span of human occupation in Louisiana's Mississippi River Delta region, from the Tchefuncte period (600-200 B.C.) to the Plaquemine period (a.d. 1000-1200).

Types of historic sites include domestic buildings, plantation sites, farmsteads, military sites, commercial sites, industrial sites, boat landings, and hunting and fishing camps along the coast. In addition to terrestrial historic sites, the project area has the potential to contain historic shipwrecks. Bayou Lafourche, Bayou Segnette, Bayou des Allemands, as well as the other

bayous in the area, have been a major means of transportation in the Louisiana "bayou country" since prehistoric times. The smaller bayous that fill the basin connecting larger bayous and lakes were also used by the local Native Americans as well as by trappers, hunters, and fishermen. Watercraft from all time periods could be present in the area. Most of the vessels used historically in this area were vernacular watercrafts.

In the early 1900s, various subsistence activities that were initially developed prior to the 20<sup>th</sup> century became more commercial in nature. Moss, first gathered for the making of beds and as filler in the construction of houses, was commercially processed and sold to the upholstery business as stuffing for furniture and car seats. Following World War II, the moss industry declined as the result of the wide availability of foam rubber and the increased cost of gathering moss. The lumber industry that had flourished in the late 1800s continued to grow with the harvesting of cypress throughout south Louisiana. Lumber towns and sawmills dotted the landscape until most of the virgin cypress forests were cut and the lumber companies moved westward.

The trapping of animals in south Louisiana began with Native Americans and continued on into the 1900s. Otter, muskrat, and nutria were trapped in the marshes and provided furs for the garment industry all over the world. Hunting camps and processing stations were located throughout the marsh. The demand for furs has declined over the years. Nutria are trapped today for food and bounties, to keep the population from expanding and destroying the marsh, or from causing problems in municipal canals.

Seafood, one of the most important natural resources in south Louisiana, has continued to become more important to the economy of Louisiana. In the middle of the 19th century, methods of preservation (such as the drying of shrimp and canning of oysters) made it possible to export seafood. The introduction of the gasoline motor and refrigeration allowed fishermen greater access to markets in New Orleans and the larger towns inland from the coast. Seafood processing camps that had been established all over the coast in the 1800s, including Manila Village, Bayou St. Malo, and the Isle de Caminada, were abandoned after being hit by numerous tropical storms and hurricanes. In the 1900s, many of these fishermen established new settlement and seafood processing businesses along the major waterways leading away from the coast. Fishing remains a major economic activity in south Louisiana.

Rice and sugar remained major cash crops across the coastal parishes. By the eve of World War II, bad weather, plant diseases, and economic policies had almost destroyed sugar production in south Louisiana. Truck farming of vegetables and citrus to towns and cities provided fresh vegetables at local markets. Other industries developed in south Louisiana in the 1900s that have shaped the economy of the state. The oil industry began in the early 1900s and continues to be a major industry. Large oil fields are located in the marshy areas of south Louisiana and offshore. Pockets of sulfur and salt are located across south Louisiana. The extraction of these natural resources became major industrial activities.

All of these economic activities have contributed to the constructed environment of south Louisiana. In addition to the residential homes, public buildings, and commercial buildings, these industries have contributed to the south Louisiana landscape and to the heritage of the area. Historic standing structures, archaeological sites, and landscape features associated with man's activities in the coastal area may be significant cultural resources. The State of Louisiana, Office of Cultural Development's Division of Archaeology maintains information on over 12,000 archaeological sites and thousands of historic standing structures.

## **Recreational Resources**

Recreation areas in the WBV Basin include Salvador Wildlife Management Area (WMA), Timken WMA, JELA, Bayou Segnette State Park, and Lake Boeuf Wildlife Management Area (Appendix A, Figure 12). 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. There are 37 boat launches throughout the WBV Basin. Table B-10 shows the number of fishing licenses, hunting licenses and boat registrations as well as the percent of state licenses and boat registrations in the WBV Basin.

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 WBV Basin, SCORP Region 1 and 3 and includes the WBV 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. Region 3 includes more than 107,000 acres for hunting, 194 boat lanes at 105 boat ramps; 131 acres with 365 tables for picnicking; 1 beach of 37 acres; and 71 acres for camping, 34 tent-sites and 422 trailer-sites. In a 2008 Residents Survey, most important activities for residents in Region 1 are visiting natural places, fishing, and visiting botanic gardens. Residents in Region 3 are identified fishing, visiting natural places, and public access to state waters as most important. Within the same survey, Region 1 residents had the highest participation rates in the following activities: driving for pleasure, fishing, and camping. Region 3 residents participated most in driving for pleasure, fishing, swimming, and camping.

Funds from the Land and Water Conservation Fund (L&WCF) have supported 65 different recreational projects within the same parishes as the WBV Basin since 1964. L&WCF provides funding for numerous boat ramps, other facilities or lands that enhance opportunities for recreation.

The following is a description of the federal and state recreation areas within the WBV Basin:

### **Salvador Wildlife Management Area (WMA)**

Salvador WMA is 31,520 acres and is located in St. Charles Parish, along the northwestern shore of Lake Salvador about 12 miles southwest of New Orleans. Access is limited to boat travel via three major routes: Bayou Segnette from Westwego into Lake Cataouatche, then west to area; Sellers Canal to Bayou Verrett into Lake Cataouatche, then west to area; or via Bayou Des Allemands. Accessibility into the interior marshes is excellent via the many canals, bayous, and ditches on the area.

Game species include waterfowl, deer, rabbits, squirrels, rails, gallinules, and snipe. Furbearing animals present are mink, nutria, muskrat, raccoon, opossum, and otter. Salvador supports a large population of alligators and provides nesting habitat for the bald eagle.



Excellent freshwater fishing is available on Lake Salvador. Bass, bream, crappie, catfish, drum, and garfish are abundant. Commercial fishing is prohibited on the WMA. Non-consumptive forms of recreation available are boating, nature study, and picnicking.

#### Timken Wildlife Management Area

The Timken WMA is a 3,000-acre marsh island that is leased by the City Park Commission of New Orleans. The area is identified as Couba Island on maps; however, it has been named the Timken WMA after the former landowner who donated it to the City Park Commission of New Orleans. The area is located immediately east of the Salvador Wildlife Management Area and can be accessed by Lake Cataouatche. Like the Salvador WMA, Timken WMA consists of fresh to intermediate marsh and provides excellent habitat for waterfowl, furbearers, and alligators. Game species include waterfowl, deer, rabbits, squirrels, rails, gallinules, and snipe. Furbearing animals present are mink, nutria, muskrat raccoon, opossum, and otter.

#### Jean Lafitte National Historical Park and Preserve

JELA consists of six physically separated sites, including the Acadian Cultural Center; Prairie Acadian Cultural Center; Wetlands Acadian Cultural Center; Barataria Preserve (BARA); Chalmette Battlefield and National Cemetery; and French Quarter Visitor Center. Only the Barataria Preserve Unit is within the project area. The Barataria Preserve features trails and waterways through bottomland hardwood forests, swamps, and marsh. Additionally, there is an Education Center providing curriculum-based programming for school groups and a visitor center providing a film and exhibits. Hunting; trapping; and fishing, including commercial fishing, is permitted by the NPS at the preserve.

#### Bayou Segnette State Park

Bayou Segnette State Park offers recreational opportunities including, boating, fishing, canoeing, picnicking, playgrounds, a one mile nature trail, boat launches and a wave pool. Bass, catfish, bream, perch, redfish and trout are common in the area. Twenty waterfront cabins are available for overnight rental, as well as, 98 locations for RV and tent camping. The park also includes comfort stations with showers and laundry, an RV dump station, and a group camp with kitchen and dormitories for up to 120 people.

#### Lake Boeuf WMA

The Lake Boeuf WMA is located east of Louisiana Highway 308, north of Raceland, Louisiana. The area includes approximately 800 acres of fresh marsh/swamp habitat and is accessible only by boat via Theriot Canal, Foret Canal, or Lake Boeuf. Hunting opportunities include archery, small game, waterfowl, and unmarked hogs.

#### **Aesthetic Resources**

The WBV Basin is a large area that includes an abundance of water resources, landscape types, terrain, historical and culturally significant features. In terms of public and institutional significance, the area boasts the Great River Road, which runs adjacent to the Mississippi River Road, the Louisiana Scenic Bayou Byway, which runs from Donaldsonville south towards Houma, and the Wetlands Cultural Trail, which is made up of a plethora of roadways crisscrossing the area around Houma and southeast towards Larose and Golden Meadow. The byways in the basin range from state designated roads to All American Roads.

Land use varies across the spectrum, but the majority of uses include residential, agricultural and some light and highway commercial. There are a great number of urban areas including that of southern New Orleans (including Algiers, Harvey, Gretna, Westwego, Estelle, Timberlane, a.k.a. "the West Bank), and other smaller communities such as Larose, Raceland, and Donaldsonville, just to name a few. The majority of communities throughout the basin are cloistered along the banks of major waterways and roadways where natural levees and ridges can be found.

With the variety of land uses present, user activity is relatively high throughout the region. The region is filled with commuters going to and from the New Orleans Metro Area for work, hunters and fishermen, and shrimping and shipping, just to name a few.

Access throughout is abundant with major U.S. Highways and State Highways crisscrossing the region. This being said, there are still many areas and thousands of acres that are remote; where access can only be attained via watercraft.

### **Air Quality**

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 (PM) less than 10 microns in diameter (PM<sub>10</sub>), PM less than 2.5 microns in diameter (PM<sub>2.5</sub>), 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.

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." Currently, all parishes in the WBV Basin are in attainment of NAAQS standards.

### **Noise**

The Noise Control Act of 1972 both regulates and promotes an environment for all Americans free from noise that jeopardizes their health or welfare. 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. 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 WBV Basin have noise ordinances addressing loud machinery. Noise is typically associated with human activities and habitations, such as the operation of commercial and recreational boats; water vessels; air boats, and other recreational vehicles; aircraft; machinery and motors; and human residential-related noise (air conditioner, lawn mower, etc.). The Corps constructed project areas are generally 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.

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

The WBV HSDDRS construction impacts would be mitigated in the Barataria Basin, between Bayou Lafourche and the Mississippi River. These resources are 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.

### **Prime and Unique Farmlands**

In 1980, the CEQ directed federal agencies to assess the effects of their actions on farmland soils classified as prime or unique by the U.S. Department of Agriculture, Natural Resource Conservation Service (NRCS). Prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops *and that is available for these uses* [emphasis added]. Unique farmland is land other than prime farmland that is used for the production of specific high-value food and fiber crops (USDA 2014).

There are no unique farmlands present within the WBV basin. However, prime farmlands are present and make up approximately 227,241.7 acres, or 27 percent of the soils; breakdown by parish is as shown in table B-9. There are map units designated as prime farmlands at the Barataria Preserve of JELA (USDA 2013). However, these areas are unavailable for agricultural uses because of their incorporation into JELA. There are no map units designated as unique farmlands at the Barataria Preserve (Ibid.).

## **Natural & Scenic Rivers**

In 1970, the Louisiana Legislature created the Louisiana Natural and Scenic Rivers System under the Wild and Scenic Rivers Act of 1968 (16 USC 1271-1287). The System was developed for the purpose of preserving, protecting, developing, reclaiming, and enhancing the wilderness qualities, scenic beauties, and ecological regimes of certain free-flowing Louisiana streams.

Certain activities are prohibited on designated Natural and Scenic Rivers because of their detrimental ecological impacts on the streams. These include, but are not limited to; channelization, clearing and snagging, channel realignment, reservoir construction, the commercial cutting of trees within 100 ft of the ordinary low water mark and the use of motor vehicles or other wheeled or tracked vehicles on a designated system stream. Scenic River Permits are required for all activities on or near System Rivers that may detrimentally impact the ecological integrity, scenic beauty or wilderness qualities of those rivers.

The only Natural and Scenic River in the WBV Basin is Bayou Des Allemands.

## **3.2 IMPORTANT RESOURCES**

This section contains a description of important resources in the project area and the impacts of the proposed action on these resources. The important resources described in this section are those recognized by: laws, executive orders, regulations, and other standards of National, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. The proposed action would not cause any significant impact upon aesthetic resources, prime and unique farmlands, and natural and scenic rivers and therefore are not analyzed further.

### **3.2.1 GEOLOGIC RESOURCES – SOILS/SEDIMENTS**

#### **Existing Conditions**

The geology of the JELA BARA is largely influenced by the relationship between this area and the historic course of the Mississippi River. The preserve is positioned within the upper Barataria estuarine basin between two distributary arms of the Mississippi River (the current main stem of the river and Bayou Lafourche) and straddles an older distributary arm, the Bayou des Familles/Bayou Barataria. Archeological evidence suggests this deltaic lobe was formed by the Mississippi River roughly 3,000 to 1,500 years ago before present (Törnqvist et al. 1996).

The soils within the preserve are characteristic of those developed in a subtropical, humid climate under frequently flooded conditions within coastal and deltaic plains. The flat topography of the preserve and abundance of slowly decaying organic matter present conditions that allow for the constant buildup of both mineral and organic sediments (NPS 2009).

Soils within project areas are generally highly disturbed if they are present at all. Most project areas within the preserve are characterized by open water. The remainder is generally spoil banks generated by dredging through Kenner muck, Allemands muck, and Barbary muck soils (NRCS 2013). Soils within spoil banks are generally elevated, compacted, dewatered, and have lost much of their organic component when compared to their sources.

#### **Future without Project (No Action)**

Geologic resources within the proposed borrow site and marsh and BLH-wet restoration sites would remain undisturbed. The spoil banks along Millaudon and Horseshoe canals would

remain intact. Impacts to geologic resources in the basin from other projects in the FWOP conditions, such as open water mining for borrow and fill deposition would continue to occur.

### **Future with Project (Proposed Action)**

Project construction would result in the excavation of spoil banks adjacent to Millaudon Canal and Horseshoe Canal on JELA and the dredging of Lake Cataouatche water bottoms. The material excavated or dredged would be deposited in Millaudon Canal, Horseshoe Canal, and Yankee Pond. Fill from outside borrow sources would be deposited in the open water of an old existing borrow pit adjacent to the HSDRRS levee for BLH restoration. These outside borrow sources would include previously permitted commercial pits or government furnished/contractor furnished pits (for details on these pits see Sections 1.4.3.2 and 1.4.3.3 of PIER #37). Impacts to soils and sediments would result from equipment use along access routes including earthmoving equipment, heavy truck traffic, as well as temporary pipeline construction, use, and demobilization.

## **3.2.2 WETLANDS AND OTHER SURFACE WATERS**

### **3.2.2.1 Marsh**

#### **Existing Conditions**

Marsh habitats (herbaceous and scrub wetlands) comprise about 5500 hectares (61%) of JELA-BARA and consist of freshwater marsh, intermediate marsh, and scrub/shrub habitats (White 1983, Nolfo-Clements 2006, Urbatsch 2009, Jin et al. 2013). These are highly productive systems that support a variety of flora and fauna and a floating peat/organic marsh system called flotant (JELA 1997, Nolfo-Clements 2006).

The project site in Yankee Pond is primarily open water and is surrounded by fresh marsh.

Detailed existing conditions for the geocrib can be found in USACE EAs 231 and 231-A, and the NPS EA 395. Recent site visits to JL15 and analysis of aerial photography indicates that the area behind the foreshore dike has been almost entirely filled to an elevation that would support marsh dominated by cattail (*Typha* sp.) or scrub/shrub communities dominated by saltbush (*Baccharis* sp.). Immediately adjacent to the foreshore dike, there is a band of relatively high fill from the excavation of the flotation ditch along the front of the dike that supports a stand of black willow (*Salix nigra*). Small stands of black willow and rattlebox (*Sesbania* sp.) are also distributed throughout the marsh and scrub/shrub areas on slightly higher ground.

Freshwater marsh covers an extensive area in the JELA-BARA from the shoreline of Lake Salvador eastward to the Kenta Canal (Urbatsch 2009), though it is important to note that the southern portions of this marsh have alternately been classified as intermediate marsh (Linscombe and Chabreck 2001, Sasser et al. 2008, Sasser et al. 2014).

The majority of these freshwater marshes are flotant where plants are rooted in an organic mat that detaches from the substrate and shifts vertically as water levels below rise and drop (Swarzenski et al. 1991). There are three distinct types of floating communities as JELA—thin mat, thick mat, and wax-myrtle thicket, which are distinguished by the thickness of the floating mat and the dominant vegetation (Nolfo-Clements 2006, Urbatsch 2009).

Invasive species of concern in marsh habitats include: Chinese tallow (*Triadica sebifera*) which invades wax-myrtle thickets, Johnson grass (*Sorghum halapense*), and giant salvinia (*Salvinia*

*molesta*) (JELA 1997, Nolfo-Clements 2006). Concerns for marsh communities also include altered hydrology due to levees and canals, erosion, subsidence, saltwater intrusion, and relative sea level rise (NPS 2015).

### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of fresh marsh within the WBV basin and on the JELA Barataria Preserve that once provided cover, resting, nesting and foraging habitat for wildlife, fisheries, and aquatic species. Marsh habitat would continue to be restored through other restoration and programs, such as CWPPRA and CIAP as described in Chapter 2 and tables B-1 and B-2, however CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied. Without action, the marshes adjacent to Yankee Pond would continue to experience erosion from wave action and the geocrib would remain largely inaccessible for aquatic organisms. Subsidence and erosion currently experienced in the basin would continue to cause the conversion of flood side marsh systems to open water.

### **Future with Project (Proposed Action)**

Approximately 108 acres of disturbed shallow open water in Yankee Pond would be restored to elevations that could support fresh marsh. Additionally, a spill box located in the southwest corner of the restoration project during construction would release effluent water from within the marsh restoration area into the existing marsh adjacent to the west side of JL1B4, potentially nourishing those marshes. Though small in size, these projects counter, to a degree, the current land loss trends throughout the basin and the progression of wetlands to open water.

#### 3.2.2.2 Swamp

### **Existing Conditions**

In an inventory of baldcypress-tupelo swamp (swamp), Urbatsch (2009) describes the community as being co-dominated by baldcypress (*Taxodium distichum var. distichum*) and swamp tupelo (*Nyssa aquatica*), and located in areas that are inundated most of the year. These areas are extensive throughout the Barataria Preserve including locations east of Kenta Canal extending north and south and in poorly drained areas along Bayous des Families. A state-listed rare plant found at JELA, floating antler-fern (*Ceratopteris pteridoides*), was originally found in baldcypress-tupelo swamp, and may be present in swamps and other shaded, slow-moving, open water areas (NPS 2015).

Several studies highlight the threats of both increasing hydro-period and inundation, driven by a combination of sea-level rise and subsidence, and altered flows due to levees, on forest communities in JELA and southern Louisiana (Taylor 1988, Conner and Brody 1989, Wasilevich 2001, Denslow and Battaglia 2002, Nelson et al. 2002). Multiple publications have raised concerns about the ability of baldcypress to maintain natural regeneration in southern Louisiana forests in areas where inundation frequency is increasing (NPS 2015). In particular, Glick et al. (2013) estimated that 66-96% of existing baldcypress stands in southeastern Louisiana would become permanently flooded by 2100 based on a calibrated implementation of the Sea Level Affecting Marshes Model (SLAMM) (NPS 2015).

### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of swamp within the WBV basin, on the JELA Barataria Preserve, and on the 404c that once provided cover, resting,

nesting and foraging habitat for wildlife, fisheries, and aquatic species. Swamp habitat would continue to be restored and enhanced through other restoration and programs, such as CIAP as described in Chapter 2 and tables B-1 and B-2, however CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied. The swamps adjacent to Millaudon and Horseshoe canals would continue to experience the effects of impoundment and/or loss of connectivity to adjacent swamp systems. Subsidence and erosion currently experienced in the basin would continue to cause the conversion of flood side swamp to marsh to open water.

### **Future with Project (Proposed Action)**

Gaps in the spoil banks adjacent to Millaudon and Horseshoe Canals would be constructed to improve hydrologic connection in adjacent swamps. Increased water exchange and nutrient cycling within these swamps would serve to nourish and enhance these wetland systems, improving the quality of the swamp habitat found there. Though small in size, proposed action helps counter the current degradation of swamps throughout the basin and the progression of wetlands to open water.

#### 3.2.2.3 BLH

### **Existing Conditions**

Bottomland hardwood forests (BLH) within the preserve are primarily located on an abandoned natural levee and backslope of a former Mississippi River distributary and Bayou des Familles/Bayou Baratavia, areas which are drained by an old network of ditches. BLH communities also exist on the narrow, artificially elevated spoil banks of canals, though spoil banks are often dominated by high amounts of exotic species, with little similarity to BLH (NPS 2015).

White and Skojac (2002) highlight the importance of the bottomland forest in JELA-BARA in that it was one of only seven forest tracts that could be described as 'old-growth' compared to other forests near the Mississippi River terminus south of Lake Pontchartrain, having likely been last logged around 1900, and furthermore the JELA-BARA forest had high levels of diversity.

Again, several studies highlight the threats of both increasing hydro-period and inundation, driven by a combination of sea-level rise and subsidence, and altered flows due to levees, on forest communities in JELA and southern Louisiana (Taylor 1988, Conner and Brody 1989, Wasilevich 2001, Denslow and Battaglia 2002, Nelson et al. 2002), and there is evidence that hydrologic changes may be altering BLH community composition (Wasilevich 2001, Denslow and Battaglia 2002). As these various drivers act to increase inundation of BLH communities, these changes will result in shifts in communities towards woody species more tolerant of inundation, that is, swamp, (Denslow and Battaglia 2002, Nelson et al. 2002), or the loss of both forest types, swamp and BLH, over a period of 50-100 years or less (Conner and Brody 1989, Nelson et al. 2002, NPS 2015).

### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of BLH-Wet within the WBV basin, on the JELA Baratavia Preserve, and on the 404c that once provided cover, resting, nesting and foraging habitat for wildlife, fisheries, and aquatic species. CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied. Subsidence and erosion currently experienced in the basin would continue to cause

the conversion of flood side BLH-Wet to swamp to ultimately open water.

### **Future with Project (Proposed Action)**

Eight acres of disturbed open water (old borrow pits) would be restored to elevations that could support BLH vegetation and replanted with high quality native BLH species (see Appendix D for a specific listing). Some impacts to BLH would occur during spoil bank gapping operations for the Park/404c swamp mitigation project and construction access. Gapping of the Millaudon Canal spoil bank in 3 locations would impact approximately 0.25 acres of existing low quality BLH and gapping of Horseshoe Canal spoil bank in 3 locations would impact approximately 0.60 acres of existing low quality BLH. Although equipment will seek to avoid all impacts to wetlands when accessing the Millaudon and Horseshoe Canal gapping locations, some minor impacts to fringe BLH along these canals may occur if equipment is walked in along these canals. However, mitigation for these impacts has been accounted for in the size of the Park/404c BLH-Wet restoration project and would be mitigated with construction of this project.

### **3.2.3 WILDLIFE**

#### **Existing Conditions**

##### *Birds*

JELA supports a diverse bird community. Moreover, JELA-BARA is part of one of the largest and most productive estuaries in the USA (Watson 2005). JELA-BARA is located within the Mississippi Alluvial Valley (MAV) which supports the largest forested floodplain in North America and serves as important habitat for wintering waterfowl, wading birds, and migrating shorebirds (Watson 2005).

The preserve itself is located within the Barataria-Terrebonne estuary and this region is designated as an Important Bird Area by the National Audubon Society (National Audubon Society 2013). A variety of efforts have reported around 240 species from the park (NPS 2014, Muth unpublished data). No threatened or endangered species are included in this dataset, although at least 43 species of conservation concern use the park (NPSpecies 2014, Muth unpublished data), including Prothonotary Warbler (*Protonotaria citrea*), Reddish Egret (*Egretta rufescens*), and Swallow-tailed Kite (*Elanoides forficatus*) (NPS 2015).

##### *Mammals*

A comprehensive inventory of mammals was conducted at JELA from 2003 to 2006, and employed a variety of sampling methods (Hood 2006). Following the initial efforts of this inventory, Hood (2012) re-surveyed the large mammal and bat communities of JELA-BARA using camera traps and other methods, incidentally capturing medium-sized mammals as well. The park provides habitat for at least seven species of bats, some that were found to be reproductively active on parklands.

White-tailed deer (*Odocoileus virginianus*) were the most commonly reported mammals in both of the most recent inventories. At high densities, white-tailed deer have the potential to alter and possibly negatively impact vegetation communities, and potentially change habitat for other species (NPS 2015).

Negative impacts from non-native mammals represent an important class of threat in the park. Seven non-native or domestic species were reported from the park (Hood 2006, Hood 2012). These included black rat (*Rattus rattus*), coyote (*Canis latrans*), domestic cat (*Felis catus*), feral hog (*Sus scrofa*), house mouse (*Mus musculus*), nine-banded armadillo (*Dasypus*



*novemcinctus*), and nutria (*Myocastor coypus*) (NPS 2015).

Until the recent invasion of feral hogs, nutria were likely the greatest mammalian threat to the native habitat at the JELA-BARA (NPS 2015). Nutria can cause severe damage to marsh vegetation (LDWF 2002), and their substantial herbivory has affected levees, and could increase bank erosion, and nutria potentially outcompete native aquatic mammals such as beaver, muskrat, and mink (NPS 2014a). Active control measures for this species have been, and continue to be, implemented on Park and land adjacent to the Park.

Feral hogs were not detected in 2003-2005 (Hood 2006), but were subsequently observed in JELA-BARA after 2006 (Hood 2012). This is an especially significant change that has occurred in the last decade, since they were undetected in the first survey and thought to have been extirpated in the 1980s. Hogs have spread rapidly in JELA-BARA and are now in every major habitat in the park. Active control measures are currently being designed and utilized for this species, as well as monitoring that will help to estimate their impact on the native flora and fauna (NPS 2015).

#### *Reptiles and Amphibians*

Three inventories of the herpetofauna in JELA-BARA (Smalley 1982, Rossman and Demastes 1989, Anderson and Seigel 2003) documented a total of 48 species. Starting in 2011, the NPS began monitoring the herpetofauna in JELA-BARA, with sampling occurring on a monthly basis (Woodman 2013). To date, no threatened or endangered species have been reported from the park. One exotic frog species that had not been previously detected, the greenhouse frog (*Eleutherodactylus planirostris*) was found during recent monitoring efforts (Woodman 2013).

#### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of marsh, swamp, and BLH-Wet within the WBV basin, on the JELA Barataria Preserve, and on the 404c that once provided cover, resting, nesting and foraging habitat for wildlife species. These species were either forced into adjacent habitat that may not have been able to permanently support an increase in its wildlife population or died during construction of the impacts. Without mitigation, wildlife populations in the basin may be permanently affected by the overall habitat losses incurred by construction of the HSDRRS and CEMVN's legal obligation to compensate for these habitat losses would not be satisfied.

#### **Future with Project (Proposed Action)**

With project construction approximately 116 acres of shallow open water would be converted to marsh and BLH-Wet. 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. Species that utilize transition zones (i.e. raccoon, bobcat, fox) would benefit from the BLH-W and fresh marsh habitat creation. The loss of open water habitat would not be expected to adversely affect species (American alligator) that utilize this habitat currently as there is ample open water habitat in the basin. Enhancement of the swamps adjacent to the Millaudon and Horseshoe Canal gaps could make these forests more productive thereby increasing the ability of this area to support larger populations thus, providing the potential for current wildlife populations to increase in size.

### **3.2.4 SPECIAL STATUS SPECIES**

#### **3.2.4.1 Threatened and Endangered Species**

##### **Existing Conditions**

The NPS requested an official species listing for the Barataria Preserve and surrounding areas, including project areas in Lake Cataouatche, from the U.S. Fish and Wildlife Service on June 8, 2015, that indicate the potential for 11 threatened, endangered, or candidate species to be present in the project areas. No critical habitat for threatened or endangered species was identified within project areas. A list of these species can be found in Table B-6.

##### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of marsh, swamp, and BLH-Wet within the WBV basin, on the JELA Barataria Preserve, and on the 404c that once had the potential to provided cover, resting, nesting and foraging habitat for threatened and endangered species.

##### **Future with Project (Proposed Action)**

Of the federally-listed threatened and endangered species in the vicinity of the project areas, only the West Indian manatee, has the potential to occur within project areas. This species has never been reported in the park (NPS 2015). If present, the presence of construction-related activity, machinery, and noise would be expected to cause these species to avoid the project area during the construction.

In order to minimize the potential for construction activities to cause adverse impacts to manatees, standard protection measures (Appendix G) would be implemented when activities are proposed that would impact habitat where manatees could occur.

#### **3.2.4.2 Protected/Special Status Species (MBTA, BGPA)**

##### **Existing Conditions**

Numerous bird species protected under the Migratory Bird Treaty Act (MBTA) during various life stages utilize JELA and the habitat it provides (Table B-11). Some JELA habitat is used by migratory birds as a place to rest during their long migratory journey while others actually forage and nest in the Preserve. Bald eagle nests are known to be located in the Barataria Preserve and surrounding area. However none of the known nest locations is within 660 ft (200 meters) of project areas, and substantial landscape buffers, typically forests, screen the project areas from those locations. During a site visit to the project areas on April 29, 2015, NPS staff observed active yellow-crowned night-heron nests at one of the proposed gap locations on Millaudon Canal.

##### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of marsh, swamp, and BLH-Wet within the WBV basin, on the JELA Barataria Preserve, and on the 404c that once had the potential to provided cover, resting, nesting and foraging habitat for protected species.

##### **Future with Project (Proposed Action)**

A survey would be performed prior to construction to identify the presence of colonial nesting water birds or nesting bald eagles. If colonial nesting water birds are present, best management practices, developed in coordination with USFWS, would be implemented to avoid potential

impacts. This could include using bird abatement procedures before nesting begins in February to avoid impacting the nesting population. Passive measures such as the placement of scary eyes or whirly birds, flagging/streamers may deter birds from nesting. If unsuccessful, other measures such as dogs, vehicular/pedestrian traffic or continual human presence could be used. More aggressive methods of hazing (i.e., cannons, flares) could also be used if necessary. With implementation of such methods, impacts to colonial nesting birds are not expected since suitable nesting/roosting habitat for these species exists elsewhere in the Park and in the basin and use of the project area would only be prevented during construction of the project. However, if despite use of these measures, nesting still occurs, work would be required to take place outside of the USFWS and LDWF declared buffer zone of 1,000 ft during nesting season. Work within the buffer zone could only take place during non-nesting season (September 1 to February 15).

If nesting bald eagles are present, the National Bald Eagle Management Guidelines would be followed (see Appendix G).

### **3.2.5 FISHERIES, AQUATIC RESOURCES AND WATER QUALITY**

#### **Existing Conditions**

The Barataria Preserve incorporates a complex set of aquatic habitats, and the waters of the preserve are primarily fresh, with brackish influence at the southern end of the park (Schultz 2006, NPS 2015). The combination of aquatic habitats allows for the potential presence of a number of fish fauna including seasonal migrants and provides critical habitat for varying life stages of marine species from the Gulf of Mexico (see Section 3.2.6 on EFH).

The waterways of the Barataria Preserve contain relatively low dissolved oxygen concentrations associated with very warm slow moving water, thus freshwater fish communities are relatively low in diversity (Schultz 2006). However, the adjacent low salinity coastal marshes include different species that increase overall fish diversity (NPS 2015). Preserve wetlands have been affected by channelization and levee construction, and their further modification, even for the purpose of restoration or mitigation, could affect fish habitat (Neill and Turner 1987, NPS 2015). Eutrophication is a major issue for many water bodies associated with the preserve as the canals provide direct channels for nutrient runoff that would be typically processed slowly through wetlands and relatively shallow, sinuous waterways. Canals also allow for brackish water and storm surges to infiltrate the fresh systems of the preserve more easily, causing mortality to native plants, increased erosion, and potential loss of fish habitat (NPS 2009, NPS 2015).

Fifty-six fish species were reported from the preserve during the most recent 2003-2005 fish inventory (Schultz 2006). For a list of these species see Table B-12. No federal or state threatened or endangered fish species were reported from the park. Most samples reported from the inventory conducted by Schultz (2006) had low proportions of intolerant species and catch rates were low, indicating that a good portion of the park's available habitat is unsuitable for sensitive species that serve as indicators of good water quality (NPS 2015). Fishing, including commercial fishing, is permitted at the preserve in accordance with state and Federal regulations.

Aquatic vegetation provides multiple ecological functions and benefits including: habitat and forage for fish and wildlife, decreasing wave energy, protecting soils, and increasing sediment accretion (Ward et al. 1984, Hemminga and Duarte 2000, Cronk and Fennessy 2001, Poirrier et

al. 2009, Poirrier et al. 2010). Additionally, submerged aquatic vegetation (SAV) can be a good indicator of environmental quality as it is sensitive to changes in salinity, turbidity, and nutrient levels (Davis and Brinson 1980, Dennison et al. 1993, Poirrier et al. 2009).

Poirrier et al. (2009, 2010) surveyed SAV at 146 locations within the preserve and adjacent waters of Lake Cataouatche and Lake Salvador during the years 2006-2008, focusing on SAV but also recording some floating aquatics. During this study, nine native and five exotic SAV and floating aquatics species were found, and the authors concluded that the park contains a diverse and robust SAV community (Poirrier et al. 2009, 2010, NPS 2015). Factors that control SAV community structure and/or threaten the community include: salinity, turbidity, armored shorelines, nuisance growth, and invasive species, including a floating aquatic species of major concern, giant salvinia (*Salvinia molesta*) (Ibid.)

Park managers have described the exotic floating aquatic vegetation present in the preserve as, constituting one of the most problematic invasive species incursions in the region; along with impeding boat and fishing access via the formation of exceptionally dense mats, the invasive plant species also alter the quality of food available to native wetland inhabitants, compete with native plant species, and have the potential for cascading impacts on the physicochemical characteristics, community structure and biological diversity of the Preserve's waterways.

Tipping (2007) attempted to establish populations of salvinia weevil (*Cyrtobagous salviniae*) for the control of common salvinia within the preserve. In 2011, the park's Natural Resource Management team began regular introductions of the same weevils to salvinia affected waterways at the preserve. Subsequent monitoring of these introductions has provided encouraging results in that weevil populations in many sites appear to be stable and at densities sufficient to control *Salvinia molesta* during the growing season (Botello-Young 2013, NPS 2015).

Since long term monitoring by the NPS began in 2008, there have been 126 violations of state and NPS water quality standards and screening criteria at the Barataria Preserve. Violations of dissolved oxygen and *E. coli* standards during that time are particularly concerning given that they have occurred every year from 2008-2014 on a somewhat regular basis (NPS 2015). Unfortunately, surface water quality within the preserve is influenced by external inputs that are beyond the park's control. Water in the preserve originates from multiple sources: rainfall, pumped stormwater from adjacent communities, saline storm surges, overland flow, and inflow from the Davis Pond Diversion of the Mississippi River (NPS 2014b). In a synthesis report, the NPS Water Resources Division (1994) concluded that the water quality within JELA is typical of developed coastal areas and has been impacted by industrial effluents, stormwater runoff, and waterway navigation (NPS 2015).

### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of fresh marsh and swamp habitat within the WBV basin, on the Barataria Preserve, and on the 404c area that once provided cover, spawning and foraging habitat for fisheries and aquatic species. The loss of wetlands and the detritus and filtering function they provide would indirectly impact fisheries productivity and water quality through a reduction in primary productivity and increased nutrient and sediment loads in these systems. CEMVN's legal obligation to compensate for habitat losses caused by construction of the HSDRRS would not be satisfied.

### **Future with Project (Proposed Action)**

With implementation of the general Fresh Marsh Restoration Project, there would be some impacts to fisheries, aquatic resources, and water quality in the form of physically altered open water bottom habitat, and temporary increases in turbidity during construction activities. Approximately 88 acres of new marsh would be created in Yankee Pond (JL1B5) and 50.4 acres of existing marsh enhanced to provide greater fisheries access at the geocrib (JL15). Approximately 42 acres of Lake Cataouatche water bottom would be deepened by an average of 10 ft for borrow acquisition. It is anticipated that anoxic conditions would be avoided with the depth of dredging and that mobile fishery species would avoid the proposed borrow site during construction, thereby minimizing impacts to those species. There would be short term direct impacts to the benthic communities at the borrow sites within open water areas. The animals that live on or in the material to be dredged would most likely be killed during removal, transportation, or placement of the dredge material. It is anticipated that the new bottoms of the borrow pits would quickly re-colonize with species similar in composition to those existing before the dredge activity since anoxic conditions would be avoided and an abundance of similar habitat exists adjacent to the borrow site. 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 adjacent to the dredge site or the placement site. Due to the lack of escape routes, some fish species in the placement area would be killed during borrow material placement. However, these species are commonly found throughout the basin and on JELA Barataria Preserve in similar shallow water environments that exist in abundance. As such, impacts to the overall population of these species in the basin and on JELA Barataria Preserve from the borrow placement are expected to be negligible. Impacts caused by increases in suspended sediments during placement of stabilization materials would be minimal, localized, and short-lived. The filtering function that the created marsh would provide would be a long term benefit to the water quality in JELA.

Approximately 8 acres of open water and fringe early successional wetland plant species in an existing borrow pit adjacent to the HSDRRS levee would be filled and planted with high quality native BLH-Wet species for the JL14A project. Impacts would be similar, but smaller, than those discussed for the JL1B5 and JL1B4 projects at the marsh creation sites. Since borrow for the JL14A project would be obtained from commercial, government and/or contractor furnished borrow pits and trucked in to the site no impacts to fisheries, aquatic resources, or water quality would occur from borrow acquisition for this project. Elevations at this site would not allow future fishery and aquatic species access.

Approximately 1.3 acres of BLH habitat would be excavated to create gaps in the berms adjacent to the Millaudon and Horseshoe Canals for the JL7 project, thereby providing access for fish and aquatic species into adjacent swamps. Though the excavated material would be disposed of in the adjacent canals it would be placed so as to prevent the conversion of aquatic habitat. Excavated woody vegetation placed in the canals would serve to provide places of refuge and foraging habitat for fishery and aquatic species. Any increase in turbidity in the adjacent canals would be temporary and short lived during the period of construction.

### **3.2.6 ESSENTIAL FISH HABITAT**

#### **Existing Conditions**

Of the proposed projects only the JL1B5 and JL1B4 projects and their borrow area are identified as EFH for red drum and shrimp. See Table 3.2 for the specific EFH per life stage.

### **Future without Project (No Action)**

Without construction of the proposed action, there would be an overall loss of fresh marsh habitat within the WBV basin and on JELA that once provided cover, spawning and foraging habitat for EFH species. 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.

### **Future with Project (Proposed Action)**

Several types of EFH associated with open water would be permanently replaced with estuarine emergent marsh and other associated EFH. Negative impacts to the existing EFH would be more than offset by the creation estuarine emergent wetlands since the support functions of the created marsh is greater than the support functions of the existing open water. Excavation of borrow from Lake Cataouatche would deepen estuarine water column and may expose a different bottom substrate, which could impact managed species by reducing available cover and foraging habitat. Though the JL15 project area is currently not considered EFH, with the addition of fish dips in the existing dike and with future subsidence of the area, it would become EFH over time. No impacts to EFH would be incurred from the construction of the swamp (JL7) and BLH-Wet (JL14A) projects.

## **3.2.7 HYDROLOGY**

### **Existing Conditions**

The JELA Barataria Preserve is a park largely shaped by its hydrologic history. With its close proximity to the Mississippi River, many of the park's features and processes have been driven by both the natural and anthropogenic influences of this major water body. A third of the water from the continental United States drains from the Mississippi River, and prior to human influence, sediment flows from the river had the greatest influence on the creation and alteration of new land in the region (NPS 2015). The Barataria Preserve lies within the upper, freshwater portion of the Barataria Basin, which is defined as the portion of the Mississippi Delta bounded by Bayou Lafourche and the Mississippi River (NPS 2012).

In recent history, anthropogenic effects have played a large role in shaping the hydrology of the park. Before human intervention, hydrology was primarily affected by the Mississippi River, tidal actions, and precipitation. Construction of artificial levees and closing of channels has kept river water from entering the upper basin. Prior to the extensive levee construction on the Mississippi River, rainwater and river floodwaters provided freshwater inputs into the marshes and lakes through surface flow (NPS 2012). Recent mitigation efforts, and most notably the Davis Pond Freshwater Diversion Project, have helped to restore inflow from the Mississippi River (NPS 2014b).

Levees constructed for storm protection, the WBV HSDRRS, separate JELA-BARA from the uppermost Barataria Basin (NPS 2015). Pumping stations that lift precipitation over these levees create points where large volumes of water containing runoff from adjacent developed areas intermittently flow into preserve waterways. In addition, drainages, canals, and channelization of the streams in the area have significantly altered hydrology and increase influence from the Gulf of Mexico.

Tidal action is also a potential player in the park's hydrology. While tidal influence is minimal in the upper portion of the basin, the occasional strong storm surge can bring saltwater into the freshwater habitats (NPS 2012). Saltwater intrusion has the potential to negatively affect plants

and animals that tolerate low levels of salinity. In addition, salinity indirectly affects soil respiration via reductions to root productivity, and potentially directly affects respiration of the microbial community with tidal action (Krauss et al. 2012). Historically, marshes buffered the influx of saltwater from storm surges, but reductions in marsh area in the region have diminished their abilities to slow the intrusions. Within JELA-BARA, relatively intact wetlands continue to buffer interior sections of the basin (NPS 2015) and the WBV HSDRRS.

Park efforts at managing their hydrologic resource have been ongoing for decades. Restoration of the natural water flow in the unit's waterways has been underway since the 1982 General Management Plan was developed (NPS 1982). Recent efforts to restore "functions, resources, and values related to hydrology" in JELA-BARA have been made through the Canal Reclamation project (NPS 2009). Over 20 miles of non-historic canals will be reclaimed to allow wetlands to be restored to their natural function. This project is the result of recognition of external pressures applied to the park's hydrology and the need to maintain integrity and improve resiliency of its ecosystems to both subsidence and climate change impacts (NPS 2009, NPS 2015).

#### **Future without Project (No Action)**

Without construction of the proposed action, hydrology within the basin and JELA would remain the same. There would be no conversion of open water to marsh and BLH, and the effect on swamps from the disruption of sheet flow from spoil banks would continue.

#### **Future with Project (Proposed Action)**

The proposed action is designed to affect hydrology. It would fill approximately 116 acres of shallow open water to restore marsh and BLH-Wet habitat and would gap remnant spoil banks adjacent to the Millaudon and Canals to restore hydrologic connection to and nourish existing swamp habitats.

### **3.2.8 CULTURAL RESOURCES**

#### **Existing Conditions**

Two locations have been proposed for Jean Lafitte fresh marsh. The two areas are a location along the east shore of Lake Salvador, and a portion of Yankee Pond. Both of these project locations possess a strong probability for the presence of cultural resources. Both Yankee Pond and the Millaudon Canal, where half of the swamp project locations are proposed, may be culturally important features, but both have lost much of the integrity that would make them significant. Unfortunately, existing literature on Yankee Pond and the Millaudon Canal is not comprehensive but limited research has shown that Yankee Pond was a small example of early 20<sup>th</sup> century land reclamation projects undertaken for agriculture in coastal areas. The swamp project locations along Horseshoe Canal are located along another 1970s-era land reclamation canal and levee which is not culturally significant. The same goes for the borrow pit BLH project area.

The area surrounding Yankee Pond has been the subject of several surveys for cultural resources. Yankee Pond appears to be an early 20<sup>th</sup> Century land reclamation project for agriculture, which had failed and was open water by the time it was included in a USGS topographic map from 1932. The site may have had a connection to Edward Wisner (Hahn 2015). A borrow source for the Yankee Pond marsh restoration project has been identified in Lake Cataouatche. A slurry pipe will be floated on water along the Bayou Segnette Waterway to transport material from Lake Cataouatche to the Yankee Pond marsh restoration project area.

Past surveys have not identified cultural resources within the Yankee Pond project area or along Bayou Segnette where the slurry pipe would be located. Remote sensing surveys have not previously been conducted in Lake Cataouatche, and submerged cultural resources could exist within the borrow area.

Millaudon Canal likely began as a drainage ditch for the largest sugar estate in Louisiana at the time, Estelle Plantation, owned by Laurent Millaudon from 1834-1870, and later owned by A.B. Merrill. The canal, or portions of the canal, has/have been modified several times to deepen and widen it for drainage or other purposes, including, most recently, dredging to raise a levee for what appears to be a residential development project beginning circa 1970 in the vicinity of the project.

The areas along the eastern shoreline of Lake Salvador have been the subject of several surveys for cultural resources in the past. Numerous cultural resources have been identified within one mile of the Lake Salvador shoreline project area. The area is within the Barataria Unit Historic District (listed on the NRHP on May 11, 1989) and cultural resources associated with the historic district are located along the Lake Salvador shoreline. Site 16JE46 is located just north of the Lake Salvador project area at the junction of Bayou Bardeaux and Lake Salvador, and is listed on the NRHP. Other sites within one mile of the Lake Salvador project area include 16JE55, 16JE56, 16JE66, and 16JE189. Sites 16JE55 and 16JE56 have been determined eligible for listing on the NRHP. The closest site to the Lake Salvador project area is identified as the remains of a shell dam once placed across the mouth of a drill hole canal to protect its entrance from the Bayou Segnette Waterway.

#### **Future without Project**

Without implementation of the proposed action, there would be no direct, indirect, or cumulative impacts to cultural resources. Cultural resources would continue to be affected by natural processes such as erosion, subsidence, and flooding.

#### **Future with Project**

It is not likely that activities associated with the proposed restoration project would have a direct impact on cultural resources within the project area. Submerged cultural resources could exist within the borrow area located in Lake Cataouatche and Yankee Pond, and the removal or placement of borrow could have a direct impact on those cultural resources. It is important to recognize that Yankee Pond and Millaudon Canal have lost much of their cultural integrity over time and that the overall condition of the landscape that surrounds these features is critical in maintaining the cultural integrity of the Barataria Historic District. On balance it is important to restore these areas to build resiliency of the natural and cultural landscape of the Preserve. The NPS will conduct consultation in accordance with Section 106 of the National Historic Preservation Act with the LA State Historic Preservation Office (SHPO) and federally recognized American Indian tribes for restoration projects that are located on NPS managed lands.

### **3.2.9 RECREATIONAL RESOURCES**

#### **Existing Conditions**

Data for annual number of visitors at JELA Barataria Preserve is available starting in 1978. After a low point shortly after the park establishment, visitation rose steadily until the early 2000s. Since that time, annual visitation has fluctuated around a mean of 650,000. Visitation dropped dramatically in 2002 and following Hurricane Katrina in 2005. Generally, visitation is highest during the summer months, and is also influenced by holidays and park events such as



memorial dedications (NPS 2014c, NPS 2015).

Visitation at the Barataria Preserve in “backcountry” areas away from visitor use developments like trails and visitor centers is dominated by hunters and fishermen arriving by boat. Access to undeveloped areas of the preserve is restricted by park policy. Access to waterways is often restricted by condition. At least one social trail used by permitted hunters, and others, exists along a spoilbank in the project area.

### **Future without Project (No Action)**

Without construction of proposed action, there would be an overall loss of fresh marsh; BLH; and swamp within the WBV basin, on the JELA Barataria Preserve, and on the 404c area that once provided cover, resting, nesting and foraging habitat for wildlife, fisheries, and aquatic species. The loss of these habitats, and the effect such losses would have on wildlife and fish species, could cause recreational opportunities in the basin, on JELA, and on the 404c area to also suffer loss since they are habitat dependant.

### **Future with Project (Proposed Action)**

The project areas would not be available for recreation use such as hunting, fishing, and boating during construction (approximately 5 months to 2 years, depending on the project location.) Fishing in waters adjacent to Lake Cataouatche, Yankee Pond, and Lake Salvador may be temporarily impacted during construction by increased turbidity during dredging and placement activities. Additionally, the floating pipeline in Bayou Segnette would temporarily restrict access and may cause an inconvenience to boaters traveling in the area during construction.

With the conversion of open water areas to forested or emergent wetlands, a change in the type of recreation conducted on these sites would occur, from largely fishing to largely hunting and bird watching.

## **3.2.10 AIR QUALITY**

### **Existing Conditions**

Air quality is an important issue in the region and appears to be currently stable (NPS 2015).

Ozone is a major air quality consideration in the region. The National Ambient Air Quality Standards (NAAQS) set by the EPA include two thresholds for primary and secondary pollutant limits. Primary limits are set with human health factors in mind, while secondary standards pertain to visibility, vegetation health, and building integrity. In the case of ozone, the NAAQS primary and secondary standard concentrations were lowered starting on May 27, 2008 from 0.080 ppm to 0.075 ppm for ozone over 8-hr periods. As a result, violations of this standard are defined as 3-year averages of the 4<sup>th</sup> highest daily maximum 8-hour average ozone concentration (4<sup>th</sup> Hi Max 8-hr means) that exceed 0.075 ppm (EPA 2014, NPS 2015).

Both the NPS Air Resources Division (ARD) and the Louisiana Department of Environmental Quality monitor ozone concentrations, and the NPS ARD produces interpolated estimates of ozone metrics, including for JELA. In a final working draft natural resource condition assessment for the park that evaluated information provided by both of these sources, the NPS (2015) found that values of the 4<sup>th</sup> highest maximum 8-hour ozone concentration varied slightly among sources, but were generally within the range of moderate concern.

Atmospheric deposition is a regional concern, and sources of pollution exist near the park.

Airborne constituents can affect ecological systems through acidification, soil fertilization, and surface water loading.

Deposition resulting from the production of mercury, nitrogen oxides (NO<sub>x</sub>) and sulfur dioxide (SO<sub>2</sub>) are particular issues. These pollutants are typically divided into wet (e.g. precipitation, condensation) and dry (e.g. adsorption, particulate, direct contact) sources, which can negatively affect growing conditions for biota, among other effects (NPS 2015). If mercury reaches aquatic environments, it can be taken up by biota, where it is converted to a different form known as methyl-mercury ([CH<sub>3</sub>Hg]<sup>+</sup>). The accumulation of methyl-mercury in organisms, known as bioaccumulation, is particularly evident in aquatic ecosystems, where organisms higher in the food chain (e.g. fish) can build up relatively high concentrations of mercury (NADP 2014).

The final working draft natural resource assessment for JELA (NPS 2015) examined data from the National Atmospheric Deposition Program (NADP) Mercury Deposition Network. The mean deposition rate was 292 nanograms per square meter (ng m<sup>-2</sup>) at a station in Hammond, LA that is likely most representative of mercury deposition at JELA, but no trend could be determined. There are no federal or state standards for mercury deposition, but there are defined thresholds for different organisms that indicate mercury contamination risk from consumption (Landers et al. 2008, NPS 2015)

The final working draft natural resource assessment for JELA (NPS 2015) also examined data collected as part of the NADP for nitrogen oxides and sulfur dioxide. Wet deposition of nitrogen oxides and sulfur dioxide was relatively high at regional monitoring stations, and mean values for the last five years available were above the NPS Air Resources Division threshold for posing threats to ecosystem health of 3 kilograms per hectare per year (kg ha<sup>-1</sup> yr<sup>-1</sup>). Data suggest that deposition rates are stable in the region (NPS 2015).

Managing regional air pollution sources and climate conditions are outside the scope of the park's management, although park management may work to mitigate the impacts of these large-scale forces (NPS 2015).

The proposed action is in Jefferson Parish which is currently in attainment of NAAQS.

#### **Future without Project (No Action)**

Jefferson Parish is currently in attainment of NAAQS and has been since 1990. Air quality in the region appears to be stable (NPS 2015). The current air quality trends in the parish would be expected to continue under the future without project conditions.

#### **Future with Project (Proposed Action)**

During project construction an increase in air emissions could be expected. These emissions could include 1) exhaust emissions from operations of material delivery and dump trucks and various types of non-road construction equipment such as cutterhead dredge, back hoe, excavators, 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 construction areas. The on-road trucks and private vehicles used to access the work area would also contribute to construction phase air pollution in the vicinity of the project when traveling along local roads. Any site-specific construction effects would be temporary and dust emissions, if any, would be controlled using standard BMPs, such as wetting of temporary access roads.

Activities associated with dredging and marsh/BLH restoration would produce localized, temporary increases in pollutant levels associated with operation of heavy machinery mainly through the combustion of diesel fuel. The highest levels would occur at the dredge offshore and at the active work zone in Yankee Pond. Pollutant concentrates are expected to diminish exponentially with distance from construction and return to ambient levels in close proximity to the work areas. Upon completion of the work, no additional discharges or sustained impacts will be associated with the project. Periodic thunderstorms and windy conditions near Lake Cataouatche are expected to disperse pollutants rapidly from the areas. Emissions are not expected to be at a level that would contribute measurably to greenhouse gases on a wider scale and not expected to produce conditions that would alter the EPA's classification of Jefferson Parish, being in attainment of NAAQS. Because the project areas are in parishes in attainment of NAAQS, a conformity analysis is not required and has not been done.

### **3.2.11 NOISE/SOUNDSCAPES**

#### **Existing Conditions**

A park's natural soundscape encompasses the natural sounds that occur in the park, including the physical capacity for transmitting those natural sounds and the interrelationship among park natural sounds of different frequencies and volumes (NPS 2006). The natural soundscape of JELA is affected by noise from many anthropogenic sources produced by park staff, special park uses, and visitors during normal park activities, as well as noise produced around the park. Common existing noise sources include on and off road vehicles of various types, heavy equipment and construction, a variety of vessels including airboats, a variety of aircraft including low-level military and passenger flights, firearms, and a nearby racetrack.

#### **Future without Project (No Action)**

The Park's natural soundscape within the vicinity of the proposed action would not be impacted.

#### **Future with Project (Proposed Action)**

Cutterhead dredges, backhoes, bull dozers, dump trucks, slurry pumps, marsh tracked vehicles and barge mounted equipment would be the primary pieces of equipment used for construction of the proposed action. 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. Noise levels quickly drop off once a buffer is established between the noise source and the receptor (e.g. distance, vegetation, levees). As such, most wildlife in the adjacent habitats should be largely undisturbed by the additional noise from this project's construction. Minor and short term impact to human populations (visitors to JELA Barataria Preserve, adjacent residents) is anticipated from the movement of construction equipment to and from project sites. Borrow delivery for the BLH restoration project would utilize an access approximately 400 ft from the adjacent residential development and noise levels from delivery equipment would be largely eliminated once the equipment proceeds to the opposite side of the levee. Noise production would be temporary during the period of construction and primarily occur during daylight hours.

### **3.2.12 SOCIOECONOMICS/LAND USE, ENVIRONMENTAL JUSTICE, TRANSPORTATION AND COMMERCIAL FISHERIES**

#### **Existing Conditions**

Several swamp tour companies are located adjacent to the Barataria Preserve. Most of these

companies provide public tours on lands and waters outside the preserve. One provides public tours within the preserve under a commercial use authorization from the NPS. Additionally, there are no commercial/industrial properties, public facilities, or transportation infrastructure within the boundaries of the proposed projects. The nearest major thoroughfare is LA Highway 45 (Barataria Boulevard). The major nearest navigable waterways are Bayou Segnette and Lake Cataouatche, LA.

In accordance with NPS Management Policies (2006), the NPS must apply appropriate land protection methods to protect park resources and values from incompatible land uses.

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, directs agencies to address environmental and human health conditions in minority and low-income communities to avoid the disproportionate placement of any adverse effects from federal policies and actions on these populations. Population demographics were reviewed for the communities adjacent to the preserve. None of the adjacent communities is identified as an environmental justice community based on the available U.S. Census Bureau Data (2010).

The NPS intermittently issues permits for commercial fishing (often crabbing) in Barataria Preserve waterways. Commercial fishers utilize navigation channels within and adjacent to the preserve.

#### **Future without Project (No Action)**

Without construction of the proposed action, there would be no impacts to socioeconomics, land use, transportation, and commercial fishing.

#### **Future with Project (Proposed Action)**

Minimal 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 the proposed action. Construction of the proposed action would result in construction contracts, as well as the associated purchase of materials, supplies, and fuel. Workers would likely purchase meals, incidentals, and lodging in the surrounding area for the duration of construction. Additional work during the OMR&R phase could result in vegetation or invasive animal species management contracts, or additional construction contracts.

The overall land use of the park would not change. Project features would be managed in perpetuity, which would affect NPS management of the features, and, possibly, the management of surrounding areas of the park. Management of the features is expected to be highly compatible with overall NPS management of the preserve.

Reserved minerals under project areas should be accessible from adjacent surface locations. There are no commercial/industrial properties, public facilities, or transportation infrastructure within the project boundaries therefore there will be no direct impacts to land use. Minimal indirect land use impacts may occur when privately owned land is converted to public use. However, only a portion of the JL15 project area is privately owned.

According to 2010 U.S. Census data, there are no residents or housing units located within the boundaries of the proposed action and therefore no impacts to population, housing, or minority or low-income populations are expected to occur. There are no impacts to the Environmental

Justice socio-economic resource. Environmental Justice issues do not typically arise from the construction of restoration projects on uninhabited sites.

Impacts may occur to traffic near the BLH restoration site on Barataria Blvd as construction material is transported to the site.

There could be some minor impacts to navigation and/or commercial fishing during the dredging of Lake Cataouatche for borrow and the transportation of the borrow via slurry pipeline. However, these impacts would be minor and temporary during the period of construction.

### **3.3 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE (HTRW)**

No Recognized Environmental Conditions (RECs) were found within the proposed mitigation areas, and the mitigation areas contain no sites of interest which pose potential environmental concerns. The environmental records search and aerial photograph analysis also did not identify any significant data suggesting environmental concerns to be present in the mitigation areas. Several oil and gas wells and natural gas pipelines exist within one mile of the proposed mitigation sites. These findings should be considered as *de minimis* conditions and not RECs; therefore, they would not be expected to have a negative impact on the project site. The probability of encountering HTRW on any of the mitigation sites is low. No further study of HTRW issues for these sites is recommended.

### **3.4 CUMULATIVE IMPACTS**

#### **Connected, Similar, and Cumulative Actions**

Per the NPS DO 12 NEPA Handbook, connected, similar, and cumulative actions are actions that result as a direct or indirect consequences of the Proposed Action and can be undertaken by federal, state, or local entities. Connected actions associated with the Proposed Action include construction of the WBV HSDRRS, including construction of its mitigation features, infrastructure relocation as a result of the WBV HSDRRS, borrow pit construction for previous levee improvements, and Lake Salvador shoreline protection. Similar actions are those that have similar geography, timing, purpose, or other similar feature to the Proposed Action. Cumulative actions are those actions that have additive or cumulative, impacts on a particular resource. Cumulative actions may have occurred in the past, present, or are reasonably foreseeable to take place in the future.

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.

Table B-13 presents the impact of the other past, present and reasonably foreseeable projects in the WBV basin on the important resources documented in this TIER 1 EA. The ecosystem restoration type projects in the basin 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 important resources, their overall effects on the system from a human and natural environmental perspective would be wholly positive. The structural projects (e.g. levee systems), 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 in the FWOP has resulted in the protection of cultural sites found within the protection of the levee system. Ecosystem restoration plans in the WBV basin and in the region that improve estuarine habitat also provide benefits to the commercial fishing industry.

### **NO ACTION**

The overall loss of fresh marsh, BLH, and swamp within the system from the HSDRRS work combined with other habitat loss incurred from implementation of projects in the FWOP conditions could have cumulative adverse impacts to wetlands, wildlife, fisheries, aquatic resources, water quality, EFH and recreational resources. If the impacts incurred by construction of the HSDRRS are not mitigated there would be a net loss of wetlands and the species that depend on them for survival in the WBV basin and on the Park.

### **PROPOSED ACTION**

Construction of the proposed projects would prevent an overall loss of fresh marsh, BLH-Wet, and swamp habitat in the basin and on JELA and the 404c area. 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, combat the overall decline of wildlife species within the basin, and would be beneficial in preserving species bio-diversity; there would be an overall loss of open water habitat in the WBV basin and on JELA, but no permanent adverse impacts are anticipated because this habitat is prevalent throughout the basin and on JELA. Impacts to SAVs would be mitigated along with the proposed projects mitigating for fresh marsh. The resulting marsh would be cumulatively neutral in the form of additional spawning, nursery, forage and cover habitat for important fish species in the WBV basin because the proposed projects are offsetting losses due to construction of the WBV HSDRRS. Though construction of these projects would result in the loss of fisheries habitat, some fish, and temporary impacts to water quality and benthic habitat; this habitat is abundant throughout the basin and on JELA, impacts to existing fisheries are minimal, and water quality and benthic species would rebound once project construction is complete. The restoration of BLH, fresh marsh and swamp in areas that are currently open water would provide indirect benefits to fisheries in the future by providing nutrients to the system in the form of detritus thereby increasing the primary productivity in the wetland system. 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 marsh 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. Those projects in the FWOP conditions which include marsh restoration as well as the proposed action for WBV HSDRRS Mitigation could have the long-

term beneficial impacts of increasing dissolved oxygen levels and the overall filtering function of wetlands which helps control local turbidity. The temporary water quality impacts from borrow excavation and the placement of such material 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. This project would cause one type of EFH in the WBV 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 WBV basin or on JELA. Impacts to cover and foraging for managed species are not anticipated to contribute significant increases in cumulative impacts to managed species as the borrow areas are small in size compared to the available EFH habitat in the basin and on JELA providing similar habitat.

No threatened or endangered species, cultural resources or HTRW sites are expected to be impacted by construction of the proposed projects.

Since mitigation replaces impacted habitats, recreational opportunities dependent on these habitats would merely shift from the area of impact to the area of mitigation, preventing the loss of these 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.

Cumulative impacts to air quality in the project area due to construction of the proposed action in addition to the other construction activities within the WBV basin that may be occurring concurrently would be temporary and minimal. 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 a parish in attainment of NAAQS. Construction of the proposed action is not anticipated to add significantly to the cumulative effect of noise in the WBV basin as the projects are situated in remote areas and noise from construction activities buffered by vegetation and the HSDRRS levee.

The cumulative impacts of the projects, 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 remote and generally unpopulated areas where the projects would be constructed and the temporary nature of the project construction activities, the proposed action would add very little and only temporary impacts to any other impacts resulting from past, present and reasonably foreseeable projects in the region and would not contribute significantly to cumulative impacts to socio-economic resources in the basin.

Construction of the proposed action has the potential to temporarily disrupt transportation, navigation and commercial fishing in project areas, however, these impacts would be minor and temporary during the period of construction. Land use impacts, such as impacts to commercial/industrial properties and public facilities, are not anticipated as the projects are typically located in unpopulated areas.

Additional evaluation of cumulative impacts associated with construction of the HSDRRS and other Corps water resource projects and public and private construction projects can be found in the Comprehensive Environmental Document, Phase 1, which may be accessed at [www.nolaenvironmental.gov](http://www.nolaenvironmental.gov). Those discussions are incorporated by reference.

## **4. MITIGATION SUCCESS CRITERIA, MONITORING, REPORTING, AND CONTINGENCY MANAGEMENT**

Specific success criteria and monitoring for the NPS fresh marsh, swamp and BLH-Wet projects as well as the general fresh marsh project can be found in Appendix D.

The purpose of contingency management (CM) activities in the life-cycle of the project is to address ecological and other uncertainties that could prevent successful implementation of a project. Contingency management (CM) 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 CM 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 E for the CM Plan.

Each project 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. 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 proposed project. See Appendix D 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.

The proposed mitigation action includes construction, with the non-Federal sponsor (NFS) 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 NFS 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 NFS 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 contingency management measures in accordance with the contingency plan and subject to cost sharing requirements, availability of funding, and current budgetary and other guidance.

## **5. COORDINATION AND CONSULTATION**

### **5.1 PUBLIC INVOLVEMENT**

Extensive public involvement has been sought in planning the mitigation for the 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](http://www.nolaenvironmental.gov).

The following public meetings were held to obtain public input on the planning process for the WBV HSDRRS mitigation, to obtain any suggestions on potential projects to mitigate WBV HSDRRS impacts, and to update the public on the project status:

1. 31 August 2009 at U.S. Army Corps of Engineers Office in New Orleans, LA
2. 13 May 2010 at Delgado Community College Westbank in Algiers, LA
3. 17 May 2010 at Westwego Tassin Senior Center in Westwego, LA
4. 19 May 2010 at NP Trist Middle School in Meraux, LA
5. 9 December 2010 at Westwego Tassin Senior Center in Westwego, LA
6. 31 July 2012 at Westwego Tassin Senior Center in Westwego, LA
7. 21 May 2014 at Mathews Government Complex in Mathews, 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](http://www.nolaenvironmental.gov). Additional, public comments were accepted anytime during the IER process via [www.nolaenvironmental.gov](http://www.nolaenvironmental.gov). The presentations given at all of these meetings can be found at [www.nolaenvironmental.gov](http://www.nolaenvironmental.gov).

The Draft PIER was distributed for a 30-day public review and comment period beginning April 4, 2014 and ending May 5, 2014. A public meeting was held in Lafourche Parish on May 21, 2014. Additional public comments were accepted through May 23, 2014. Analysis of the comments revealed nothing substantial that would prevent signature of the DR. The PIER 37 DR was signed by the CEMVN commander on June, 13 2014. Responses to all comments were generated and can be found in the final PIER 37.

The Draft WBV PIER 37 TIER 1 EA was released for thirty-day public review and comment on October 13, 2015. Public and agency comments are addressed in Appendix I.

## **5.2 AGENCY COORDINATION**

The public will be notified through the official state journal (The Advocate) of the USACE's application for a State Water Quality Certificate pursuant to Section 401 of the Department of Environmental Quality in that regard. A public notice will also be distributed by the USACE pursuant to Section 404 (b) (1) of the Clean Water Act and will be provided on the NPS Planning, Environment, and Public Comment System website at <http://parkplanning.nps.gov/jela>. The notice will seek comments on the deposition of dredged material into waters of the United States. The public notice announcing the availability of the PIER 37, TIER 1 EA for the 30 public review period will also be placed on the NPS Planning, Environment, and Public Comment System website at <http://parkplanning.nps.gov/jela>. Comments on the EA can be submitted on this website or mailed to Elizabeth Behrens at U.S. Army Corps of Engineers, New Orleans District; Coastal Environmental Planning Section, P.O. Box P.O. Box 60267, New Orleans, LA 70118

Preparation of this TIER 1 EA has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. The following agencies, as well as other interested parties, are receiving copies of this TIER 1 EA:

U.S. Department of the Interior, Fish and Wildlife Service  
U.S. Environmental Protection Agency, Region VI  
U.S. Department of Commerce, National Marine Fisheries Service  
U.S. Natural Resources Conservation Service, State Conservationist  
Louisiana Coastal Protection and Restoration Authority  
Advisory Council on Historic Preservation  
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  
Southeast Louisiana Flood Protection Authority West, West Jefferson Levee District  
Alabama-Coushatta Tribe of Texas  
Caddo Nation of Oklahoma  
Chitimacha Tribe of Louisiana  
Choctaw Nation of Oklahoma  
Coushatta Tribe of Louisiana  
Quapaw Tribe of Oklahoma  
Mississippi Band of Choctaw Indians  
Jena Band of Choctaw Indians  
Seminole Tribe of Florida  
Seminole Nation of Oklahoma  
Tunica-Biloxi Tribe of Louisiana

MVN received the draft Coordination Act Report (CAR) from USFWS dated July 9, 2015 (Appendix H). The Final CAR was received on December 15, 2015. USFWS' recommendations and MVN's responses are as follows:

Recommendation 1: Impacts to Essential Fish Habitat (EFH) should be avoided and minimized to the greatest extent possible. Because impacts to designated EFH habitat may need to be mitigated the Corps should coordinate with the NMFS regarding this need and maintain an account of all EFH habitats (e.g., openwater, marsh) impacted and mitigated.

CEMVN Response 1: Concur. The USACE would seek to avoid impacts to EFH and would coordinate with NMFS on any unavoidable impacts. All impacts are being maintained in the WBV HSDRRS GIS database.

Recommendation 2: Impacts to wetland habitat (including SAV 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 mitigation features through sizing (i.e., boundary adjustments) of the mitigation features in close coordination with the natural resource agencies.

CEMVN Response 2: Concur.

Recommendation 3: 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 found in Appendix A 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 3: Concur. Best management practices would be employed to minimize impacts to water quality from borrow dredging activities. The general guidelines for borrow pit design found in Appendix B of the CAR 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 4: The Corps should coordinate with the natural resource agencies to ensure that necessary information to conduct detailed project planning/design and finalize the WVA analysis is developed and available. Final sizing of mitigation must be based on revised WVAs conducted on advanced project designs.

CEMVN Response 4: Concur. Coordination with the natural resource agencies to ensure that necessary information to conduct detailed project planning/design and finalize the WVA analysis will occur as early in the process as possible. Final sizing of mitigation projects would be based on revised WVAs conducted on advanced project designs.

Recommendation 5: 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 Louisiana Department of Natural Resources (LDNR). The Service shall be provided an opportunity to review and submit recommendations on the all work addressed in those reports.

CEMVN Response 5: 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 6: A fully defined mitigation plan should be included in the authorizing report and Decision Record. The mitigation plan should be developed including locations and AAHUs vetted through the natural resource agencies

CEMVN Response 6: The USACE will comply with the Water Resources Development Act of 2007, Sections 2036(a) and 2036(c) and relevant USACE regulations and guidance in its development of mitigation plans and will coordinate with the natural resource agencies in the development of such plans.

Recommendation 7: The Corps should continue to coordinate with land managing agencies during planning of mitigation features that may be built on their lands or lands to be turned over to them for management. Coordination should continue until construction of the projects are complete and prior to any subsequent maintenance. Points of contacts National Park Service (NPS) lands within the area please contact Superintendent Lance Hatten, (504) 589-3882 extension 108, ([lance\\_hatten@nps.gov](mailto:lance_hatten@nps.gov)) or Chief of Resource Management Guy Hughes (504) 589-3882 extension 128, ([guy\\_hughes@nps.gov](mailto:guy_hughes@nps.gov)).

CEMVN Response 7: Concur.

Recommendation 8: 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 8: 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 9: Any proposed change in mitigation features or plans should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

CEMVN Response 9: Concur.

Recommendation 10: The Service encourages the Corps to finalize mitigation plans and proceed to mitigation construction so that it will be concurrent with project construction. If construction is not concurrent with mitigation implementation then revising the impact and mitigation period-of-analysis to reflect additional temporal losses will be required

CEMVN Response 10: 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 11: The Service recommends that the Corps immediately finalize selection and approval of mitigation and augmentation features in coordination with federal and state natural resource agencies and with required approval from EPA. All necessary studies for the mitigation and augmentation features have been completed and agencies have reached agreement on those features. Further, the Service recommends that all such mitigation and augmentation features be implemented as soon as possible. All terms and conditions specified in the EPA 2009 Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination should be followed with regard to mitigation and augmentation requirements.

CEMVN Response 11: The CEMVN continues to work in coordination with the IET to finalize selection of the augmentation features. CEMVN plans to complete a joint EA with the National Park Service (NPS) in 2016 that would address the augmentation features and include an overall long-term monitoring plan that would meet the conditions of the EPA 2009 Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination (Final Determination). The USACE will comply with the terms and conditions of the Final Determination and will fulfill its obligations under that modification as quickly as possible given agency resource constraints.

Recommendation 12: The Corps should immediately develop a long-term monitoring plan for the Bayou aux Carpes 404(c) area, as required under the EPA 2009 Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination. The plan should be coordinated with the

natural resources agencies and approved by EPA. All terms and conditions specified in the EPA 2009 Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination with regard to the long-term monitoring and operation plan should be followed. Once approved, that plan should be implemented as soon as possible.

CEMVN Response 12: Development of the long-term monitoring plan for the Bayou aux Carpes 404(c) area, as required under the EPA 2009 Modification to the Bayou aux Carpes CWA Section 404(c) Final Determination will occur in 2016 and will be coordinated with the natural resources agencies and with approval sought from EPA.

Recommendation 13: The Service recommends that all of the terms and conditions outlined in the EPA Bayou aux Carpes 404(c) 2009 modification be implemented without delay. The Corps is responsible for funding all mitigation and augmentation features in this agreement. A link to the 2009 final modified determination may be found at [www.nolaenvironmental.gov](http://www.nolaenvironmental.gov) under the EPA heading for IER 12.

CEMVN Response 13: The USACE will comply with the terms and conditions of the Final Determination and will fulfill its obligations under that modification as quickly as possible given agency resource constraints.

Recommendation 14: The Service recommends that the Corps work with the natural resource agencies to refine the "GUIDELINES – WET BLH HABITAT ENHANCEMENT, SWAMP HABITAT RESTORATION, AND SWAMP HABITAT ENHANCEMENT" and incorporate all changes in the Mitigation Success Criteria and Mitigation Monitoring: Marsh Mitigation Features from the LPV PIER 36 and the Bayou Sauvage Task Force Guardian BLH mitigation monitoring plan.

CEMVN Response 14: The guidelines cited by USFWS, which actually now include guidelines for fresh marsh and intermediate marsh mitigation (Appendix L in PIER 37), 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.).

See appendices D and E for project-specific information pertaining to the proposed mitigation work plan, mitigation success criteria, mitigation monitoring and reporting, mitigation management/maintenance, and proposed contingency management plan for each TSMP. The project-specific mitigation information developed would supersede the cited general guidelines and would incorporate lessons learned from the Bayou Sauvage project.

Recommendation 15: 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. Documentation should be provided and referenced to demonstrate funding obligation for the Corps to fulfill initial success criteria at a minimum.

CEMVN Response 15: 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.

Recommendation 16: The Service recommends that all mitigation planning documents should describe in detail actions needed by the Corps and/or the local sponsor if mitigation is not succeeding as planned.

CEMVN Response 16: Concur. See appendices D and E.

Recommendation 17: The Corps should 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 17: 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 18: We recommend that the Corps re-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 18: Concur. The USACE would fulfill its consultation responsibilities as required under the ESA.

Other agency comment letters and the USACE response are attached in Appendix I.

### **5.3 COMPLIANCE WITH ENVIRONMENTAL LAWS, REGULATIONS, AND GUIDANCE**

Environmental compliance for the proposed action would be achieved upon the following:

- coordination of the TIER 1 EA and draft FONSI with appropriate agencies, organizations, and individuals for their review and comment;
- Louisiana Department of Natural Resources (LDNR) concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the Louisiana Coastal Resources Program; Consistency (C20120324 mod 2). Concurrence letter received Aug 21, 2015.

- Receipt of and acceptance or resolution of all USFWS Fish and Wildlife Coordination Act recommendations; CEMVN is in receipt of Draft CAR dated July 9, 2015 , USFWS recommendations have been accepted or resolved and responses are provided in Section 5.0, Coordination. The Final CAR was received December 15, 2015.
- Receipt and acceptance or resolution of all Louisiana Department of Environmental Quality (LDEQ) comments on the air quality impact analysis documented in the TIER 1 EA.
- USFWS concurrence with a determination of not likely to adversely affect Federally-listed threatened or endangered species, or their critical habitat, under the jurisdiction of USFWS. Concurrence received July 7, 2015.
- Receipt of a State Water Quality Certificate from the Louisiana Department of Environmental Quality. Certificate 151207-02 was issued on December 8, 2015.
- Public notice for the Section 404(b)(1) Evaluation. The Section 404(b)(l) evaluation was released for a 30 public comment period on October 13, 2015. No comments were received during the public review period. The Section 404(b)(l) evaluation was signed on December 3, 2015.
- Louisiana State Historic Preservation Officer (SHPO) concurrence with a recommendation of no adverse effect on historic properties. Concurrence letter received December 3, 2015.
- On October 13, 2015, the USNPS offered federally-recognized Tribes the opportunity to review and comment on a “no historic properties affected” finding that included the APE for the proposed action.

The FONSI will not be signed until the proposed action achieves environmental compliance with applicable laws and regulations, as described above.

## **6. CONCLUSION**

The proposed action would provide compensatory mitigation for impacts incurred during construction of the WBV HSDRRS improvements to fresh marsh, both on and off JELA, and to BLH and swamp on JELA and the 404c area. This office has assessed the environmental impacts of the proposed action and has determined that the proposed action would have no significant adverse impact on the human and natural environment.

## **7. PREPARERS**

The TIER 1 EA and the associated FONSI were prepared by Elizabeth Behrens, Biologist, U.S. Army Corps of Engineers, and Dusty Pate, Natural Resource Program Manager, U.S. National Park Service. Ms. Behrens can be reached at New Orleans District; Regional Planning and Environment Division South, MVN-PDN-CEP; P.O. Box 60267; New Orleans, Louisiana 70160-0267. Mr. Pate can be reached at Jean Lafitte National Historic Park and Preserve, 419 Decatur Street, New Orleans, LA 70130.

## 8. REFERENCES

- Alperin, Lynn, 1983. History of the Gulf Intracoastal Waterway. Navigation History NWS-83-9, National Waterways Study, U.S. Army Engineer Water Resources Support Center, Institute for Water Resources. Available on the Internet. <http://www.gicaonline.com/media/about/alperin.pdf>
- American Canal Society, 1979. The American Canal Guide, The Lower Mississippi And Gulf States. Part 3, pp.24  
[http://www.americancanals.org/Am\\_Canal\\_Guides/Am\\_Canal\\_Guides\\_files/guide%203%20rvsd.pdf](http://www.americancanals.org/Am_Canal_Guides/Am_Canal_Guides_files/guide%203%20rvsd.pdf)
- , 2012a. Gulf Intracoastal Waterway in Louisiana. Retrieved March 20, 2012 from [http://www.americancanals.org/Data\\_Sheets/Louisiana/Gulf\\_ICWW.pdf](http://www.americancanals.org/Data_Sheets/Louisiana/Gulf_ICWW.pdf)
- , 2012b. Empire Lock, Plaquemines Parish, Louisiana. Retrieved March 20, 2012 from [http://www.americancanals.org/Data\\_Sheets/Louisiana/Empire\\_Lock.pdf](http://www.americancanals.org/Data_Sheets/Louisiana/Empire_Lock.pdf)
- , 2012c. Harvey Lock, Jefferson Parish, Louisiana. Retrieved March 20, 2012 from [http://www.americancanals.org/Data\\_Sheets/Louisiana/Harvey\\_Canal\\_and\\_Lock.pdf](http://www.americancanals.org/Data_Sheets/Louisiana/Harvey_Canal_and_Lock.pdf)
- Anderson, N. J., and R. A. Seigel. 2003. Jean Lafitte National Historical Park and Preserve – Barataria Unit: inventory and monitoring program for amphibians and reptiles. Southeastern Louisiana University, Hammond, Louisiana.
- 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.
- Botello-Young, G. 2013. Salvinia and larval mosquito monitoring in the Jean Lafitte National Park and Preserve. Presentation, November 1, 2013.
- Coastal Protection and Restoration Authority (CPRA), 2012. Fiscal Year 2013 Annual Plan: Integrated Ecosystem Restoration and Hurricane Protection in Coastal Louisiana. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA. Available on the Internet. [http://www.lacpra.org/assets/docs/2012%20Plans/Final\\_FY\\_2013\\_Annual\\_Plan\\_3-19-2012\\_Web\\_Format.pdf](http://www.lacpra.org/assets/docs/2012%20Plans/Final_FY_2013_Annual_Plan_3-19-2012_Web_Format.pdf)
- , 2013. Coastal Protection and Restoration Authority Quarterly Progress Report, October 2013, Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA.
- , 2015. Fiscal Year 2016 Annual Plan: Integrated Ecosystem Restoration and Hurricane Protection in Coastal Louisiana. Coastal Protection and Restoration Authority of Louisiana. Baton Rouge, LA.
- Conner, W. H., and M. Brody. 1989. Rising water levels and the future of southeastern Louisiana swamp forests. *Estuaries* 12:318-323.
- Cronk, J. K., and M. S. Fennessy. 2001. *Wetland Plants: Biology and Ecology*. CRC Press LLC, Boca Raton, Florida.



- Davis, G. J., and M. M. Brinson. 1980. Responses of submersed vascular plant communities to environmental change. Kearneysville, WV, U.S. Fish and Wildlife Service: 70.
- Dennison, W. C., R. J. Orth, K. A. Moore, J. C. Stevenson, V. Carter, S. Kollar, P. W. Bergstrom, and R. A. Batiuk. 1993. Assessing water quality with submersed aquatic vegetation. *Bioscience* 43:86-91.
- Denslow, J. S., and L. Battaglia. 2002. Stand composition and structure across a changing hydrologic gradient: Jean Lafitte National Park, Louisiana, USA. *Wetlands* 22:738-752.
- Environmental Protection Agency (EPA). 2012. National ambient air quality standards (NAAQS). Available at: <http://www.epa.gov/air/criteria.html> (accessed 4 August 2014).
- Glick, P., J. Clough, A. Polaczyk, B. Couvillion, and B. Nunley. 2013. Potential effects of sea-level rise on coastal wetlands in southeastern Louisiana. *Journal of Coastal Research* 63:211-233.
- Hahn, Thurston 2015. Personal communication. History of Yankee Pond. June 3, 2015.
- Harris, Nicole, 2015. NOV levee project status. Email to Christina Saltus, 06 May 2015.
- Harper, Timothy, 2012. Lafitte Tidal Protection Surplus 2007 projects. Email to Christina Saltus, 9 April 2012.
- Hemminga, M. A., and C. M. Duarte. 2000. *Seagrass Ecology*. Cambridge University Press, New York, New York.
- Hood, C. S. 2006. Final report: Inventory of the mammals of Jean Lafitte National Historical Park and Preserve, Barataria Preserve and Chalmette Battlefield. Loyola University, New Orleans, Louisiana.
- Hood, C. S. 2012. Final report: Re-survey and inventory of the mammals of Jean Lafitte National Historical Park and Preserve, Barataria Preserve. Loyola University, New Orleans, Louisiana.
- Jin, S., Yang, L., Danielson, P., Homer, C., Fry, J., and Xian, G. 2013. A comprehensive change detection method for updating the National Land Cover Database to circa 2011. *Remote Sensing of Environment* 132: 159 – 175.
- Jean Lafitte National Historical Park and Preserve (JELA). 1997. Jean Lafitte National Historical Park and Preserve Resource Management Plan. Jean Lafitte National Historical Park and Preserve, New Orleans, Louisiana.
- Krauss, K. W., J. L. Whitbeck, and R. J. Howard. 2012. On the relative roles of hydrology, salinity, temperature, and root productivity in controlling soil respiration from coastal swamps (freshwater). *Plant Soil* 358:265-274.
- Kryter, K. D. 1994. *The Handbook of Hearing and the Effects of Noise: Physiology, and Public Health*. McGraw Hill, New York.
- Landers, D. H., S. L. Simonich, D. A. Jaffe, L. H. Geiser, D. H. Campbell, A. R. Schwindt, C. B.

Schreck, M. L. Kent, W. D. Hafner, H. E. Taylor, and others. 2008. The fate, transport, and ecological impacts of airborne contaminants in western national parks (USA). EPA/600/R-07/138. U.S. Environmental Protection Agency, Office of Research and Development, Corvallis, Oregon.

Linscombe and Chabreck 2001

Linscombe, G., and R. Chabreck. 2001. Task III.8—Coastwide aerial survey, brown marsh 2001 assessment: Salt marsh dieback in Louisiana—Brown marsh data information management system. Available at: <http://brownmarsh.com/data/michot/index.htm> (accessed April 2014).

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 (LDWF). 2002. Monitoring plan. Coastwide Nutria Control Program, CWPPRA Project (LA-03b).

McMenis, James, 2012 East of Harvey Canal Interim Hurricane Protection. Email to Christina Saltus, 4 April 2012.

Miller, Brad, RE:TE-111 state surplus Valentine to Larose Levee. Email to Christina Saltus, 24 March 2014.

National Audubon Society. 2013. Important Bird Areas in the U.S. Available at: <http://www.audubon.org/bird/iba> (accessed January 2014).

National Park Service (NPS). 1982. General management plan/development concept plan, Jean Lafitte National Historical Park. National Park Service, Denver, Colorado.

---. 2006. Management Policies 2006.

---. 2009. Canal reclamation at Barataria Preserve, Jean Lafitte National Historical Park and Preserve, Louisiana: Environmental Assessment. National Park Service, Denver, Colorado.

---. 2012a. Administrative history of Jean Lafitte National Historical Park and Preserve. National Park Service, Cultural Resources Division, Atlanta, Georgia.

---. 2014a. Nonnative species. Available at: <http://www.nps.gov/jela/naturescience/nonnativespecies.htm> (accessed March 2014).

---. 2014b. Jean Lafitte National Historical Park and Preserve water quality summary calendar year 2013. Gulf Coast Network resource brief. National Park Service, Inventory and Monitoring Network Southeast Region, Atlanta, Georgia.

---. 2014c. National Park Service visitor use statistics website. Available at: <https://irma.nps.gov/Stats/> (accessed April 2014).

NPS Water Resources Division (WRD). 1994. Baseline water quality data inventory and analysis: Jean Lafitte National Historic Park and Preserve. Natural Resource Technical Report

NPS/NRWRD/NRTR—94/25. Water Resources Division, National Park Service, Fort Collins, Colorado.

Natural Resources Conservation Service (NRCS). 2013. Web soil survey. Available at: <http://websoilsurvey.nrcs.usda.gov/> (accessed 10 November 2014).

Nelson, S. A. C., P. A. Soranno, and J. Qi. 2002. Land-cover change in upper Barataria Basin Estuary, Louisiana, 1972-1992: increases in wetland area. *Environmental Management* 29:716-727.

Neill, C. and R. E. Turner. 1987. Comparison of fish communities in open and plugged backfilled canals in Louisiana coastal marshes. *North American Journal of Fisheries Management* 7:57-62.

Nolfo-Clements, L. E. 2006. Vegetation survey of wetland habitats at Jean Lafitte National Historic Park and Preserve in southeastern Louisiana. *Southeastern Naturalist* 5:499-514.

Poirrier, M. A., K. Burt-Utley, J. F. Utley, and E. A. Spalding. 2009. An inventory and assessment of the distribution of submersed aquatic vegetation at Jean Lafitte National Historical Park and Preserve. University of New Orleans, New Orleans, Louisiana.

---. 2010. Submersed aquatic vegetation of the Jean Lafitte National Historical Park and Preserve. *Southeastern Naturalist* 9:477-486.

Rossmann, D. A., and J. W. Demastes. 1989. Final report to the National Park Service: inventory of the amphibians, reptiles, and mammals of the Jean Lafitte National Historical Park. Louisiana State University, Baton Rouge, Louisiana.

Saint Charles Parish, 2013, November 25. West Bank Hurricane Protection Levee Updates. Retrieved from <http://www.stcharlesparish-la.gov/index.aspx?page=957>

---, 2015. St Charles West Bank Hurricane Protection Levee (BA-85). St Charles Parish Government. Email to Christina Saltus, 04 May 2015 from Holly Fonseca.

Salaam, Tutashinda, 2015. WBV HSDRSS construction info. USACE WBV Project Manager Email to Christina Saltus, 01 May 2015.

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.

---. 2014. Vegetation types in coastal Louisiana in 2013: U.S. Geological Survey Scientific Investigations Map 3290, 1 sheet, scale 1:550,000.

Schiltz, Greg, 2011. St. Charles Parish Levees. Email to Christina Saltus, 20 May 2011.

---, 2012. Personal Communication. St. Charles Parish Non-federal Levees. 27 March 2012.

Schultz, D. L. 2006. A survey and analysis of the fish fauna of the Barataria Preserve of Jean Lafitte National Park. Nicholls State University, Thibodaux, Louisiana.

Shaffer, Gary P. Thais E. Perkins, Susanne Hoepfner, 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.

Smalley, A. E. 1982. Final report to the National Park Service: faunistic inventory of the core area – Jean Lafitte National Historical Park. Tulane University, New Orleans, Louisiana.

Southeast Louisiana Flood Protection Authority West (SLFPW), 2012. MRL/WBV Levee Construction. E-mail to Christina Saltus, 27 March 2012.

Swarzenski, C. M., E. M. Swenson, C. E. Sasser, and J. G. Gosselink. 1991. Marsh mat flotation in the Louisiana delta plain. *Journal of Ecology* 79:999–1011.

Taylor, N. C. 1988. Ecological characterization of Jean Lafitte National Historical Park, Louisiana: basis for a management plan. Louisiana State University, Baton Rouge, Louisiana.

Tipping, P. W., M. R. Martin, T. D. Center, and T. M. Davern. 2008. Suppression of *Salvinia molesta* Mitchell in Texas and Louisiana by *Cyrtobaagous salviniae* calder and sands. *Aquatic Botany* 88:196-202.

Törnqvist, T. E., T. R. Kidder, W. J. Austin, K. van der Borg, A. F. M. de Jong, C. J. W. Klerks, E. M. A. Snijders, J. E. A. Storms, R. I. van Dam, and M. C. Wiemann. 1996. A revised chronology for Mississippi river subdeltas. *Science* 273:1693-1696.

Urbatsch, L. E. 2009. Vascular plant inventories of Jean Lafitte National Historical Park and Preserve, Barataria Preserve and Chalmette Battlefield. Louisiana State University, Baton Rouge, Louisiana.

U.S. Army Corps of Engineers (USACE), 2011a. Final Environmental Impact Statement New Orleans to Venice, Louisiana, Hurricane Risk Reduction Project: Incorporation of Non-Federal Levees from Oakville to St. Jude, Plaquemines Parish, Louisiana. Vicksburg District, Vicksburg, Louisiana.

---, 2011b. Final Supplemental Environmental Impact Statement New Orleans to Venice Federal Hurricane Protection Levee, Plaquemines Parish, Louisiana. Vicksburg District, Vicksburg, Mississippi.

U.S. Census Bureau. 2010. QuickFacts for Estelle CDP. Available online at: <http://quickfacts.census.gov/qfd/index.html>. Accessed November 2014.

U.S. Department of Agriculture (USDA), Natural Resources Conservation Service. 2013. Web Soil Survey. Available online. Accessed May 29, 2015.

---. 2014. National soil survey handbook, title 430-VI. Available online. Accessed May 29, 2015.

U.S. National Park Service (NPS). 2015. NPSpecies, Information on Species in National Parks. Available online <https://irma.nps.gov/NPSpecies/Search/SpeciesList/JELA>. Accessed 8 June 2015.

Ward, L. G., W. M. Kemp, and W. R. Boynton. 1984. The influence of waves and seagrass

communities on suspended sediment dynamics in an estuarine embayment. *Marine Geology* 59:85-103.

Wasilevich, M. J. 2001. Effects of hydroperiod on seed and seedling banks in a bottomland hardwood forest of southeastern Louisiana. Dissertation. Tulane University, New Orleans, Louisiana.

Watson, J. K. 2005. Avian conservation implementation plan (ACIP): Jean Lafitte National Historical Park and Preserve. U.S. Fish and Wildlife Service, Asheville, North Carolina.

White, D. A., S. P. Darwin, and L. B. Thien. 1983. Plants and plant communities of Jean Lafitte National Historical Park, Louisiana. *Tulane Studies in Zoology and Botany* 24:100-129.

White, D. A., and S. A. Skojac. 2002. Remnant bottomland forests near the terminus of the Mississippi River in Southeastern Louisiana. *Castanea* 67:134-145.

Wilson-Prater, Tawanda, 2015. RE\_Larose to Golden Meadow. Email to Christina Saltus, 8 May 2015.

Ward, L. G., W. M. Kemp, and W. R. Boynton. 1984. The influence of waves and seagrass communities on suspended sediment dynamics in an estuarine embayment. *Marine Geology* 59:85-103.