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

REPLY TO
ATTENTION OF

Planning, Programs, and
Project Management Division
Environmental Planning
and Compliance Branch

Decision Record

Individual Environmental Report #16
WESTERN TIE-IN
JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA

IER #16

Description of Proposed Action. The New Orleans District, US Army Corps of Engineers (CEMVN) proposes to construct and maintain a new 100–year level of Risk Reduction along the West Bank and Vicinity (WBV), Western Tie-In from the Lake Cataouatche Levee and continuing westerly along the south bank of the outer Cataouatche Canal before turning north to the Mississippi River Levee along the Davis Pond Freshwater Diversion's east guide levee. The action is located in Jefferson and St. Charles Parishes, near New Orleans, Louisiana. The term "100-year level of Risk Reduction," refers to a level of protection that reduces the risk of hurricane surge and wave-driven flooding that the New Orleans Metropolitan area has a 1 percent chance of experiencing each year.

The project is located on the west bank of the Mississippi River, in Jefferson and St Charles Parishes, Louisiana. The approximate project area boundaries are South Kenner Road on the east; the Davis Pond Freshwater Diversion Project Canal on the west; South Kenner at the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroad Lines and the Mississippi River on the north and the Outer Cataouatche Canal and Davis Pond on the south. Communities near the project area include Avondale and Waggaman to the east, Ama and South Kenner to the north, and Luling to the west. With the exception of landfills on the eastern portion of the project area and some development between Hwy 90 and the Outer Cataoutache Canal, much of the project area remains undeveloped.

The project consists of approximately 23,600 linear feet of levee, floodwall, and closure structures constructed to an elevation of +13.5 feet to +15.5 feet NAVD88. Originating on the western end of the Lake Cataouatche Levee, the alignment would begin as an earthen closure of the Outer Cataouatche Canal. Discharge lines from the Highway 90 Pumping Station would be extended and cross over the closure so that the pump station discharge would be on the flood side of the alignment. Proceeding westward, the alignment would continue as levee south of, and parallel to, the Outer Cataouatche Canal for approximately 2,400 feet. On the eastern side of Bayou Verret, the levee would transition to a floodwall approximately 300 feet in length before transitioning to a closure structure on Bayou Verret. The closure structure would preserve navigation and drainage through the Outer Cataouatche Canal and Bayou Verret.

On the western side of the closure structure, the alignment would transition back to a 300-foot long reach of floodwall and then transition to earthen levee, continuing in a western direction for transition to a floodwall prior to crossing Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the floodwall.

On the north side of Hwy 90, the floodwall would continue for approximately 400 feet in length in a northern direction before turning to the west and transitioning to a levee on a west northwestern direction for approximately 2,700 feet long to the Davis Pond Freshwater Diversion Canal's eastern construction ROW.

An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy 90, and further north would be widened from approximately 20 feet to approximately 100 feet and deepened to 10 ft. The existing culvert under Hwy 90 may be replaced or removed. Where the alignment transitions from floodwall to levee and extends to the Davis Pond Freshwater Diversion Canal's eastern construction ROW, a new drainage canal would be constructed parallel to the 2,700–foot length of levee.

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north incorporating the existing Davis Pond Diversion Project's Main East Guide Levee into the new levee while continuing to the Burlington Northern Santa Fe (BNSF) Railroad. The levee alignment would continue to the north and terminate into high ground at the Mississippi River Levee. Between the BNSF Railroad and high ground of the Mississippi River Levee the alignment would alternate between floodwall (to accommodate closure structures for the two railroad crossings and the River Road crossing) and levee. A geotextile base would be incorporated into the east-west levee reaches.

The construction would likely begin with construction of the sand cells and the north-south levee. Following completion of the sand cells the east-west levees would begin construction. Concurrently construction of the railroad crossings and Bayou Verret Closure structure would be underway. Assuming a 60- hour workweek, approximately 23 months would be needed to complete construction.

Draft IER #16, which detailed the impacts to the actions, was released for public review on 1 May 2009. Stakeholders had until 30 May 2009 to comment on the document. Comments were received from Federal and state governmental agencies and the public. Public meetings were held on 17 July and 19 September 2007, and 15 January and 25 March, 15 May, 22, July and 19 November 2008 and May 28 2009.

Factors Considered in Determination. CEMVN has assessed the impacts of the action on significant resources in the project area including air quality, water quality, terrestrial habitats, wetlands, fisheries and aquatic habitat, wildlife, threatened and endangered species, cultural resources, recreation, aesthetics, and socioeconomic resources.

The CEMVN has assessed the environmental impacts of the proposed action and has determined that the proposed action would have the following impacts:

Short-term impact to air quality from heavy equipment and trucks used during the 23-month construction and maintenance thereafter of the 100-year level of risk reduction,

Short-term direct impact to water quality in the Outer Cataouatche Canal from construction and the placement of fill into the Outer Cataouatche Canal, Short-term direct impact to water quality in Bayou Verret from the dredging and construction of the Bayou Verret closure structure and the Bayou Verret bypass canal and closure structures,

Long term indirect impact to the water quality of 60 acres of aquatic habitat enclosed by the western levee crossing of the Outer Cataouatche Canal and reconnected to the Davis Pond Freshwater Diversion flows through the 50-foot cut in the guide levee,

Short-term disturbance to nearby habitat from construction noise,

Permanent loss of 211 acres of vegetated wetlands including fresh marsh, scrub/shrub and wet bottomland hardwoods,

Permanent loss of 12 acres of aquatic habitat,

Permanent displacement of fish and temporary displacement of wading birds, waterfowl, or other wildlife within the footprint of construction, and

Significant risk reduction for the residences and businesses between Hwy 90 and the Outer Cataouatche Canal.

All jurisdictional wetlands and bottomland hardwood forest impacts were assessed by the US Fish and Wildlife Service (USFWS) and CEMVN under the NEPA, Fish and Wildlife Coordination Act, and Section 906 (b) WRDA 1986 requirements. The impacts for the action are shown in Table 1.

Mitigation IERs will be prepared documenting and compiling the unavoidable impacts discussed in each IER. The mitigation IERs will implement compensatory mitigation as early as possible. All mitigation activities will be consistent with standards and policies established in the Clean Water Act Section 404 and the appropriate USACE policies and regulations governing this activity.

Table 1: Impacts to jurisdictional wet bottomland hardwoods and fresh marsh swamps

Habitat Type	**Acres**	**AAHUs Needed** (average annual habitat units)
Wet Bottomland Hardwoods	78.6	36.18
Fresh Marsh	137.8	66.3

Environmental Design Commitments. The majority of the USFWS recommendations have been incorporated by reference into the IER. However, the USFWS recommendations that non-development easements be acquired for enclosed wetlands, hydrologic connections with adjacent enclosed wetlands be maintained and additional hydrologic studies be conducted was not adopted by USACE. USACE Policy on mitigation for induced development states that "indirect impacts such as land development are subject to compliance with federal, local and state permit and zoning requirements and therefore, those interests are responsible for defining the appropriate mitigation requirement for land development activities. Acquiring non-development easements is contrary to the USACE Policy and would relieve potential future developers of their responsibility to mitigation wetlands impacts they cause by their own development activities.

Therefore, the recommendation to acquire non-developmental easements will not be implemented. Hydrologic connections for the majority of the wetland enclosed will be maintained except during storm events when the system is closed. The need to perform additional studies of the 289 acre area to further investigate ponding or impacts to Hwy 90 east of the floodwall is unnecessary. 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.

Agency & Public Involvement. Various governmental agencies, non-governmental organizations, and citizens were engaged throughout the preparation of IER #16. Agency staff from USFWS, National Marine Fisheries Service (NMFS), USEPA, US Geologic Survey, National Park Service, Louisiana Department of Natural Resources (LDNR), and Louisiana Department of Wildlife and Fisheries (LDWF) were part of an interagency team that has and will continue to have input throughout the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS) planning process (Appendix C of Final IER #16).

There have been over 100 public meetings since March 2007 about proposed HSDRRS work. Issues relating to draft IER #16 have been discussed at some meetings. CEMVN sends out public notices in local and national newspapers, news releases (routinely picked up by television and newspapers in stories and scrolls), and mail notifications to stakeholders for each public meeting. In addition, www.nolaenvironmental.gov was set up to provide information to the public regarding proposed HSDRRS work. CEMVN sends out e-mail notifications of the meetings to stakeholders who requested to be notified by this method. Public meetings will continue throughout the planning process.

Draft IER #16 Public Review Period

1. Agency Comments (found in Appendix D of Final IER #16)
    a. EPA
        1. Comment letter dated 22 May 2009
    b. NMFS
        1. Comment letter dated 26 May 2009
    c. LDWF
        1. Comment letter dated 29 May 2009
    d. USFWS
        1. Comment letter dated 29 May 2009
    e. Office of Coastal Protection and Restoration
        1. Email comment dated 29 May 2009

2. Public Comments (found in Appendix B of Final IER #16)
    a. Jeffrey Roux
        1. Email comment dated 29 May 2009

Verbal comments about the proposed action were received at several public meetings.

Decision. The CEMVN Environmental Planning and Compliance Branch has assessed the potential environmental impacts of the proposed action described in this IER, and performed a review of the comments received during the public review period for draft IER #16, as well as public meetings held on 17 July and 19 September 2007, 15 January, 25 March, 15 May, 22, July and 19 November 2008 and May 28 2009.

Furthermore, all practicable means to avoid or minimize adverse environmental effects have been incorporated into the recommended plan. Approximately 36.18 AAHUs of wet bottomland hardwood and 66.3 AAHUs of fresh marsh impacts will be addressed in a separate mitigation IER.

The public interest will be best served by implementing the selected plan as described in IER #16 in accordance with the environmental considerations discussed above.

CEMVN will prepare a Comprehensive Environmental Document (CED) or supplemental IER that may contain additional information related to IER #16 that becomes available after the execution of the Final IER. The CED will provide a final mitigation plan, comprehensive cumulative impacts analysis, and any additional information that addresses outstanding data gaps in any of the IERs.

I have reviewed IER #16, and have considered agency recommendations and comments received from the public during the scoping phase and comment periods. I find the recommended plan fully addresses the objectives as set forth by the Administration and Congress in the 3rd, 4th, and 5th Supplemental Appropriations.

The plan is justified, in accordance with environmental statutes, and it is in the public interest to construct the actions as described in this document.

6-12-2009
Date

Alvin B. Lee
Alvin B. Lee
Colonel, U.S. Army
District Commander

FINAL INDIVIDUAL ENVIRONMENTAL REPORT

WEST BANK AND VICINITY

WESTERN TIE-IN

JEFFERSON AND ST. CHARLES PARISHES, LOUISIANA

IER #16

US Army Corps
of Engineers®

JUNE 2009

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1.0 INTRODUCTION

The U.S. Army Corps of Engineers (USACE), Mississippi Valley Division, New Orleans District (CEMVN), has prepared this Individual Environmental Report # 16 (IER # 16) to evaluate the potential impacts associated with the proposed construction and maintenance of the 100-year level of hurricane damage risk reduction along the West Bank and Vicinity (WBV), Western Terminus Flood Damage Reduction Project Area. The term "100-year level of risk reduction," as it is used throughout this document, refers to a level of protection that reduces the risk of hurricane surge and wave-driven flooding that the New Orleans metropolitan area experiences by a 1 percent chance each year. The proposed action is located in Jefferson and St. Charles Parishes near New Orleans, Louisiana (see figure 1).

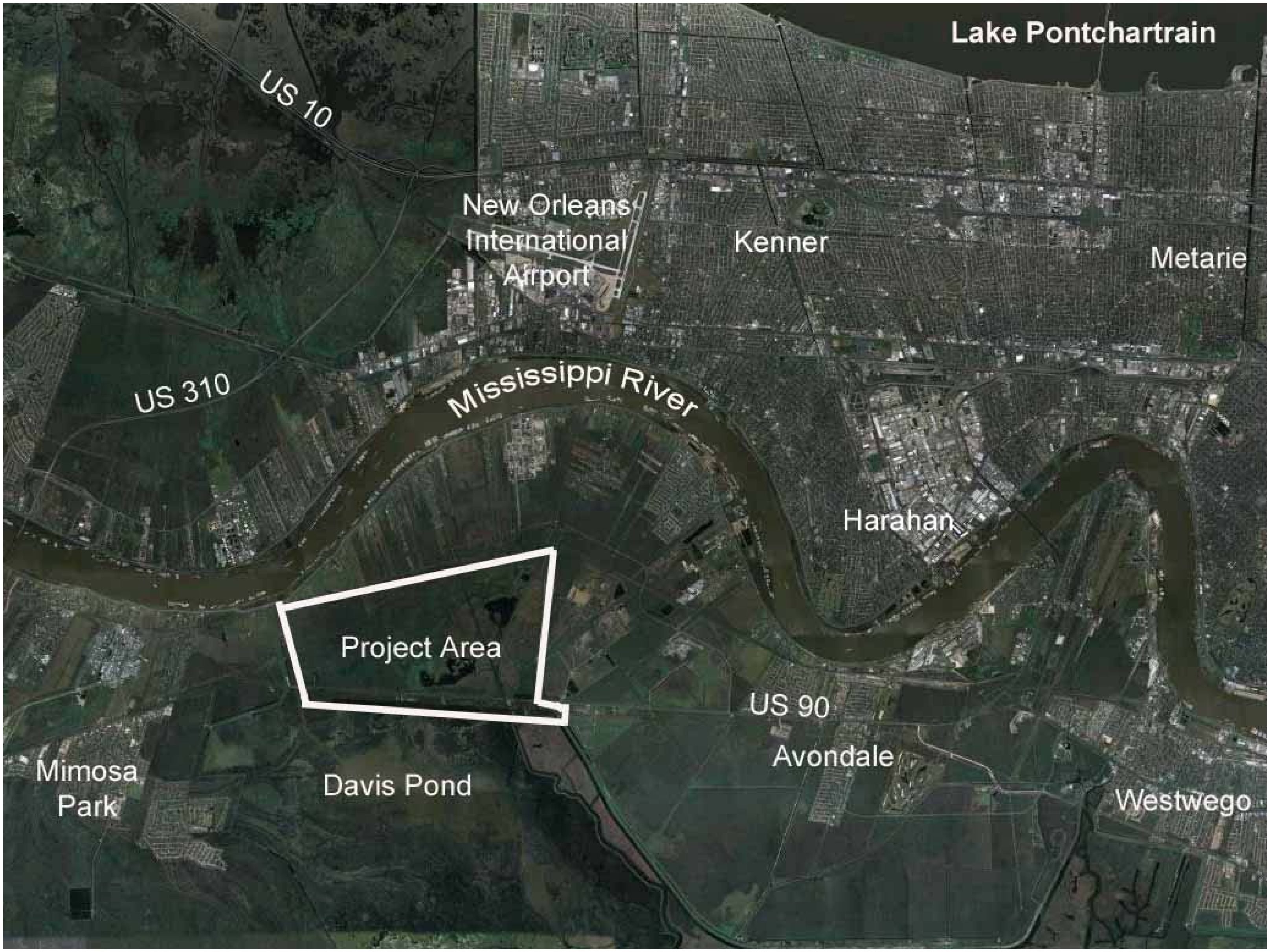
The approximate project-area boundaries are South Kenner Road on the east (Jefferson Parish); the Davis Pond Freshwater Diversion Project Canal on the west (St. Charles Parish); South Kenner at the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroad Lines and the Mississippi River on the north, and the Outer Cataouatche Canal and Davis Pond to the south. Communities near the project area include Avondale and Waggaman to the east, Ama and South Kenner to the north, and Luling to the west. With the exception of landfills on the eastern portion of the project area, much of the study area remains undeveloped.

The 1996 Westwego to Harvey Canal, Louisiana, Hurricane Protection Project, Lake Cataouatche Area, Post Authorization Change Report and Environmental Impact Statement (USACE, 1996) approved the western tie-in north of Highway (Hwy) 90 along South Kenner Road and ending at the elevated Southern Pacific Railroad. Although approved for completion, the western tie-in was never constructed due to limited funding.

IER #16 has been prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and the Council on Environmental Quality's Regulations (40 CFR §1500-1508), as reflected in the USACE Engineering Regulation, ER 200-2-2. The execution of alternative arrangements, in lieu of the traditional Environmental Assessment or Environmental Impact Statement, is provided for in ER 200-2-2, Environmental Quality (33 CFR §230) and pursuant to the Council on Environmental Quality NEPA Implementation Regulations (40 CFR §1506.11). The alternative arrangements can be found at www.nolaenvironmental.gov, and are herein incorporated by reference.

The CEMVN implemented Alternative Arrangements on 13 March 2007, under the provisions of the CEQ Regulations for Implementing the NEPA (40 CFR §1506.11). This process was implemented in order to expeditiously complete environmental analysis for any changes to the authorized system and the 100-year level of the Hurricane and Storm Damage Risk Reduction System (HSDRRS), formerly known as the Hurricane Protection System (HPS), authorized and funded by Congress and the Administration. The proposed actions are located in southeastern Louisiana and are part of the Federal effort to rebuild and complete construction of the HSDRRS in the New Orleans Metropolitan area as a result of Hurricanes Katrina and Rita.

Figure 1. IER #16 WBV – Western Tie-In Project Area



This draft IER will be distributed for a 30-day public review and comment period. A public meeting specific to the proposed action will be held if requested by a stakeholder during the review period. Any comments received during this public meeting will be considered part of official record. After the 30-day comment period, and public meeting if requested, the CEMVN District Commander will review all comments received during the review period and make a determination as to whether or not they are substantive. If comments are not considered to be substantive, the District Commander will make a decision on the proposed action. This decision will be documented in an IER Decision Record. If comments are determined to be substantive an Addendum to the IER will be prepared and published for a 30-day public review and comment period. After the expiration of the public comment period the District Commander will make a decision on the proposed action. The decision will be documented in an IER Decision Record.

1.1 PURPOSE AND NEED FOR THE PROPOSED ACTION

On 29 August 2005, Hurricane Katrina caused major damage to the Federal and non-Federal flood control and HSDRRS in southeast Louisiana. Hurricane Rita followed this storm on 24 September 2005, and made landfall on the Louisiana-Texas state border, causing damage to the HSDRRS in southern Louisiana. Since the storms, the USACE has been working with state and local officials to restore the Federal and non-Federal flood control and HSDRRS projects and related works in the affected area.

To date, approximately 60 percent of the New Orleans population has returned to the area. Many residences and businesses are waiting to see positive improvements in the level of risk reduction before returning to the area. A USACE goal of June 2011 has been set for completion of much of the work that will raise the level of risk reduction in the New Orleans area to a new standard and provide a level of security to residents and businesses that will allow and encourage them to return to the area.

The purpose of the proposed action is to construct and maintain 100-year flood risk reduction for the residents and businesses in the Western Tie-in area. The proposed action results from a defined need to reduce flood risk and storm damage to residences, businesses, and other infrastructure from hurricanes (100-year storm events) and other high water events. The completed HSDRRS would lower the risk of harm to citizens, and damage to infrastructure during a storm event. The safety of people in the region is the highest priority of the CEMVN.

1.2 AUTHORITY FOR THE PROPOSED ACTION

The authority for the proposed action was provided as part of a number of hurricane and storm damage risk reduction projects spanning southeastern Louisiana, including the Lake Pontchartrain and Vicinity (LPV) Hurricane Protection Project and the WBV Hurricane Protection Project. Congress and the Administration granted a series of supplemental appropriations acts following Hurricanes Katrina and Rita to repair and upgrade the project systems damaged by the storms that gave additional authority to the USACE to construct 100-year HSDRRS projects.

The Westwego to Harvey Canal Hurricane Protection 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, Section 101(a)(17) & P.L. 104-303, 101(b)(11)). 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.

Department of Defense, Emergency Supplemental Appropriations to Address Hurricanes in the Gulf of Mexico, and Pandemic Influenza Act of 2006 (3rd Supplemental - P.L. 109-148, Chapter 3, Construction, and Flood Control and Coastal Emergencies) appropriated funds to accelerate the completion of the previously authorized project and to restore and repair the project at full Federal expense. The Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery of 2006 (4th Supplemental - P.L. 109-234, Title II, Chapter 3, Construction, and Flood Control and Coastal Emergencies) appropriated funds and added authority to raise levee heights where necessary, reinforce and replace floodwalls, and otherwise enhance the project to provide the levels of protection necessary to achieve the certification required for participation in the National Flood Insurance Program. Additional Supplemental Appropriations include the U.S. Troop Readiness, Veterans' Care, Katrina Recovery, and Iraq Accountability Appropriations Act, 2007 (P.L. 110-28) Title IV, Chapter 3, Flood Control and Coastal Emergencies, Section 4302 (5^{th} Supplemental), and the 6^{th} Supplemental (P.L. 110-252), Title III, Chapter 3, Construction.

1.3 PRIOR REPORTS

The CEMVN and others have prepared a number of studies and reports on water resources development in the vicinity of the study area. Previous Federal and non-Federal studies have established an extensive database and are hereby incorporated by reference.

Studies and Reports on West Bank Hurricane Protection Project:

- On 18 February 2009, the CEMVN District Engineer signed Decision Record on IER # 12 entitled "GIWW, Harvey, and Algiers Levees and Floodwalls, Jefferson, Orleans, and Plaquemines Parishes, Louisiana." IER # 12 evaluates the potential impacts associated with raising and/or constructing levees, floodwalls, and other structures to meet the 100-year level of risk reduction for Harvey-Westwego, Gretna-Algiers, and Belle Chase areas.

- On 3 February 2009 the CEMVN signed a Decision Record on IER # 25 entitled, "Government Furnished Borrow Material, Orleans, Jefferson, and Plaquemines Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 21 January 2009 the CEMVN signed a Decision Record on IER # 17 entitled "Company Canal Floodwall, Jefferson Parish, Louisiana." The document was prepared to evaluate the proposed construction and maintenance of the 100-year level of hurricane and storm damage risk reduction along the Company Canal from the Bayou Segnette State Park to the New Westwego Pumping Station.

- On 20 October 2008, the CEMVN signed a Decision Record on IER # 26 entitled "Pre-Approved Contractor Furnished Borrow Material # 3, Jefferson, Plaquemines, and St. John the Baptist Parishes, Louisiana, and Hancock County, Mississippi." The document was prepared to evaluate the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 26 August 2008, the CEMVN signed a Decision Record on IER # 14 entitled "Westwego to Harvey Levee, Jefferson Parish, Louisiana." The document was prepared to examine the potential environmental impacts associated with the proposed construction and maintenance of 100-year level of hurricane and storm damage risk reduction along the WBV, Westwego to Harvey Levee project area.

- On 12 June 2008, the CEMVN signed a Decision Record on IER # 15 entitled "Lake Cataouatche Levee, Jefferson Parish, Louisiana." The proposed action includes constructing a 100-year level of risk reduction in the project area.

- On 30 May 2008, the CEMVN signed a Decision Record on IER # 22 entitled "Government Furnished Borrow Material, Plaquemines and Jefferson Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 6 May 2008, the CEMVN signed a Decision Record on IER #23, entitled "Final Individual Environmental Report, Pre-Approved Contractor Furnished Borrow Material #2, St. Bernard, St. Charles, Plaquemines Parishes, Louisiana, and Hancock County Mississippi." The document was prepared to evaluate the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 21 February 2008, the CEMVN signed a Decision Record on IER # 18 entitled "Government Furnished Borrow Material, Jefferson, Orleans, Plaquemines, St. Charles, and St. Bernard Parishes, Louisiana." The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of excavating borrow areas for use in construction of the HSDRRS.

- On 14 February 2008, the CEMVN signed a Decision Record on IER # 19 entitled "Pre-Approved Contractor Furnished Borrow Material, Jefferson, Orleans, St. Bernard, Iberville, and Plaquemines Parishes, Louisiana, and Hancock County, Mississippi." The document was prepared to evaluate the potential impacts associated with the actions taken by commercial contractors as a result of excavating borrow areas for use in construction of the HSDRRS.

- In July 2006, the CEMVN signed a FONSI on an EA # 433 entitled, "USACE Response to Hurricanes Katrina & Rita in Louisiana." The document was prepared to evaluate the potential impacts associated with the actions taken by the USACE as a result of Hurricanes Katrina and Rita.

- On 23 August 2005, the CEMVN signed a FONSI on EA # 422 entitled "Mississippi River Levees – West Bank Gaps, Concrete Slope Pavement Borrow Area Designation, St. Charles and Jefferson Parishes, Louisiana." The report investigates the impacts of obtaining borrow material from various areas in Louisiana.

- On 22 February 2005, the CEMVN signed a FONSI on EA # 306A entitled "West Bank Hurricane Protection Project – East of the Harvey Canal, Floodwall Realignment and Change in Method of Sector Gate." The report discusses the impacts related to the relocation of a proposed floodwall moved because of the aforementioned sector gate, as authorized by the LPV Project.

- On 19 June 2003, the CEMVN signed a FONSI on EA # 373 entitled "Lake Cataouatche Levee Enlargement." The report discusses the impacts related to improvements to a levee from Bayou Segnette State Park to Lake Cataouatche.

- The final EIS for the WBV, East of Harvey Canal, Hurricane Protection Project was completed in August 1994. A ROD was signed by the CEMVN in September 1998.

- The final EIS for the WBV, Lake Cataouatche, Hurricane Protection Project was completed. A ROD was signed by the CEMVN in September 1998.

- In December 1996, the USACE completed a post-authorization change study entitled, "Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area, EIS." The study investigated the feasibility of providing hurricane and storm damage risk reduction to that portion of the west bank of the Mississippi River in Jefferson Parish between Bayou Segnette and the St. Charles Parish line. A Standard Project Hurricane (SPH) level of risk reduction was recommended along the alignment followed by the existing non-Federal levee. The project was authorized by Section 101 (b) of the WRDA of 1996 (P. L. 104-303) subject to the completion of a final report of the Chief of Engineers, which was signed on 23 December 1996

- In August 1994, the CEMVN completed a feasibility report entitled "WBV (East of the Harvey Canal)." The study investigated the feasibility of providing hurricane and storm damage risk reduction to that portion of the west bank of metropolitan New Orleans from the Harvey Canal eastwards to the Mississippi River. The final report recommends that the existing West Bank Hurricane Project, Jefferson Parish, Louisiana, authorized by the WRDA of 1986 (P.L. 99-662), approved November 17, 1986, be modified to provide additional hurricane and storm damage risk reduction east of the Harvey Canal. The report also recommends that the level of risk reduction for the area east of the Algiers Canal deviate from the National Economic Development Plan's level of risk reduction and provide risk reduction for the SPH. The Division Engineer's Notice was issued on 1 September 1994. The Chief of Engineer's report was issued on 1 May 1995. Pre-construction, engineering, and design was initiated in late 1994 and is continuing. The WRDA of 1996 authorized the project.

- The CEMVN conducted the "Southeast Louisiana Hurricane Preparedness Study" (1994) to provide state and local emergency managers with detailed information concerning the potential levels of hurricane surge flooding in nine southeastern Louisiana parishes.

- The CEMVN reconnaissance report titled, "Jefferson and Orleans Parishes, Louisiana Urban Flood Control and Water Quality Management" (1992) authorized to investigate rainfall flooding and water quality problems associated with storm water runoff in Jefferson and Orleans Parishes.

- In February 1992, the USACE completed a reconnaissance study entitled "West Bank Hurricane Protection, Lake Cataouatche, Louisiana." The study investigated the feasibility of providing hurricane and storm damage risk reduction to that portion of the west bank of the Mississippi River in Jefferson Parish, between Bayou Segnette and the St. Charles Parish line. The study found a 100-year level of risk reduction to be economically justified based on constructing a combination levee/sheetpile wall along the alignment followed by the existing non-Federal levee. Due to potential impacts to the Westwego to Harvey Canal project, the study is proceeding as a post-authorization change.

- In December 1986, the CEMVN completed a Feasibility Report and EIS entitled, "West Bank of the Mississippi River in the Vicinity of New Orleans, La." The report investigates the feasibility of providing hurricane surge risk reduction to that portion of the west bank of the Mississippi River in Jefferson Parish between the Harvey Canal and Westwego, and down to the vicinity of Crown Point, Louisiana. The report recommends implementing a plan that would provide the standard project hurricane (SPH) level of risk reduction to an area on the west bank between Westwego and the Harvey Canal north of Crown Point. The project was authorized by the WRDA of 1986 (P.L. 99-662). Construction of the project was initiated in early 1991.

- In 1984, a feasibility report titled, "Louisiana Coastal Area, Freshwater Diversion to Barataria and Breton Sound Basins" was completed by the CEMVN that recommends diverting Mississippi River water near Caernarvon into the Breton Sound and near Davis Pond into the Barataria Basin to enhance habitat conditions and improve fish and wildlife resources. The Davis Pond site is just west of, and tributary to, Bayou Segnette.

- A report titled, "Flood Control, Mississippi River and Tributaries" (1927) resulted in authorization of a project by the Flood Control Act of 1928 providing comprehensive flood control for the lower Mississippi Valley below Cairo, Illinois. The levees provide risk reduction from the standard project flood and the Mississippi River and Tributaries system.

1.4 INTEGRATION WITH OTHER INDIVIDUAL ENVIRONMENTAL REPORTS

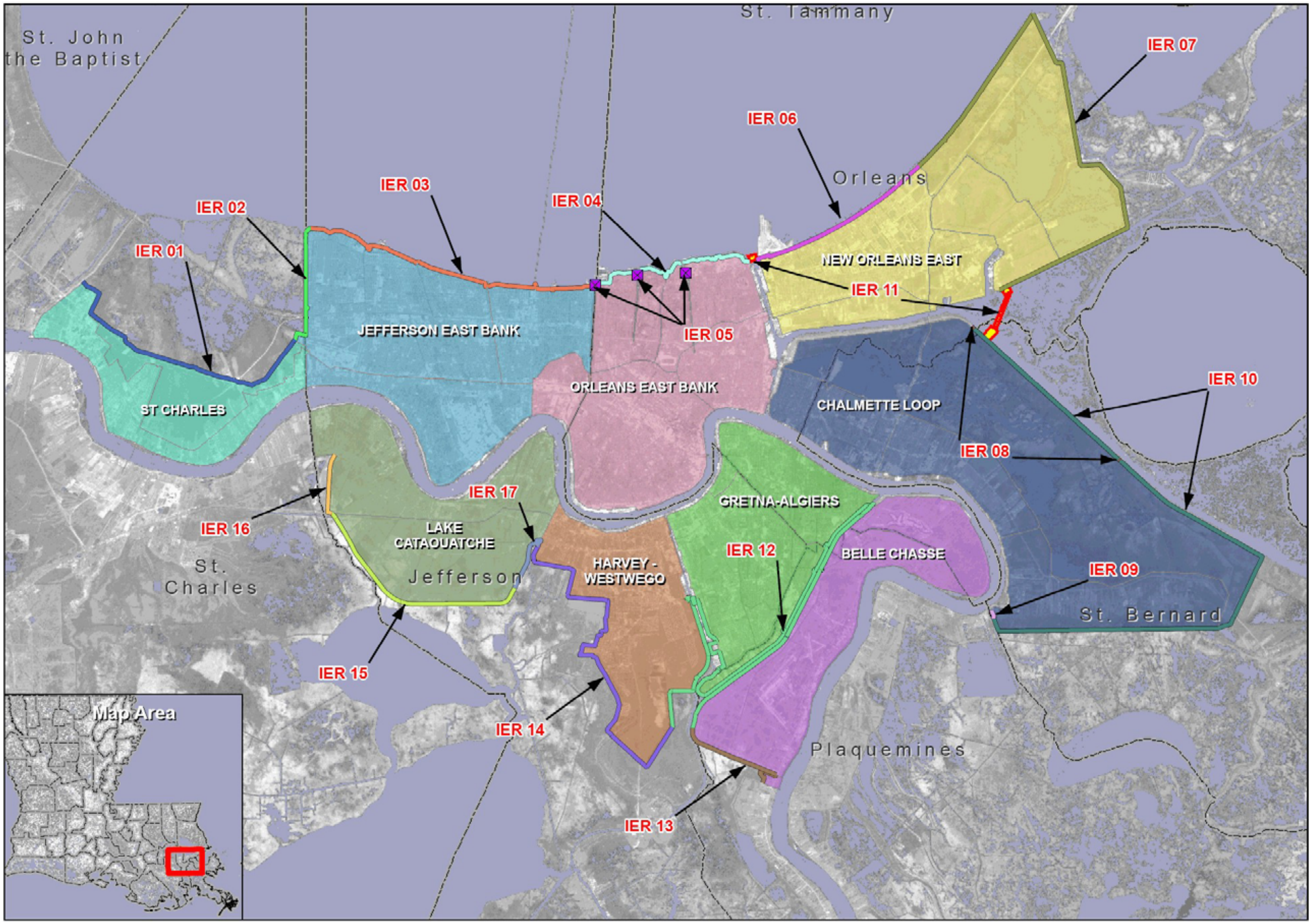
In addition to this IER, the CEMVN is preparing a draft Comprehensive Environmental Document (CED) that will describe the work completed and the work remaining to be constructed. The purpose of the draft CED will be to document the work completed by the CEMVN on a system-wide scale. The draft CED will describe the integration of individual IERs into a systematic planning effort. Overall cumulative impacts and future operations and maintenance requirements will also be included. Additionally, the draft CED will contain updated information for any IER that had incomplete or unavailable data at the time it was posted for public review.

The draft CED will be made available for a 60-day public review period. The document will be posted on www.nolaenvironmental.gov, or can be requested by contacting the CEMVN. A notice of availability will be mailed/e-mailed to interested parties advising them of the availability of the draft CED for review. Additionally, a notice of availability will be placed in national and local newspapers. Upon completion of the 60-day review period, all comments will be compiled and appropriately addressed. Upon resolution of any comments received, a final CED will be prepared, signed by the District Commander, and made available to any stakeholders requesting a copy.

Compensatory mitigation for unavoidable impacts associated with IER # 16 and other proposed HSDRRS projects will be documented in forthcoming mitigation IERs, which are being written concurrently with all other IERs.

There are 17 IERs being prepared to address different reaches of the HSDRRS for New Orleans. Figure 2 depicts the various reaches and their respective IERs.

Figure 2. Sub Basins and Representative IERs



1.5 PUBLIC CONCERNS

The foremost public concern is reducing risk of hurricane, storm, and flood damage for businesses and residences, and enhancing public safety during major storm events in the Greater New Orleans metropolitan area. Hurricane Katrina forced most Jefferson Parish residents from their homes, and, due to extensive flooding, made the timely return to their homes unsafe. Additional concerns have been expressed about impacts to wetlands and aquatic ecology as well as noise from construction activities. Public concerns have also been identified regarding the criteria for alternative selection and the increase in local traffic from the use of borrow areas on the west bank.

1.6 DATA GAPS AND UNCERTAINTY

At the time of submission of this report, engineering evaluations had not been completed for the proposed action and alternatives. Final selection and engineering details (e.g., location and height of wavebreaks, actual footprint expansion, if any) of the proposed action could vary based on the final engineering report. Substantial changes to the proposed action resulting in further impact to the natural or human environment would be addressed in a supplemental IER.

In addition, design reports for the alternatives assessed in IER #16 are currently being prepared. As such, this analysis has been performed prior to formal design and is based on concept level design and reasonable assumptions regarding the proposed actions. While the alternatives described in this evaluation are preliminary, the basic function of their features and the footprint for their construction should remain substantially the same as the project progresses through design. Estimates of materials necessary to construct the project were developed from best professional judgment and design reports completed for similar levee and floodwall alignments nearby. As such, the alternative features and associated numbers developed were used to quantify the magnitude of the proposed actions and not to prescribe detailed materials, quantities, or design specifications.

The estimated environmental impacts have been developed to create an envelope of effects within which design may proceed without compromising the integrity of the assessment. As such, the description of the features does not represent any formal commitment to final design, equipment for use, vendors for supply of materials, or methods of construction, but gives an approximation of how the features could be constructed and the associated impacts thereof. Because of data gaps and uncertainties surrounding this project, comprehensive project costs have not yet been determined.

The CEMVN has not completed identification of the source for levee material (i.e., borrow areas) to be used. In IERs #18, #19, #22, #23, #25, and #26, the CEMVN is examining issues associated with the identification of acceptable borrow materials. The environmental consequences of borrow transportation remain a gap in the data because of the lack of a detailed transportation routing plan. When more detailed borrow information is available, the environmental consequences of borrow transportation may be quantified.

2.0 ALTERNATIVES

2.1 ALTERNATIVES DEVELOPMENT AND PRELIMINARY SCREENING CRITERIA

NEPA requires that in analyzing alternatives to the proposed action, a Federal agency consider an alternative of "No Action." Likewise, Section 73 of the WRDA of 1974 (PL 93-251) requires Federal agencies to give consideration to non-structural measures to reduce or prevent flood damage. The CEMVN Project Delivery Team (PDT) considered a no action alternative and non-structural measures in this IER, discussed in sections 2.3.1 and 2.5.2, respectively.

In addition to these mandated alternatives, a range of reasonable alternatives was formulated through input by the CEMVN PDT, Value Engineering Team, engineering and design consultants, as well as local government, the public, and resource agencies for each of the reaches described in this IER. The "action" alternatives formulated are comprised of alternative alignments for each flood risk reduction corridor. Within each of these alignment alternatives, several scales were considered to encompass various flood risk reduction design alternatives that could be utilized within that alignment.

The following standard set of alignment alternatives and scales within these alignments were initially considered for each reach:

Alternatives:

- Constructing the Previously-Authorized Alignment[1] Along South Kenner Road to the Union Pacific Rail Road Tracks then West to the Davis Pond Freshwater Diversion Canal (alternative 1);
- New Structural Alignment South of Hwy 90 and North of the Outer Cataouatche Canal, then North Along the East Side of the Davis Pond Freshwater Diversion Canal (alternative 2); and
- New Structural Alignment South of the Outer Cataouatche Canal then North Along the East Side of the Davis Pond Freshwater Diversion Canal (alternative 3).

Alternative Scales:

- Earthen Levee
- Floodwall
- Earthen Levee with Floodwall
- Earthen Levee using Deep Soil Mixing
- Closure Structures (e.g., miter gate, sector gate).

In addition to this standard set of action alternatives common to all reaches, alternatives were formulated to address reach-specific opportunities and constraints. Once a full range of alternatives was established for each reach, a preliminary screening was conducted to identify alternatives that would proceed through detailed analysis. The criteria used to make this

[1] The Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area Post Authorization Change Report (USACE, 1996) authorized a levee north of Highway 90 along South Kenner Road tying into the higher elevation of the railroad embankment. Providing the 100-year elevation for alternative 1 requires the extension of a new alignment parallel to, and on the south side of, the railroad embankment. Alternative 1 therefore includes the previously authorized north-south segment along South Kenner Road and a new east-west segment along the railroad embankment.

determination included engineering effectiveness, economic efficiency, and environmental and social acceptability. Those alternatives that did not adequately meet all of these criteria were considered infeasible and therefore were eliminated from detailed study in this IER. Where there is sufficient real estate to allow different alternative scales (i.e., earthen levee, floodwall, etc.), the significant cost differences between earthen levee and all others typically leads to the selection of earthen levee as the preferred approach when alternative techniques are all feasible.

2.2 DESCRIPTION OF THE ALTERNATIVES

Although it is the CEMVN's intent to employ an integrated, comprehensive, and systems-based approach to hurricane and storm damage risk reduction in raising the HSDRRS to the 100-year level of risk reduction, each reach has its own range of alternatives. This approach allows for individual reach alternative decisions to be made in a manner cognizant of unique local circumstances. At the same time, the alternatives analysis and selection remain integrated and comprehensive, considering reaches in relation to one another and other past, current, and reasonably foreseeable actions by the CEMVN and other entities within the project study area.

As such, the alternatives description that follows is organized by reach, noting those alternatives that are common among all reaches. The alternative description also states how each alternative relates to the range of alternatives for adjacent reaches, to insure awareness of the HSDRRS as a whole.

2.3 PROPOSED ACTION

The proposed action for IER #16 is alternative 3, the alignment south of Hwy 90 and south of the Outer Cataouatche Canal and then along the eastern side of the Davis Pond Freshwater Diversion Canal to the Mississippi River Levee.

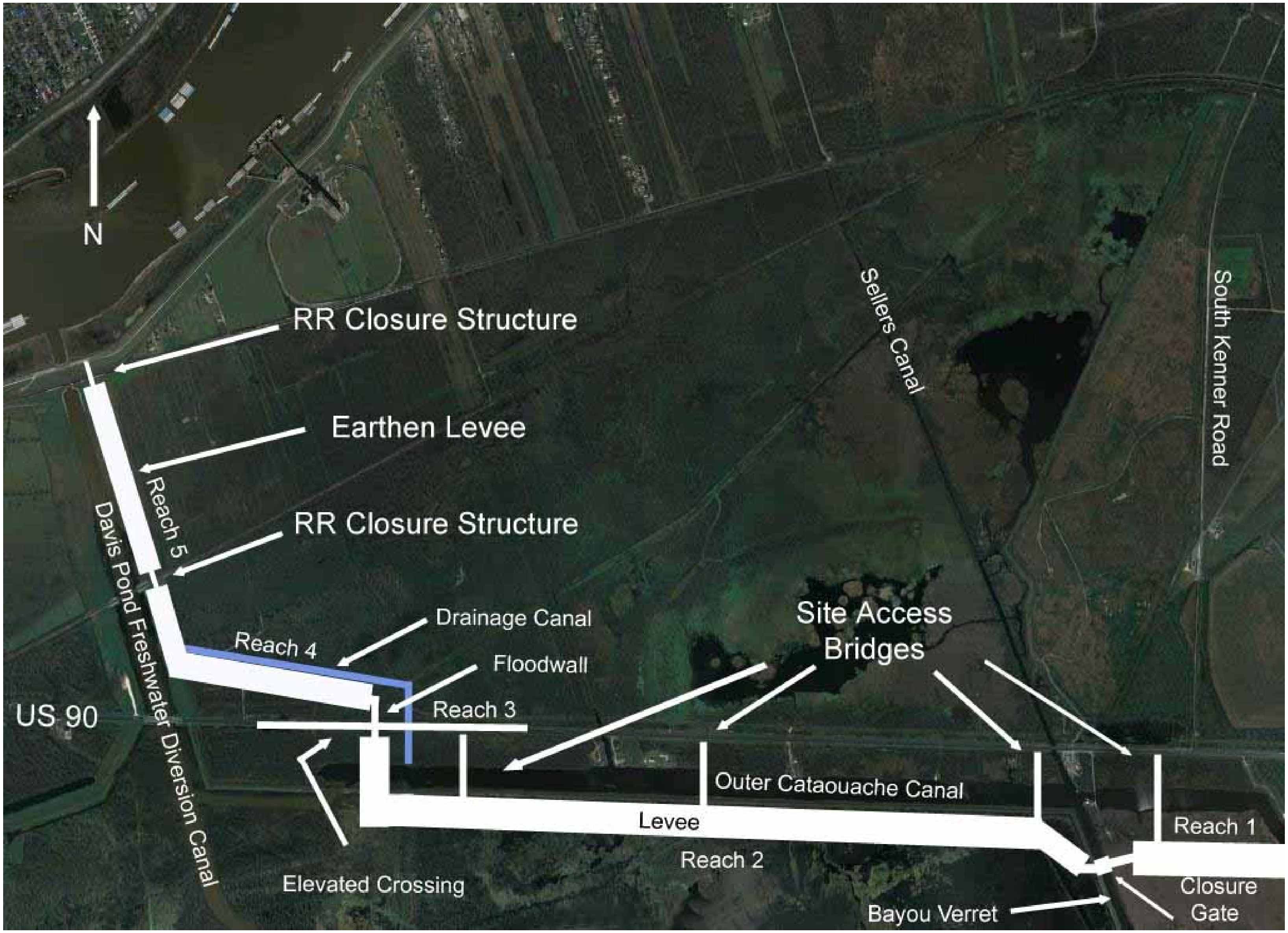
Alternative 3 was selected because it simultaneously (1) minimizes impacts to residential, commercial and industrial properties, (2) has the greatest reliability based on project features, and (3) has the least overall operations and maintenance considerations.

In order to clearly demonstrate the selection rational for IER # 16, a summary of the alternative evaluation process, including presentations with the resource agencies, are provided in appendix H. Each alternative was evaluated with respect to risk reduction and reliability, adverse environmental impacts (human and natural), time and constructability, cost and operations, and maintenance.

2.3.1 Alternative 3 (Proposed Action) South of Outer Cataouatche Canal to Davis Pond Tie-In

Alternative 3 is the South of Outer Cataouatche Canal to Davis Pond Tie-In (see figure 3). This alternative would consist of approximately 23,600 linear feet of levee, floodwall, and closure structures constructed to an elevation of +13.5 feet to +15.5 feet NAVD88. Originating on the western end of the Lake Cataouatche Levee, the alignment would begin as an earthen closure of the Outer Cataouatche Canal. Discharge lines from the Highway 90 Pumping Station would be extended and cross over the closure so that the pump station discharge would be on the flood side of the alignment. Proceeding westward, the alignment would continue as levee south of, and parallel to, the Outer Cataouatche Canal for approximately 2,400 feet. On the eastern side of

Figure 3. Proposed Action - Alternative 3



Bayou Verret, the levee would transition to a floodwall approximately 300 feet in length before transitioning to a closure structure on Bayou Verret. The closure structure would preserve navigation and drainage through the Outer Cataouatche Canal and Bayou Verret.

On the western side of the closure structure, the alignment would transition back to a 300-foot long reach of floodwall and then transition to earthen levee, continuing in a western direction for approximately 9,600 feet long to a point approximately 850 feet east of the western end of the Outer Cataouatche Canal. In that vicinity, the levee would then turn north, cross, and close the Outer Cataouatche Canal. Between the Outer Cataouatche Canal and Hwy 90 the levee would transition to a floodwall prior to crossing Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the floodwall.

On the north side of Hwy 90, the floodwall would continue for approximately 400 feet in length in a northern direction before turning to the west and transitioning to a levee on a west northwestern direction for approximately 2,700 feet long to the Davis Pond Freshwater Diversion Canal's eastern construction ROW.

An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy 90, and further north would be widened from approximately 20 feet to approximately 100 feet and deepened to 10 feet. The existing culvert under Hwy 90 may be replaced. Where the alignment transitions from floodwall to levee and extends to the Davis Pond Freshwater Diversion Canal's eastern construction ROW, new drainage canal would be constructed parallel the 2,700-foot length of levee.

When the alignment reached the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north incorporating the existing Davis Pond Diversion Project's Main East Guide Levee into the new levee while continuing to the BNSF Railroad. The levee alignment would continue to the north and terminate into high ground at the Mississippi River Levee. Between the BNSF Railroad and high ground of the Mississippi River Levee the alignment would alternate between floodwall (to accommodate closure structures for the two railroad crossings and the River Road crossing) and levee.

2.3.1.1 Reach 1 - Closure Across Outer Cataouatche Canal and Levee to Bayou Verret

Connecting to the western end of the Lake Cataouatche Levee, reach 1 of alternative 3 originates approximately 1,200 feet south of Hwy 90 with an approximately 500 foot long, non-navigable earthen closure across the Outer Cataouatche Canal. The new closure would have a base width of approximately 500 feet, a top elevation of +15.5 feet NAVD88, and be used for site access and egress during construction. The protected-side toe of the earthen closure would begin approximately 400 feet south from the southern bank of the east-west reach of the Outer Cataouatche Canal. The earthen closure would require approximately 500 feet of ROW to accommodate construction resulting in approximately 5.7 acres being disturbed for construction of which 2.3 acres would be fill placed into open water. Discharge lines from the Highway 90 Pumping Station would be extended approximately 800 feet in length south to cross over the new closure so that the pumping station discharge would be on the flood side of the new alignment.

Once across the Outer Cataouatche Canal, the alignment would continue west as earthen levee with a geotextile base, a base width of 500 feet, and a top elevation of +15.5 feet NAVD88. The alignment would continue west and transition to an approximately 300-foot long floodwall on the eastern side of Bayou Verret with a top of elevation of +15.5 feet NAVD88. The floodwall would then tie into the approximately 135 feet long Bayou Verret closure structure. In the area adjacent to the new Bayou Verret closure structure, the ROW width would be expanded to 700 feet, as the increased ROW would be necessary to accommodate construction staging and access areas. The Bayou Verret closure structure itself would cross Bayou Verret on a southwesterly alignment. Within this reach, guide walls would be constructed on both the north and south ends of the closure structure within the bayou.

Although there is no final decision for the design of the Bayou Verret closure structure, possible designs include a sector gate, a stoplog structure, and a barge gate. The structure would have a usable navigation opening of approximately 60 feet and a depth of -10 feet NAVD88. The total width of the structure depends on the final design selected. However, the maximum width would be approximately 135 feet. The closure structure would remain open most of the time. In the event of a storm, the structure would be closed and remain closed until the storm has passed and emergency operations were concluded. The different gate designs would require different closure timing prior to a storm event due to operational closure considerations. The method of closure for a stoplog structure involves the use of a crane, which during high winds becomes unsafe to operate. This necessitates the closure of this type of structure prior to increased wind speeds. However, due to the remote nature of this area and the limited number of staff of the local sponsor it is likely that other structure types would also be closed relatively early prior to a storm event. This is likely because this closure would result in little to no impact to navigation traffic, particularly commercial navigation traffic versus other structures that are part of the overall West Bank and vicinity system that are located in more commercial/industrial areas to the east.

Adjacent to the Bayou Verret structure, a bypass channel would be constructed to allow navigation and drainage while the closure structure was being built. Providing a cross sectional drainage area equal to the cross sectional area of the openings under Hwy 90 was a design criteria to ensure water exchange to the more than 2,000 acres of wetland north of Hwy 90. Based on detailed examination of the cross sectional area of the openings under Hwy 90 (see Hydrology and Hydraulics appendix F), an additional 110 square feet of cross sectional area would be incorporated into a second structure adjacent to the Bayou Verret closure structure or within the bypass channel. The bypass channel could be on the east or west side of Bayou Verret and would be approximately -6 feet deep NAVD88, approximately 78 feet wide, and 1,000 feet long. Approximately 50,000 cubic yards of dredged material generated during the construction and maintenance of the bypass channel and Bayou Verret approach channels would be placed within the project ROW east and west of the Bayou Verret structure. Maintenance dredging of the Bayou Verret approach channels and the bypass channel would be infrequent and would require removal and disposal of less than 1,000 cubic yards of dredge material.

In addition to the eastern closure of the Outer Cataouatche Canal, access and egress to reach 1 would be provided by the construction of a permanent access corridor beginning at a point approximately 1,400 feet west of the Hwy 90 access to the Lake Cataouatche Levee and continuing south to the construction area south of the Outer Cataouatche Canal. As part of this access, a permanent bridge would be constructed spanning the outer Cataouatche Canal. The bridge itself could be constructed of pre-fabricated concrete and would be set high enough off the water surface for small recreational boats to pass underneath.

The access corridor would be approximately 100 feet wide and extend approximately 500 feet in length from Hwy 90 to the north bank of the Outer Cataouatche Canal. Continuing on approximately the same line, the permanent bridge would be approximately 100 feet wide, and span the approximately 400 feet width of the canal. South of the Outer Cataouatche Canal, the permanent access would continue the 100-foot width for an additional 300-foot length to join the work site.

The site preparation would require clearing all vegetation and grubbing within the footprint of all work areas including stripping topsoil. The clearing and grubbing of the vegetation and topsoil stripping would be necessary to ensure that trees roots and topsoil zones would not provide weak path planes where water seepage could jeopardize the integrity of the levee. None of the grubbed material would be re-used as fill for the project. Woody vegetation generated during construction activities would be windrowed and burned on site or removed for off site disposal or beneficial reuse. The grubbed material would be deposited and stored in a fashion to ensure that material would not be eroded from the site before being hauled off site.

Construction access for equipment and materials to the construction site could be provided by barge access from Bayou Verret or from the permanent access corridor and bridge. Because the proposed location of the closure structure would be within the existing waterway, the structures would be constructed in a cofferdam. Due to the depth and size of the excavation, unwatering wells or well points would be continually pumped during construction to keep the area dry. Because space inside the cofferdam would be very limited, the equipment used to build the structure would be outside of the excavation on a marine plant or temporary work platform.

Construction of reach 1 would require approximately 44 acres of new ROW, would permanently fill approximately 4.5 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 38 acres of vegetated wetlands, and excavation of 1.78 acres of wetlands to construct the bypass channel and would permanently alter approximately 0.15 acres of canal bottom from the footing under a permanent bridge spanning the Outer Cataouatche Canal.

2.3.1.2 Reach 2 - Bayou Verret Closure Structure to Hwy 90 Crossing Levee

On the west side of the Bayou Verret closure structure, the alignment would continue west as floodwall with a top elevation of +15.5 feet NAVD88 for approximately 300 feet in length. The alignment would then turn northwest for a short distance and then again transition to a westerly direction to parallel the south bank of the Outer Cataouatche Canal. Along the west side of the Bayou Verret closure structure, the ROW would be expanded to 1,100 feet in width. This increased ROW width would be necessary for construction and staging areas. Within this increased ROW, an approximately 1,200-foot length of an unnamed canal that is approximately 100 feet wide, would be filled.

As the alignment continues west, the floodwall would transition to a geotextile base levee with a base width of 500 feet and a top of elevation of +15.5 NAVD88 for a length of approximately 9,600 feet. The northernmost 100 feet of this 500-foot width, along the entire 9,600-foot length of levee, would incorporate the existing the Davis Pond guide levee. In addition to the 500-foot levee width, an additional 100 feet of ROW would be required on the flood side throughout the 9,600 feet length to construct de-watering cells. The de-watering cells would be built on the south side of the levee and would be necessary to keep the levee construction area de-watered while the Davis Pond Diversion Structure operates throughout the construction period. Upon the completion of construction, the de-watering cells would be leveled to an elevation suitable for the return of wetlands vegetation.

At the western end of the 9,600-foot length, the levee would then turn north for a length of approximately 800 feet crossing the Outer Cataouatche Canal and approaching Hwy 90. The canal crossing would form a second permanent closure of the Outer Cataouatche Canal (the reach 1 closure was the first) and also be used for site access and egress during construction. This cutoff would isolate approximately 6 acres open water of the Outer Cataouatche Canal. To provide some opportunity for water exchange to this portion of the Outer Cataouatche Canal, a gap would be cut into the Davis Pond east guide levee (to the south) opening the potential for flow into Davis Pond. The cut would be approximately 50 feet wide and would be to an elevation zero NAVD88 with scour protection at the cut. North of the Outer Cataouatche Canal, the levee would transition to a floodwall, approximately 300 feet in length, turn 90-degrees to the west, and continue westward parallel Hwy 90. Natural resource agencies have recommended that further Davis Pond east guide levee degradation be pursued. Additional engineering, real estate and environmental evaluation would need to be conducted to determine if that recommendation is practicable.

An unnamed drainage canal, parallel to, and approximately 500 feet to the east of the floodwall, would be enlarged between Hwy 90 and the Outer Cataouatche Canal. The enlarged canal would tie into an existing (or replacement) culvert that passes under Hwy 90. The drainage canal would be enlarged from the existing 20-foot width to approximately 100-feet wide and 10-feet deep.

Within reach 2, two temporary access corridors with temporary bridges, a permanent access corridor and permanent bridge, and two temporary staging areas would be constructed. The temporary and permanent access corridors and temporary staging areas would be located between Hwy 90 and the north bank of the Outer Cataouatche Canal. The first temporary bridge, access corridor and staging area would originate approximately 300 feet west of Sellers Canal on the south side of Hwy 90. The staging areas would be south of Hwy 90 and north of the Outer Cataouatche Canal and would be approximately 200 feet wide by 400 feet long. The access corridor between Hwy 90 and the Outer Cataouatche Canal would be approximately 100-feet wide by 500-feet long and the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. The site preparation would require clearing and grubbing vegetation within the footprint of the access and work areas. Woody vegetation within the footprint of these areas would be cleared, grubbed, windrowed, and burned in place or removed for off site disposal or beneficial re-use. The temporary bridge would be used to transport construction equipment and materials to and from the construction area south of the Outer Cataouatche Canal. Bridge design has not been completed, but would include an approximately 40-foot opening to allow navigation during the construction period. Advanced notice would be required to deploy the opening.

A second temporary access corridor and temporary bridge would originate on Hwy 90 approximately 4,300 feet west of the first temporary staging area; the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. The staging area would be approximately 100 feet wide by 500 feet long. The permanent access area and permanent bridge would similarly extend south from Hwy 90 originating approximately 1,000 feet east of the western termination of the Outer Cataouatche Canal. The access area would be approximately 120 feet wide by 500 feet long and an approximately 60 foot wide, permanent bridge would span the Outer Cataouatche Canal at this location. The bridge itself could be constructed of pre-fabricated concrete and would be set high enough off the water surface for small recreational boats to pass underneath.

Construction of reach 2 would require approximately 167 acres of new ROW, would create approximately 1 acre of aquatic habitat (canal widening), would permanently fill approximately 7.4 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 143 acres of vegetated wetlands, and would permanently alter approximately 0.1 acres of canal bottom from the footing under a permanent bridge spanning the Outer Cataouatche Canal.

2.3.1.3 Reach 3 – Hwy 90 Crossing

The floodwall that had paralleled Hwy 90 in the end of reach 2 would turn north on a 90-degree angle and continue another 800 feet in length crossing Hwy 90. The intersection of the highway and floodwall would be constructed by raising the highway approaches over the +15.5 foot NAVD88 profile to have an elevated crossing of the floodwall. The roadway's grade change for crossing the floodwall would be very gradual to allow the safe flow of traffic; the transition would be approximately 2,000 feet long in both directions and require a 2.04 percent grade. The roadway would include a median, four 12-foot lanes, two 10-foot shoulders, and a cross slope of 0.025 foot/foot away from the median. This design would not impede the proposed I-49 elevated highway construction through this reach as the bottom girders of the raised highway would be designed to be above the floodwall for the full width of the highway. This reach would also include pipeline crossings.

Elevating Hwy 90 over the floodwall was recommended, rather than providing a closure gate, because of the importance of keeping Hwy 90 open to traffic during hurricane evacuation. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway. The temporary roadway, or lane detour would be a four-lane shift to the north, but entirely within the existing Hwy 90 ROW.

Construction of reach 3 would require approximately 10.2 acres of new ROW and would require the clearing, grubbing, and fill of approximately 1 acre of vegetated wetlands. All other actions necessary to construct this reach would occur within existing LADOTD Hwy 90 ROW.

2.3.1.4 Reach 4 – Hwy 90 Crossing to Davis Pond Diversion Control Structure

North of Hwy 90, the floodwall would continue for approximately 200 feet in length, turn 90 degrees west for approximately 100 feet in length with a width of disturbance of approximately 500 feet. At the end of the floodwall, the alignment would transition to a geotextile base earthen levee with a base width of 300 feet and a top elevation of +13.5 NAVD88. The levee would extend approximately 2,700 feet long in a west northwesterly direction. The drainage canal enlargement that began south of Hwy 90 would continue in this reach initially paralleling and offsetting the floodwall alignment by approximately 500 feet and then turning west northwesterly and paralleling the protected-side levee toe for the entire 2,700-foot length. The drainage canal would be approximately 100 feet wide and 10 feet deep.

Construction of reach 4 would require approximately 29 acres of new ROW and would require the clearing, grubbing, and fill of approximately 22 acres of vegetated wetlands. An additional 6.75 acres of vegetated wetlands would be excavated to create 6.75 acres of new open water (drainage canal) habitat.

2.3.1.5 Reach 5 – Levee on East Side of the Davis Pond Diversion Project to Mississippi River Levee

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north and run parallel to the Davis Pond Diversion Project's Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The new levee would be constructed to +13.5 feet NAVD88 for a distance of approximately 1,300 feet. The centerline of the proposed levee would be offset a minimum of 120 feet from the existing canal bank, but would be within the Davis Pond Freshwater Diversion Canal's previously disturbed ROW. The width of the ROW for the levee in this section would be approximately 500 feet for the entire 1,300-foot length to the railroad crossing. This construction would occur within an area of previous disturbance.

At the BNSF Railroad crossing, the alignment would transition to floodwall of approximately +13.5 feet NAVD88 for a distance of approximately 150 feet and require 400 feet of construction ROW for the construction of the railroad closure structure. The closure structure would be constructed of structural steel and covered with a steel skin plate. On the north side of the BNSF Railroad crossing, the alignment would again return to a levee of +13.5 feet NAVD88 for the remaining distance (approximately 3,000 feet). The width of the construction ROW would be approximately 500 feet over the entire distance. This construction would occur within the previously disturbed Davis Pond Freshwater Diversion Canal ROW.

At the northern end of the alignment, the levee would transition to floodwall and closure structures (e.g., roller gate) to cross the Union-Pacific Railroad track, River Road (with a closure structure), and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. This section would require a 400-foot construction ROW over the approximately 600-foot length of the section, but would be within the previously disturbed Davis Pond Freshwater Diversion Canal ROW, the ROW for River Road, or the Mississippi River Levee ROW.

During construction of the closure structures on River Road (Hwy 18), a temporary traffic detour would be constructed south of, and parallel to, River Road and an emergency bypass route with two ramps would be constructed on the north side of River Road, to provide emergency access to the toe of the Mississippi River Levee. Less than 0.25 acres would be graded, filled with earthen material, and surfaced with asphalt to construct the traffic detour on the south side of River Road. The emergency bypass route would similarly be graded, filled with earthen material, and surfaced with asphalt over less than 0.25 acres. The emergency bypass route would have two sloping ramps from River Road to the shoulder that is located on the toe of the Mississippi River Levee.

Construction of these features would occur entirely within previously designated and disturbed River Road or Mississippi River Levee ROW. Material used to construct the detour road and bypass route would be hauled in from off site or would be purchased from a commercial source. Approximately 1,300 cubic yards of earthen fill and 180 tons of asphalt would be required for the detour road, bypass route, and ramp construction. To minimize erosion and runoff of exposed solids at the road construction sites a combination of sod, erosion control, and soil stabilizing mats and seeding would be utilized. These activities would result in the physical disturbance of approximately 0.5 acres of maintained levee toe and maintained road shoulder.

Construction of reach 5 would require less than 5 acres of new construction ROW as the majority of the footprint of disturbance is already designated as USACE ROW. There would be no clearing, grubbing, or filling of wetlands, as this reach would utilize previously disturbed areas.

2.3.1.6 Quantities Summary

In total, construction of alternative 3 would require approximately 255 acres of new ROW, approximately 211 acres of vegetated wetlands would be cleared, grubbed, and filled or cleared and excavated; 7.8 acres of aquatic (open water) habitat would be created; and approximately 10 acres of aquatic habitat would be filled. Construction of the footings for the permanent bridges spanning the Outer Cataouatche Canal would permanently alter approximately 0.25 acres of canal bottom, and the western tie-in would enclose approximately 2,750 acres of wetlands within the WBV portion of the HSDRRS.

Constructing alternative 3 would require approximately:

- 175,000 linear feet of pipe or h-pile,
- 105,000 square feet of sheet pile,
- 18,000 cubic yards of material dredged and removed,
- 100,000 cubic yards of earthen material excavated and removed,
- 11,000 cubic yards of concrete,
- 10,000 tons of stone and riprap,
- 2,000,000 cubic yards of earthen fill,
- 500,000 cubic yards granular sand fill,
- 200,400 square yards geotextile fabric,
- 95,000 excavated for drainage canal construction/enlargement,
- 10,000 cubic yards excavated for the Bayou Verret bypass channel, and
- Working 60-hour workweeks for 23 months.

2.4 ALTERNATIVES TO THE PROPOSED ACTION

2.4.1 No Action

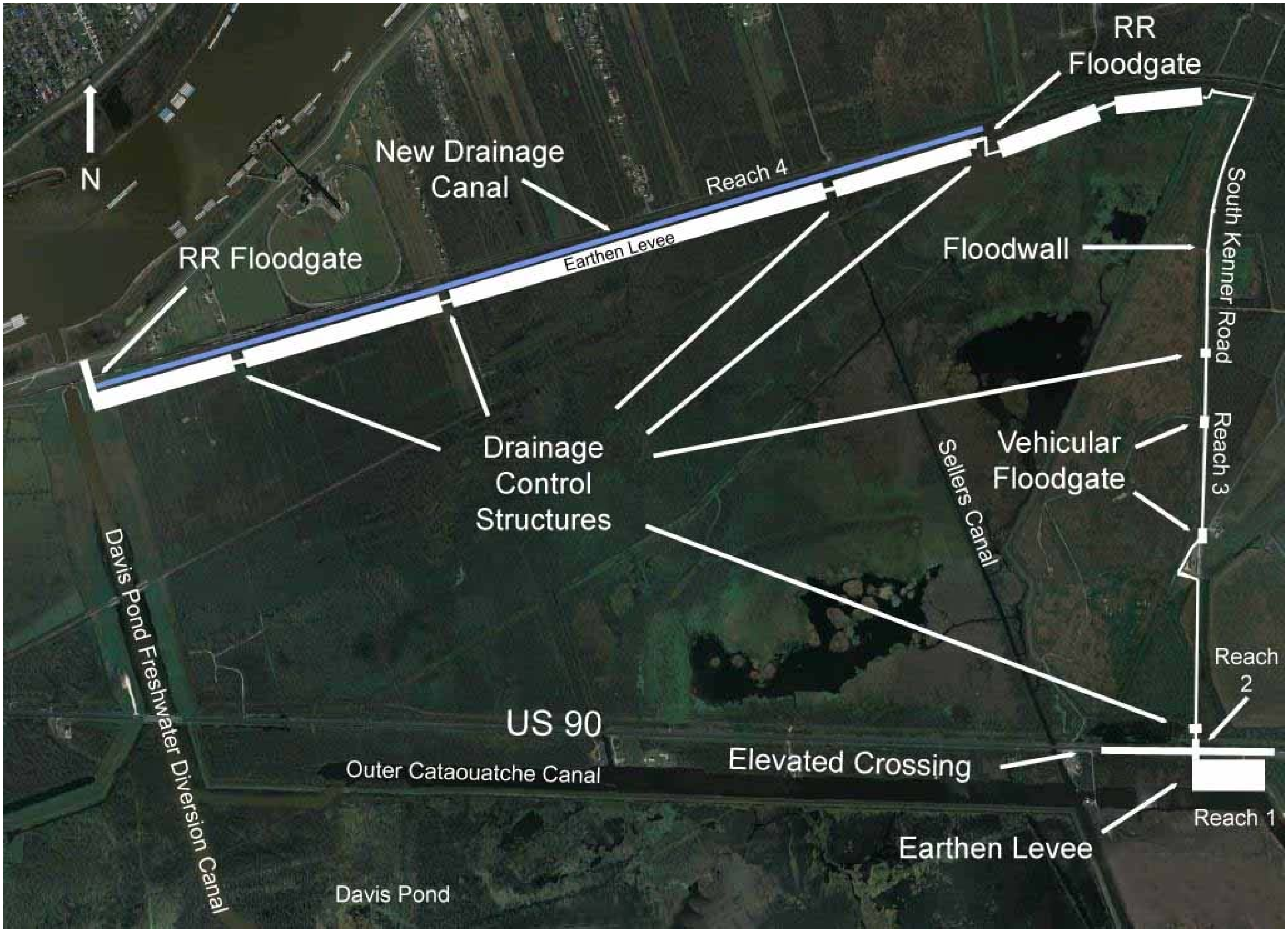
The previously authorized project (see footnote 1) for this portion of the WBV, as described in the Westwego to Harvey Canal, Louisiana Hurricane Protection Project Lake Cataouatche Area Post Authorization Change Report (USACE, 1996), was a +6.5 foot NAVD88 levee between Hwy 90 and the higher elevation of the Burlington Northern Santa Fe (BNSF) Railroad built on the existing South Kenner Road (USACE, 1996). This authorized project is no longer viable because of expansion of the nearby landfills and changes to the design requirements for levee construction. Under the no action alternative, the proposed 100-year level of the HSDRRS would not be constructed by the CEMVN in this portion of the WBV Project and no additional actions would be taken to construct the previously authorized project. The elevation of existing risk reduction for this reach of the WBV is approximately +4 feet NAVD88 afforded by the elevation of the crown of Hwy 90 between the Davis Pond Freshwater Diversion Canal and the end of the Lake Cataouatche Levee at Hwy 90.

The alternatives described in this IER are an integral part of the WBV Project as they would provide the tie-in to the Mississippi River Levee and complete the project on the west bank. Taking no action along this reach of the WBV would result in a significant gap in the WBV project and the benefits for projects constructed to the east of the western tie-in would be diminished if the tie-in were not completed. With the Lake Cataouatche levee being constructed to an elevation of +14.5 feet to +15 feet NAVD88, the absence of the western tie-in would render the new Lake Cataouatche Levee ineffective for floods with water surface elevations exceeding +4 feet NAVD88.

2.4.2 Alternative 1
South Kenner Road Floodwall and West Railroad Tie-In Levee

Alternative 1 is the South Kenner Road Floodwall and West Railroad Tie-In Levee Alignment (see figure 4). The alignment would be comprised of approximately 17,700 linear feet of levee, 12,050 linear feet of floodwall, and closure structures constructed to an elevation of +13.5 feet to +15.5 feet NAVD88. The alignment would begin as earthen levee joining the western end of the Lake Cataouatche Levee and proceeding approximately 800 feet long parallel to Hwy 90 in a

Figure 4. Alternative 1



westerly direction before turning 90-degrees to the north. At that point, the alignment would transition to a 300-foot long section of floodwall crossing Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the proposed floodwall.[2]

On the north side of Hwy 90, the floodwall would continue for approximately 7,400 feet in length along South Kenner Road. Just south of the BNSF Railroad right-of-way (ROW) the alignment would turn west, continuing as floodwall for approximately 800 feet long, bounding the northern perimeter of the Greater New Orleans Landfill. On the western edge of the Greater New Orleans Landfill, the alignment would transition to earthen levee for approximately 1,400 feet in length. Thereafter, the alignment would again transition to floodwall for approximately 400 feet long to allow the crossing of a 12-inch pipeline (Bridgeline Gas Company).

After the pipeline crossing, the alignment would return to earthen levee for approximately 2,500 feet in length, at which point the earthen levee would transition to floodwall and turn 90 degrees to the north for approximately 150 feet in length to a gated closure structure (e.g., railroad roller gate) across the BNSF Railroad tracks. On the north side of the BNSF tracks the alignment would turn 90-degrees to the west, make a transition to earthen levee, and proceed westward approximately 13,000 feet in length to the east side of the Davis Pond Freshwater Diversion Canal. Throughout this reach of levee, the alignment would be parallel to, and on the south side of, the Union-Pacific Railroad ROW. Within the Davis Pond Freshwater Diversion Canal's eastern ROW, the earthen levee would again transition to floodwall, turn 90-degrees to the north and proceed approximately 600 feet in length to cross the Union-Pacific Railroad track with a closure structure (e.g., railroad roller gate), River Road with a closure structure, and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. The floodwall along South Kenner Road would include three vehicular floodgates because of limited ROW and existing utilities. Six drainage control structures at major canal crossings and a parallel drainage canal along the east-west reach (as noted in figure 4) would also be required for this alignment. The design assumptions, including needed ROW to construct the reaches of this alternative, are presented below.

2.4.2.1 Reach 1 - Lake Cataouatche Levee to Hwy 90

This reach begins on the south side of Hwy 90 as full levee, by tying into the Lake Cataouatche levee. The levee would be located south of the highway ROW and would have no impact on utilities or drainage located in the Hwy 90 ROW. The levee would be in the east-west direction and could tie into the existing Lake Cataouatche Levee without crossing the Outer Cataouatche Canal.

This levee would have a geotextile base and be approximately 800 feet long with a top elevation of +15.5 feet NAVD88 and a bottom width of approximately 500 feet. Design standards require including a wave berm on the flood side and a stability berm on the protected side. These components, plus the necessary construction ROW would result in a total width of construction footprint of approximately 500 feet. In order to accommodate the full width needed (approximately 500 feet), the construction would extend approximately 75 feet into the open water of the Outer Cataouatche Canal. The footprint of construction would require complete

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[2] For each of the three alternatives, the alignment would cross US 90 with a floodwall on an elevated crossing. Gradual approaches (approximately 2000 feet from both directions) would be constructed to elevate US 90 over the floodwall. The same design assumptions are applied to each of the three alternatives.

removal of all habitat, structures, and improvements from the south side of the Hwy 90 ROW and into the open water of the Outer Cataouatche Canal.

The site preparation would require clearing all vegetation and grubbing within the footprint of all work areas including stripping topsoil. The clearing and grubbing of the vegetation and topsoil stripping would be necessary to ensure that trees, roots, and topsoil zones do not provide weak path planes where water seepage could jeopardize the integrity of the levee. None of the grubbed material would be re-used as fill for the project. Woody material generated during construction activities would be windrowed and burned on site or removed for off site disposal or beneficial reuse. The grubbed material would be deposited and stored in a fashion to ensure that materials would not be eroded from the site before being hauled off site.

Construction would require building the toe of the wave berm approximately 75 feet out into the Outer Cataouatche Canal by "pushing a mud wave." This involves placing earthen fill at the toe of the existing grade (into the wetland/open water) to push the organic material out into the open channel and eventually achieve the desired ground surface elevation. Based on the depth of the canal, the depth to which this material must be filled is assumed to be 6 feet. The flood-side would be expanded at this 6-foot depth 75 feet into the canal with the mud wave pushing to the limits of construction. This would result in approximately 1,340 cubic yards[3] of fill being placed into wetlands and open water over an area of approximately 1.38 acres.[4]

Construction of reach 1 would require approximately 9.2 acres of new ROW, would permanently fill approximately 1.4 acres of open water habitat, and would require the clearing, grubbing, and fill of approximately 7.8 acres of vegetated wetlands.

2.4.2.2 Reach 2 – Hwy 90 Crossing

At Hwy 90 and South Kenner Road the levee would turn to the north and transition to a floodwall with a width of approximately 500 feet and a length of approximately 800 feet to cross Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the proposed floodwall. To accomplish this, the bottom girders of the raised highway would be designed to be above the floodwall for the full width of the highway. The roadway's grade change for crossing the floodwall would be very gradual to allow the safe flow of traffic; the transition would be approximately 2,000 feet long and require a 2.04 percent grade in both directions. The crossing would include a median, four 12-foot lanes, two 10-foot shoulders, and a cross slope of 0.025 foot/foot away from the median. This design would not impede the proposed I-49 elevated highway construction through this reach when the Federal Highway Administration (FHWA) and Louisiana Department of Transportation and Development (LADOTD) are prepared to build this section.

Elevating Hwy 90 over the floodwall was recommended, rather than providing a closure gate, because of the importance of keeping Hwy 90 open to traffic during hurricane evacuation. Traffic would be maintained during floodwall construction by the construction and use of a temporary bypass roadway. The temporary roadway, or lane detour, would be a four-lane shift to the north, but entirely within the existing Hwy 90 ROW.

Construction of reach 2 would require approximately 10.2 acres of new ROW and would require the clearing, grubbing, and fill of approximately 1 acre of vegetated wetlands. All other actions necessary to construct this reach would occur within existing LADOTD Hwy 90 ROW.

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[3] 6 ft deep x 75 ft toe expansion x 800 ft length of reach = 36,000 CF/27 CF per CY = 1,340 CY.
[4] 75 ft toe expansion into open water x 800 ft length / 43,560 SF/AC = 1.38 AC of fill in aquatic habitat.

2.4.2.3 Reach 3 - South Kenner Road to BNSF Railroad

Upon crossing to the north side of Hwy 90, the +15.5 foot NAVD88 floodwall would transition to +13.5 foot NAVD88 floodwall and would continue on the west side of South Kenner Road, parallel to the roadway. Placement of the floodwall on the west side of South Kenner Road would be within the existing road ROW and would minimize the impact to the truck traffic to and from the River Birch Landfill facility. Proceeding north, the wall would leave the existing road ROW just south of the truck weigh station, continue around the west side of the weigh station, and rejoin South Kenner Road. This would require acquiring an additional 40-foot width of new ROW over a length of approximately 1,000 feet.

North of the weigh station, the floodwall would return to the existing road ROW, but be constructed approximately on the centerline of South Kenner Road. Constructing the floodwall on the centerline of South Kenner Road would ensure that piles would remain clear of the existing landfill geotextile liner. To accommodate this, the existing roadway, shoulder, and fencing would be demolished and reconstructed approximately 40 feet to the east of the current location. This shift would require the acquisition of a total width of 60 feet of new ROW (20 foot width for the floodwall plus the 40 foot width for moving the road to the east) between the weigh station and the BNSF Railroad (approximately 6,400 feet). Three vehicular floodgates (e.g., 24-foot) would be required to access the existing roadways on the west side of the floodwall. All vehicular floodgates would be constructed of structural steel and covered with a steel skin plate. Two existing culverts would be replaced by two drainage control structures at two canal crossings within this reach.

Construction of reach 3 would require approximately 9.8 acres of new ROW. Construction would also require the demolition and reconstruction of an approximately 6,400-foot reach of South Kenner Road, generating approximately 5,000 CY of debris. All of these activities would take place in areas of extensive prior disturbance.

2.4.2.4 Reach 4 – BNSF Railroad to Mississippi River Levee

Reach 4 is an alternating series of floodwall, levee, and closure structures to provide the 100-year elevation while accommodating a landfill, one pipeline and two railroad crossings, and four drainage control structures. This reach would also require the construction of a protected side drainage canal approximately 185 feet wide and 13,000 feet long on the western end.

This reach begins just south of the BNSF Railroad ROW, by turning west from the north-south floodwall along South Kenner Road and continuing as floodwall (at +13.5 feet NAVD88) for approximately 800 feet in length. The alignment would be just north of the northern perimeter of the Greater Orleans Landfill and would require approximately 60 feet wide of new ROW. On the western edge of the Greater Orleans Landfill, the alignment would transition to earthen levee with a geotextile base and an elevation of +13.5 feet NAVD88 for approximately 1,400 feet in length. This levee section would require approximately 300 feet wide of new ROW.

Thereafter, the alignment would transition back to floodwall for approximately 400 feet in length to accommodate the crossing of a 12-inch gas pipeline (Bridgeline Gas Co.). This reach would require 50 feet wide of new ROW. Once past the gas pipeline, the alignment would transition back to a geotextile base earthen levee of +13.5 feet NAVD88 and proceed westward--parallel to the south side of the BNSF Railroad ROW--for approximately 2,500 feet in length. Approximately 300 feet wide of new ROW would be necessary throughout this levee section.

At the end of the levee section, the alignment would turn 90 degrees to the north, transition to floodwall of +13.5 feet NAVD88 for 150 feet in length, and connect to a gated closure structure (e.g., railroad roller gate) across the BNSF Railroad tracks. This floodwall and closure gate would require approximately 50 feet wide of ROW, and would be built within a previously disturbed area.

North of the BNSF tracks, the floodwall would turn 90-degrees to the west, make a transition to earthen levee of +13.5 feet NAVD88 and a geotextile base, and proceed westward for approximately 13,000 feet in length to the east side of the Davis Pond Freshwater Diversion Canal. Throughout this reach of levee, the alignment would be parallel to, and on the south side of, the Union-Pacific Railroad ROW. North of the new levee, but south of the Union Pacific Railroad, a new protected-side canal (approximately 185 feet wide) would be constructed over the entire distance of the levee. Within this levee section, there would be four drainage control structures at four discharge locations. This levee section, protected side canal, and drainage control structures would require approximately 515 feet wide of new ROW over the entire distance.

Within the Davis Pond Freshwater Diversion Canal's eastern ROW, the earthen levee would again transition to floodwall of +13.5 feet NAVD88 and turn 90-degrees to the north. On the north-south alignment, the floodwall would cross the Union-Pacific Railroad track with a closure structure (e.g., railroad roller gate), cross River Road with a closure structure, and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. This section would require a 400-foot construction ROW over the approximately 600-foot length of the section, but would be within the previously disturbed Davis Pond Freshwater Diversion Canal ROW, the ROW for River Road, or the Mississippi River Levee ROW.

During construction of the closure structures on River Road (Hwy 18) a temporary traffic detour would be constructed south of, and parallel to, River Road and an emergency bypass route with two ramps would be constructed on the north side of River Road, to provide emergency access to the toe of the Mississippi River Levee. Less than 0.25 acres would be graded, filled with earthen material, and surfaced with asphalt to construct the traffic detour on the south side of River Road. The emergency bypass route would similarly be graded, filled with earthen material, and surfaced with asphalt over less than 0.25 acres. The emergency bypass route would have two sloping ramps from River Road to the shoulder, which is located on the toe of the Mississippi River Levee.

Construction of these features would occur entirely within previously designated and disturbed River Road or Mississippi River Levee ROW. Material used to construct the detour road and bypass route would be hauled in from off site or would be purchased from a commercial source. Approximately 1,300 cubic yards of earthen fill and 180 tons of asphalt would be required for the detour road, bypass route, and ramp construction. To minimize erosion and runoff of exposed solids at the road construction sites a combination of sod, erosion control, and soil stabilizing mats and seeding would be utilized. These activities would result in the physical disturbance of approximately 0.5 acres of maintained levee toe and maintained road shoulder.

Construction of reach 4 would require approximately 188 acres of new ROW and would require the clearing, grubbing, and fill or clearing and excavating of approximately 181 acres of vegetated wetlands. Excavation of the drainage canal would create approximately 55 acres of new open water (drainage canal) habitat.

2.4.2.5 Drainage Control Structures

To maintain existing drainage capacity through the levee and floodwall, a system of six drainage control structures would be required for alternative 1. The drainage control structures would likely utilize box culvert designs to allow maintenance vehicles to cross the new drainage canals and perform routine maintenance (e.g., clean debris bar screens). A ramp system would be designed to provide access to the box culvert crossings from the levee crown. The structures would use steel sluice gates to allow flow through the structure during rain events and permit them to be closed during storm surge to prevent backflow. The new canal would collect drainage that flows southerly through existing culverts under the railroad tracks where it would be directed to new drainage control structures through the proposed levee. These features allow drainage through the railroad to remain unchanged by this project and surface water flows would then drain south through existing outfall canals and bayous.

2.4.2.6 Quantities Summary

The total area of new ROW needed to complete construction of alternative 1 would be approximately 217 acres. Approximately 1.4 acres of open water within the Outer Cataouatche Canal would be filled to complete construction. Approximately 190 acres of vegetated wetlands would be cleared, grubbed, and filled or cleared and excavated to construct the alternative. Approximately 55.2 acres of new aquatic habitat would be created by the construction of the drainage canal in reach 4. Constructing alternative 1 would enclose approximately 17 acres of wetlands within the WBV portion of the HSDRRS.

Constructing alternative 1 would require approximately:

- 500,000 linear feet of pipe or h-pile,
- 300,000 square feet of sheet pile,
- 76,000 square yards of geotextile fabric
- 300,000 cubic yards earthen material excavated and removed,
- 36,000 cubic yards of concrete,
- 1,315,000 cubic yards of earthen fill, and
- Working 60-hour workweeks for 24 months.

2.4.3 Alternative 2 North of Outer Cataouatche Canal to Mississippi River Levee

Alternative 2 is described as the North of Outer Cataouatche Canal to Mississippi River Levee (see figure 5). The alignment consists of approximately 23,000 linear feet of levee, floodwall, drainage control, and closure structures built to +13.5 to +15.5 feet NAVD88 in elevation. As in alternative 1, the alignment would begin as earthen levee joining the western end of the Lake Cataouatche Levee. However, instead of turning north and crossing Hwy 90 near South Kenner Road (as with alternative 1), this alternative would continue in a western direction for approximately 13,000 feet in length parallel to, and on the south side of, Hwy 90. Throughout the 13,000-foot length, the alignment would alternate between levee and floodwall sections to accommodate three drainage control structures needed to convey surface water flow through the alignment.

Approximately 800 feet west of the western termination of the Outer Cataouatche Canal, the alignment (within a floodwall section) would turn 90-degrees to the north, crossing over Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the proposed floodwall similar to the crossing described for alternative 1. On the north side of Hwy 90, the floodwall would continue for approximately 400 feet in length in a northern direction before turning to the west and transitioning to a levee on a west northwestern direction for approximately 2,700 feet long to the Davis Pond Freshwater Diversion Canal’s eastern construction ROW.

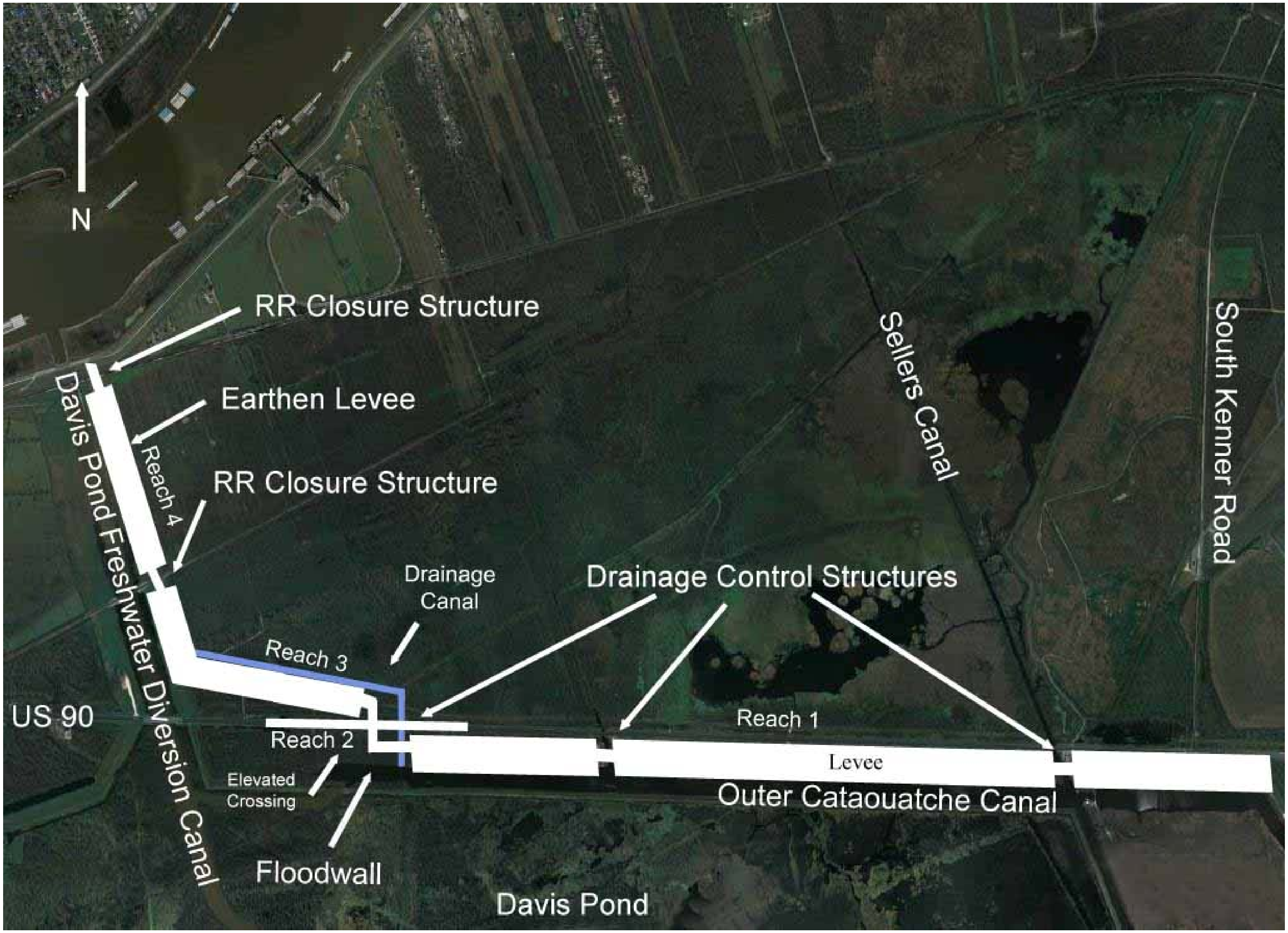
An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy 90, and further north would be widened from approximately 20 feet to approximately 100 feet and deepened to 10 feet. The existing culvert under Hwy 90 may be replaced. Where the alignment transitions from floodwall to levee and extends to the Davis Pond Freshwater Diversion Canal’s eastern construction ROW, new drainage canal would be constructed parallel the 2,700-foot length of levee.

When the alignment reaches the Davis Pond Freshwater Diversion Canal’s eastern construction ROW, the levee would turn north and continue parallel to the Davis Pond Diversion Project’s Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The alignment would continue to the north and terminate by tying into high ground at the Mississippi River levee. Between the BNSF Railroad and high ground of the Mississippi River levee the alignment would alternate between floodwall, closure structures, and levee to accommodate closure structures for the two railroad and River Road crossings.

2.4.3.1 Reach 1 - Lake Cataouatche Levee to Hwy 90 Crossing

Reach 1 of alternative 2 would originate as levee at the western end of the Lake Cataouatche Levee and would proceed west on the south side of Hwy 90. Throughout this reach the alignment would alternate between levee and floodwall sections to accommodate three drainage control structures needed to convey surface water flow through the alignment. Reach 1 of alternative 2 would require three sections of earthen levee with geotextile base. Each of these sections would be constructed to an elevation of +15.5 feet NAVD88 with a width of approximately 500 feet, and lengths of approximately 2,900 feet, 6,500 feet, and 2,800 feet respectively; total length of levee in reach 1 would be approximately 12,200 feet.

Figure 5. Alternative 2



In order to accommodate the full width needed (approximately 500 feet), the levee would extend approximately 75 feet into the open water of the Outer Cataouatche Canal. The footprint of construction would require complete removal of all habitat, structures, and improvements from the south side of the Hwy 90 ROW to the open water of the Outer Cataouatche Canal. There are approximately 12 structures of varying sizes within the project area that would result in approximately 1,000 cubic yards of demolition debris requiring removal for off-site disposal.

Construction would require building the toe of the wave berm approximately 75 feet out into the Outer Cataouatche Canal by "pushing a mud wave." This involves placing earthen fill at the toe of the existing grade (into the wetland/open water) to push the organic material out into the open channel and eventually achieve the desired ground surface elevation. Based on the depth of the canal, the depth to which this material must be filled is assumed to be 6 feet. The flood-side would be expanded at this 6-foot depth at least 75 feet along each of the three levee sections of reach 1. Pushing the mud wave into the Outer Cataouatche Canal would require the placement of approximately 205,000 cubic yards[5] of fill into wetlands and open water over an area of approximately 21 acres.[6]

In addition to the levee sections, reach 1 of alternative 2 would include three new drainage control structures: a 54-foot structure on Sellers Canal and a 40-foot and 18-foot drainage control structure across two other unnamed drainage canals to the west of Sellers Canal (see figure 5). For each of these crossings, the design would include approximately 100 feet long of floodwall (built to +15.5 feet NAVD88) on either side of the drainage structure. On the western side of the westernmost drainage control structure, the alignment would continue in a western direction for approximately 700 feet long before turning 90-degrees to the north into reach 2 of alternative 2. The width of disturbance to construct each of the floodwall sections would be approximately 500 feet.

The westernmost unnamed canal (with the 18-foot drainage control structure) would also be widened and deepened from the current approximately 20-foot width to approximately 100 feet wide and deepened to 10 feet over the entire approximate 530-foot length between Hwy 90 and the discharge into Outer Cataouatche Canal. Replacement of this existing culvert under Hwy 90 may also be required. These actions would replace approximately 0.25 acres of open water habitat in the existing canal with 1.22 acres of open water after widening. This would result in a net increase of 0.97 acres of open water habitat from modifications to the drainage canal. North of Hwy 90 the same canal would be similarly widened and deepened as well as extended to the northwest. These modifications are discussed in the reach 3 descriptions.

The site preparation for every area of construction would require clearing all vegetation and grubbing within the footprint of all work areas, including stripping topsoil. The clearing and grubbing of the vegetation and topsoil stripping would be necessary to ensure that trees, roots, and topsoil zones do not provide weak path planes where water seepage could jeopardize the integrity of the levee. None of the grubbed material would be re-used as fill for the project. Woody material generated during construction activities would be windrowed and burned on site or removed for off site disposal or beneficial reuse. The grubbed material would be deposited and stored in a fashion to ensure that materials would not be eroded from the site before being hauled off site.

In total, construction of reach 1 would require approximately 156 acres of new ROW, demolition and removal of all structures resulting in approximately 1,000 CY of construction demolition

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[5] 6 ft deep x 75 ft toe expansion x 12,200 ft length of levee in reach 1 = 5,490,000 CF/27 CF per CY = 203,333 CY.
[6] 75 ft toe expansion into open water x 12,200 ft length of reach = 21.01 AC of effects.

waste, would permanently fill approximately 21 acres of open water habitat in the Outer Cataouatche Canal, would require the clearing, grubbing, and fill of approximately 136 acres of vegetated wetlands, and would create approximately 1 acre of new open water (drainage canal) habitat.

2.4.3.2 Reach 2 - Hwy 90 Crossing

At the start of reach 2, the floodwall that had paralleled Hwy 90 would turn north on a 90-degree angle and continue another approximately 800 feet in length crossing Hwy 90. The intersection of the highway and floodwall would be constructed by raising the highway approaches over the +15.5 foot NAVD88 profile to have an elevated crossing of the floodwall. The roadway's grade change for crossing the floodwall would be very gradual to allow the safe flow of traffic; the transition would be approximately 2,000 feet long and require a 2.04 percent grade in each direction. The roadway would include a median, four 12-foot lanes, two 10-foot shoulders and a cross slope of 0.025 foot/foot away from the median. This design would not impede the proposed I-49 elevated highway construction through this reach as the bottom girders of the raised highway would be designed to be above the floodwall for the full width of the highway. This reach would also include pipeline crossings.

Elevating Hwy 90 over the floodwall was recommended, rather than providing a closure gate, because of the importance of keeping Hwy 90 open to traffic during hurricane evacuation. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway. The temporary roadway, or lane detour, would be a four-lane shift to the north, but entirely within the existing Hwy 90 LADOTD ROW.

Construction of reach 2 would require approximately 10.2 acres of new ROW and would require the clearing, grubbing, and fill of approximately 1 acre of vegetated wetlands north of Hwy 90. All other actions necessary to construct this reach would occur within the disturbed LADOTD Hwy 90 ROW.

2.4.3.3 Reach 3 - Hwy 90 Crossing to Davis Pond Diversion Control Structure

North of Hwy 90, the floodwall would continue for approximately 200 feet in length, turn 90 degrees west for 100 feet in length, and then transition to an earthen levee with a geotextile base and a base width of 300 feet and a top elevation of +13.5 NAVD88. The levee would extend approximately 2,700 feet long in a west northwesterly direction. The drainage canal enlargement that began south of Hwy 90 would continue in this reach initially paralleling and offsetting the floodwall alignment by approximately 500 feet and then turning west northwesterly and paralleling the levee for the entire 2,700 foot length. The drainage canal would be approximately 100 feet wide and 10 feet deep.

Construction of reach 3 would require approximately 26.5 acres of new ROW, would require the clearing, grubbing, and fill or clearing and excavating of approximately 26.3 acres of vegetated wetlands, and would create approximately 6.9 acres of new open water (drainage canal) habitat.

2.4.3.4 Reach 4 – Levee on East Side of the Davis Pond Diversion Project to Mississippi River Levee

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north and run parallel to the Davis Pond Diversion Project's Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The top of the existing guide levee would be degraded to drain into the Davis Pond Freshwater Diversion Canal's existing drainage canal and match the slope requirements for the wave berm and the new levee would be constructed to +13.5 feet NAVD88 for a length of approximately 1,300 feet. The centerline of the proposed levee would be offset a minimum of 120 feet from the existing canal bank, but would be within the Davis Pond Freshwater Diversion Canal's previously disturbed ROW. The width of the construction ROW for the levee in this section would be approximately 500 feet for the entire 1,300 foot length to the railroad crossing and would result in an area of disturbance of approximately 14.9 acres. However, this construction would occur within an area of previous disturbance.

At the BNSF Railroad crossing, the alignment would transition to floodwall of +13.5 feet NAVD88 for a length of approximately 150 feet and require an approximate 60-foot easement for the construction of the railroad closure structure. The gate would be constructed of structural steel and covered with a steel skin plate. On the north side of the BNSF Railroad crossing, the alignment would again return to a levee of +13.5 feet NAVD88 for the remaining length (approximately 3,000 feet) within the Davis Pond Freshwater Diversion Canal's eastern ROW. The width of the construction ROW would be approximately 500 feet over the entire distance resulting in an area of disturbance of approximately 34.4 acres. This construction would occur within the previously disturbed Davis Pond Freshwater Diversion Canal ROW.

At the northern end of the alignment, the levee would transition to floodwall and closure structures (e.g., roller gate) to cross the Union-Pacific Railroad track, River Road (with a closure structure), and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. This section would require an approximately 400-foot construction ROW over the approximately 600-foot length of the section, but would be within the previously disturbed Davis Pond Freshwater Diversion Canal ROW, the ROW for River Road, or the Mississippi River Levee ROW.

During construction of the closure structures on River Road (Hwy 18) a temporary traffic detour would be constructed south of, and parallel to, River Road and an emergency bypass route with two ramps would be constructed on the north side of River Road, to provide emergency access to the toe of the Mississippi River Levee. Less than 0.25 acres would be graded, filled with earthen material, and surfaced with asphalt to construct the traffic detour on the south side of River Road. The emergency bypass route would similarly be graded, filled with earthen material, and surfaced with asphalt over less than 0.25 acres. The emergency bypass route would have two sloping ramps from River Road to the shoulder that is located on the toe of the Mississippi River Levee.

Construction of these features would occur entirely within previously designated and disturbed River Road or Mississippi River Levee ROW. Material used to construct the detour road and bypass route would be hauled in from off site or would be purchased from a commercial source. Approximately 1,300 cubic yards of earthen fill and 180 tons of asphalt would be required for the detour road, bypass route, and ramp construction. To minimize erosion and runoff of exposed solids at the road construction sites a combination of sod, erosion control, and soil stabilizing mats and seeding would be utilized. These activities would result in the physical disturbance of approximately 0.5 acres of maintained levee toe and maintained road shoulder.

Construction of reach 4 would require less than 5 acres of new construction ROW as the majority of the footprint of disturbance is already designated as in Davis Pond Freshwater Diversion Canal ROW. There would be no clearing, grubbing, or fill of wetlands, as this reach would utilize previously disturbed areas.

2.4.3.5 Drainage Control Structures

To ensure adequate flow capacity through the components of alternative 2, three drainage control structures would be required along the levee between Hwy 90 and the Outer Cataouatche Canal (see figure 5). These drainage control structures would likely utilize box culvert designs to allow maintenance vehicles to cross the drainage canals and have access to maintain them (e.g., clean bar screens). A ramp system would be designed to provide access to the box culvert crossings from the levee crown. The structures would use steel sluice gates to allow normal flow through the structure and permit them to be closed during storm surge. These drainage control structures would remain open until the threat of hurricane storm surge required closing to prevent surge from entering through the structures.

2.4.3.6 Quantities Summary

The total area of new ROW needed to complete construction of alternative 2 would be approximately 198 acres. Approximately 164 acres of vegetated wetlands would be cleared, grubbed, and filled or cleared and excavated, approximately 7.9 acres of aquatic (open water) habitat would be created, and approximately 21 acres of aquatic habitat would be filled. In addition, approximately 12 structures would need to be demolished and removed generating approximately 1,000 cubic yards of construction and demolition debris. Constructing alternative 2 would enclose approximately 2,485 acres of wetlands within the WBV portion of the HSDRRS.

Constructing alternative 2 would require approximately:

- 110,000 linear feet of pipe or h-pile,
- 42,000 square feet of sheet pile,
- 84,500 cubic yards earthen material excavated and removed,
- 5,400 cubic yards of concrete,
- 1,900,000 cubic yards of earthen fill
- 95,000 cubic yards excavated for drainage canal
- 193,000 square yards of geotextile fabric, and
- Working 60-hour workweeks for 18 months.

2.4.4 Actions Common to All Alternatives

2.4.4.1 Armoring

Armoring may be provided at specific locations throughout the HSDRRS. Armoring may be used to protect against erosion and scour on the protected side of selected critical portions of levees and floodwalls in the HSDRRS. These critical areas include: transition points (where levees transition into any hardened feature such as other levees, floodwalls, pumping stations, etc.), utility pipeline crossings, floodwall protected side slopes, and earthen levees that are exposed to wave and surge overtopping during a 500-year hurricane storm event. Specific locations have not been fully identified.

There are five proposed methods of armoring that could be used at the critical locations:

1. ACB - Articulated concrete blocks;

2. ACB/TRM – Articulated concrete blocks/Turf reinforcement mattress: The physical conditions or hydraulic parameters are such that small modifications could allow a reduction to a TRM;
3. TRM – Turf reinforcement mattress;
4. TRM/Grass – The physical conditions or hydraulic parameters are such that small modifications could allow a reduction to a surface with good grass cover only;
5. Good grass cover.

2.4.4.2 Deep Soil Mixing

Deep soil mixing is being used on 3 of 59 construction projects that have been awarded to repair the entire levee system. Two of these projects entail using deep soil mixing to decrease lateral active earth pressures and increase lateral passive earth pressures at closure structures under construction at the mouths of interior drainage canals in New Orleans. The third deep soil mixing application is being used beneath an earthen hurricane/river flooding levee in Plaquemines Parish to improve the overall foundation competency with respect to landside slope stability.

The deep soil mixing method involves the blending of a binder (e.g., lime, cement, slag, fly ash, etc.) into the soil through a hollow stem auger and mixing tool arrangement to produce round "columns" of treated soil (Woodward, 2006). These columns of treated soil exhibit markedly different physical characteristics than the existing conditions and have proven to be a viable method to effectively improve the competency of soils in Southeast Louisiana. Both dry and wet deep soil mixing methods[7] have demonstrated that they can be used to substantially raise the in situ shear strength of the soil several orders of magnitude. Deep soil mixing is substantially more expensive than typical levee construction. All three of the locations where Task Force Guardian has utilized deep soil mixing justified the costs because the situations required rapid construction techniques, construction sequencing, and was further constrained by working in confined work areas. With the current extent of engineering completed for IER # 16, it is unknown whether deep soil mixing could be used. If detailed engineering and subsequent soil borings dictate use of the technique, the overall construction effects assessed in this IER would encompass the environmental consequences of implementing deep soil mixing.

2.4.4.3 Relocations

Where needed, utilities would be relocated to cross the project in accordance with existing hurricane damage reduction standards. Disruptions to existing facilities would be kept to a minimum.

[7] The dry mix method uses a mixing tool that is rotated downward into the soil at high speed while compressed air is blown through the binder port in the tool shearing the soil. Once the required depth is reached, the direction of the tool is reversed and dry binder is pneumatically blown into the soil as the mixing tool is withdrawn. Moisture is drawn from the in-situ soil for hydration of the binder. In the wet mix method, the binder is premixed with water to create slurry that is pumped into soil under relatively low pressures. The wet method normally produces columns of higher strength compared to dry mixed columns, but produces significant spoils compared to a relative absence of spoils with the dry mix method.

2.4.4.4 Clearing, Grubbing, and De-Mucking

Site preparation to construct earthen levee for each of the alignments would require clearing vegetation, grubbing, and stripping topsoil within the footprint of all work areas. The clearing and grubbing of the vegetation and topsoil stripping are necessary to ensure that trees, roots, and topsoil zones do not provide weak path planes where water seepage could jeopardize the integrity of the levee. Removed vegetation (e.g., woody material) would be trucked off site for disposal or beneficial reuse or would be burned in situ. The material would be deposited and stored (i.e., windrowed) in a manner to ensure that materials would not be eroded from the site. After clearing and grubbing was completed, much, if not all, of the areas where floodwall or levee is constructed through wetlands would require de-mucking prior to construction. The quantity of organic material generated has not yet been determined, but could be extensive. Material not suitable as fill within the construction ROW would be removed off site for disposal.

2.4.4.5 Operation Maintenance, Repair, Replacement and Rehabilitation

In addition to the activities necessary to construct these features, this proposed action includes all routine maintenance (e.g., mowing, inspections, re-paving, repairs to structures, in-kind replacements, and maintenance dredging) for both the local sponsor Operation Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) and USACE-related activities necessary to maintain the safety or integrity of the HSDRRS. All of these actions, including transportation and disposal of materials (e.g., dredged material) generated during operation maintenance, repair, replacement and rehabilitation, are included in the proposed action.

OMRR&R of the HSDRRS would have minimal impact on the significant resources of the area. The levees would be mowed periodically and herbicides may be used on a very limited basis around control structures. The floodwall and levees would be subject to annual inspection and repair as necessary up to and including in-kind replacement as well as the adding of subsequent lifts of earthen material to levees to address subsidence. Maintenance dredging of navigable closure structure approach channels and bypass channels as well as disposal of dredged materials would be conducted as necessary. Activities would be conducted within the existing ROW and would be within previously disturbed areas. Temporary and localized construction-related effects (e.g., noise, emissions-air quality, temporary increase in traffic, etc.) would occur during OMRR&R.

2.4.4.6 Temporary Flood Risk Reduction Contractually Required During Construction

As part of the construction process, temporary flood risk reduction would be required whenever a reach of the existing floodwall or levee would be removed until the replacement floodwall or levee was sufficiently completed to withstand floodwaters. Sufficiently completed is defined as the time when the concrete in the replacement floodwall reaches a compressive strength of 4,000 pounds per square inch and all earthwork for the floodwall/levee replacement has been completed. Typically, the contractor would provide temporary risk reduction or a cofferdam that would in no way affect the stability of the existing flood risk reduction or flood risk reduction being constructed. The contractor would maintain all temporary flood control, including maintaining and operating drainage facilities, during the time they were required. It would be the responsibility of the contractor to provide, maintain, and operate pumps of adequate capacities, for the removal of the water that could accumulate in excavations within the area protected by the temporary flood risk reduction, from whatever sources throughout the life of this project. The discharge from the pumps would be into the flood side. The contractor would remove all temporary flood control structures, and incidental features when no longer required. All materials used in providing temporary flood control structures, and any debris generated during their removal would become the property of the contractor and be removed from the job site prior to completion.

Prior to beginning work, the contractor would submit for approval their proposed plan to accomplish the specified temporary flood risk reduction. The submittal would be in accordance with Section 01330, “Submittal Procedures” and would include, but not necessarily be limited to the following:

1. Design and layout of temporary flood risk reduction works,
2. Methods and duration of maintenance of temporary flood risk reduction,
3. Methods, sequence, and equipment and materials to be used for drainage of excavations for floodwall demolition and floodwall replacement, and
4. Method and sequence of removal, including disposal of materials.

These measures provide assurance that risk reduction would be maintained during the construction process even in the event of significant flooding.

2.5 ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

The criteria used to determine whether an alternative would be feasible included consideration of engineering effectiveness, economic efficiency, and environmental and social acceptability.

2.5.1 Structural Risk Reduction Alternatives

2.5.1.1 Alternative 4

Alternative 4 would be similar to alternative 1 and would involve constructing the north-south alignment along South Kenner Road (as in alternative 1), but would have the east-west alignment constructed between the BNSF Railroad and the Union Pacific railroad, south of the alternative 1 alignment. The western completion of the alignment would finish with the north-south alignment within the east Davis Pond Guide levee. Alternative 4 would require constructing a north-south project along South Kenner Road adjacent to the Greater New Orleans Landfill and then turning to the west with an east-west project alignment immediately north of the BNSF Railroad. Alternative 4 would also require constructing a parallel drainage canal immediately north of the east west project alignment and utilizing material generated from the construction of the drainage canal as levee construction material.

Alternative 4 differs from alternative 1 in that the east west alignment in alternative 4 is further south than the Alternative 1 alignment. This shift further south of the alternative 1 alignment shifts impacts to higher quality wetlands, especially in the most western portion of the alignment. This alternative was eliminated from further consideration because similar to alternative 1, it has a higher cost and constructability issues adjacent to the Greater New Orleans Landfill. In addition, the alternative would impact higher quality wetlands than alternative 1. While alternative 4 would propose to use material excavated for construction of the drainage canal for levee construction along the east-west alignment, based on available soils information it is unlikely that the material excavated for drainage canal construction would meet the geotechnical criteria for levee construction. Therefore construction savings likely could not be realized. This alternative was eliminated from detailed consideration primarily on the basis of engineering effectiveness and economic efficiency.

2.5.1.2 Alternative 5

Alternate 5 would involve shifting the western boundary of the project further west than the westernmost boundary of all three alternatives. Shifting the western project boundary to the west Davis Pond Guide levee would shift the project outside of the approved project area for the WBV project and into the project area for the Donaldsonville to the Gulf project. Currently the Donaldsonville to the Gulf project is approved for study but not for construction. The WBV project has been approved for construction and is funded. Delaying the environmental evaluation, design, and construction of the WBV project while awaiting the outcome of the Donaldsonville to the Gulf study to be completed is in direct conflict with the goal of providing "100-year level of risk reduction in a timely manner." The Donaldsonville to the Gulf and the WBV projects are separate projects that have been authorized for study and construction respectively by Congress. This alternative was eliminated from further consideration because the proposed western completion would be outside of the approved project area and therefore could not be completed under the currently authorized project.

2.5.1.3 Alternative 6

This alignment would begin, similar to alternative 1, by following the South Kenner Road adjacent to the Greater New Orleans Landfill and then continuing in a northerly direction all the way to the Mississippi River Levee. The alignment would be through an existing utility corridor or through populated areas. In both cases either the alignment of the structures or the relocated utilities would impact existing residential areas. This alternative was eliminated from detailed consideration on the basis of social acceptability because construction of the alternative would result in impacts to homes and businesses. There is no corridor of vacant land between the end of the Greater New Orleans Landfill and the Mississippi River and constructing such an alignment would leave all residents and businesses between South Kenner Road and the Davis Pond Freshwater Diversion outside of the WBV 100-year project.

2.5.1.4 Alternative 7

This alternative would follow the general alignment of alternative 3 but would shift the water control structure over 3 miles south in Bayou Verret close to the north shore of Lake Cataouatche and tie into the Lake Cataouatche Levee south of the proposed alignment 3. The existing east Davis Pond guide levee would need to be improved and raised. Shifting the location of the water control structure to the south would significantly increase the overall length of levee required for project construction and would require a containment/unwatering system during levee construction to allow for the continued operation of Davis Pond. This alternative was eliminated from further consideration based on economic efficiency, environmental acceptability, and engineering effectiveness criteria.

2.5.1.5 Earthen Levee With Floodwall Cap

Another structural alternative considered was the construction of a floodwall (i.e., T-wall) cap atop a lower elevation levee. The floodwall on the levee could provide the necessary structural elevation on a smaller footprint than a levee alone would require. Constructing an earthen levee with a floodwall cap would require less earthen fill than the full levee. However, the floodwall component of the design would require hundreds of tons of structural steel (i.e., sheet pile and H-pile) as well as thousands of cubic yards of concrete.

This alternative was eliminated from detailed consideration for two primary reasons: the cost and because the design does not adequately address subsidence. Although possible, adding concrete over time to a pre-fabricated floodwall would not be economically viable or a desirable construction practice. Adding subsequent height to the alignment to compensate for the subsidence would significantly increase the long-term maintenance costs. As such, this alternative was eliminated from detailed consideration for failing to meet engineering effectiveness or economic efficiency criteria in the preliminary screening process.

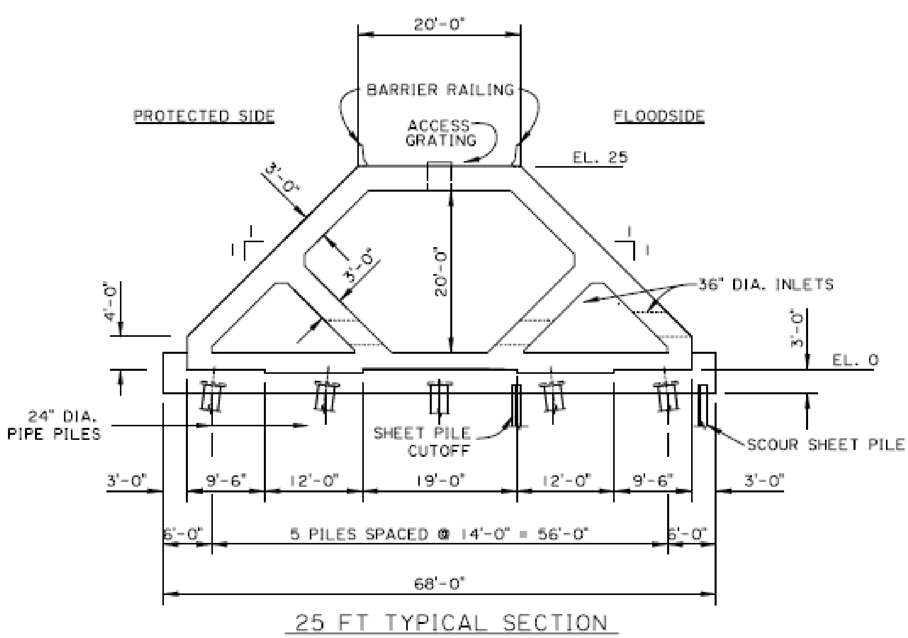
2.5.1.6 Hollow Core Levee

The concept of the hollow concrete levee system is such that the section fills with water from the bottom as the storm surge rises. The combined weight of the concrete frame and its water filled voids inside the frame result in a gravity structure that is designed to resist hydrostatic forces and impact forces from vessel collision.

Hollow concrete levees are comprised of trapezoidal shapes similar to earthen levees. The levee superstructure sections are comprised of sloped sidewalls with a flat bottom slab with access to the interior via steel grating or manholes in the crest. Water inlets or ports are incorporated into the cross-section near the levee base on the flood side to allow the section to flood with water to contribute to the overall weight for stability purposes. Shear keys in the base are designed to protect against sliding under design loading conditions. The substructure consists of a concrete base slab or pad that would be supported by steel pipe piles. Excavation and granular backfill would be required to construct the pile supported concrete pad. The concrete base slab serves a two-fold purpose. It distributes loads to the pile foundations as well as serves as a "roadway" for cast-in-place construction. A typical section is shown in figure 6.

Earthen levees and floodwalls are both more robust and resilient than hollow core levees. In the cases where earthen levees are not feasible, floodwall would be preferred over hollow core levees for the reason of engineering effectiveness.

Figure 6. Typical Hollow Core Levee Section



2.5.2 Non-Structural Risk Reduction Alternatives

In addition to the alternative alignments and different structural methods of risk reduction, non-structural alternatives were formulated to address hurricane damage reduction. However, full-scale, non-structural measures were screened out early in plan formulation because of the lack of an existing project at the Western Tie-in and due to the number of flood-prone structures in the study area.

The structural alternatives described in this IER are an integral part of the WBV Project (i.e., not a separable project element) as they would provide the tie-in to the Mississippi River Levee and complete the project on the west bank. Providing non-structural risk reduction along this reach of the WBV would result in a significant gap in the WBV project making the communities to the east of the western tie-in vulnerable to flooding. With the majority of the WBV project being constructed to an elevation of +14.5 to +15 feet NAVD88, the absence of the western tie-in would render the WBV project ineffective for floods with water surface elevations exceeding +4 feet NAVD88.[8]

The following non-structural measures were identified as potentially applicable to flood damage reduction in the study area, including: (1) acquisition of flood-prone structures, (2) floodplain zoning, and (3) floodproofing. Analysis of the non-structural measures to provide flood damage reduction eliminated most of these measures.

As with the structural alternatives, the criteria used to determine feasibility included engineering effectiveness, economic efficiency, and environmental and social acceptability. Those alternatives that did not adequately meet the criteria were considered infeasible and therefore were eliminated from detailed consideration in this IER. The screening of non-structural measures is summarized below.

2.5.2.1 Acquisition of Flood-Prone Structures

Permanent evacuation of the floodplain involves acquisition of land and structures by fee purchase or by exercising powers of eminent domain. Following acquisition, all structures and improvements are demolished or relocated. Buyout costs for approximately 1,275 residential structures in the immediate vicinity could exceed $180 million (1,275 x $144,000) and relocation costs under the Uniform Relocation Assistance Act could total an additional $20 million. The cost savings in annual flood insurance premiums, assuming 100 percent flood insurance participation by every property in the flood zone would equal roughly $240,000. This is the maximum value of the potential flood damage reduction benefits of relocation plans. Relocation of the SPH floodplain structures would result in a maximum savings of $240,000 in average annual flood damage reduction benefits, compared to over $200 million in average flood damage reduction costs (the total cost of acquisition and relocation). Under this alternative, the affected property owners would relinquish title to their existing lot in exchange for ownership of the property to which they were relocated.

No new use value would be attributed to the vacated lands. No value would be associated with reduced damages to public property, such as roads and utilities. Minor reduction in emergency services costs would be gained. No reduction in administrative costs of the National Flood Insurance Program and disaster relief programs would be anticipated.

[8] The elevation of existing risk reduction for this reach of the WBV is approximately +4 feet NAVD88 afforded by the elevation of the crown of Hwy 90 between the Davis Pond Freshwater Diversion Canal and the end of the Lake Cataouatche Levee at Hwy 90.

While environmental benefits of a buyout in the study area initially appear to be attractive, more detailed analyses of the potential benefits cannot support a positive recommendation for an acquisition/relocation plan. Restoring the ecosystem through the acquisition of flood-prone structures would generate benefits, but it is highly unlikely that these benefits would be sufficient to justify the approximate $200 million cost of the relocation of all structures in the SPH floodplain, or the scaled costs of smaller relocation efforts. Establishing Federal, state, or regional significance would be problematic because there are no designated habitats for Federal or state listed species within or near the study area. Regarding the Other Social Effects (OSE) and Regional Economic Development (RED) Accounts, the social and economic impacts resulting from the necessary displacement of 1,275 households, 20 businesses and public buildings, the demolition of an equivalent number of buildings of all types, and the removal of tens of millions of dollars in property value and tax base would have significant negative effects on the local economy. The plan would also generate significant local controversy, disrupt community cohesion, and place economic burdens on relocated families, relatives, and neighbors.

For the reasons cited previously, it is unlikely that a floodplain buyout plan would meet P&G guidelines (Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies). Additionally, the buyout plan would not provide significant offsetting environmental or economic benefits, and would have negative effects on the RED and OSE Accounts. Therefore, acquisition of flood-prone structures was eliminated from consideration as a stand-alone alternative.

2.5.2.2 Floodplain Zoning

Through proper land use regulation, floodplains can be managed to ensure that their use is compatible with the severity of a flood hazard. Several means of regulation are available, including zoning ordinances, subdivision regulations, and building and housing codes. Their purpose is to reduce losses by controlling the future use of floodplain lands. Jefferson Parish and St. Charles Parish already participate in the National Flood Insurance Program (NFIP) and manage floodplain land uses consistent with the program. However, a majority of the buildings in the study area floodplain were built prior to the adoption of NFIP zoning standards and are not subject to current floodplain zoning regulations unless they are substantially improved. Therefore, zoning cannot be considered independently as a long-term mitigation solution for flood damage reduction to existing structures.

2.5.2.3 Floodproofing

Floodproofing reduces flood damages through modifications to structures and relocation of building contents. Floodproofing techniques involve keeping water out of the structure, as well as reducing the effects of inundation. Non-structural adjustments, such as the elevation of structures, can be applied by an individual or as part of a collective action either when flood-prone buildings are under construction or through retrofitting of an existing structure. Floodproofing alone was found to be prohibitively expensive, since a majority of structures would require costly raising (an average cost of $95 per square foot, (USACE 2007a)). While eliminated as a major element in the formulation of alternative plans, selective floodproofing was retained as a flood damage reduction measure as a part of other comprehensive alternative plans.

2.6 SUMMARY

Table 1 summarizes the alternatives that were examined for each of the reaches for IER # 16.

Table 1.
Summary of Preliminary Alternative Screening Results

Alternative	**Scale**	Alt. 1	Alt. 2	Alt. 3
No Action		✓	✓	✓
Non-Structural		X	X	X
Existing Alignment				
•	Earthen Levee	X	X	X
•	Floodwall	X	X	X
•	Earthen Levee with Floodwall Cap	X	X	X
•	Earthen Levee with Deep Soil Mixing	X	X	X
Flood-side Shift				
•	Earthen Levee	n/a	n/a	n/a
•	Floodwall	n/a	n/a	n/a
•	Earthen Levee with Floodwall cap	n/a	n/a	n/a
•	Earthen Levee with Deep Soil Mixing	n/a	n/a	n/a
Protected-side Shift				
•	Earthen Levee	n/a	n/a	n/a
•	Floodwall	n/a	n/a	n/a
•	Earthen Levee with Floodwall cap	n/a	n/a	n/a
•	Earthen Levee with Deep Soil Mixing	n/a	n/a	n/a
New Alignment				
Alt.1: South Kenner Road Floodwall and West Railroad Tie-in	Floodwall and Earthen Levee	✓	✓	✓
Alt 2: North of Outer Cataouatche Canal to Mississippi River Levee	Floodwall and Earthen Levee	✓	✓	✓
Alt 3: South of Outer Cataouatche Canal to Mississippi River Levee	Floodwall and Earthen Levee	✓	✓	✓
Alt 4: South Kenner Road Floodwall and Between BNSF and UP RR	Floodwall and Earthen Levee	X	X	X
Alt 5: Western Tie-in West of Davis Pond Freshwater Diversion Canal	Floodwall and Earthen Levee	X	X	X
Alt 6: South Kenner Road Floodwall North to Mississippi River Levee	Floodwall and Earthen Levee	X	X	X
Alt 7: Levee South of Outer Cataouatche Canal With Bayou Verret Gate Near Lake Cataouatche	Floodwall and Earthen Levee	X	X	X

X: eliminated from further study ✓: considered in detail n/a: not applicable; this alternative was not formulated for this reach

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 ENVIRONMENTAL SETTING

The project area is situated on the west bank of the Mississippi River in Jefferson Parish near New Orleans, Louisiana, between approximate Mississippi River miles 105 and 114 above Head of Passes. The area is part of the Barataria Basin. The basin is bounded to the west by the Bayou Lafourche ridge, the Mississippi River to the north, the Davis Pond Freshwater Diversion Canal to the east, and the Gulf of Mexico to the south. Lakes Salvador and Cataouatche are estuary areas to the south that connect to the Gulf of Mexico through Barataria Bay. Tidal waters can be carried into the project area through Bayou Barataria, Lakes Salvador and Cataouatche, and Bayou Verret. Freshwater is introduced into the area from the Mississippi River via the Harvey and Algiers Locks, direct rainfall, pumpage from levied areas, and the Davis Pond Freshwater Diversion Canal.

3.1.1 Terrain

The area has little relief and is characteristic of an alluvial plain. Land elevations slope quickly from an average elevation of about 10 feet NAVD88 along the levee of the Mississippi River to about 1 foot to 3 feet below sea level through much of the project area. Natural ground elevations in the marsh areas in the central and southern part of the area are between –1 foot and +1 feet (USACE, 2008). The entire area is protected from Mississippi River flooding by the Mississippi River levee system. However, flooding originating in the Gulf of Mexico and Lakes Salvador and Cataouatche can travel across the marsh and through the many natural and man-made channels (e.g., Bayou Verret, Sellers Canal) to threaten the project area from the south.

3.1.2 Geology

The project area is located south of the Mississippi River, and north of Lake Cataouatche, in the north-central portion of the Mississippi River deltaic plain. Dominant physiographic features in the vicinity include the Mississippi River and its associated natural levee, Hwy 90, Lake Cataouatche, and freshwater swamps and marshes.

The surface and shallow subsurface is composed of swamp, interdistributary, and prodelta deposits. Swamp deposits are found at the surface, are approximately 20 feet thick and are composed of soft to medium clays with some silt, peat, and wood. Interdistributary deposits are approximately 25 feet thick are found beneath swamp deposits. Interdistributary deposits are characterized by very soft to soft clay with silt strata and shells. Prodelta deposits up to 25 feet thick are located below the interdistributary deposits. Prodelta deposits are generally composed of medium clay with minor amounts of silt. Bay Sound deposits approximately 5 feet thick are located beneath prodelta deposits. Bay Sound deposits are generally soft to medium clay and silty clay with shell fragments. Below Bay Sound are Pleistocene deposits characterized by oxidized, stiff to very stiff clay and silty clay with silt and some sand layers. The top of the Pleistocene surface is approximately -70 feet in elevation.

The project area contains Kenner-Allemands soils which are level, very poorly drained soils that have a moderately thick mucky surface layer and mucky and clayey underlying material in freshwater marshes (US Soil Conservation Service, Jefferson Parish, 1983 and US Soil Conservation Service, St. Charles Parish, 1987). Groundwater is at or near the surface.

Long-term relative subsidence, resulting mainly from compaction of Holocene sediments, is estimated at 0.5 feet per century. Eustatic sea level is predicted to rise an additional 1.3 feet over the next century (IPCC, 2001). Therefore, the natural, long-term, relative subsidence rate in the project area is estimated to be 1.8 feet per century.

3.1.3 Climate

The study area has a subtropical marine climate. Located in a subtropical latitude, its climate is influenced by the many water surfaces of the lakes, streams, and the Gulf of Mexico. Throughout the year, these water bodies modify the relative humidity and temperature conditions decreasing the range between the extremes. When southern winds prevail, these effects are increased, thus imparting the characteristics of a marine climate.

The area has mild winters and hot, humid summers with monthly mean temperature extremes from the low 50s in January to the low 80s in July. Temperature extremes of greater than 100°F and less than 10°F have been recorded within the last 30 years. During the summer, prevailing southerly winds produce conditions favorable for afternoon thundershowers. In the colder seasons, the area is subject to frontal movements that produce squalls and sudden temperature drops. River fogs are prevalent in the winter and spring when the temperature of the Mississippi River is somewhat colder than the air temperature.

Southeast winds predominate in the spring. The prevailing winds of the fall and winter are from the northeast. Winter storms in the area have produced wind speeds of up to 47 miles per hour (mph). The mid-late summer is often disturbed by tropical storms and hurricanes that produce the highest winds in the area.

The annual normal precipitation for New Orleans Audubon Park and New Orleans Algiers station is over 60 inches. Extreme monthly rainfalls exceeding 12 inches are common and as much as 20 inches of rainfall has been recorded in a single month. The maximum 24-hour recorded rainfall in over 50 years of monitoring at the Algiers station is over 22 inches.

3.2 SIGNIFICANT RESOURCES

This section identifies the significant resources located in the vicinity of the proposed action, and describes in detail those resources that would be impacted, directly or indirectly, by the alternatives. Direct impacts are those that are caused by the action taken and occur at the same time and place (40 CFR §1508.8(a)). Indirect impacts are those that are caused by the action and are later in time or further removed in distance, but are still reasonably foreseeable (40 CFR §1508.8(b)). Cumulative impacts are discussed in section 4.

The resources described in this section are those recognized as significant by laws, executive orders, regulations, and other standards of Federal, state, or regional agencies and organizations; technical or scientific agencies, groups, or individuals; and the general public. Further detail on the significance of each of these resources can be found by contacting the CEMVN, or on www.nolaenvironmental.gov, which offers information on the ecological and human value of these resources, as well as the laws and regulations governing each resource. Search for “Significant Resources Background Material” in the website’s digital library for additional information. Table 2 shows those significant resources found within the project area, and notes whether they would be impacted by the proposed action analyzed in this IER.

Table 2
Significant Resources in Project Study Area

Significant Resource	Impacted	Not Impacted
Air Quality	X	
Water Quality	X	
Terrestrial Habitat	X	
Aquatic Habitat	X	
Fish and Wildlife	X	
Wetlands	X	
Threatened and Endangered Species		X
Recreational Resources	X	
Aesthetic Resources	X	
Cultural Resources		X
Farmland		X

3.2.1 Air Quality

3.2.1.1 Existing Conditions

The U.S. Environmental Protection Agency (USEPA) Office of Air Quality Planning and Standards has set National Ambient Air Quality Standards (NAAQS) for six principal pollutants, called "criteria" pollutants. They are carbon monoxide, nitrogen dioxide, ozone, lead, particulates of 10 microns or less in size (PM-10 and PM-2.5), and sulfur dioxide. Ozone is the only parameter not directly emitted into the air but forms in the atmosphere when three atoms of oxygen (0^3) are combined by a chemical reaction between oxides of nitrogen (NOx) and volatile organic compounds (VOC) in the presence of sunlight. Motor vehicle exhaust and industrial emissions, gasoline vapors, and chemical solvents are some of the major sources of NOx and VOC, also known as ozone precursors. Strong sunlight and hot weather can cause ground-level ozone to form in harmful concentrations in the air.

The Clean Air Act General Conformity Rule (58 FR 63214, November 30, 1993, Final Rule, Determining Conformity of General Federal Actions to State or Federal Implementation Plans) dictates that a conformity review be performed when a Federal action generates air pollutants in a region that has been designated a non-attainment or maintenance area for one or more NAAQS. A conformity assessment would require quantifying the direct and indirect emissions of criteria pollutants caused by the Federal action to determine whether the proposed action conforms to Clean Air Act requirements and any State Implementation Plan (SIP).

The general conformity rule was designed to ensure that Federal actions do not impede local efforts to control air pollution. It is called a conformity rule because Federal agencies are required to demonstrate that their actions "conform with" (i.e., do not undermine) the approved State Implementation Plan (SIP) for their geographic area. The purpose of conformity is to (1) ensure Federal activities do not interfere with the air quality budgets in the SIPs; (2) ensure actions do not cause or contribute to new violations, and (3) ensure attainment and maintenance of the NAAQS. Federal agencies make this demonstration by performing a conformity review when the actions they are planning to carry out will be conducted in an area designated as a non-attainment or maintenance area for one of the criteria pollutants.

Because Jefferson Parish and St. Charles Parish are designated as attainment areas for the designated priority pollutants, no detailed conformity is required and direct significant environmental effects to air quality are not likely.

If one or more of the priority pollutants was not in attainment, then the proposed action would be subject to detailed conformity determinations unless these actions are clearly *de minimus* emissions. Use of the *de minimus* levels assures that the conformity rule covers only major Federal actions (USEPA, 1993). A conformity review requires consideration of both direct and indirect air emissions associated with the proposed action. Sources that would contribute to direct emissions from this project would include demolition or construction activities associated with the proposed action and equipment used to facilitate the action (e.g., construction vehicles). To be counted as an indirect emission, the Federal proponent for the action must have continuing control over the source of the indirect emissions. Sources of indirect emissions include commuter activity to and from the construction site (e.g., employee vehicle emissions). Both stationary and mobile sources must be included when calculating the total of direct and indirect emissions, but this project would involve only mobile sources.

For all of Greater New Orleans, including Jefferson Parish and St. Charles Parish, all six parameters are in attainment of the air quality standards (USEPA, 2007). Because the project area is designated as an attainment area, no conformity review is required for the proposed action.

3.2.1.2 <u>Discussion of Impacts</u>

3.2.1.2.1 <u>No Action</u>

<u>Direct and Indirect</u>

Under the no action alternative, potential direct and indirect air quality impacts associated with the construction and operation of new storm damage reduction measures in this reach would not occur. Air quality would not be predicted to change from existing conditions where periodic flooding can lead to temporary deterioration in air quality during and after flooding. Floods typically result in the contamination of surface waters with sewage and other contaminants that can contribute to poor air quality. In addition, the indirect effects to air quality from sediment clean up can lead to temporary increases in fugitive dust from street sweeping.

<u>Cumulative</u>

The transportation of debris and rubble from clean up of storm damages contribute to the cumulative effects from local emissions and decrease air quality.

3.2.1.2.2 Alternative 1

Direct

Because design reports are currently being prepared, detailed quantification of the direct emissions associated with construction of any of the action alternatives cannot be completed. Probable direct impacts to air quality would include emissions from the operation of heavy construction equipment and associated fugitive dust. This alternative represents the longest total length of structural risk reduction and the longest construction duration of any of the alternatives (approximately 26,500 linear feet of alignment and 24 month construction period) and would likely have the greatest emissions from construction. The burning in place of woody material cleared within the footprint of construction would also cause a minor and temporary decrease in air quality downwind of the burning. These direct impacts are anticipated to be localized and temporary.

Indirect

The indirect effects to air quality of implementing alternative 1 would be related to the emissions from transportation of personnel and equipment to and from the job site on a daily basis until the completion of construction.

Cumulative

The cumulative effects to air quality would be the combined emissions from the direct and indirect sources from constructing alternative 1, when added to other emissions sources within the region. These emissions and their cumulative effects are being considered separately in the CED.

3.2.1.2.3 Alternative 2

Direct

The total length of the alignment for alternative 2 would be approximately 21,500 feet and construction duration would be approximately 18 months. Constructing this shorter alignment would result in less construction-related emissions and direct effects to air quality than construction of alternative 1.

Indirect

Because of the shorter reach of alternative 2, the indirect effects to air quality from implementing alternative 2 would be expected to be commensurately less than with alternative 1.

Cumulative

The cumulative effects to air quality would be the combined emissions from the direct and indirect sources from constructing alternative 2, when added to other emissions sources within the region. These emissions and their cumulative effects are being considered separately in the CED.

3.2.1.2.4 Alternative 3 (Proposed Action)

Direct

The total length of the alignment for alternative 3 would be approximately 23,000 feet and it is estimated that construction would take 23 months. The direct effect of construction-related emissions would be more than those from alternative 2 and slightly less than alternative 1.

Indirect

The indirect effects to air quality from implementing alternative 3 would be related to the emissions from transportation of personnel and equipment to and from the job site on a daily basis until the completion of construction. The indirect effects to air quality from implementing alternative 3 would be similar to alternative 1.

Cumulative

The cumulative effects to air quality would be the combined emissions from the direct and indirect sources from constructing alternative 3, when added to other emissions sources within the region. These emissions and their cumulative effects are being considered separately in the CED.

3.2.2 Water Quality

3.2.2.1 Existing Conditions

Surface waters in the project area consist of bayous, ponds, wetlands, canals, and other drainageways. The Mississippi River forms the northern boundary of the area, but does not directly drain the area; its only hydrological connection is through the Davis Pond Freshwater Diversion Canal. The named waterbodies include the Davis Pond Freshwater Diversion Canal, the Outer Cataouatche Canal, Sellers Canal, and Bayou Verret. These waterbodies flow predominantly southward through the marshes, Davis Pond, Lake Cataouatche, Lake Salvador, Barataria Bay, and eventually into the Gulf of Mexico. Water quality in the project area is affected by both point source and non-point source discharges. Point sources include mainly industrial, municipal, and sewer discharges. Non-point sources include storm water runoff, industrial discharges, landscape maintenance activities, forestry, agriculture, and natural sources (FHWA, 2007).

Section 303(d) of the Clean Water Act (CWA) requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily loads (TMDLs) for those pollutants suspected of preventing the waterbodies from meeting their standards. TMDLs are the maximum amount of a given pollutant that can be discharged into a water body from all natural and anthropogenic sources including both point and non-point source discharges. In Louisiana, the Department of Environmental Quality (LDEQ) oversees the program.

The LDEQ surface water monitoring program is designed to measure progress towards achieving water quality goals at state and national levels, to gather baseline data used in establishing and reviewing the state water quality standards, and to provide a data base for use in determining the assimilative capacity of the waters of the state. Information is also used to establish permit limits for wastewater discharges. The program provides baseline data on a water body to monitor long-term trends in water quality.

The state of Louisiana has an ambient surface water monitoring site in the Outer Cataouatche Canal west of Avondale (sub-segment 020303 - Lake Cataouatche and tributaries). The results of ongoing water quality monitoring at this location are compared to standards in accordance with Section 303(d) of the Clean Water Act to protect the public health and welfare. The most recently reported summary (2006) indicates that at this location, Lake Cataouatche and tributaries were fully supporting the designated uses of primary contact recreation (e.g., swimming) and secondary contact recreation (e.g., boating) (LDEQ, 2006). This is for primary contact and secondary contact recreation. The remaining designation, for fish and wildlife propagation, is not fully supported. This designation was assigned in 2004 for chloride, low dissolved oxygen, high sulfates, and high total dissolved solids (LDEQ, 2006).

Surface water quality monitoring by Jefferson Parish similarly indicates that the water quality in protected side canals along the adjacent Lake Cataouatche Levee is poor (USACE, 1996). Analyses indicate that fecal coliform readings and BOD levels are typically elevated (USACE, 1996). Levels of copper and lead have also been detected at elevated levels in many of the samples (USACE, 1996). These data indicate that the water quality in the drainage canal system near the landfills often does not meet applicable water quality standards (USACE, 1996). These chronic water quality problems are not associated with runoff from the landfills because the water quality is similar to the water quality in nearby protected area waterbodies (USACE, 1996).

The following summary of the effects to water quality from Hurricane Katrina is taken from the State of Louisiana's Water Quality Management Plan Water Quality Inventory Integrated Report (LDEQ, 2006).

Most water quality sampling following Hurricane Katrina was conducted at existing ambient water quality monitoring sites throughout the impacted area. This was done in order to permit comparisons with historical data and criteria for each sampled water body. Sampling at ambient monitoring sites also allowed LDEQ to determine when these water bodies had returned to pre-storm conditions.

Results of LDEQ's testing largely agreed with what is commonly expected following a hurricane. Marshes to the south and east of New Orleans, while heavily impacted by wind and storm surge, suffered lesser long-term water quality impacts to dissolved oxygen and other parameters. This was because the area is primarily marsh as opposed to forestland, resulting in less debris being deposited into the water. However, the region did suffer from extensive marsh loss as vegetation and bottom sediments were torn up and washed away and re-deposited elsewhere. This has resulted in increased saltwater intrusion, further exacerbating the destruction of fresh and brackish marsh habitat. In some cases, areas formerly consisting of solid marsh have now become open water.

Due to the counter-clockwise winds of Hurricane Katrina, areas to the southwest, west, and northwest of New Orleans received less damage during the hurricane. Limited post-hurricane monitoring in these areas revealed relatively minor, short-term water quality impacts due to debris and storm surge.

3.2.2.2 Discussion of Impacts

3.2.2.2.1 No Action

Direct

Implementing the no action alternative would not result in any temporary or permanent direct effects to water quality of the surface waters in the project area.

Indirect

There would not be any permanent indirect effects to water quality from changes to the existing system.

Cumulative

Failing to provide this segment of the WBV with 100-year risk reduction measures would predictably, and regularly, contribute to the temporary deterioration of the surface water quality in the event of large-scale flooding. Flooding in residential and commercial areas frequently results in the mixing of surface waters with sewage, contamination of drinking water supplies, and potential mobilization of hazardous, toxic, and radioactive waste (HTRW). As floodwaters recede, these constituents all enter the surface waters causing temporary reductions in surface water quality.

3.2.2.2.2 Alternative 1

Direct

Within reach 1, the direct effects to water quality from the clearing, grubbing, placement of fill into the Outer Cataouatche Canal, and re-grading for the new levee would likely cause some temporary, construction-related decrease in the water quality. The localized temporary decrease in water quality would result from an increase in turbidity and suspended sediments, a mobilization of nutrients and detritus from the bottom leading to a localized reduction in dissolved oxygen, and a potential for the mobilization of contaminants sequestered in bottom sediments. No permanent, direct effects would be expected in the Outer Cataouatche Canal.

Construction of reaches 2 and 3 would take place in areas of significant previous disturbance and would not be expected to result in direct effects to water quality. With best management practices (e.g., sediment curtain) in place during construction, the temporary effects to water quality in reach 4 should be isolated to the immediate footprint of construction for the levee, floodwall, closure structures, canal, and drainage control structures. Earth-moving activities during construction disturb soils and can create indirect water quality effects (e.g., increased turbidity and suspended sediments) in the event of uncontrolled runoff or simply poor sediment control practices during construction.

Indirect

The indirect effects to water quality from constructing the new alignment, drainage canal, and drainage control structures would be expected to be minimal. Base discharge into the project area would remain unchanged and changes to flow would only occur during storm surge when the drainage control structures were closed. These closures would be closed a very small percentage of the time such that changes from the current water quality in the receiving waterbodies would not be predicted.

Cumulative

Should construction of reach 1 coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related water quality degradation that could have a temporary cumulative effect. Adherence to best management practices and an approved sediment control plan by the construction contractor would minimize the risk of indirect water quality effects. There would be no permanent cumulative effects to water quality anticipated by implementing alternative 1.

3.2.2.2.3 Alternative 2

Direct

In addition to the earth moving and site preparation activities within the limits of construction (e.g., clearing, grubbing, de-mucking, etc.) necessary to construct the reaches of levee and floodwall within reach 1, alternative 2 would require the placement of fill material into approximately 21 acres of open water on the north bank of the Outer Cataouatche Canal. The widening and deepening of the unnamed canal on the western end of reach 1 would transform nearly an acre of vegetated wetlands to open water habitat and would require extensive excavation to achieve the designed configuration. Constructing reach 2 would not be expected to cause changes to water quality, but reach 3 would require the excavation of almost 7 acres of vegetated wetlands into open water (drainage canal) habitat. Constructing the remainder of the alignment (reach 4) would take place in areas of previous disturbance and would not be expected to effect water quality.

Indirect

Earth-moving activities during construction disturb soils and can create indirect water quality effects in the event of uncontrolled runoff or simply poor sediment control practices during construction. Within all reaches of this alternative, clearing, grubbing, placement of fill, re-grading and excavation to construct drainage canals would likely cause some temporary, construction-related effects (e.g., increased turbidity, localized decrease in dissolved oxygen) to the water quality. No permanent effects would be expected in the Outer Cataouatche Canal or Bayou Verret. With best management practices (e.g., sediment curtain) in place during construction, the temporary effects to water quality should be isolated to the immediate footprint of construction for the levee, floodwall, closure structure, and drainage control structures.

The indirect effects to water quality from constructing the new alignment, drainage canal, closure structure and drainage control structures for alternative 2 would be expected to be minimal. Base surface water discharge into the project area would remain unchanged and changes to flow would only occur during storm surge when the drainage control and closure structures were closed. These closures would be closed a very small percentage of the time such that changes from the current water quality in the receiving waterbodies would not be predicted.

Cumulative

Should construction coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related water quality degradation that could have a temporary cumulative effect. Adherence to best management practices and an approved sediment control plan by the construction contractor would minimize the risk of indirect water quality effects. There would be no permanent cumulative effects to water quality anticipated by implementing alternative 2.

3.2.2.2.4 Alternative 3 (Proposed Action)

Direct

Because the majority of the east-west component of alternative 3 is south of the Outer Cataouatche Canal requiring two permanent closures to the Outer Cataouatche Canal, the potential direct effects to water quality from alternative 3 are the greatest. The following activities necessary to construct alternative 3 would be expected to temporarily decrease water quality in the immediate vicinity:

- Placing earthen material in approximately 2.3 acres of the open water of the Outer Cataouatche Canal for the eastern tie-in to the Lake Cataouatche Levee,
- Clearing, grubbing, and de-mucking and clearing and excavating of approximately 211 acres within the construction ROW,
- Excavating the area for and constructing the closure structure across Bayou Verret,
- Dredging the 1,000-foot long navigation bypass channel around the Bayou Verret Closure Structure construction site and constructing the bypass channel closure structures,
- Filling approximately 2.75 acres of an unnamed canal within the levee footprint east of Bayou Verret,
- Placing earthen material in approximately 4.59 acres of the open water of the Outer Cataouatche Canal for the levee crossing in the western portion of reach 2,
- Constructing two permanent bridge spans across the Outer Cataouatche Canal, and
- Excavating almost 7 acres of vegetated wetlands into open water (drainage canal) habitat.

The localized temporary decrease in water quality would result from an increase in turbidity and suspended sediments, a mobilization of nutrients and detritus from the bottom leading to a localized reduction in dissolved oxygen, and a potential for the mobilization of contaminants sequestered in bottom sediments.

Indirect

Isolation of the western portion of the Outer Cataouatche Canal from flow-through could indirectly affect water quality within the approximately 60 acre partially enclosed area. The open water would be cut off from the natural drainage south through the Outer Cataouatche Canal, Bayou Verret, and the Bayou Verret bypass channel leading to a predictable decline in water quality from an increase in water temperatures, a decrease in dissolved oxygen content, and diminished flow (i.e., stagnation). At the same time a 50-foot cut (to elevation zero NAVD88) would be constructed in the Davis Pond East guide levee. The cut would connect this area to Davis Pond Freshwater Diversion discharge and reconnect the area to Mississippi River fresh water and nutrients. The reintroduction of Mississippi River water into the 60 acre area would likely result in a net benefit to water quality.

The water quality in the eastern portion of the Outer Cataouatche Canal (but to the west of the eastern-most closure) may also decline from the diminished flow in the canal even though the canal would still be connected through Bayou Verret and the Bayou Verret bypass channel. The water quality in proximity to the new western terminus of the Outer Cataouatche Canal (on the flood side of the eastern-most closure) would also be diminished because flow would only be possible in a southern direction.

Base discharge into these waterbodies would remain unchanged and the changes to flow during storm surge (when the Bayou Verret closure gate and the bypass channel gates would be closed) would be such a small percentage of the time that changes from the current water quality in the remaining areas would not be predicted.

Cumulative

Should construction coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related water quality degradation that could have a temporary cumulative effect. Adherence to best management practices and an approved sediment control plan by the construction contractor would minimize the risk of indirect water quality effects. There would be no permanent, cumulative effects to water quality anticipated by implementing alternative 3.

3.2.3 Terrestrial Habitat

3.2.3.1 Existing Conditions

Large portions of the terrestrial habitat within the potential footprint of disturbance for these three alternatives persist in a substantially natural condition, as does the terrestrial habitat on the interior of the various alignments, despite the existing physical barriers to surface water flow on all sides. Vegetation communities can be grouped into the following habitats: bottomland hardwoods, cypress/tupelo swamp, scrub/shrub, freshwater marsh, developed areas, and open water (FHWA, 2007). Bottomland hardwoods, cypress swamp, and marsh are all considered wetland habitats and figures 7 and 8 are photographs of bottomland hardwoods and marsh within the project area.

In developed areas, naturally occurring vegetation has been disturbed as a result of construction of roadways, railroad, landfills, buildings, parking lots, utility ROWs, and residences. Standard mixed vegetation associated with human communities is primarily kept in a low state of succession by regular mowing and/or maintenance. These areas tend to be populated by woody species that were present prior to clearing and certain invasive plant species and often tend to have a strong brush and herbaceous component. Figure 9 shows the disturbed vegetation on the western side of South Kenner Road (looking north) close to the landfills. Figure 10 shows the maintained herbaceous vegetation on the Davis Pond Guide levee south of the Outer Cataouatche Canal (looking west), and figure 11 shows the construction ROW east of the Davis Pond Freshwater Diversion Canal. The photo for figure 11 was taken from the top of the Mississippi River Levee looking south towards Hwy 90.

Figure 7. Bottomland Hardwoods North of the Outer Cataouatche Canal

Figure 8. Marsh Habitat East of Bayou Verret and South of the Outer Cataouatche Canal

Plant species common to bottomland hardwood forests include bald cypress (*Taxodium distichum*), water oak (*Quercus nigra*), willow oak (*Quercus phellos*), overcup oak (*Quercus lyrata*), hackberry (*Celtis laevigata*), red maple (Acer rubrum), green ash (*Fraxinus pennsylvanica*), pecan (*Carya illinoensis*), American elm (*Ulmus americana*), box elder (Acer negundo), palmetto (Sabal minor), elderberry (*Sambucus canadensis*), and deciduous holly (Ilex decidua). Swamps are predominantly comprised of bald cypress and tupelo (*Nyssa aquatica*) in the overstory, with the potential to support red maple, water locust (*Gleditsia aquatica*), and buttonbush (*Cephalanthus occidentalis*) as well as emergent wetland plants.

Fresh marsh and open water areas support emergent and submerged aquatic vegetation. Vegetation found in emergent wetlands includes smartweed (*Polygonum*), rushes (*Juncus and Eleocharis*), sedges (*Carex* and *Cyperus*), reeds (*Phragmites*), pickerelweed (*Pontederia cordata*), bulltongue (*Sagittaria lancifolia*), alligator weed, (*Alternanthera philoxeroides*), lizardtail (*Saururus cernuus*), wild rice (*Zizania aquatica*), and cattail (*Typha*).

Wet ditches present on either side of Hwy 90 in the study area support a preponderance of emergent vegetation. Open water areas can support emergent vegetation along banks and levees and floating and submerged aquatic plants including pennywort (*Hydrocotyle ranunculoides*), American frog-bit (*Limnobium spongia*), water hyacinth (*Eichhornia crassipe*s), water lettuce (*Pistia stratiotes*), duck weed (*Lemna minor*), parrotfeather (*Myriophyllum aquatica*), waterweed (*Elodea*), and the invasive hydrilla (*Hydrilla verticillata*). Agricultural lands in the study area primarily support sugarcane, cattle, and hay production. Sugar cane occupies the largest acreage. In addition to the crops, trees present on the agricultural lands include live oak (*Quercus virginiana)*, pecan (*Carya illinoensis*), southern magnolia (*Magnolia grandiflora*), sweetgum (*Liquidambar styraciflua*), hackberry, and bald cypress. Native grasses that may be present in conjunction with crops or in pasture include barnyard grass (*Echinochloa walteri*), rye grass (*Elymus virginicus*), and switchgrass (*Panicum virgatum*).

Figure 9. Western Side of South Kenner Road Looking North

Figure 10. Davis Pond Guide Levee South of Outer Cataouatche Canal Looking West

Figure 11. Construction ROW East of the Davis Pond Freshwater Diversion Canal Looking South

3.2.3.2 Discussion of Impacts

3.2.3.2.1 No Action

Direct

Under the no action alternative, potential direct terrestrial habitat impacts associated with the construction and operation of the additional storm damage reduction measures would not occur.

Indirect

In the absence of constructing the Western Tie-in, the indirect effects to the existing terrestrial habitat communities north of Hwy 90 would persist, despite the physical barriers to surface water flow on all sides. The BNSF Railroad, Union-Pacific Railroad, South Kenner Road, Hwy 90, and the Davis Pond Freshwater Diversion Canal guide levee already enclose and affect the terrestrial habitat observed north of Hwy 90. The foundations for these linear features typically have poorly-maintained culverts and drainage ditches subject to sedimentation. Taking no action to provide the 100-year project would likely not affect the decline in vegetation quality already occurring to the habitat enclosed by these linear features.

Cumulative

There would be no cumulative effects to terrestrial habitat if there were no action taken on the Western Tie-in.

3.2.3.2.2 Alternative 1

Direct

Direct effects to terrestrial habitat as a result of constructing alternative 1 would be permanent within the construction ROW. The terrestrial habitat that would be permanently destroyed, includes, by reach, approximately:

Reach 1 - 7.8 acres of vegetated wetlands (scrub/shrub),
Reach 2 – 1 acre of vegetated wetlands (scrub/shrub),
Reach 3 – 3.86 acres of developed areas (mowed-maintained),
Reach 4 – 181 acres of vegetated wetlands (both shrub-scrub and bottomland hardwood forest) and 5.5 acres of maintained ROW.

Indirect

The indirect effects of construction (e.g., noise, fugitive dust, etc.) would have only temporary effects to the terrestrial habitat. Another indirect effect to the terrestrial habitat adjacent to the footprint of construction would likely include the unintended introduction of exotic plant species and creation of conditions favorable for their growth.

Cumulative

Should construction coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related disturbance to nearby terrestrial habitat that could have a temporary cumulative effect.

3.2.3.2.3 Alternative 2

Direct

Direct effects to terrestrial habitat as a result of constructing alternative 2 would be permanent within the construction ROW. The terrestrial habitat that would be permanently destroyed, includes, by reach, approximately:
Reach 1- 136.2 acres of vegetated wetland, of which 8 acres would be bottomland hardwood forest and 128.2 would be scrub/shrub,
Reach 2 - 1 acre of vegetated wetlands (scrub/shrub),
Reach 3 – 26.4 acres vegetated wetlands (scrub/shrub and bottomland hardwood forest), and
Reach 4 – 55 acres of maintained ROW.

Indirect

The indirect effects of construction (e.g., noise, fugitive dust, etc.) would have only temporary effects to the terrestrial habitat. The unintended introduction of exotic plant species during the construction process would also be highly likely.

Cumulative

Should construction coincide with construction activities for IER #15 (Lake Cataouatche Levee located immediately to the east of IER #16), there could be construction-related disturbance to nearby terrestrial habitat that could have a temporary cumulative effect.

3.2.3.2.4 Alternative 3 (Proposed Action)

Direct

Direct effects to terrestrial habitat as a result of constructing alternative 3 would be permanent within much of the construction ROW. The terrestrial habitat that would be permanently destroyed includes, by reach, approximately:
Reach 1- 38 acres of vegetated wetland (marsh),
Reach 2 – 143 acres of vegetated wetland (marsh,scrub/shrub and bottomland hardwood forest),
Reach 3 – 1 acre of vegetated wetlands (scrub/shrub),
Reach 4 – 28.75 acres of vegetated wetlands (scrub/shrub and bottomland hardwood forest), and
Reach 5 – 56 acres of maintained ROW.

In addition, approximately 4 acres of vegetated wetland (scrub/shrub and bottomland hardwood forest) would be temporarily destroyed for construction laydown and temporary bridge access between Hwy 90 and the Outer Cataouatche Canal. These areas would be available for restoration after the completion of construction.

Indirect

The indirect effects of construction (e.g., noise, fugitive dust, etc.) would have only temporary effects to the terrestrial habitat. The unintended introduction of exotic species, or creations of perturbations to the ground surface favorable to exotic species proliferation, would be a likely indirect effect of implementing the proposed action.

Cumulative

Should construction coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related disturbance to nearby terrestrial habitat that could have a temporary cumulative effect.

3.2.4 Aquatic Habitat

3.2.4.1 Existing Conditions

Most of the open water habitats in the project area consist of freshwater canals, ditches, and maintained navigation channels. Almost all of the interior water bodies are designed for, and function as, drainage for the developed areas to the north and east. Within these canals, flow is sluggish to non-existent, except during and shortly after a rain. The shallower areas support submerged and/or floating aquatic vegetation such as Eurasian water milfoil, coontail, pondweeds, naiads, fanwort, water hyacinth, and American lotus. Many of the smaller canals become choked with aquatic vegetation during the summer and most are subjected to large variations in flow because of their drainage function. Figure 12 shows mats of floating water hyacinth in the Outer Cataouatche Canal (looking west).

Figure 12. Outer Cataouatche Canal Aquatic Habitat

3.2.4.2 Discussion of Impacts

3.2.4.2.1 No Action

Direct, Indirect, and Cumulative

Under the no action alternative, no changes from the existing conditions and therefore no impacts to aquatic habitat within the footprint of disturbance would occur. There would be no changes to the runoff or discharges to protected side or flood side canals allowing the factors that have contributed to lower quality aquatic habitat to continue. In the absence of a new Western Tie-in, there would be no direct, indirect, or cumulative effects.

3.2.4.2.2 Alternative 1

Direct

Direct and permanent effects from implementation of alternative 1 would result from the placement of earthen material into approximately 1.4 acres of the aquatic habitat of the Outer Cataouatche Canal to construct reach 1. Constructing reaches 2 and 3 of alternative 1 would not have effects to aquatic habitat. Construction of reach 4, including the digging of the new protected side-canal (185 feet wide x 13,000 feet long), would create approximately 55 acres of new aquatic habitat where there is currently primarily scrub/shrub wetland. Clearing, grubbing, construction, and re-grading for alternative 1 could cause some temporary, construction-related degradation of water quality within these wetlands, but would have the long-term effect of creating more than 50 acres of new aquatic habitat.

Indirect

With best management practices (e.g., sediment curtain) in place during construction, the indirect effects to water quality should be isolated to the immediate vicinity of active construction and would be temporary.

Cumulative

Potential cumulative impacts on the aquatic habitat would primarily involve the loss of open water habitat in the Outer Cataouatche Canal from alternative 1 (1.4 acres) combined with the loss of approximately 10 acres of aquatic habitat from constructing the Lake Cataouatche Levee (IER # 15) to the east and south. The area of potentially affected aquatic habitat in the entire Outer Cataouatche Canal is more than 350 acres.

3.2.4.2.3 Alternative 2

Direct

Direct and permanent effects from implementation of alternative 2 would result from the placement of earthen material into approximately 21 acres of the aquatic habitat of the Outer Cataouatche Canal to construct reach 1. However, widening and deepening the unnamed drainage canal on the western end of reach 1 would create 1 additional acre of aquatic habitat.

Constructing reach 2 of alternative 2 would not effect aquatic habitat. Construction of reach 3, including widening and deepening an existing drainage canal, as well as excavating a new protected-side drainage canal (100 feet wide x 2,700 feet long), would create almost 7 acres of new aquatic habitat.

Indirect

Clearing, grubbing, construction, and re-grading for alternative 2 could cause some indirect temporary, construction-related degradation of water quality within adjacent wetlands, but would have the long-term effect of creating more than 8 acres of new aquatic habitat. Implementation of best management practices and sediment management during construction should minimize the risk of temporary indirect effects to aquatic habitat.

Cumulative

Potential cumulative impacts on the aquatic habitat would primarily involve the loss of open water habitat in the Outer Cataouatche Canal from alternative 2 (21 acres) combined with the loss of approximately 10 acres of aquatic habitat from constructing the Lake Cataouatche Levee (IER # 15) to the east and south. The area of potentially affected aquatic habitat in the entire Outer Cataouatche Canal is more than 350 acres.

3.2.4.2.4 Alternative 3 (Proposed Action)

Direct

Direct and permanent effects to aquatic habitat from constructing reach 1 would result from constructing the closure of the Outer Cataouatche Canal on the eastern end of the alignment, the navigation closure gate in Bayou Verret, the Bayou Verret navigation bypass channel and closure gates, and the eastern-most permanent access bridge across the Outer Cataouatche Canal. Reach 2 would require permanently filling 2.75 acres of aquatic habitat in an unnamed canal in the footprint of construction, permanently filling 4.6 acres of aquatic habitat for the alignment's western crossing of the Outer Cataouatche Canal, disturbance from constructing the western-most permanent access bridge across the Outer Cataouatche Canal, and excavating an additional 1 acre of aquatic habitat by widening an existing drainage canal similar to alternative 2. Constructing reach 3 of alternative 3 would not have effects to aquatic habitat. Construction of reach 4, including widening and deepening an existing drainage canal, as well as excavating a new protected-side drainage canal (100 feet wide x 2,700 feet long), would create almost 7 acres of new aquatic habitat. Clearing, grubbing, construction, and re-grading for alternative 3 could cause some temporary, construction-related degradation of water quality within adjacent wetlands, but would have the long-term effect of creating more than 7.7 acres of new aquatic habitat.

Indirect

Implementation of best management practices and sediment management during construction should minimize the risk of temporary, construction-related, indirect effects to aquatic habitat. The aquatic habitat includes the area where the fill would be placed and the potential area of disturbance during construction. There would be no changes predicted to the aquatic habitat of unmodified inner canals, as the source of that water would remain unchanged and no significant alterations in operations would be expected. Indirect effects to aquatic habitat from construction (e.g., increased local turbidity, decreased dissolved oxygen, vibration, and subsurface noise) would have only temporary effects and would not be considered significant.

Construction of the western closure of the Outer Cataouatche Canal would result in the isolation of the western portion of the Outer Cataouatche Canal from flow-through and could indirectly decrease the quality of the aquatic habitat within the approximately 60-acre partially enclosed area. The open water would be cut off from the natural drainage south through the Outer Cataouatche Canal and Bayou Verret. However, the 50-foot cut (to elevation zero NAVD88) would be constructed in the Davis Pond East guide levee connecting this area to the Davis Pond Freshwater Diversion discharge and reconnect the area to Mississippi River fresh water and nutrients. The anticipated decline in water quality from an increase in water temperatures, a decrease in dissolved oxygen content, and diminished flow (i.e., stagnation) caused by the construction of the closure would be reduced by the construction of the cut. The reintroduction of Mississippi River water into the 60-acre area would likely result in a net benefit to aquatic habitat.

The aquatic habitat in the eastern portion of the Outer Cataouatche Canal (but to the west of the eastern-most closure) may decline from the diminished flow in the canal even though the canal would still be connected through Bayou Verret. The aquatic habitat in proximity to the new western terminus of the Outer Cataouatche Canal (on the flood side of the eastern-most closure) would also decrease because flow would only be possible in a southern direction.

<u>Cumulative</u>

Potential cumulative impacts on the aquatic habitat would primarily involve the loss of open water habitat from alternative 3 (10 acres), combined with the loss of approximately 10 acres of aquatic habitat from constructing the Lake Cataouatche Levee (IER # 15) to the east and south. The area of potentially affected aquatic habitat in the entire Outer Cataouatche Canal is more than 350 acres.

3.2.5 Fish and Wildlife

3.2.5.1 <u>Existing Conditions</u>

The benthos of the interior canals is dominated by low water quality tolerant species adapted to the soft substrates (e.g., midges and oligochaetes) (USACE, 1996). Fish in the interior canals are similarly represented by species tolerant of low dissolved oxygen (shortnose and longnose gar and bowfin). The diversity of species in the Outer Cataouatche Canal indicates moderately improved water quality and consists of a mixture of fresh and saltwater species, including sunfish species, channel catfish, shortnose and longnose gar, striped mullet, and gizzard shad (USACE, 1996). The Outer Cataouatche Canal forms the southern boundary of the project area and is heavily used for access to Lake Cataouatche, Lake Salvador, Salvador wildlife management area, and Couba Island/Timken wildlife management area by sport and commercial fishermen (USACE, 1996).

Many species of waterfowl (e.g., wood ducks, blue-winged teal, green-winged teal, and mallards) utilize the canals, borrow pits, and forested wetlands as permanent residents or for wintering (USACE, 1996). Numerous other game birds are present in or adjacent to the project area, including American coot, rails, gallinules, common snipe, and American woodcock.

Passerine and wading bird species also utilize the area, including least bittern, pied-billed grebe, killdeer, and various species of gulls and terns. Two active rookeries are located less than ten miles west and southwest of the project area. Those rookeries support nearly 1,000 nesting tricolor herons, little blue herons, cattle egrets, snowy egrets, and white and glossy ibis (USACE, 1996), but are at too great a distance to be affected by the proposed activities.

Although not concentrated at any single location, wading bird nests are common in the treetops between the Outer Cataouatche Canal and Hwy 90 (see figure 13).

Many permanent resident and wintering birds of prey can be observed in the general area (USACE, 1996). Permanent residents include red-shouldered hawk, barn owl, common screech owl, great horned owl, and barred owl. Winter residents include red-tailed hawk, northern harrier, and American kestrel. The Mississippi kite and broad-winged hawk are common summer residents (breeding in the general area). In addition, the area supports many species of resident and migratory passerine birds; cuckoos, swifts, hummingbirds, goatsuckers, woodpeckers, and belted kingfishers are also present.

Bald eagle nesting territories are approximately 2 square miles and nesting has been documented near Lake Cataouatche, St. Charles Parish (USGS, 2008). Nests are characteristically found in large trees near the water's edge and are rarely found in areas of heavy human use (USGS, 2008). Bald eagles would not be expected to nest within or near the proposed alignments, but may use the Outer Cataouatche Canal and Bayou Verret for foraging.

Important game mammals occurring in the project area include white-tailed deer, eastern cottontail, swamp rabbit, gray squirrel, and fox squirrel. Furbearers include nutria, striped skunk, raccoon, and mink. Other land mammals inhabiting the project area include various species of insectivores, bats, rodents, coyote, and the nine-banded armadillo (USACE, 1996).

Amphibians expected to occur on canal and ditch edges and forested wetlands of the project area include lesser siren, three-toed amphiuma, Gulf Coast toad, eastern narrow mouthed toad, Fowler's toad, green tree frog, cricket frog, bronze frog, and bullfrog. Commercially important reptiles found in the project-area canals include American alligator, common snapping turtle, alligator snapping turtle, and softshell turtles. Other reptiles commonly found in the project area include red-eared turtle, painted turtle, Mississippi mud turtle, stinkpot, green anole, broad-headed skink, various water snakes, western ribbon snake, speckled king snake, and western cottonmouth.

Urban expansion in the upper portions of the drainage areas has led to increased eutrophication of many of the waterways. Important factors in that process include increased volume of nutrient-laden urban runoff, decreased acreage of wetlands that serve to filter nutrients emanating from developed urban areas, and increased structural flood control and drainage measures which directly bypass adjacent wetlands and shunt urban runoff into downstream aquatic systems. Consequently, degraded water quality in the Barataria Basin remains a concern relative to fish and wildlife resources, as reported by the Barataria Terrebonne National Estuary Program Comprehensive Conservation and Management Plan (Moore and Rivers, 1996).

Figure 13. Wading Bird Nests Between Outer Cataouatche Canal and Hwy 90

3.2.5.2 Discussion of Impacts

3.2.5.2.1 No Action

Direct

Under the no action alternative, there would be no direct impacts to the fisheries and wildlife of the terrestrial habitat, Outer Cataouatche Canal, Bayou Verret, Lake Cataouatche, or Barataria Bay.

Indirect

Failing to provide risk reduction for the IER # 16 area would allow contamination of surface waters during flooding by floodwaters mobilizing contaminants from domestic, industrial/commercial, or municipal sources (e.g., sanitary sewage, chemicals from industrial facilities). Although diluted by the volume of water associated with flooding, these constituents enter the aquatic environment, and food chain, during floods.

Cumulative

Under the no action alternative, there would be no cumulative changes to fish and wildlife abundance and diversity and the area would remain substantially unchanged.

3.2.5.2.2 Alternative 1

Direct

Direct and permanent effects to fish habitat would result from the placement of earthen material into approximately 1.4 acres of the aquatic habitat of the Outer Cataouatche Canal to construct reach 1. There would be minor permanent effects to wildlife for alternative 1 because of the permanent loss of terrestrial habitat from the clearing and grubbing for construction on approximately 190 acres of vegetated wetlands. Mobile species of fish and wildlife could find refuge in nearby habitat, but sessile and dormant species would likely be destroyed during construction. Fish and aquatic species of wildlife could benefit from the excavation of approximately 55 acres of new drainage canal.

Indirect

Indirect effects to fish and wildlife species due to construction activities (e.g., noise, vibration) within adjacent wetlands or aquatic habitat would be short term and temporary. However, the area of disturbance is a relatively small part of the local aquatic ecosystem and mobile species could find refuge in other areas until the construction disturbance is over.

Ongoing coordination with the U.S. Fish and Wildlife Service (USFWS) indicates that no significant effects to fish or wildlife are expected to occur. As such, the responsibilities of the USACE to protect migratory birds under Executive Order (EO) 13,186 (66 FR 3853 (17 January 2001)) would be met. This EO establishes further coordination requirements with the USFWS when agency actions have, or are likely to have, a measurable negative effect on migratory bird populations.

Cumulative

Should construction of alternative 1 coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related disturbance to nearby fish and wildlife that could have a temporary cumulative effect. The cumulative effects to fish and wildlife from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.5.2.3 Alternative 2

Direct

Direct and permanent effects to fish habitat would result from the placement of earthen material into approximately 21 acres of the aquatic habitat of the Outer Cataouatche Canal to construct reach 1. There would also be permanent effects to wildlife because of the permanent loss of terrestrial habitat from the clearing and grubbing for construction on approximately 164 acres of vegetated wetlands.

Indirect

Mobile species of fish and wildlife could find refuge in nearby habitat, but sessile and dormant species would likely be destroyed during construction. Fish and aquatic species of wildlife could benefit from the excavation of approximately 8 acres of new drainage canal. Indirect effects would be similar to alternative 1.

Cumulative

Should construction of alternative 2 coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related disturbance to nearby fish and wildlife that could have a temporary cumulative effect. The cumulative effects to fish and wildlife from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.5.2.4 Alternative 3 (Proposed Action)

Direct

Direct and permanent effects to fish habitat would result from the placement of earthen material into approximately 12 acres of the aquatic habitat of the Outer Cataouatche Canal. There would also be permanent effects to wildlife because of the permanent loss of terrestrial habitat from the clearing and grubbing or excavating for construction on approximately 211 acres of vegetated wetlands. These areas would be transformed from natural habitat by removing all of the vegetation and constructing the new alignment or related features.

Dredging of the navigation channel for Bayou Verret and the Bayou Verret bypass channel excavation would cause temporary localized increases in turbidity from the disruption of sediments during construction. Mobile species of fish and wildlife could find refuge in nearby habitat, but sessile and dormant species would likely be destroyed during construction. Fish and aquatic species of wildlife could benefit from the excavation of approximately 8 acres of new drainage and bypass canals.

Indirect

The footings of the permanent bridges across the Outer Cataouatche Canal would be set in open, soft-bottomed, deep-water areas of the canal. These supports would provide a hard structural substrate attractive to small and predatory fishes. The bridges would also produce a shaded area providing refuge from sunlight; these aspects would be beneficial to fish.

Construction of the western closure of the Outer Cataouatche Canal would result in the isolation of the western portion of the Outer Cataouatche Canal from flow-through and could indirectly alter the fish community sustainable within the approximately 60-acre partially enclosed area. The open water would be cut off from the drainage south through the Outer Cataouatche Canal, Bayou Verret, and the Bayou Verret bypass channel. At the same time, a 50-foot cut (to elevation zero NAVD88) would be constructed in the Davis Pond East guide levee. The cut would connect this area to Davis Pond Freshwater Diversion discharge and reconnect the area to Mississippi River fresh water and nutrients. The reintroduction of Mississippi River water into the 60-acre would likely result in a net benefit to fish habitat.

Fish habitat in the eastern portion of the Outer Cataouatche Canal (but to the west of the eastern-most closure) may be altered from the diminished flow in the canal, even though the canal would still be connected through Bayou Verret and the Bayou Verret bypass channel. The fish habitat in proximity to the new western terminus of the Outer Cataouatche Canal (on the flood side of the eastern-most closure) would decrease because flow would only be possible in a southern direction.

Cumulative

Should construction of alternative 3 coincide with construction activities for IER # 15 (Lake Cataouatche Levee located immediately to the east of IER # 16), there could be construction-related disturbance to nearby fish and wildlife that could have a temporary cumulative effect. The cumulative effects to fish and wildlife from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.6 Wetlands

3.2.6.1 Existing Conditions

Nearly 25 percent (140,000 acres) of Barataria Basin wetlands have been lost over the past 30 years via conversion to open-water areas or uplands (USACE, 1996). Contributing factors responsible for those wetland losses include subsidence, saltwater intrusion, sea level rise, canal and levee construction, urban expansion, and navigation and flood-control projects. Such wetland losses have resulted in serious biological and socioeconomic impacts. Aquatic species, while gaining newly available open water habitat, are adversely affected by decreases in productivity, nursery habitat, and detrital export associated with wetland loss. All terrestrial or semi-aquatic animals are adversely affected by the loss of cover, nesting, and feeding habitat. Even relatively small or localized wetland losses can, when combined with other such events, have significant, long-term impacts to fish and wildlife resources on a regional scale.

During field visits, many areas exhibited visual wetland characteristics (see figure 14 looking west at wetland habitat south of Outer Cataouatche Canal).

Swamp habitat features semi-permanent inundation of large areas of land by shallow bodies of water, generally with a substantial number of dry-land protrusions. The vegetation composition of swamps typically includes bald cypress, tupelo, black willow, green ash, buttonbush, water lily (*Nymphaea odorata*), pickerelweed (*Pontederia cordata*), smartweed (*Polygonum punctatum*), alligator weed (*Alternanthera philoxeroides*), and duckweed (*Lemna minor*).

Typical marsh species observed in the project area include soft rush (*Juncus effusus*), spikerush (*Eleochoris spp*.), sedges (*Cyperus spp*.), bulltongue (*Sagittaria falcata*), pickerelweed, smartweed, alligatorweed, water hyacinth (*Eichhornia crassipes*), and deer pea (*Vigna luteola*).

Bottomland forest habitat exists in the project area in increasing density proceeding from east to west south of Hwy 90. In the bottomland hardwood forested potential wetlands, typical species include black willow, bald cypress (*Taxodium distichum*), green ash (*Fraxinus pennsylvanica*), tupelo (*Nyssa aquatica*), nuttall oak (*Quercus nuttallii*), water oak (*Quercus nigra*), American elm (*Ulmus americana*), red maple (*Acer rubrum*), elderberry (*Sambucus canadensis*), palmetto (*Sabal minor*), lizards tail (*Saururus cernuus*), trumpet creeper (*Campsis radicans*), cinnamon fern (*Osmunda cinnamomea*), poison ivy (*Toxicodendron radicans*), and sawgrass (*Cladium jamaicense*).

The USFWS field investigations determined that the site provides valuable habitat for an abundance of wildlife species. The marshlands and forested wetlands provide feeding, resting, nesting, hunting, and escape habitat to numerous species of game and non-game mammals and commercially important furbearers, as well as songbirds, raptors, migratory and resident waterfowl, wading birds, woodpeckers, and many species of amphibians and reptiles.

Figure 14. Wetland Habitat South of the Outer Cataouatche Canal

3.2.6.1.1 No Action

Direct

There would be no direct impacts to wetlands under the no action alternative.

Indirect

In the absence of the HSDRRS, the wetlands within the project area would continue to be influenced by the suburban housing development to the north and the surface water flow limitations from the existing barriers, culverts, and canals. The existing wetland communities north of Hwy 90 persist despite physical barriers to surface water flow on all sides. The BNSF Railroad, Union-Pacific Railroad, South Kenner Road, Hwy 90, and Davis Pond Freshwater Diversion Canal guide levee already enclose and affect the wetlands observed north of Hwy 90. The foundations for these linear features typically have poorly-maintained culverts and drainage ditches subject to sedimentation. Taking no action to provide the 100-year project would likely not affect the wetlands habitat enclosed by these linear features.

Cumulative

Under the no action alternative, there would be no cumulative changes to wetlands and the area would remain substantially unchanged.

3.2.6.1.2 Alternative 1

Direct

A total of 190 acres of vegetated wetland habitat would be directly impacted by the construction of alternative 1. Impacts would be from mechanically clearing, grubbing, and filling (or excavating in the case of new drainage canals) the area to construct the features.

Indirect

Indirect effects of implementing alternative 1 on wetlands include the relocation of motile organisms to nearby habitats along with the localized noise, vibration, and deterioration in water quality associated with construction. Design of the surface water controlling features (canals, drainage control structures, and culverts) would be completed to maintain the combined cross sectional area of drainage, thereby minimizing the potential for indirect effects on wetlands within the new alignment. There are approximately 17 acres of wetland that would be on the protected side of the alternative 1 alignment.

Cumulative

Potential cumulative impacts on wetlands from construction of alternative 1 would involve the combined effects from construction of the entire WBV and LPV projects as well as other CEMVN, federal, state, parish, and private citizen projects that effect wetlands in the greater New Orleans area. The cumulative effects to wetlands from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.6.1.3 Alternative 2

Direct

Constructing alternative 2 would cause the direct loss of approximately 164 acres of vegetated wetland habitat. Impacts would be from mechanically clearing, grubbing, and filling (or excavating in the case of new drainage canals) the area to construct the features.

Indirect

Indirect effects of implementing alternative 2 on wetlands include the relocation of motile organisms to nearby habitats along with the localized noise, vibration, and deterioration in water quality associated with construction. Design of the surface water controlling features (canals, drainage control structures, and culverts) would be completed to maintain the combined cross sectional area of drainage, thereby minimizing the potential for indirect effects on wetlands within the new alignment. There are approximately 2,500 acres of wetland that would be on the protected side of the alternative 2 alignment.

An additional indirect effect involves the potential to induce commercial or residential development north of Hwy 90 because of the new 100-year project. Resources agencies have stated their concern that constructing the risk-reduction project south of Hwy 90 would enable commercial and residential development (i.e., induced development) where development would not occur without the project. In these cases, where enclosure of wetlands is unavoidable, the USFWS has recommended that non-developmental easements on enclosed wetlands should be acquired, and hydrologic connections with adjacent, un-enclosed wetlands should be maintained to minimize secondary impacts from development and hydrologic alteration.

USACE policy is that the CEMVN would mitigate, to the extent justified, the adverse direct environmental impacts of projects. However, the CEMVN would not mitigate for speculative indirect impacts related to future land development, which would be subject to compliance with local and state permit and zoning requirements. Federal, local, and state interests would be responsible for approving or denying permits to construct and defining the appropriate mitigation requirements for future land development activities, should they occur. (See appendix G for a copy of USACE Headquarters Policy on Mitigation for Induced Development).

Cumulative

Potential cumulative impacts on wetlands from construction of alternative 2 would involve the combined effects from construction of the entire WBV and LPV projects as well as other CEMVN, Federal, state, parish, and private citizen projects that effect wetlands in the greater New Orleans area. The cumulative effects to wetlands from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.6.1.4 Alternative 3 (Proposed Action)

Direct

Constructing alternative 3 would cause the direct loss of approximately 211 acres of vegetated wetland habitat including fresh marsh, scrub/shrub and wet bottomland hardwoods. Impacts would be from mechanically clearing, grubbing, and filling (or excavating in the case of new drainage canals) the area to construct the features.

Other direct effects of implementing alternative 3 on wetlands include the relocation of motile organisms to nearby habitats along with the localized noise, vibration, and deterioration in water quality associated with construction.

Indirect

Design of the surface water controlling features (canals, drainage control structures, and culverts) is being completed to maintain the combined cross sectional area of drainage equal to the cross sectional area of drainage through Hwy 90, thereby minimizing the potential for indirect effects on the approximately 2,500 acres of wetlands north of Hwy 90.

The combined cross-sectional area of openings under Hwy 90 has been measured to be approximately 757 square feet (see Hydrology and Hydraulics appendix F). After construction, the combined cross sectional area for the Bayou Verret closure structure (approximately 647 square feet) and the Bayou Verret bypass channel closure structures (approximately 110 square feet) would be approximately equal (647 + 110 = 757) to the combined cross-sectional area of openings under Hwy 90. The USFWS draft Coordination Act Report (USFWS, 2009) states, "if drainage structures are constructed to provide at least the same drainage capacity as currently exists then any hydrologic impacts due to enclosure should be avoided."

The combined cross-sectional area of discharge for Bayou Verret (1,141.9 square feet) and the Outer Cataouatche Canal (1,013 square feet) is currently 2,154.9 square feet. After construction, approximately 35-percent of the pre-construction cross sectional area would remain (757/2,154.9). These changes in cross sectional area (between the protected side and the Gulf of Mexico side via Bayou Verret, the Bayou Verret bypass channel, Davis Pond, and Lake Cataouatche) could lead to delays in water surface elevation equilibrium through the Bayou Verret and Bayou Verret bypass channel closure structures. Changes in flood-side water surface elevation, whether wind or tidally driven, would take longer to equilibrate with the protected side through the smaller opening to the flood side. There are approximately 164 acres of wetland south of Hwy 90, but on the protected side of alternative 3, that would be most affected by these changes.

Construction of the western closure in the Outer Cataouatche Canal would result in the western portion of the Outer Cataouatche Canal and adjacent cypress swamp and flooded bottomland hardwoods being cut off from the Outer Cataouatche Canal. However, the approximately 60-acre area would be connected to Davis Pond through the 50-foot cut in the Davis Pond East guide levee. While the 50-foot cut is smaller in size than the width of the Outer Cataouatche Canal at the proposed closure location, the area would be reconnected to the Mississippi River and the fresh water and nutrients conveyed by the Davis Pond Freshwater Diversion flow. The Davis Pond Freshwater Diversion provides a controlled flow of water from the Mississippi River into the wetlands south of the structure. Additionally, due to the fluctuations in the Mississippi River flows that change the water surface elevations, Davis Pond Freshwater Diversion discharges fluctuate more closely resembling historic ecological conditions. The cypress swamp and flooded bottom land hardwoods within this approximately 60-acre area would benefit from the connection to the Davis Pond Freshwater Diversion discharge and a hydrologic regime that more closely replicates historic Mississippi River overflows.

Similar to alternative 2, an additional indirect effect involves the potential to induce commercial or residential development north of Hwy 90 because of the new 100-year project. Resource Agencies have stated their concern that constructing the project south of Hwy 90 would enable commercial and residential development (i.e., induced development) where development would not occur without the project. In these cases, where enclosure of wetlands is unavoidable, the Resource Agencies have recommended that non-developmental easements on enclosed wetlands should be acquired, and hydrologic connections with adjacent, un-enclosed wetlands should be maintained to minimize secondary impacts from development and hydrologic alteration.

USACE policy is that the CEMVN would mitigate, to the extent justified, the adverse direct environmental impacts of projects. However, the CEMVN would not mitigate for speculative indirect impacts related to future land development, which would be subject to compliance with local and state permit and zoning requirements. Federal, local, and state interests would be responsible for approving or denying permits to construct and defining the appropriate mitigation requirements for future land development activities, should they occur. (See appendix G for a copy of USACE Headquarters Policy on Mitigation for Induced Development).

Cumulative

Potential cumulative impacts on wetlands from construction of alternative 3 would involve the combined effects from construction of the entire WBV and LPV projects as well as other CEMVN, Federal, state, parish, and private citizen projects that effect wetlands in the greater New Orleans area. The cumulative effects to wetlands from all of the WBV and LPV projects will be fully characterized in the CED.

3.2.7 Threatened and Endangered Species

3.2.7.1 Existing Conditions

Except for the occasional transient species, no Federally listed endangered, threatened, or candidate species under USFWS jurisdiction are known to exist in the project area. However, the American alligator is common in canals. This species is listed as threatened under the Similarity of Appearance clause of the Endangered Species Act (Federal Register 1981, Vol. 46, pp. 40664-40669), but is not biologically threatened or endangered. Therefore, no Biological Assessment or further Section 7 consultation under the Endangered Species Act is required with the USFWS.

The USFWS also indicated that requirements under the Fish and Wildlife Coordination Act (FWCA) would be met upon completion of a final programmatic FWCA report and a project-specific FWCA report. The Fish and Wildlife Coordination Act provides that whenever the waters or channel of a body of water are modified by a department or agency of the U.S., the department or agency first shall consult with the USFWS and with the head of the agency exercising administration over the wildlife resources of the state where construction would occur, with a view to the conservation of wildlife resources. The USFWS concurred with the USACE's determination that project implementation would not adversely affect any threatened or endangered species in their letter dated 28 November 2007 (USFWS, 2007). In their 8 November 2007 correspondence, the National Oceanic and Atmospheric Administration's (NOAA) National Marine Fisheries Service (NMFS) Protected Resources Division provided a list of threatened and endangered species under their jurisdiction in Louisiana. Based on that information, the CEMVN made a determination of no effect for species under NMFS jurisdiction.

3.2.7.2 Discussion of Impacts

3.2.7.2.1 No Action

Direct, Indirect, and Cumulative

Taking no action would not have any effect on protected species as none have been identified in the vicinity of the project.

3.2.7.2.2 Alternative 1

Direct, Indirect, and Cumulative

Consultation with appropriate resource agencies indicates that no listed endangered, threatened, or candidate species are known to exist in the potential project impact areas. Therefore, no direct, indirect, or cumulative effects would be predicted to protected species as a result of implementing alternative 1.

3.2.7.2.3 Alternatives 2 and 3

Direct, Indirect, and Cumulative

The effects would be the same as alternative 1.

3.2.8 Recreational Resources

3.2.8.1 Existing Conditions

The project area for this segment of the WBV includes the northern border of the Davis Pond Freshwater Diversion Project east of the diversion channel. There are several regionally important recreation areas south of the project area. Figure 15 is a Louisiana Department of Natural Resources aerial image depicting important natural areas affected by the Davis Pond Freshwater Diversion Channel discharge.[9] Areas with significant recreational opportunities south of the Davis Pond Freshwater Diversion include Lake Cataouatche, Lake Salvador, and the Barataria Bay. Important wildlife areas influenced by Davis Pond include the Salvador and Timken wildlife management areas.[10]

The Louisiana Department of Wildlife and Fisheries has annual estimates of total fishing and hunting effort in the Barataria Basin (including the project area) by means of surveys with regular over flights in light aircraft. Conducted three times per month on randomly scheduled days, these surveys record the location of every vessel sighted (using the sampling grid shown in figure 15) and classify the boats as fishing, crabbing, hunting, oystering, and three categories of shrimping (LDNR, 2008).

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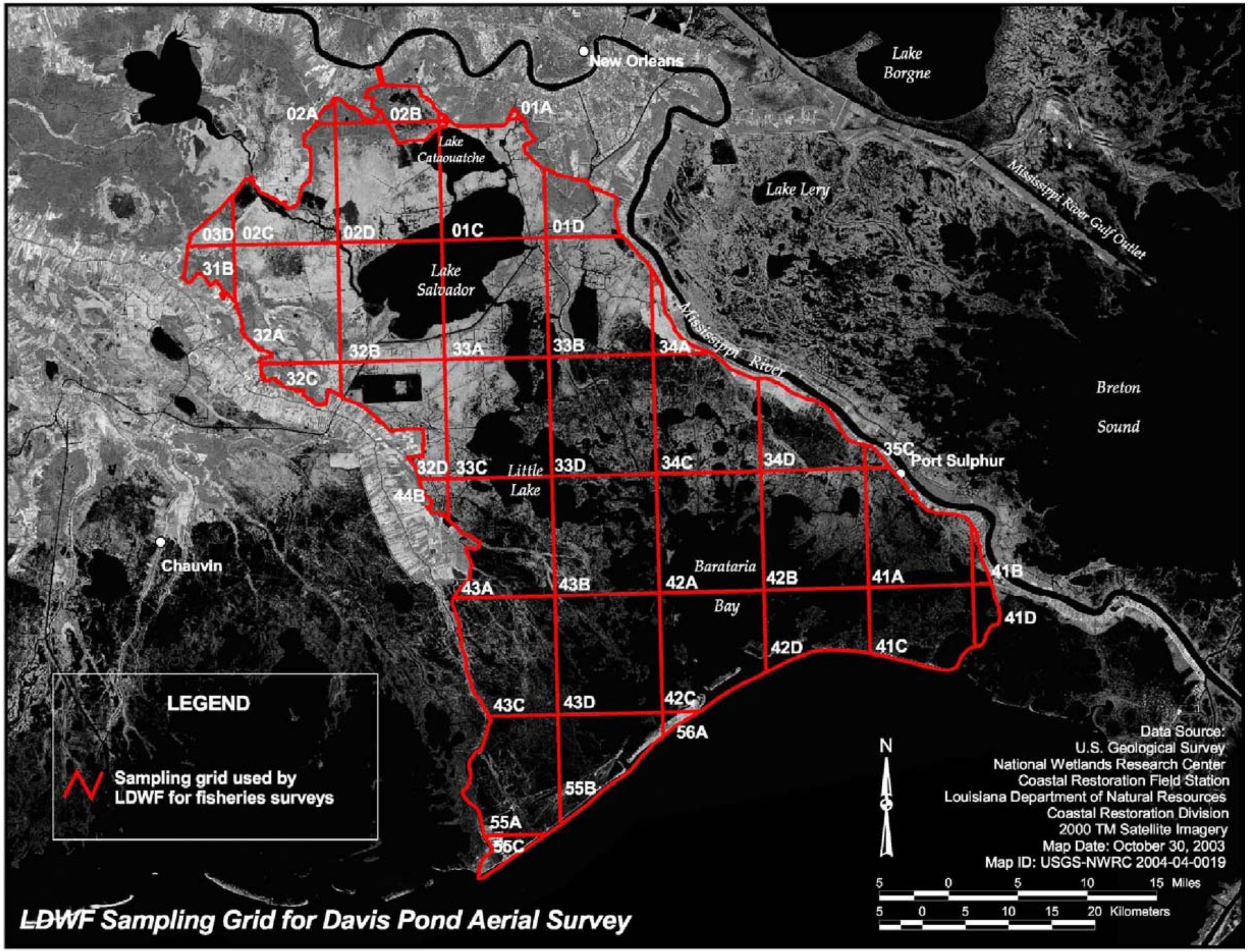
[9] On Line at: http://dnr.louisiana.gov/crm/coastres/projectdata/ba01/Maps/2004-04-0019.pdf
[10] On Line at: http://www.wlf.state.la.us/pdfs/wmas/Salvador-Timken.pdf

Figure 15. Louisiana Department of Wildlife and Fisheries Davis Pond Aerial Survey Grid



Portions of the project area are within sample grid 02B at the northernmost extent of the surveyed area (see figure 15). On-line aerial survey data collected for 2007 and 2006 (a total of 72 aerial surveys in grid 02B) failed to record a single vessel (fishing, hunting, crabbing, or shrimping) during the aerial flyovers of grid 02B.[11] While there certainly is some recreational activity within grid 02B, these surveys demonstrate that the area surrounding the project area (within area 02B) is not recreationally significant for fishing, crabbing, hunting, oystering, or shrimping.

Although the project area is not recreationally significant, a public boat ramp providing access to the important recreational areas to the south is located within the project area. The Pier 90 Marina is just south of Hwy 90 along the Outer Cataouatche Canal. Able to accommodate 60-80 boats and trailers in their parking areas at one time, the facility is a for-fee boat ramp offering easy access into the Davis Pond/Salvador Wildlife Management areas as well as into Lakes Cataouatche and Salvador via Bayou Verret. Access to Lake Cataouatche, Lake Salvador, Salvador wildlife management area, and Couba Island/Timken wildlife management area, and the Barataria Preserve is only available via boat. Access may be from Bayou Segnette State Park in Westwego; the Pier 90 Marina within the project area; Bayou Des Allemands to the southwest and Lafitte to the southeast. The Pier 90 ramp and parking areas represent a small percentage of the total parking areas available at boat launches in these other areas.

3.2.8.2 Discussion of Impacts

3.2.8.2.1 No Action

Direct

Under the no action alternative, there would be no direct impacts to the recreational resources of the Outer Cataouatche Canal, Bayou Verret, Lake Cataouatche, Lake Salvador, or Barataria Bay.

Indirect

Failing to provide flood protection for the IER # 16 area would allow contamination of surface waters during flooding by floodwaters mobilizing contaminants from domestic, industrial/commercial, or municipal sources (e.g., sanitary sewage, chemicals from industrial facilities). Although diluted by the volume of water associated with flooding, these constituents enter the aquatic environment, and food chain, during floods and could impact resources essential for recreational fishing and hunting.

Cumulative

Under the no action alternative, there would be no changes in land use predicted near the project area. In the absence of a flood protection measure for IER # 16, wildlife abundance and diversity in recreational opportunities within the project area would remain substantially unchanged.

[11] On Line at: http://dnr.louisiana.gov/crm/coastres/projectdata/ba01/Data/dpflyover2007.csv

3.2.8.2.2 Alternative 1

Direct

Under alternative 1, there would be direct effects to approximately 1.4 acres of aquatic habitat and therefore the alternative would be predicted to have negligible direct effects to the limited recreational fishing within the project area. While there would be permanent effects to wildlife habitat (as noted in section 3.2.5, Fish and Wildlife) within the project area, there would be very little effect on recreation, as the area of disturbance under alternative 1 is not extensively used for recreation.

Indirect

Indirect effects to fish and wildlife species due to construction activities (e.g., noise, vibration) within adjacent wetlands or aquatic habitat would be short term and would not effect recreation.

Cumulative

Implementation of any of the action alternatives would have beneficial cumulative impacts on recreational resources because the western tie-in for the WBV was never completed and completion of the HSDRRS would have beneficial risk reduction for existing recreation infrastructure.

3.2.8.2.3 Alternative 2

Direct

The alignment for alternative 2 would require the taking of all commercial and residential properties between the Outer Cataouatche Canal and US 90. Approximately 4 residences, 2 camps along the northern bank of the Outer Cataouatche Canal, and 1 camp on the southern bank of the Outer Cataouatche Canal would have to be relocated as a result of levee construction along Hwy 90. The direct effects to landowners with recreational properties on the north side of the Outer Cataouatche Canal would be permanent loss of their property improvements by the removal of their camps and homes. A direct effect of constructing alternative 2 would also include the permanent loss of the boat launch and Pier 90 Marina business and the displacement of those currently using this location for recreational access. Construction for alternative 2 would require all of the real estate where the Pier 90 Marina currently operates and would result in the permanent loss of public boat access from this location. Public access boat launches in Bayou Segnette State Park to the southeast, Bayou Des Allemands to the southwest and Lafitte to the southeast could accommodate the displaced boat launch needs, but would inconvenience recreationists closer to the Pier 90 Marina location.

Indirect

Under alternative 2, direct and indirect impacts to fishing and hunting would be similar to alternative 1 because of the limited importance of the areas adjacent to construction for recreation.

Cumulative

The cumulative effects would be similar to alternative 1.

3.2.8.2.4 Alternative 3 (Proposed Action)

Direct

Under alternative 3, direct impacts to fishing and hunting recreation would be similar to alternative 1 (little effect on recreation), as the area of disturbance under alternative 3 is not extensively used for recreation.

Indirect

The indirect effects on recreation would include the inconvenience from delays in boat access to open water from the Hwy 90 pier or private launch site during construction. The temporary and permanent bridges spanning the Outer Cataouatche Canal could impede recreationists that attempt boat access to Davis Pond, Lake Cataouatche, or Salvador and Timken wildlife management areas during construction. The indirect effects of constructing alternative 3 would also include beneficial effects as a result of the creation of a protected area in the Outer Cataouatche Canal and Pier 90 Marina that currently is not protected from storms.

Cumulative

Cumulative effects from alternative 3 would be similar to alternatives 1 and 2.

3.2.9 Aesthetic (Visual) Resources

3.2.9.1 Existing Conditions

Visually, the project area exhibits a natural landscape altered by urban development. Viewpoints into the project area's natural landscape highlight freshwater marsh, low lying natural levees topped with bottomland hardwood tree species, and small ponds and bayous. The natural landscape is contrasted by straight channels, and spoil banks, cutting through the marsh, which were most likely caused by navigation related exploration as well as previous borrow areas for levee building material or fill for other projects. Flood risk reduction measures such as earthen berm levees, floodwalls, and drainage canals are evident as one travels River Road and Hwy 90, as well as the Davis Pond Freshwater Diversion Structure and Canal. Land development in the project area includes railroad corridors, landfills along South Kenner Road, and residential and commercial development.

3.2.9.2 Discussion of Impacts

No Action

Direct, Indirect, and Cumulative

With implementation of this alternative, visual resources would either change from existing conditions in a natural process, or change as dictated by future land-use maintenance practices. Regardless of what the future holds for the project area, visual access to the proposed project sites is minimal as most of the project area is visually remote and inaccessible.

Alternative 1

Direct, Indirect, and Cumulative

The direct, indirect, and cumulative impacts to visual resources would be similar to the proposed action.

Alternative 2

Direct, Indirect, and Cumulative

The direct, indirect, and cumulative impacts to visual resources would be similar to the proposed action.

Direct, Indirect, and Cumulative

Alternative 3 (Proposed Action)

Direct and Indirect

With implementation of the proposed action, the direct and indirect impacts to visual resources would be minimal. Visually, the vast majority of the footprint of disturbance necessary to construct the proposed action is visually inaccessible to most as there is limited access to the area via the Davis Pond Diversion Canal and Hwy 90.

The movement of material and construction of the flood control infrastructure would also have minimal impacts on visual resources. The visual attributes of the project corridor would be temporarily impacted by construction activities at the project sites and by transport activities needed to move equipment and materials to and from the sites. However, these impacts would last only through the construction period. The long-term impacts on visual resources would be minimal.

Cumulative

Cumulatively, the visual impacts caused by structural risk reduction measures regionally and nationwide may be considered significant. Flood prone natural landscapes protected by unnatural visual conditions similar to the proposed project may be increasingly converted to developable land. Land development that may be considered visually distressing depending on the complexity of natural elements lost.

3.2.10 Cultural Resources

3.2.10.1.1 Existing Conditions

Records on file at the Louisiana Division of Archaeology and the CEMVN indicate seven previously recorded archaeological sites are located within one mile of the IER # 16 project area. Site forms and archaeological reports on file at the Louisiana Division of Archaeology and the CEMVN describe these known sites. They consist of three sites exhibiting both prehistoric and historic components and four historic sites, which are largely associated with historic nineteenth century sugar plantations. These previously recorded archaeological sites are located adjacent to the Mississippi River. None are situated in the IER # 16 project area. There are no National

Register of Historic Places (NRHP) listed properties or historically significant standing structures recorded in the area.

Fourteen previously conducted cultural resource surveys fall completely within, intersect, or are in the vicinity of the IER # 16 project area. Of these, two investigations are particularly relevant. Earth Search, Inc. conducted a cultural resources survey of the Davis Pond Freshwater Diversion Corridor in 1994 (Jones et al. 1994). This corridor encompasses the entire proposed alternative 3 study area as well as a large portion of alternative 2. No cultural resources were identified in either alternative. In the second study, Coastal Environments, Inc. conducted historic research on the Louisa and Davis Plantations, which together constitute the majority of the Mississippi River natural levee within alternative 1 (Enzweiler and Yakubik, 1994). Sites 16SC73 and 16SC74 were both recorded in the course of the survey. Site 16SC73 was determined not eligible for listing in the NRHP and has since been destroyed by construction of the freshwater diversion canal. Site 16SC74 showed evidence of eighteenth century brick features associated with the residence of Augustin Masicot, an early planter in St. Charles Parish. This site is located outside of the current project area.

The CEMVN contracted Coastal Environments, Inc. to conduct reconnaissance and Phase 1 terrestrial surveys of the three proposed alternative alignments for the IER # 16 project (Wells, 2008). In this study, researchers utilized background research, previous cultural resource investigations review, aerial photographs, soil and topographic analyses, field reconnaissance information, and Phase 1 survey data to identify and investigate high potential areas for archaeological resources and assess any historic structures in the project area. No historic standing structures were identified in the project area. Seven land parcels in the IER # 16 alternative alignments were found to exhibit a high potential for archaeological resources. Phase 1 level field investigations conducted in these high potential areas identified one archaeological site in alternative 1 alignment. Site 16SC84 (Louisa Mill) is the remains of nineteenth century sugar mill complex exhibiting a mill pond, brick cistern base, and subsurface features. No archaeological sites or significant standing structures were encountered on alternatives 2 and 3, and no further work is recommended on these alignments.

The CEMVN held meetings with State Historic Preservation Office (SHPO) staff and Tribal governments to discuss the emergency alternative arrangements approved for NEPA project review and the development of a Programmatic Agreement (PA) to tailor the Section 106 consultation process under the alternative arrangements. The CEMVN formally initiated Section 106 consultation for the WBV project (100-year), which includes IER # 16, in a letter dated 9 April 2007. This letter emphasized that standard Section 106 consultation procedures would be implemented during PA development. A public meeting was held on 18 July 2007 to discuss the working draft PA. The CEMVN anticipates the PA will be executed in the near future.

In letters sent to the SHPO and Indian Tribes dated 10 March 2008, the CEMVN provided project documentation, evaluated cultural resources potential for the alternative 2 alignment, and found that the proposed action would have no impact on cultural resources. The SHPO and the Choctaw Nation of Oklahoma concurred with our "no historic properties affected" finding in letters dated 24 March 2008 and 31 March 2008, respectively. No other Indian Tribes responded to CEMVN’s first request for comment.

In a second letter sent to SHPO and Indians Tribes dated 20 October 2008, the CEMVN evaluated the potential for cultural resources in the alternative 3 alignment and again found that the proposed action would have no impact on cultural resources. The SHPO, Seminole Nation of Oklahoma, Alabama Coushatta Tribe of Texas, and the Seminole Tribe of Florida concurred with our second "no historic properties affected" finding in letters dated 11 December 2008, 24 October 2008, 5 November 2008 and 24 November 2008, respectively. No other Indian Tribes responded to CEMVN’s second request for comments.

Finally, in a third letter sent to SHPO and Indian Tribes dated 2 January 2009, the CEMVN evaluated cultural resources potential within expanded portions of the alternative 3 alignment and found that no cultural resources would be impacted. The SHPO, Alabama Coushatta Tribe of Texas, and the Tunica-Biloxi Tribe of Louisiana concurred with CEMVN's third "no historic properties affected" finding in letters dated 29 January 2009, 22 January 2009, and 26 January 2009, respectively. No other Indian Tribes responded to CEMVN's third request for comments.

Section 106 consultations for the proposed action is concluded. However, if any unrecorded cultural resources are determined to exist within the proposed project boundaries, then no work would proceed in the area containing these cultural resources until a CEMVN archaeologist has been notified and final coordination with the SHPO and Indian Tribes has been completed.

3.2.10.2 Discussion of Impacts

3.2.10.2.1 No Action

Direct

Under the no action alternative, failing to provide flood protection for the IER # 16 study area would have no direct impacts to cultural resources. Proposed action would not be built and cultural resources that may be located directly in the proposed action alignment would not be directly impacted.

Indirect and Cumulative

Ground surface erosion during flood events under the no action alternative would have detrimental indirect and cumulative impacts on cultural resources that would have been protected by the proposed action. Erosion of ground deposits during flood events causes severe damage and destruction of cultural resources.

3.2.10.2.2 Alternative 1

Direct

Recent cultural resources investigations in the alternative 1 alignment identified one archaeological site (Wells, 2008). Site 16SC84 (Louisa Mill) is a sugar mill complex that is noted on the 1884 Mississippi River Commission Map as comprising two large rectangular buildings and a small number of tenant buildings or utility structures. None of these mapped structures remain on the site today, however, a mill pond and a single large, circular brick cistern base is located just south of the project corridor. Shovel test excavations identified subsurface features related to the mill operation, including brick paving and buried piping, that extend well into the project alignment in an area measuring 360 feet north to south and 420 feet east to west. Historic research of Louisa Plantation suggests that sugar production was terminated by flooding from the Davis crevasse of 1884 and that the sugar house machinery was sold a short time later. Archaeological data suggest the site may be eligible for listing on the National Register of Historic Places (NRHP). Implementation of alternative 1 would have a direct impact on this potentially significant site. Further research would be required to determine NRHP eligibility and additional consultation with the SHPO and Indian Tribes would be required prior to construction.

Indirect

Implementation of alternative 1 would have beneficial indirect impacts by providing an added level of flood protection to known and unknown cultural resources located on the protected side of the project vicinity by reducing the damage caused by flood events. Erosion of soil deposits during flood events can result in severe damage and destruction of cultural resources.

Cumulative

Implementation of alternative 1 would have beneficial cumulative impacts on historic properties in the West Bank area. This proposed action is part of the ongoing Federal effort to reduce the threat to property posed by flooding. The combined effects from construction of the multiple projects underway and planned for the HSDRRS would reduce flood risk and storm damage to significant archaeological sites, individual historic properties, engineering structures and historic districts.

3.2.10.2.3 Alternative 2

Direct

Based on the review of state records, previous cultural resources studies, and the results of a recent reconnaissance and Phase 1 cultural resources investigation, implementation of alternative 2 would have no direct impact on cultural resources. Researchers analyzed background, soils, and geological data and identified several land parcels exhibiting a high potential for archaeological resources. Field investigations conducted in these parcels did not produce any archaeological material or subsurface features. The likelihood for intact and undisturbed cultural resources in this alternative is considered extremely minimal. No further cultural resources investigations would be recommended.

Indirect, and Cumulative

Implementation of alternative 2 would have the same indirect and cumulative effects as those described for alternative 1.

3.2.10.2.4 Alternative 3 (Proposed Action)

Direct

Based on the review of state records, previous cultural resources studies, and the results of a recent reconnaissance and Phase 1 cultural resources investigation, implementation of alternative 3 would have no direct impact on cultural resources. Researchers analyzed background, soils, and geological data and identified several land parcels exhibiting a high potential for archaeological resources. Field investigations conducted in these parcels did not produce any archaeological material or subsurface features. The majority of the alternative 3 alignment is located in very low, frequently flooded marshland and has been severely impacted by previous canal excavation. The likelihood for intact and undisturbed cultural resources in this alternative is considered extremely minimal. No further cultural resources investigations would be recommended.

Indirect

Implementation of alternative 3 would have beneficial indirect impacts by providing an added level of flood protection to known and unknown cultural resources located on the protected side of the project vicinity by reducing the damage caused by flood events. Erosion of soil deposits during flood events can result in severe damage and destruction of cultural resources.

Cumulative

Implementation of alternative 3 would have beneficial cumulative impacts on historic properties in the West Bank area. This proposed action is part of the ongoing Federal effort to reduce the threat to property posed by flooding. The combined effects from construction of the multiple projects underway and planned for the HSDRRS would reduce flood risk and storm damage to significant archaeological sites, individual historic properties, engineering structures and historic districts.

3.2.11 Farmland

3.2.11.1 Existing Conditions

Within NEPA evaluations, the USACE must consider the protection of the nations' significant/important agricultural lands from irreversible conversion to uses that result in their loss as an environmental or essential food production resource. The Farmland Protection Policy Act (FPPA), 7 USC 4201 et seq., and the U.S. Department of Agriculture's (USDA) implementing procedures (7 CFR § 658) require Federal agencies to evaluate the adverse effects of their actions on prime and unique farmland, including farmland of statewide and local importance.

During consultation with the Natural Resources Conservation Service (NRCS) for previous Lake Cataouatche levee work, a farmland conversion impact rating form was developed and sent to the NRCS containing information on those lands to be converted by the proposed action (USACE, 1996). The rating form was returned with the explanation that there were no prime farmlands in the project area (USACE, 1996). Therefore, no further action is required and no consultation on this issue would be necessary.

3.2.11.2 Discussion of Impacts

3.2.11.2.1 No Action

Direct, Indirect, and Cumulative

There are no protected farmlands designated within the potential area of effect; thus, taking no action would have no more or less effect than any of the action alternatives.

3.2.11.2.2 Alternatives 1, 2, and 3

Direct, Indirect, and Cumulative

The actions necessary to implement any of the action alternatives (including the proposed action) would not involve conversion of, or otherwise cause direct, indirect, or cumulative effects to prime, unique, or important U.S. farmland.

3.3 SOCIOECONOMICS

The focus of this section is to evaluate the relative socioeconomic impacts of construction activities associated with the proposed Western Tie-In of the WBV project. The proposed project includes portions of Jefferson and St. Charles Parishes in the state of Louisiana, and the purpose is upgrading to and maintaining 100-year flood risk reduction for the residents and businesses in the Western Tie-in area.

According to the 2005 American Community Survey that documented conditions prior to Hurricane Katrina, Jefferson Parish had a population of 449,000. The Greater New Orleans area, which includes both Jefferson and Orleans Parishes, is the largest metropolitan area in the state. Jefferson Parish was affected by Hurricane Katrina, but has rebounded more quickly than neighboring Orleans Parish, probably because homes were most often flooded in Orleans Parish but only wind and rain damaged in Jefferson Parish. A population estimate conducted after Hurricane Katrina (June through October 2006) by the Louisiana Recovery Authority (LRA, 2007) estimated Jefferson Parish at 440,000 residents or 99 percent of its 2005 total. Because the proportion of post-Katrina population to pre-Katrina population is nearly 100 percent, it has been assumed that demographic, employment, income, and housing data from the 2005 American Community Survey adequately depicts current post-Hurricane Katrina socioeconomic conditions.

The lands being considered in this IER for additional hurricane damage reduction are located in Jefferson Parish and are bounded by the Mississippi River on the north, Bayou Segnette to the east, Lake Cataouatche to the south, and the St. Charles Parish line to the west. The 20,400-acre study area lies within an area of tidal influence and is currently provided with hurricane damage reduction by Federal levees located adjacent to Lake Cataouatche. The majority of the urban development in the Lake Cataouatche study area has taken place in the area surrounding the Huey P. Long Bridge, as well as along Hwy 90, River Road, and the Westbank Expressway. The major communities located within the study area include Avondale, Bridge City, Waggaman, and the western part of Westwego.

3.3.1 Displacement of Population and Housing

3.3.1.1 Existing Conditions

The protected area under the proposed action extends from the east bank of the David Pond Freshwater Diversion Project Canal to the west bank of the Harvey Canal, and from the Mississippi River to the Outer and Inner Cataouatche Canals. Communities within the protected area include Marrero, Woodmere, Estelle, Westwego, Bridge City, Avondale, Waggaman, and Ama.

The area that may potentially be affected by construction is between the David Pond Freshwater Diversion Project Canal and South Kenner Road; and between the Union Pacific railroad tracks and south of the Outer Cataouatche Canal. Most of the project area is within St. Charles Parish, except for parts of the River Birch and Jefferson Parish landfills and adjacent areas.

The project area is generally vacant with no structures for residential use north of Hwy 90 and only 6 housing units between Hwy 90 and the Outer Cataouatche Canal. Just north of the study area is the community of Ama. Ama is characterized by small- to medium-sized single-family homes.

3.3.1.2 Discussion of Impacts

3.3.1.2.1 No Action

Direct

The previously authorized project for this portion of the WBV project was a +6.5 foot NAVD88 levee between Hwy 90 and the higher elevation of the BNSF Railroad, built on the existing South Kenner Road. The previously authorized project is no longer viable because of expansion of the nearby landfills and changes to the design requirements for levee construction.

Under the no-action alternative, the proposed 100-year level of the HSDRRS would not be constructed by the CEMVN in this portion of the WBV project, and no additional actions would be taken to construct the previously authorized project. The risk reduction alternative described in this IER is an integral part of the WBV project as it provides the tie-in to the Mississippi River Levee and completes the risk reduction project for the west bank. Taking no action along this reach of the WBV would result in a significant gap in the WBV project, and without it the storm surge risk reduction system would not comply with the minimum requirements of the National Flood Insurance Program (NFIP). There would be no direct impacts to population and housing under the no action alternative.

Indirect

Because this alternative fails to provide 100-year level of risk reduction as required under the NFIP, the actual and perceived risks to population in the area would be indirectly negatively impacted. Flooding increases the potential for permanent displacement of population and housing and costs associated with residential development would likewise be impacted.

Cumulative

The lack of completed project would be a long-term detriment to the economic vitality of the west bank communities.

3.3.1.2.2 Alternative 1

Direct

There would be no direct impacts to population and housing under this alternative.

Indirect

There would be construction-related indirect impacts to residences in Ama. There would likely be increased traffic congestion as a result of an increased presence of construction vehicles along River Road. Additionally, there would be temporary noise impacts to residences just to the north of the construction ROW close to the BNSF Railroad tracks. None of these indirect effects would be expected to displace people from their homes.

Cumulative

With any of the action alternatives, including alternative 1, there could be a cumulative beneficial effect to population and housing as a result of the completion of the WBV project. When the HSDRRS is completed, the lower flood risk throughout much of greater New Orleans may enhance the desirability of living within the protected areas. As a result, a shift from dispersion of population from the New Orleans Metropolitan Statistical Area (MSA) to growth in population may occur. Also, to the extent that the completion of the HSDRRS encourages regional economic growth, additional jobs may lead to in-migration or an increase in commuting activity.

3.3.1.2.3 Alternative 2

Direct

There would be permanent direct impacts to population and housing under this alternative. Approximately 4 residences, 2 camps along the northern bank of the Outer Cataouatche Canal, and 1 camp on the southern bank of the Outer Cataouatche Canal would have to be relocated as a result of levee construction along Hwy 90.

Indirect

There may be temporary, construction-related indirect impacts to residents in the vicinity of construction. These may include increased noise levels, degraded air quality, and increased congestion on nearby roadways. However, these impacts would only last through the construction period.

Cumulative

With any of the action alternatives, including alternative 2, there could be a cumulative beneficial effect to population and housing as a result of the completion of the WBV project. The nature of these potential beneficial cumulative effects are similar to those described for alternative 1.

3.3.1.2.4 Alternative 3 (Proposed Action)

Direct

There would be no permanent direct impacts to population and housing under the proposed action.

Indirect

There may be temporary, construction-related indirect impacts to residents in the vicinity of construction, particularly along the two middle access roads between Hwy 90 and the south bank of the Outer Cataouatche Canal. At the nearest point, residences are within 300-450 feet from the access roads. The proximity may lead to increased noise levels, degraded air quality, and increased congestion on nearby roadways. However, these impacts would only last through the construction period. These impacts may be moderate to severe for residents between the Outer Cataouatche Canal and Hwy 90, since the four access roads and associated staging areas must be constructed from Hwy 90 to the construction area.

Cumulative

The cumulative effects from alternative 3 would be similar to those described for alternatives 1 and 2.

3.3.2 Impacts to Employment, Business, and Industrial Activity

3.3.2.1 Existing Conditions

The protected area for the proposed project includes the west bank of the Mississippi River, which is home to industries that are dependent on the river, including industries that revolve around ship building and repair, tow boats, marine supply, and those that support the petro-chemical industry. An extensive commercial network of retail, wholesale, and light industrial properties characterizes the area. Together with residential properties, this infrastructure, which is valued upwards of $9.2 billion, constitutes a significant tax base for Jefferson Parish government. Critical facilities in the study area include the Harvey Canal industrial corridor, Northrup Grumman Shipbuilding facility, and the West Jefferson Medical Center. The Northrup Grumman Shipbuilding facility, located on the Mississippi River near Westwego, and the Harvey Canal industrial corridor are among the largest commercial enterprises in the metropolitan area.

The project area is generally vacant, with no structures for commercial use north of Hwy 90, and very few buildings between Hwy 90 and the Outer Cataouatche Canal; however, there are two boat launch facilities in this area. Additionally, a large, private industrial complex operated by Archer Daniels Midland is located north of the Union Pacific and Burlington Northern Santa Fe railroad lines, and east of Ama. A small portion of the study area is zoned for industrial usage.

3.3.2.2 Discussion of Impacts

3.3.2.2.1 No Action

Direct

The previously authorized project for this portion of the WBV project was a +6.5 foot NAVD88 levee between Hwy 90 and the higher elevation of the BNSF Railroad, built on the existing South Kenner Road. The previously authorized project is no longer viable because of expansion of the nearby landfills and changes to the design requirements for levee construction.

Under the no-action alternative, the proposed 100-year level of the HSDRRS would not be constructed by the CEMVN in this portion of the WBV project, and no additional actions would be taken to construct the previously authorized project. The proposed action described in this IER is an integral part of the WBV project as it provides the tie-in to the Mississippi River Levee and completes the alignment for the west bank. Taking no action along this reach of the WBV results in a significant gap in the WBV project, and without it the storm surge risk reduction system would not comply with the minimum requirements of the National Flood Insurance Program (NFIP). There would be no direct impacts to employment, business, and industry under the no action alternative.

Indirect

Flooding occurring under the no action alternative increases the potential for permanent displacement of business and industry. The predictable loss of productivity because of cleanup after large-scale flooding also results from taking the no action alternative. Costs associated with business development would also be increased.

Cumulative

There would be no cumulative effects to employment, business, and industrial activity as a result of taking the no action alternative.

3.3.2.2.2 Alternative 1

Direct

There would be permanent direct impacts to the landfill business as a result of construction of this alternative. The floodwall (as opposed to levee) would be constructed on South Kenner Road minimizing the footprint of construction and associated impacts to truck traffic using the landfill. However, South Kenner Road would need to be relocated 40 feet to the east, and vehicles would need to pass through floodgates in order to access roads on the west side of the floodwall. Additionally, new ROW would have to be acquired in order to construct the floodwall, and this would encroach upon the landfill. There may also be temporary, construction-related impacts to the landfill during construction.

Indirect

There would be indirect effects from the increased congestion on South Kenner Road as a result of an increased presence of construction vehicles. Floodwall, rather than levee, would be constructed near the landfill so as to minimize impacts to truck traffic using the landfill.

Cumulative

With any of the action alternatives (including alternative 1) there could be a cumulative beneficial effect to employment, business, and industrial activity as a result of the construction expenditures for the WBV and LPV projects. In addition, the lower flood risk that accrues to the much of the New Orleans metropolitan area upon completion of the HSDRRS may have the effect of spurring additional economic growth in the region that would otherwise not occur. As a result, an increase in the number of firms and the output of business and industry would likely occur.

3.3.2.2.3 Alternative 2

Direct

There would be permanent direct impacts to business under this alternative because the marina business along the Outer Cataouatche Canal would have to be relocated as a result of levee construction along Hwy 90.

Indirect

There may be temporary, congestion-related impacts to businesses along Hwy 90 due to an increased presence of construction vehicles. Access points to the construction site would be built between Hwy 90 and construction along the Outer Cataouatche Canal.

Cumulative

With any of the action alternatives (including alternative 2) there could be a cumulative beneficial effect to employment, business, and industrial activity as a result of the construction expenditures for the WBV and LPV projects.

3.3.2.2.4 Alternative 3 (Proposed Action)

Direct

With the exception of landfills in the area, most of the immediate vicinity of the project area is undeveloped. There would be no permanent direct impacts to businesses as a result of the proposed action.

Indirect

There may be indirect impacts to Pier 90 marina along the Outer Cataouatche Canal due to increased noise levels and a decrease in water quality. Additionally, under this alternative, the western end of the Outer Cataouatche Canal would be permanently closed using an earthen closure. A closure structure would be constructed across Bayou Verret. In order to build this structure, a bypass channel would be constructed, so as to allow navigation during the construction period. However, navigation may be temporarily impeded. Lastly, there may be temporary, congestion-related impacts to businesses along the Hwy 90 corridor due to an increased presence of construction vehicles. Access points to the construction site would be built between Hwy 90 and construction along the Outer Cataouatche Canal.

Cumulative

With any of the action alternatives, including alternative 3, there could be a cumulative beneficial effect to employment, business, and industrial activity as a result of the construction expenditures for the WBV and LPV projects.

3.3.3 Availability of Public Facilities and Services

3.3.3.1 Existing Conditions

The protected area of Harvey-Westwego-Lake Cataouatche is the location of many municipal facilities, including government administrative buildings, water and sewerage treatment plants, telecommunications operations, libraries, and transportation facilities. As classified by the 2006 draft Final Report of the Interagency Performance Evaluation Task Force, there is 1 major hospital and 1 clinic; as well as 9 buildings that function as nursing and assisted living facilities. There are 7 fire stations and 1 police station. There are 43 school buildings in the area. Other critical facilities in the study area include electrical and natural gas distribution facilities, the Harvey Canal industrial corridor, and Northrup Grumman Shipbuilding facility. There are no public facilities in the immediate vicinity of the project area.

3.3.3.2 Discussion of Impacts

3.3.3.2.1 No Action

Direct

Under the no action alternative, the proposed 100-year level of the HSDRRS would not be constructed by the CEMVN in this portion of the WBV project, and no additional actions would be taken to construct the previously authorized project. The action described in this IER is an integral part of the WBV project as it provides the tie-in to the Mississippi River Levee and completes the alignment for the west bank. Taking no action along this reach of the WBV results in a significant gap in the WBV project, and without it the storm surge risk reduction system would not comply with the minimum requirements of the NFIP. There would be no direct impacts to the availability of public facilities under the no action alternative.

Indirect

There would be indirect impacts to the availability of public facilities and services under the no action alternative. Under these conditions, the actual and perceived risks to public facilities in the west bank of Jefferson Parish would be directly impacted and the costs of providing these services would likewise be increased because of the continued flooding risk. The lack of enhanced risk reduction could be a long-term detriment to the economic vitality of the area.

Cumulative

There would be no cumulative effects expected from implementing the no action alternative.

3.3.3.2.2 Alternative 1

Direct

There would be no direct impacts on the availability of public facilities and services under this alternative.

Indirect

Reduction of risk from flooding by implementation of alternative 1 would preserve and enhance the availability of public services in the area.

Cumulative

For each of the action alternatives, the cumulative effect on the availability of public facilities and services would be similar. The HSDRRS, when completed, would reduce damages for the 1 percent chance event to municipal facilities in the protected area by an estimated $5.9 billion. Upon completion of the HSDRRS, the lower flood risk within much of the New Orleans metropolitan area may enhance the desirability of living within the protected areas. To the extent that the completion of the HSDRRS encourages regional economic growth and the increase in the demand for public facilities and services would follow.

3.3.3.2.3 Alternative 2

Direct

There would be no direct impacts on the availability of public facilities and services under this alternative.

Indirect

Reduction of risk from flooding by implementation of alternative 2 would preserve and enhance the availability of public services in the area.

Cumulative

The cumulative effects of implementing alternative 2 are similar to those described for alternative 1.

3.3.3.2.4 Alternative 3 (Proposed Action)

Direct

There would be no direct impacts on the availability of public facilities and services under the proposed action.

Indirect

Reduction of risk from flooding by implementation of the proposed action would preserve and enhance the availability of public services in the area.

Cumulative

The cumulative effects of implementing alternative 3 are similar to those described for alternatives 1 and 2.

3.3.4 Effects on Transportation

3.3.4.1 Existing Conditions

Hwy 90 is the primary roadway for the project area, and is a critical roadway as it serves as a major highway and evacuation route. The most recent LADOTD average daily traffic count (2007) reports approximately 18,423 vehicles per day on Hwy 90 on the western end of the project area (LADOTD, 2009). River Road also borders the project area and is the major roadway through Ama. South Kenner Road is the eastern boundary of the project area, and serves as the access point for the landfills in the area. There are two railroad lines, BNSF and Union Pacific, which also pass through the project area. The protected area includes 501 miles of roads and highways, along with 38 miles of railroad.

3.3.4.2 Discussion of Impacts

3.3.4.2.1 No Action

Direct

Under this alternative, there would be no construction in the Western Tie-In area, so there would be no direct impacts to transportation resources due to construction.

Indirect

Failing to provide this section of the WBV would predictably lead to substantial traffic effects prior to, and after, large-scale flooding. Community evacuation in preparation for storms leads to significant traffic. When flooded, roads are impassable until after floodwaters recede and residual sediments and debris are cleaned up. Removal of debris destroyed by flooding (building materials, appliances, furniture, etc.) also causes substantial increases in local traffic.

Cumulative

The cumulative effect of chronic flooding could include the accelerated deterioration of bridges, culverts, and road surfaces for which longer-term traffic problems would exist until the infrastructure was repaired or replaced.

3.3.4.2.2 Alternative 1

Direct

With the construction of any of the action alternatives, the direct effect on transportation would result from increased vehicular congestion along collector and local roads leading to and from the construction sites. Under this alternative there would be temporary, congestion-related impacts to transportation in the project area, mainly along South Kenner Road and Hwy 90. This alternative represents the longest total length of each of the alternatives, and as such the congestion-related impacts would be greatest under this alternative.

Each of the action alternatives would require constructing long approaches (2,000 feet from both directions) to cross the floodwall as it crosses Hwy 90. The design would not impede the proposed I-49 elevated highway construction through the area. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway, which would be a two-lane shift to the north within the existing Hwy 90 ROW. Additionally, under this alternative, South Kenner Road (existing roadway, shoulder, and fencing) would have to be shifted approximately 40 feet to the east of the current location and reconstructed. This may cause traffic congestion and restrict access during the construction period. After the floodwall is constructed, three vehicular gates would be required to access the existing roadways on the west side of the floodwall. This may constrict truck access and cause congestion.

In order to cross the BNSF and Union Pacific Railroad tracks, a gated closure structure would have to be built across each set of tracks. This may cause temporary disruption to railroad activity during the construction period. It would also impede railroad traffic when the gates are closed.

Indirect

There may also be moderate but temporary congestion-related impacts to traffic in the project area as a result of construction. These impacts would temporarily affect Hwy 90, South Kenner Road, and River Road.

Cumulative

Current estimates of the total earthen borrow truck transportation for the WBV and LPV construction are over 3 million round trips, accumulating over 73 million miles traveled, with 40 continuous weeks of more than 6,000 daily round trips. Daily trips for steel and concrete would add fewer than 300 additional daily round trips. The incremental cumulative effect from selecting and implementing alternative 1 on transportation would not be substantial, but the cumulative effect of all materials transportation for the WBV and LPV projects may be significant.

3.3.4.2.3 Alternative 2

Direct

With the construction of any of the action alternatives, the direct effect on transportation would result from increased vehicular congestion along collector and local roads leading to and from the construction sites.

Although it would be constructed further west from the location where the floodwall crosses Hwy 90 in alternative 1, the design of the crossing, temporary lane shift during construction, and therefore the direct effects would be identical to that described for alternative 1. In order to cross the BNSF and Union Pacific Railroad tracks, a gated closure structure would have to be built across each set of tracks. This may cause temporary disruption to railroad activity during the construction period. It would also impede railroad traffic when the gates are closed. This alternative would also require crossing River Road with a closure gate. This would cause temporary disruption to River Road during the period of construction, as well as closing River Road when the structure is closed.

Indirect

There may also be moderate, but temporary congestion-related impacts to traffic in the project area as a result of construction. These impacts may affect Hwy 90, South Kenner Road, and River Road.

Cumulative

Current estimates of the total earthen borrow truck transportation for the WBV and LPV construction are over 3 million round trips, accumulating over 73 million miles traveled, with 40 continuous weeks of more than 6,000 daily round trips. Daily trips for steel and concrete would add fewer than 300 additional daily round trips. The incremental cumulative effect from selecting and implementing alternative 2 on transportation would not be substantial, but the cumulative effect of all materials transportation for the WBV and LPV projects may be significant.

3.3.4.2.4 Alternative 3 (Proposed Action)

Direct

With the construction of any of the action alternatives, the direct effect on transportation would result from increased vehicular congestion along collector and local roads leading to and from the construction sites.

Indirect

Indirect effects from vehicle emissions, decreases in level of service (e.g., longer waits at intersections), and decrease in road surface quality would be expected. Some impacts to waterborne transportation systems may occur if construction activities are conducted on a marine plant or temporary work platform located over water. To reduce the impacts to waterborne transportation, where possible, water based construction activities would be phased or sequenced to minimize impacts.

The design of the floodwall crossing Hwy 90 as well as the temporary lane shift during construction would be essentially identical to that described for alternatives 1 and 2. This alternative would require constructing long approaches (2,000 feet from both directions) to cross the floodwall as it crosses Hwy 90. The design would not impede the proposed I-49 elevated highway construction through the area. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway, which would be a two-lane shift to the north within the existing Hwy 90 ROW.

In order to cross the BNSF and Union Pacific Railroad tracks, a gated closure structure would have to be built across each set of tracks. This may cause temporary disruption to railroad activity during the construction period. It would also impede railroad traffic when the gates are closed. This alternative would also require crossing River Road with a closure gate. This would cause temporary disruption to River Road during the period of construction, as well as closing River Road when the structure is closed.

There may also be moderate but temporary congestion-related impacts to traffic in the project area as a result of construction. These impacts would affect South Kenner Road and River Road. However, it is more likely that there may be temporary, congestion-related impacts to businesses along the Hwy 90 corridor due to an increased presence of construction vehicles. Access points to the construction site would be built between Hwy 90 and construction along the Outer Cataouatche Canal.

Recreational navigation through the Outer Cataouatche Canal and Bayou Verret may be temporarily impeded during construction, but temporary bypass around the Bayou Verret closure structure during construction should aid navigation. Construction of the temporary and permanent bridges may impede recreational navigation during the construction period, and would prevent commercial fishing boats (e.g., shrimpers) from getting through the Outer Cataouatche Canal. Additionally, a permanent closure would be constructed on the western end of the Outer Cataouatche Canal that would permanently prevent recreational vessels from passing all the way through the canal. Recreational and commercial navigation would also be impacted prior to, during, and following storm events when the Bayou Verret Closure and Bayou Verret bypass structures are closed. During a storm event the structure could be closed for as much as 5 days.

Cumulative

Current estimates of the total earthen borrow truck transportation for the WBV and LPV construction are over 3 million round trips, accumulating over 73 million miles traveled, with 40 continuous weeks of more than 6,000 daily round trips. Daily trips for steel and concrete would add fewer than 300 additional daily round trips. The incremental cumulative effect from selecting and implementing alternative 3 on transportation would not be substantial, but the cumulative effect of all materials transportation for the WBV and LPV projects may be significant.

3.3.5 Disruption of Desirable Community and Regional Growth

3.3.5.1 Existing Conditions

Desirable community growth is considered a growth that provides a net increase in benefits to a local or regional economy, social conditions, and the human environment, including water resource development. Similar to other references to social and economic conditions, community and regional growth has been heavily dependent on reliable flood risk reduction. The proposed project is planned with the result being improved flood and hurricane risk reduction within the HSDRRS.

The CEMVN examined the potential for induced development attributable to construction of each of the alternatives for Western Tie-in (IER # 16) (USACE, 2008a). As described in appendix E, the area examined was between the south bank of the Outer Cataouatche Canal and the Union Pacific Railroad to the north and the Davis Pond Freshwater Diversion Canal to the west and some distance to the east of South Kenner Road (USACE, 2008a).

The purpose of the study was to identify and describe changes in the land use and socioeconomic trends that would be expected to occur, and would affect the study area, for a period of 12 years, from 2008 to 2020. The study was performed to determine the magnitude of residential development occurring in a selected portion of the West Bank of St. Charles Parish (i.e., no action) relative to what may occur if the 100-year level of risk reduction was provided (alternatives 1, 2, and 3). The 12-year period of analysis was appropriate for this type of real estate market study and is typical of the period of study used by real estate research firms in support of requests for financing. Such mid-term forecasts are distinct from Federal projects that represent public investments, which utilize long-term forecasts and a period of analysis of 50 years. The analysis will be used to determine the incremental effects, if any, attributable to the alternatives considered in this IER. The results of specific market research indicated that, despite enhanced hurricane risk reduction afforded, numerous adverse attributes characteristic of the area examined would continue to significantly discourage infrastructure development for the foreseeable future (USACE, 2008a).

3.3.5.2 Discussion of Impacts

3.3.5.2.1 No Action

Direct, Indirect, and Cumulative

Under the no action alternative the proposed HSDRRS would not be constructed in this portion of the WBV project and no additional actions would be taken to construct the previously authorized project. However, this project is integral to the completion of the WBV project as well as completing the HSDRRS 100-year elevation, and without it the storm surge risk reduction system would not comply with the minimum requirements of the NFIP.

There would be no direct impacts to community and regional growth under the no action alternative. However, without the project, the actual and perceived risks to businesses would be higher than those under the action alternatives. Costs associated with business and residential development would likewise be indirectly impacted. The lack of enhanced flood risk reduction could be a long-term cumulative detriment to the economic vitality of the area.

3.3.5.2.2 Alternative 1

Direct, Indirect, and Cumulative

Implementing alternative 1 would advance the growth of communities within the HSDRRS by making possible improvements to the hurricane and storm damage risk reduction system. Without implementation of hurricane and storm risk reduction measures as proposed in alternative 1, a community's growth would necessarily be limited. The limitation in growth would be primarily caused by the inability to certify the levee system such that the protected area could comply with the requirements of the NFIP, and consequently would face higher flood risk and insurance premiums. By advancing the hurricane and storm damage risk reduction system, confidence and investment in the Greater New Orleans community would increase.

Additionally, construction activities may temporarily increase local commerce, such as in Ama, by increasing traffic and activity around the proposed project area. This increased activity would likely benefit businesses in the protected area and in the region. Within the area investigated no accelerated residential or commercial development would be expected to occur (USACE, 2008a).

3.3.5.2.3 Alternative 2

Direct, Indirect, and Cumulative

Implementing alternative 2 would advance the growth of communities within the HSDRRS by making possible improvements to the hurricane and storm damage risk reduction system. Without implementation of hurricane and storm risk reduction measures as proposed in alternative 2, a community's growth would necessarily be limited. The limitation in growth would be primarily caused by the inability to certify the levee system such that the protected area could comply with the requirements of the NFIP, and consequently would face higher flood risk and insurance premiums. By advancing the hurricane and storm damage risk reduction system, confidence and investment in the Greater New Orleans community would increase.

Additionally, construction activities may temporarily increase local commerce, such as in Ama, by increasing traffic and activity around the proposed project area. This increased activity would likely benefit businesses in the protected area and in the region.

However, there would also be a negative direct impact on community growth under this alternative since the construction of this alignment would require acquiring the Pier 90 business and 4 residences. Within the area investigated, no accelerated residential or commercial development is expected to occur (USACE, 2008a). The results of specific market research indicate that despite enhanced hurricane risk reduction afforded to this area, numerous adverse attributes characteristic of the project area would continue to significantly discourage infrastructure development in this area for the foreseeable future.

3.3.5.2.4 Alternative 3 (Proposed Action)

Direct, Indirect, and Cumulative

The proposed project would advance the growth of communities within the HSDRRS by making possible improvements to the hurricane and storm damage risk reduction system. Without implementation of hurricane and storm risk reduction measures as proposed under the proposed action, a community's growth would necessarily be limited. The limitation in growth would be primarily caused by the inability to certify the levee system such that the protected area could comply with the requirements of the NFIP, and consequently would face higher flood risk and insurance premiums. By advancing the hurricane and storm damage risk reduction system, confidence and investment in the Greater New Orleans community would increase.

Additionally, construction activities may temporarily increase local commerce, such as in Ama, by increasing traffic and activity around the proposed project area. This increased activity would likely benefit businesses in the protected area and in the region.

Within the area investigated, no accelerated residential or commercial development is expected to occur (USACE, 2008a). The results of specific market research indicate that despite enhanced hurricane risk reduction afforded to this area, numerous adverse attributes characteristic of the project area would continue to significantly discourage infrastructure development in this area for the foreseeable future (USACE, 2008a).

3.3.6 Impacts to Tax Revenues and Property Values

3.3.6.1 Existing Conditions

The project area is generally vacant with no structures for commercial or residential use north of Hwy 90 and seven scattered sites with buildings between Hwy 90 and the Outer Cataouatche Canal. As such, the project area provides limited tax revenue to St. Charles Parish government.

The protected area, which includes the Gretna-Algiers, Harvey-Westwego, and Lake Cataouatche polders, has a total of 36,814 residential structures and 1,088 non-residential structures. There is an extensive commercial network of retail, wholesale, and light industrial properties, as well as much heavy industry. Together with the residential properties, this infrastructure, which is valued upwards of $9.2 billion, constitutes a significant tax base for Jefferson Parish government.

According to the 2000 U.S. Census, the project area includes the following:

- Jefferson Parish: Tracts 250.01- 250.03, 251.02-251.04, 252.01-252.02, 253-274, 275.01-275.02, 276.01-276.02, 277.01, 277.03, 278.03-278.07, 278.09, 278.10-278.12.

- Orleans Parish: Tracts 1-4, 6.01-6.08, 6.11, 6.13-6.14.

Residential development in the protected area ranges from upper middle-income to subsidized low-income housing; and from single-family to multi-family developments. Median values for specified owner-occupied housing units in the protected area range from $37,200 to $168,000.

The protected area also includes the town of Ama, which according to the 2000 U.S. Census is comprised of tract 630 within St. Charles Parish. The median value for specified owner-occupied housing units in this area is $81,500.

3.3.6.2 Discussion of Impacts

3.3.6.2.1 No Action

Direct, Indirect, and Cumulative

Under the no action alternative the proposed 100-year project would not be constructed in this portion of the WBV and no additional actions would be taken to construct the previously authorized project. However, this segment is integral to the upgrade of the WBV project to the 100-year elevation, and without it the storm surge risk reduction system would not comply with the minimum requirements of the NFIP.

There would be no direct impacts to tax revenues and property values under the no action alternative. However, under these conditions, the actual and perceived risks to businesses and residences in the vicinity would be directly impacted. Costs associated with business and residential development would likewise be impacted. As a result, tax revenues and property values may be indirectly affected by a relative decrease in development. The lack of enhanced flood risk reduction could be a long-term detriment to the economic vitality of the area to be protected.

3.3.6.2.2 Alternative 1

Direct, Indirect, and Cumulative

This alternative would likely preserve or possibly enhance property values in the protected area. Increased confidence in the HSDRRS providing storm surge risk reduction to the area would have a positive effect on property values, and thus tax revenues, in the vicinity.

3.3.6.2.3 Alternative 2

Direct, Indirect, and Cumulative

This alternative would likely preserve or possibly enhance property values in the protected area. Increased confidence in the HSDRRS providing storm surge risk reduction to the area would have a positive effect on property values, and thus tax revenues, in the vicinity.

However, since the Pier 90 Marina, 4 residences, and 2 camps would have to be removed under this alternative, there would be a decrease in tax revenues, relative to the proposed action.

3.3.6.2.4 Alternative 3 (Proposed Action)

Direct, Indirect, and Cumulative

The proposed action would likely preserve or possibly enhance property values in the protected area. Increased confidence in the HSDRRS providing storm surge risk reduction to the area would have a positive effect on property values, and thus tax revenues, in the vicinity.

3.3.7 Changes in Community Cohesion

3.3.7.1 Existing Conditions

Community cohesion refers to the common vision and sense of belonging within a community that is created and sustained by the extensive development of individual relationships that are social, economic, cultural, and historical in nature. The degree to which these relationships are facilitated and made effective is contingent upon the spatial configuration of the community itself: the functionality of the community owes much to the physical landscape within which it is set. The viability of community cohesion is compromised to the extent to which these physical features are exposed to interference from outside sources.

3.3.7.2 Discussion of Impacts

3.3.7.2.1 No Action

Direct, Indirect, and Cumulative

Under the no action alternative the western tie-in for the WBV project would not be constructed and no additional actions would be taken to construct the previously authorized project. However, this project is integral to the upgrade of the WBV project and without it the storm surge risk reduction system would not comply with the minimum requirements of the NFIP.

There would be no direct impacts to community cohesion under the no action alternative. However, under these conditions, the actual and perceived risks to businesses would be higher than those under other alternatives. The lack of enhanced flood risk reduction could be a long-term detriment to the economic vitality of the area to be protected. Additionally, an increased risk of flooding due to a lower level of risk reduction may have detrimental effects on community cohesion in the area.

3.3.7.2.2 Alternative 1

Direct, Indirect, and Cumulative

The impacts on community cohesion would be similar for all of the action alternatives: the storm surge risk reduction measures are designed to protect the community from the catastrophic effects of flooding, preserving the physical integrity of the developed landscape that promotes patterns of social interchange.

This alternative would increase the level of community cohesion for the protected area, which in this case is the west bank of Jefferson Parish and the town of Ama, in St. Charles Parish. However, the remainder of the west bank of St. Charles Parish does not fall within the HSDRRS and would not benefit from any of the action alternatives. This may have a negative impact on community cohesion with respect to communities within the lower parish.

3.3.7.2.3 Alternative 2

Direct, Indirect, and Cumulative

This alternative's impacts on community cohesion would be similar to alternative 1. Additionally, under this alternative, the Pier 90 Marina, 4 residences, and 2 camps would have to be demolished within the footprint of construction. This would cause direct negative impacts to community cohesion.

3.3.7.2.4 Alternative 3 (Proposed Action)

Direct, Indirect, and Cumulative

The impacts on community cohesion from implementing alternative 3 would be similar to those from the other action alternatives: the storm surge risk reduction measures are designed to protect the community from the catastrophic effects of flooding, preserving the physical integrity of the developed landscape that promotes patterns of social interchange.

The proposed action would increase the level of community cohesion for the protected area, which in this case is the west bank of Jefferson Parish and the town of Ama, in St. Charles Parish. However, the remainder of the west bank of St. Charles Parish does not fall within the HSDRRS and would not directly benefit from its advancement. This may have a negative impact on community cohesion with respect to communities within the lower parish.

3.4 ENVIRONMENTAL JUSTICE

Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Population and Low-Income Populations* (Executive Order, 1994), directs Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority population and low-income populations. When conducting NEPA evaluations, the USACE incorporates Environmental Justice (EJ) considerations into both the technical analyses and the public involvement in accordance with the USEPA and the Council on Environmental Quality guidance (CEQ, 1997). The CEQ guidance defines “minority” as individual(s) who are members of the following population groups: American Indian or Alaskan native, Asian or Pacific Islander, Black, not of Hispanic origin, and Hispanic (CEQ, 1997). The Council defines these groups as minority populations when either the minority population of the affected area exceeds 50 percent of the total population, or the percentage of minority population in the affected area is meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis.

Low-income populations are identified using statistical poverty thresholds from the Bureau of the Census Current Population Reports, Series P-60 on Income and Poverty (U. S. Bureau of the Census, 2000). In identifying low-income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect. The threshold for the 2000 census was an income of $17,761 for a family of four (U.S. Bureau of the Census, 2000). This threshold is a weighted average based on family size and ages of the family members.

The EJ analysis for the proposed project follows the guidance and methodologies recommended in the Federal CEQ’s Environmental Justice Guidance under the National Environmental Policy Act (December 1997). Executive Order 12898 Federal Actions To Address Environmental Justice in Minority Populations and Low Income Populations, issued in 1994, directs Federal and state agencies to incorporate environmental justice as part of their mission by identifying and addressing the effects of all programs, policies and activities on minority and low-income populations. The fundamental principles of EJ are as follows:

- Ensure the full and fair participation by all potentially affected communities in the decision-making process;
- Prevent the denial of, reduction in or significant delay in the receipt of benefits by minority and low-income populations; and
- Avoid, minimize or mitigate disproportionately high and adverse human health and environmental effects, including social and economic effects, on minority populations and low-income populations.

In addition to Executive Order 12898, the Environmental Justice analysis is being developed per requirements of "Department of Defense's Strategy on Environmental Justice" (March 24, 1995).

Per the above directives, EJ analyses identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of the project on minority and low-income populations. The methodology to accomplish this includes identifying low-income and minority populations within the study area, as well as community outreach activities such as stakeholder meetings with the affected population. As the project planning process advances, EJ impacts will be analyzed further when additional project planning data become available. Aerial photos were utilized to confirm the presence of habitation in the various project areas, and to analyze potential EJ impacts.

Census Block Group statistics from the 2000 Census and Environmental Systems Research Institute (ESRI) estimates for year 2007 were utilized for EJ data analysis. The proposed actions and alternatives were evaluated for potential disproportionately high, environmental effects on minority or low-income populations.

3.4.1 Existing Conditions

The west bank of Jefferson Parish and St. Charles Parishes, which stretches from the Mississippi River south to the Gulf of Mexico, is a more diverse area than its northern counterpart (east bank). The west bank is home to an assorted mix of land uses, income groups, and ethnic communities. The northern section of both Parishes' west bank is a more developed residential and retail area, as well as host to several large hospitals. The southern section has a much more rural character, with a strong economic base tied to the fishing industry and oil support services.

Jefferson Parish and St. Charles Parish are diverse areas compared to Louisiana, with a substantial Hispanic and Asian population. Since 2000, the white population decreased while the Black/African-American population increased. This trend will likely not continue, and the current distribution of whites and Blacks/African Americans currently mirrors the state racial composition. A series of community-focused public meetings is currently on going as an outreach effort to explain the proposed 100-year level of construction activities to interested parties. The dates and times for these public meetings are being posted to the calendar at the website www.nolaenvironmental.gov. Table 3 presents the Parish-specific 2000 population by race and ethnicity.

Table 3. Population by Race and Ethnicity St. Charles and Jefferson Parishes, 2000

<table>
<tr><th colspan="2"></th><th>White, Non-Hispanic</th><th>Black, Non-Hispanic</th><th>Hispanic and other</th><th>Totals</th></tr>
<tr><td rowspan="2">St. Charles</td><td>Population</td><td>34,238</td><td>12,161</td><td>1,673</td><td rowspan="2">48,072</td></tr>
<tr><td>% of Parish</td><td>71.20%</td><td>25.30%</td><td>3.50%</td></tr>
<tr><td rowspan="2">Jefferson</td><td>Population</td><td>302,648</td><td>104,957</td><td>54,028</td><td rowspan="2">461,633</td></tr>
<tr><td>% of Parish</td><td>66.40%</td><td>23.00%</td><td>11.90%</td></tr>
<tr><td>Louisiana</td><td>Population</td><td>2,856,161</td><td>1,451,944</td><td>160,871</td><td>4,468,976</td></tr>
<tr><td colspan="6">Source: FHWA, 2007</td></tr>
</table>

3.4.2 Discussion of Impacts

3.4.2.1 No Action

Direct

Under the no action alternative, the HSDRRS would not be constructed to protect the residences and businesses in the WBV. No disproportionate impacts would occur to minority or low-income communities under the no action alternative.

Indirect

Failing to provide this segment of the WBV 100-year risk reduction measures would predictably contribute to the damages from large-scale flooding. Future catastrophic flooding could result in major economic and social effects to the area including loss of homes and businesses. In areas with recurring flooding, homes tend to become more degraded over time because money that could be used for general improvements is used for flood repairs. Over time, the market value of real property diminishes and negatively impacts local tax revenues.

Cumulative

Recurring flooding also requires the expenditure of local tax revenues for flood-fighting, clean-up, infrastructure repair, and emergency response. This diverts local revenues from infrastructure and recreation improvements from the entire community, not just the flooded areas. Damage to commercial and industrial facilities ripple through the economy when businesses are forced to close, lay-off workers, and cease production for several weeks.

3.4.2.2 Alternative 1

Direct, Indirect, and Cumulative

No minority and low-income populations would be adversely impacted by the actions necessary to construct and maintain alternative 1.

3.4.2.3 Alternative 2

Direct, Indirect, and Cumulative

Implementing alternative 2 would not result in direct EJ impacts, because no minority and low-income populations would be adversely impacted.

3.4.2.4 Alternative 3 (Proposed Action)

Direct, Indirect, and Cumulative

Implementing alternative 3 would not require the taking of residences or businesses. No minority and low-income populations would be adversely impacted. The cumulative EJ impacts from all alternatives will be analyzed when further project planning data become available, and will be included in the CED.

3.5 HAZARDOUS, TOXIC, AND RADIOACTIVE WASTE

3.5.1 Existing Conditions

There must be reasonable identification and evaluation of all HTRW contamination within the vicinity of the proposed action. ER 1165-2-132 identifies the USACE policy to avoid the use of project funds for HTRW removal and remediation activities. Costs for necessary special handling or remediation of wastes (e.g., Resource Conservation and Recovery Act (RCRA) regulated), pollutants and other contaminants, which are not regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), would be treated as project costs if the requirement is the result of a validly promulgated Federal, state, or local regulation.

An American Society for Testing and Materials (ASTM) E Phase I Environmental Site Assessment (ESA) was completed for the project area (USACE, 2008). A copy of the Phase I ESA will be maintained on file at the CEMVN. The Phase I ESA documented the Recognized Environmental Conditions (RECs) for the project area and no RECs were identified within the project footprint. If a REC cannot be avoided, due to the necessity of construction requirements, the CEMVN may further investigate the REC to confirm presence or absence of contaminants, actions to avoid possible contaminants, and if local, state, or Federal coordination is required. Because the CEMVN plans to avoid RECs, the probability of encountering HTRW in the project area is very low.

3.5.2 Discussion of Impacts

3.5.2.1.1 No Action

Direct, Indirect, and Cumulative

Potential flooding as a result of not providing the 100-year elevation could indirectly contribute to the dispersion of HTRW materials and environmental damage to the local communities, Lake Cataouatche, and Bayou Segnette. Significant flooding can result in the mobilization and dispersion of HTRW from commercial, municipal, and residential sources. Hurricane damage clean-up experience has shown that vast quantities of debris and increasingly hazardous materials are dispersed into the terrestrial and aquatic environment when large-scale flooding occurs.

3.5.2.1.2 Alternative 1

Direct

The Phase I report states that during interviews with the River Birch Landfill manager, he stated that "South Kenner Road was possibly constructed above an area of the Greater New Orleans Landfill that accepted asbestos containing building materials" (USACE, 2008). Exploratory drilling in this area was not conducted, but the presence of these materials could complicate the floodwall construction in reach 3 of alternative 1.

Indirect

In addition to this limited concern, the potential to create HTRW materials during the construction process remains an environmental concern. Storage, fueling, and lubrication of equipment and motor vehicles associated with the construction process would be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants, and oil would be managed and stored in accordance with all Federal, state, and local laws and regulations. Used lubricants and used oil would be stored in marked corrosion-resistant containers and recycled or disposed in accordance with appropriate requirements. The construction contractor would be required to develop a Spill Control Plan.

Cumulative

There would be no cumulative effects expected from selecting and implementing alternative 1 from HTRW.

3.5.2.1.3 Alternative 2

Direct

Site investigations indicate that there are four petroleum production wells within the footprint of construction for alternative 2 (USACE, 2008). If alternative 2 were selected, all four of these sites would require more detailed characterization, capping, and decommissioning prior to construction.

Indirect, and Cumulative

No specific HTRW concerns were identified from previous site investigations (USACE, 2008); no direct, indirect, or cumulative effects from HTRW would be predicted from implementing alternative 2.

3.5.2.1.4 Alternative 3 (Proposed Action)

Direct, Indirect, and Cumulative

No specific HTRW concerns were identified from previous site investigations (USACE, 2008); no direct, indirect, or cumulative effects from HTRW would be predicted from implementing alternative 3.

The potential to create HTRW materials during the construction process remains an environmental concern. Storage, fueling, and lubrication of equipment and motor vehicles associated with the construction process would be conducted in a manner that affords the maximum protection against spill and evaporation. Fuel, lubricants, and oil would be managed and stored in accordance with all Federal, state, and local laws and regulations. Used lubricants and used oil would be stored in marked corrosion-resistant containers and recycled or disposed in accordance with appropriate requirements. The construction contractor would be required to develop a Spill Control Plan.

3.6 NOISE

3.6.1 Existing Conditions

The project area includes residential, commercial, and recreational areas with varying degrees of associated noise. Changes in noise are typically measured and reported in units of dBA, a weighted measure of sound level. The primary sources of noise within the area include everyday vehicular traffic along nearby roadways (typically between 50 and 60 dBA at 100 feet), maintenance of roadways, bridges, and the other structures (typically between 80 and 100 dBA at 50 feet), and the ongoing construction of various components of the existing floodwalls, pumping stations, and closure structures.

Noise effects to the residences and businesses within the project area are dominated by transportation sources such as trains, garbage and construction trucks, private vehicles, and emergency vehicles. Noise from occasional commercial aircraft crossing at high altitudes is typically indistinguishable from the natural background noise of the area. Noise ranging from about 10 dBA for the rustling of leaves to as much as 115 dBA (the upper limit for unprotected hearing exposure established by the Occupational Safety and Health Administration) is common in areas where there are sources of industrial operations, construction activities, and vehicular traffic.

The U.S. Federal Transit Administration (FTA) has established noise impact criteria founded on well-documented research on community reaction to noise based on change in noise exposure using a sliding scale (USFTA, 1995). The FTA Noise Impact Criteria groups noise sensitive land uses into the following three categories:

- Category 1: Buildings or parks where quiet is an essential element of their purpose,
- Category 2: Residences and buildings where people normally sleep (e.g., residences, hospitals, and hotels with high nighttime sensitivity), and
- Category 3: Institutional buildings with primarily daytime and evening use (e.g., schools, libraries, and churches).

Lands adjacent to the project area do not include any Category 1 properties or Category 3 buildings. However, the 4 residences and 3 camps adjacent to the Outer Cataouatche Canal are Category 2 properties. Also, residences at the southern end of Kennedy Street, Anna Street, Champagne Lane, and the western end of River Road are within several hundred feet of the alternative 1 construction ROW.

3.6.2 Discussion of Impacts

3.6.2.1 Discussion of Impacts

3.6.2.1.1 No Action

Direct

Without construction of the HSDRRS for the Western Tie-in, noise within the area would remain unchanged from current conditions where the largest source of noise is truck traffic on Hwy 90 and in and out of the landfills on South Kenner Road.

Indirect

In the event of significant hurricane flooding, noise would be generated associated with the clean up after floodwaters had receded from the heavy equipment used for cleanup and reconstruction. Under the no action alternative, this cleanup and reconstruction noise would occur more frequently than if one of the action alternatives would be implemented.

Cumulative

There would be no cumulative effects associated with noise from selecting the no action alternative.

3.6.2.1.2 Alternatives 1, 2, or 3

Direct, Indirect, and Cumulative

With the construction of any of the alternatives, noise would be created from high-powered machinery and human activities within the project ROW and emanate various distances beyond the construction site until the noise energy dissipated. The distance between the construction

ROW and Category 2 (residences) adjacent to alternatives 1, 2, or 3 are not less than approximately 250 feet and are frequently much greater.

Construction activity, and the associated noise, can be quite annoying and disruptive during leisure hours, during sleep hours, and any time when loud continuous noises may affect receptors. Time constraints and use of equipment regulations can be effective in reducing the effects caused during these hours of the day. The basis for the noise control strategy is to limit the times that certain construction activities may be conducted. Generally, this can be accomplished by requiring contractors to perform such work during daylight hours when the majority of individuals who would ordinarily be affected by the noise are either not present or are engaged in less noise-sensitive activities.

4.0 CUMULATIVE IMPACTS

NEPA requires a Federal agency to consider not only the direct and indirect impacts of a proposed action, but also the cumulative impact of the action. A 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. These actions include on- or off-site projects conducted by government agencies, businesses, or individuals that are within the spatial and temporal boundaries of the actions considered in this IER.

As indicated previously, in addition to this IER, the CEMVN is preparing a draft CED that will describe the work completed and the work remaining to be constructed. The purpose of the draft CED will be to document the work completed by the USACE on a system-wide scale. The draft CED will describe the integration of individual IERs into a systematic planning effort. Additionally, the draft CED will contain updated information for any IER that had incomplete or unavailable data at the time it was posted for public review. Overall cumulative impacts and future operation maintenance, repair, replacement and rehabilitation requirements will also be included. The discussion provided below describes an overview of other actions, projects, and occurrences that may contribute to the cumulative impacts previously discussed.

Providing the Western Tie-in reach of the WBV with the 100-year level of risk reduction would contribute to the protection of life and to the reduction of physical and environmental damage. Significant flooding often results in contamination of drinking water supplies, dispersion of HTRW, and dispersion of large quantities of solid waste that require clean up and disposal. Experience has shown that vast quantities of debris (e.g., homes, vehicles, mobile homes, etc.) and sediment must be collected and hauled away after a flooding event. Hauling the collected debris to a local municipal landfill requires significant transportation and involves large quantities of solid waste that fill available landfill space. Providing the 100-year level of risk reduction significantly reduces the probability that these environmental consequences of flooding would be incurred.

Negative effects associated with implementation of the proposed action (alternative 3) that could contribute cumulatively with the effects of other projects include temporary construction-related increases in truck traffic, noise and vibration, vehicle and equipment emissions, and localized degradation of water quality. Permanent loss of approximately 12 acres of aquatic habitat and 211 acres of wetlands would also be required. The total loss of habitat related to the implementation of all actions under all of the IERs has not yet been compiled, but the current totals are presented in table 4. When available, the loss from IER # 16 will be included in the total cumulative loss. The positive cumulative effects of implementing the proposed action include the temporary expansion of the local economy through the influx of construction-related expenditures.

The WBV project extends approximately 66 miles in length from the Western Tie-in to the Hero Canal Levee and Eastern Terminus in Belle Chasse (IER # 13) (USACE, 2007). The LPV Project (IERs # 1-11) extends an even larger distance protecting the East Bank of New Orleans. The construction-related negative effects as well as the positive consequences (e.g., spending in the local economy) resulting from providing the 100-year level of hurricane damage risk reduction for these projects may potentially represent the largest cumulative environmental consequences in the New Orleans region for the next 4 years to 7 years.

Table 4. HSDRRS Impacts and Compensatory Mitigation to be Completed

IER	Parish	Protected or Flood Side	Non-wet BLH[12] (acres)	Non-wet BLH AAHUs[13]	BLH (acres)	BLH AAHUs	Swamp (acres)	Swamp AAHUs	Marsh (acres)	Marsh AAHUs	EFH[14] (acres)
1- LPV, La Branch Wetlands Levee	St. Charles	Protected	-	-	-	-	137.05	73.99	-	-	-
		Flood	-	-	11.33	8.09	143.57	110.97	-	-	-
2 - LPV, West Return Floodwall	St. Charles, Jefferson	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	33.40	9.00	-	-	-
3 - LPV, Lakefront Levee	Jefferson	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	26.00
4 – LPV, Orleans Lakefront Levee	Orleans	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
11-Tier 2 Borgne IHNC Protection	Orleans, St. Bernard	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	15.00	2.59	-	-	186.00	24.33	-
12 – GIWW, Harvey, Algiers	Jefferson, Orleans, Plaquemines	Protected	-	-	251.70	177.3	-	-	-	-	-
		Flood	-	-	2.30	1.90	74.90	38.50	-	-	-
14 - WBV, Westwego to Harvey Levee	Jefferson	Protected	-	-	45.00	30.00	-	-	-	-	-
		Flood	-	-	45.50	18.58	29.75	17.02	-	-	-
15 - WBV, Lake Cataouatche Levee	Jefferson	Protected	-	-	23.50	6.13	-	-	-	-	-
		Flood	-	-	3.60	1.35	-	-	-	-	-
17 – Company Canal Floodwall	Jefferson	Protected	-	-	5.50	2.69	-	-	-	-	-
		Flood	-	-	-	-	19.00	17.09	-	-	-
18 - GFBM[15]	Jefferson, Plaquemines, St. Charles	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
18 - GFBM	Orleans	Protected	226.00	68.79	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
18 - GFBM	St. Bernard	Protected	74.30	43.59	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
19 - CFBM	Hancock County, MS; Iberville; Orleans; Plaquemines; St. Bernard	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
19 - CFBM	Jefferson	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
22 - GFBM	Jefferson	Protected	157.76	89.64	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-

[12] BLH – Bottomland hardwood.
[13] AAHUs – Annual average habitat units are the total number of habitat units gained or lost as a result of a proposed action, divided by the life of the action.
[14] EFH – Essential Fish Habitat.
[15] GFBM/CFBM – Government furnished borrow material / contractor furnished borrow material.

22 - GFBM	Plaquemines	Protected	86.93	28.90	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
23 - CFBM	Hancock County, MS; Plaquemines; St. Bernard; St. Charles	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
25 – GFBM	Jefferson	Protected	78.83	40.90	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
25 – GFBM	Orleans	Protected	873.00	231.00							
		Flood	-	-	-	-	-	-	-	-	-
25 – GFBM	Plaquemines	Protected	17.70	12.10	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
26 - CFBM	Jefferson, Plaquemines, St. John the Baptist; Hancock County, MS	Protected	-	-	-	-	-	-	-	-	-
		Flood	-	-	-	-	-	-	-	-	-
TOTALS		Protected	1,473.09	514.92	325.70	216.12	137.50	73.99	-	-	-
		Flood	-	-	77.73	32.51	300.62	192.58	186.00	24.33	26.00
		Both	1,473.09	514.92	403.43	248.63	437.67	266.57	-	-	26.00

4.1 FHWA AND LADOTD I-49 SOUTH - ROUTE US 90

The U.S. Department of Transportation's Federal Highway Administration and the Louisiana Department of Transportation and Development have completed a final EIS and published a Record of Decision (FHWA, 2007; FHWA, 2008) that approves the selected alternative for the portion of proposed I-49 South that would extend along the Hwy 90 corridor from the LA 1 interchange in Raceland in Lafourche Parish to the existing completed portion of the elevated Westbank Expressway near Ames Boulevard in Jefferson Parish.

This final EIS studied the proposed construction of an elevated, controlled access freeway with local access frontage roads along portions of the Hwy 90 corridor. The elevated structures were designed to "provide clearance for the 100-year floodplain." Use of the existing Hwy 90 corridor was maximized to minimize disruption to traffic during construction as well as the effects to the natural and human environment. This approach would also provide the best access for local and business traffic in the completed project in addition to an improved hurricane evacuation route.

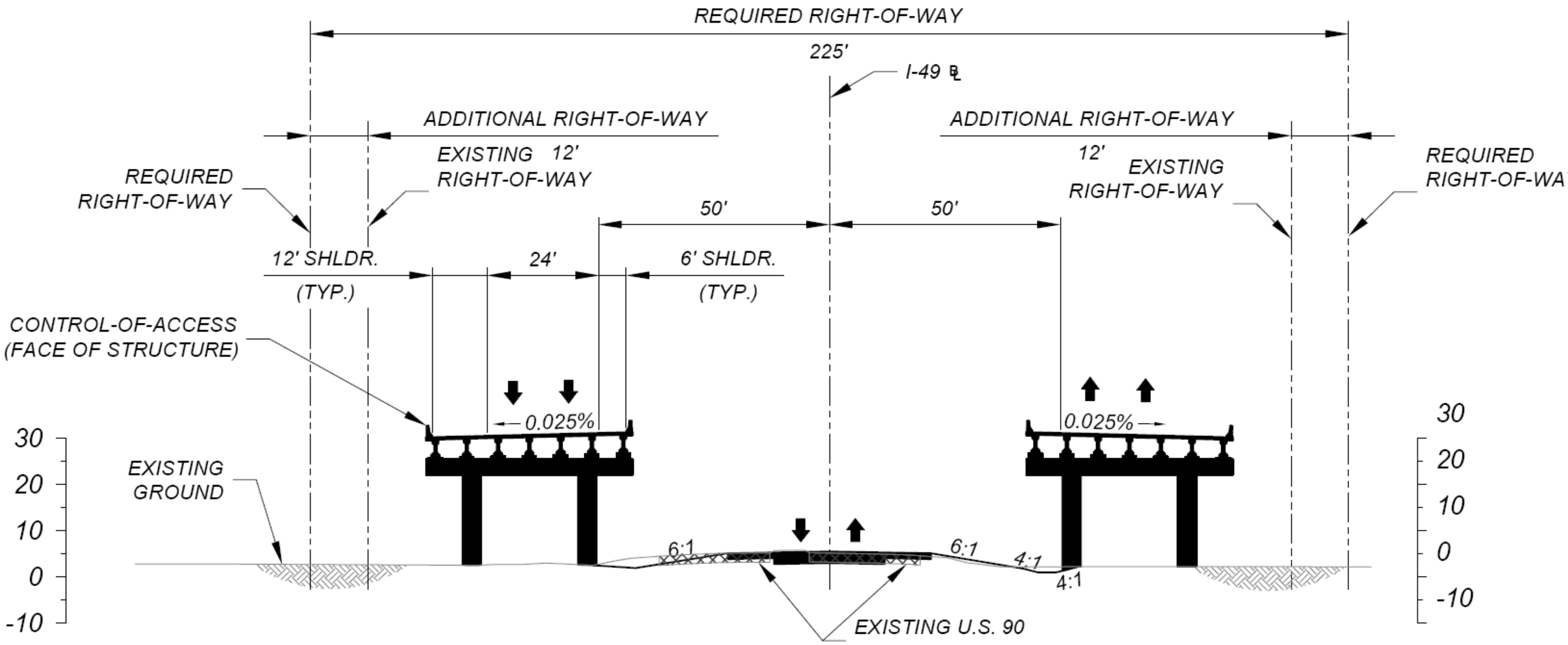
The project was made up of links that are portions of roadway alignment distinguished by geometry, environmental conditions, and/or use of the Hwy 90 ROW. Link 5, including the IER 16 project area, begins at the Davis Pond Freshwater Diversion Canal in St. Charles Parish and continues to Avondale in Jefferson Parish. Three I-49 alignment alternatives were developed for Link 5: an entirely elevated 5A, a partially elevated 5B, and a partially elevated 5C. Alternative 5A (entirely elevated) was the selected alternative in the ROD (FHWA, 2008).

Alternative 5A would extend from the Davis Pond Freshwater Diversion Canal to Avondale on the existing Hwy 90 alignment. I-49 would be on two elevated structures (see example cross-section in figure 16) near the edges of the ROW with a frontage (local) road between them on the existing fill section of Hwy 90. The required ROW in this area would be expanded slightly to provide the desirable 25 feet outside the proposed structures. Acquisition would involve small amounts of land, much of it wetlands, in which no construction would occur. ROW would be acquired to ensure 25 feet of clearance on either side of the mainline structures (FHWA, 2007). As currently proposed, the frontage road would be 2-ways and 2-lanes. The distance between the northbound and southbound I-49 structures would be adequate to provide a 4-lane frontage road with a 16-foot median (FHWA, 2008).

The FHWA assigns the priorities for the sequence of segment construction in chapter 8 of the final EIS (FHWA, 2007). Therein, the priority for section 9 (within the IER # 16 project area) is assigned as part of the agency's implementation plan. Based on the FHWA criteria of traffic demand and safety issues, segment 9 was assigned the lowest construction priority of any mainline segment with construction to begin after 2015 and completion of the HSDRRS (FHWA, 2007). This priority was assigned because "it is projected to have the lowest mainline traffic volumes after completion of the project (FHWA, 2007)."

Early planning efforts for the I-49 project examined the feasibility of using the existing Hwy 90 corridor to construct a combined HSDRRS and interstate highway with a single project. Combining levee and roadway together were initially thought to save substantial tax dollars, offer risk reduction to the community, and minimize the environmental consequences (FHWA, 2003). However, the combined levee/roadway was determined to be infeasible because the roadway on top of the levee does not allow additional lifts of levee material to be added as the levee settles. The FHWA therefore determined to proceed independently and not pursue a single coordinated alternative (FHWA, 2003a).

Figure 16. Example Cross-Section of Proposed I-49



Note: Cross-section not within project area and for example purposes only.

Source: FHWA, 2007.

5.0 SELECTION RATIONALE

On the basis of the assessment of potential environmental impacts presented in this IER and the evaluation of feasibility based on the engineering effectiveness, economic efficiency, and environmental and social acceptability criteria, alternative 3 (the proposed action) is selected and is environmentally preferred.

The CEQ regulations for implementing NEPA require that the Record of Decision (ROD) for an environmental impact statement specify "the alternative or alternatives which were considered to be environmentally preferable" (40 CFR §1505.2(b)). This alternative has generally been interpreted to mean the alternative that will promote the national environmental policy as expressed in NEPA's Section 101 (CEQ's "Forty Most-Asked Questions," 46 Federal Register, 18026, March 23, 1981). Ordinarily, this means the alternative that causes the least damage to the biological and physical environment; it also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources.

The proposed action for IER #16 presents an engineering-effective, cost-efficient, environmentally-preferable selection to other alternatives. The two alternatives not selected were not the engineering-preferred alternatives, based on economic efficiency and engineering effectiveness. Taking no action, although avoiding the direct effects from construction of the 100-year level of risk reduction, may lead to indirect effects from large-scale flooding to area residences and businesses, and associated costs for clean up.

Alternative 3 was selected because it would simultaneously (1) minimize impacts to residential, commercial and industrial properties, (2) have the greatest reliability based on project features, and (3) have the least overall operations and maintenance considerations.

Failing to provide residents with flood damage risk reduction measures could, in the predictable occurrence of a significant flood, contribute to the loss of life and physical as well as environmental damage to Jefferson Parish and St. Charles Parish. Significant flooding can result in the overtopping of sewage treatment works, contamination of drinking water supplies, dispersion of HTRW and dispersion of large quantities of solid waste that need clean up from the floodplain when the storm surge subsides. Substantial quantities of debris (e.g., homes, vehicles, mobile homes, etc.) and sediment must be removed from the area after a flooding event. The physical removal of the debris from the damaged area typically involves large, heavy equipment and requires the removal of trees and vegetation to provide points of ingress and egress for the cleanup equipment. Hauling the collected debris to a local municipal landfill requires significant transportation, construction-type noise during cleanup, and involves huge quantities of solid waste that fill available landfill space.

Debris generated as a result of hurricane damages to Louisiana in 2005 has been estimated at 26.5 million CY; all of this debris needed to be removed for appropriate disposal (USACE, 2007a). Assuming the clean up was performed using dump trucks that could haul 40 CY of debris, the debris removal alone would require more than 1 million truckloads and tens of millions of miles traveled (USACE, 2007a). Failing to provide New Orleans with appropriate hurricane risk reduction would result in significant quantities of debris requiring extraction, transportation, and disposal.

6.0 COORDINATION AND CONSULTATION

6.1 PUBLIC INVOLVEMENT

Extensive public involvement has been sought in preparing this IER. Proposed Federal projects analyzed by IERs have been publicly disclosed and described in the Federal Register on 13 March 2007 (72 FR 11337) and on the website www.nolaenvironmental.gov. Scoping for this project was initiated on 12 March 2007, through placing advertisements/public notices in *USA Today* and the *Times-Picayune*. Nine public scoping meetings were held throughout the New Orleans Metropolitan area between 27 March 2007 and 12 April 2007, after which a 30-day scoping period was open for public comment submission. Additionally, the CEMVN is hosting monthly public meetings to keep the stakeholders advised of project status. The public has been able to provide verbal comments during the meetings and written comments after each meeting in person, by mail, and via the www.nolaenvironmental.gov website. Project-specific public meetings were also held 19 July and 19 September 2007 as well as 15 January, 25 March, 15 May, 22 July, and 19 November 2008.

Comments were received at a public meeting on 19 July 2007 at the St. Bonaventure Catholic Church in Avondale, LA. The public concern that evening was focused on getting clarification regarding the schedule for completion of the ongoing levee work, the schedule for construction to the new authorized elevation, and how the alignment would intersect Hwy 90 at the western end. Additional questions posed included sources of borrow material for levee construction and the extent of storm surge reduction due to the wetlands near Lake Cataouatche. There were no questions specifically addressing issues associated with IER # 16.

At the meeting held on 19 September 2007 at Westwego City Hall, Westwego, the community members expressed their concerns about the following:

- Lack of better models to address coastal restoration and wetlands preservation,
- HSDRRS concentrating more on the levee construction and not on coastal restoration and wetland restoration and preservation,
- 404(c) Bayou aux Carpes site is of great concern for its historical and cultural value,
- Relationship between 100-year level of flood risk reduction and categories of storms (1-5) with respect to the level of risk reduction that needs to be provided,
- Criteria for 100-year level of risk reduction and recent storm data incorporation into the selection criteria and models,
- Interim risk reduction for the area from hurricanes and floods before the entire levee system is brought up to the 100-year level of risk reduction, and
- General concerns about floodwalls being replaced.

Comments were also received on 15 January 2008 at the St. Bonaventure Catholic Church in Avondale, LA. The public concern that evening addressed whether the decisions regarding the type of risk reduction (e.g., floodwall vs. levee) was risk based, why St. Charles Parish was not part of the original WBV project, whether the design for pumping station modifications would include back-flow prevention, whether the new levees would have armoring, and questions involving the identification, selection, use, and post-extraction use of borrow locations.

Comments were received 25 March 2008 at the John Ehret High School gym in Marrero, LA. During that meeting, no public comments were made addressing IER # 16. Public comments that evening focused on the issues of borrow site suitability in the West Bank. There were other more general questions such as characterizing the difference between I-walls and T-walls and whether the West Bank communities would have been damaged more severely if Hurricane Katrina had made landfall 20 miles to the west. One comment was also made asking the

CEMVN staff to correlate the 100-year level of risk reduction being developed as the HSDRRS to risk reduction for a storm of what category on the Saffir-Simpson scale.

Comments were also received at the 15 May 2008 public meeting at Cytec's Tom Call Pavilion in Waggaman, LA. That evening, much of the question, answers, and discussion specifically addressed IER # 16. Community members raised the following issues:

- Whether pump stations be included as part of the project,
- Whether St. Charles Parish would have the opportunity to state its preferred alignment,
- Concerns about alternatives being revealed to the public so close to the time when the IER would be released,
- Questioning the amount of freeboard that would be built into the levees and floodwalls, and whether or not subsidence was taken into account in determining design heights,
- Concerns that the US 90 pier would be impacted by alternative 2 limiting access for thousands of hunters and fishermen,
- Questioning if the USACE was required to comply with the Clean Water Act and what effect would constructing alternative 2 have on water quality,
- Commenting that alternative 2 would directly affect homes, incomes, and quality of life. The commenter further stated that after receiving a letter one year ago citing the USACE's potential involvement; they received no additional contact until just recently when flags were placed in his yard for surveys.

Comments were received at the 22 July 2008 public meeting at Cytec's Tom Call Pavilion in Waggaman, LA. That evening, many of the questions, answers, and discussion addressed IER # 16. Community members raised the following issues:

- What effect Hurricane Katrina would have had if it came through Lake Cataouatche and Davis Pond,
- Whether the USACE had conducted an objective design and evaluation process when considering alternatives 1, 2, and 3,
- Whether the Western Tie-in was 100-percent funded,
- How the operation of the Davis Pond Freshwater Diversion Project would be affected by the HSDRRS Western Tie-in,
- Whether the USACE could use the existing Davis Pond Guide Levee as a foundation for the Western Tie-in alignment,
- What effect the different alternatives would have on recreational boat access to the area,
- Whether the Davis Pond Freshwater Diversion Project was realizing the ecosystem benefits that had been expected,
- Property owners directly affected by alternatives 2 and 3 expressed concern at both the process and the decision the USACE was apparently reaching, and
- Concerns regarding how the USACE would relocate families from within the project footprint.

Comments were received at the 19 November 2008 public meeting at Cytec's Tom Call Pavilion in Waggaman, LA. That evening, many of the questions, answers, and discussion addressed IER # 16. Community members raised the following issues:

- Whether there would be navigation access under the bridges crossing the Outer Cataouatche Canal in alternative 3 and what elevation would be clear,
- Would the USACE consider leaving the bridge access open during heavy boat traffic times (e.g., duck season),
- What needs to be done to have the risks in Willowdale, River Ridge, Ama, and the rest of the West Bank of St. Charles Parish reduced like they are within the proposed actions,
- Can a large levee also be built for the Donaldson to the Gulf project, and
- Can Hwy 90 be raised from Davis Pond to Avondale.

Since this project would include unavoidable adverse impacts to jurisdictional wetlands under Section 404 of the Clean Water Act, a 404 public notice was made available to the public and other interested parties on the www.nolaenvironmental.gov website. The 404 public notice was be was advertised for the 30-day period of 1 May – 30 May 2009.

This draft IER was distributed for the 30-day public review of 1 May - 30 May 2009. A public meeting specific to the proposed action was held on 28 May 2009. Comments received during this public meeting are considered part of official record. After the 30-day comment period, the CEMVN District Commander will review all comments received during the review period and make a determination if they rise to the level of being substantive in nature. If comments are not considered to be substantive, the District Commander will make a decision on the proposed action. This decision will be documented in an IER Decision Record. If a comment(s) is determined to be substantive in nature, an Addendum to the IER will be prepared and published for an additional 30-day public review and comment period. After the expiration of the public comment period the District Commander will make a decision on the proposed action. The decision will be documented in an IER Decision Record.

6.2 AGENCY COORDINATION

Preparation of this IER has been coordinated with appropriate Congressional, Federal, state, and local interests, as well as environmental groups and other interested parties. An interagency environmental team was established for this project in which Federal and state agency staff played an integral part in the project planning and alternative analysis phases of the project (members of this team are listed in appendix D). This interagency environmental team was integrated with the CEMVN Project Delivery Team to assist in the planning of this project and to complete a mitigation determination of the potential direct and indirect impacts of the proposed action. Monthly meetings with resource agencies were also held concerning this and other CEMVN IER projects. Project specific discussion of the proposed IER # 16 project took place during the 1 December 2008, 2 February 2009, 2 March 2009, and 6 April 2009 interagency environmental team meetings. The following agencies, as well as other interested parties, received copies of the draft IER:

U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Environmental Protection Agency, Region VI
U.S. Department of Commerce, National Marine Fisheries Service
U.S. Natural Resources Conservation Service, State Conservationist
Advisory Council on Historic Preservation
Governor's Executive Assistant for Coastal Activities
Louisiana Department of Wildlife and Fisheries
Louisiana Department of Natural Resources, Coastal Management Division
Louisiana Department of Natural Resources, Coastal Restoration Division
Louisiana Department of Environmental Quality
Louisiana State Historic Preservation Officer

The USFWS has reviewed the proposed action and in a Planning Aid letter dated 28 November 2007, stated that the USFWS is unaware of any known threatened or endangered species under its jurisdiction in the proposed project area. National Oceanic and Atmospheric Administration (NOAA) National Marine Fisheries Service (NMFS) has reviewed the proposed action to ensure compliance with Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act and the Fish and Wildlife Coordination Act.

In their 8 November 2007 correspondence, the NMFS Protected Resources Division provided a list of threatened and endangered species under their jurisdiction in Louisiana. Based on that information, the CEMVN made a determination of no effect for species under NMFS jurisdiction. In addition, Essential Fish Habitat (EFH) has not been designated for any of the alignments under consideration, so no coordination on EFH is required (NMFS, 2009).

In compliance with the Coastal Zone Management Act, the CEMVN has coordinated with LDNR for consistency with the Louisiana Coastal Resource Program (LCRP) and the Consistency Determination was issued on 14 April 2009. A copy of the Consistency Determination is included in appendix I.

A Water Quality Certification has been received from the Louisiana Department of Environmental Quality (LDEQ) by letter dated 20 April 2009 (appendix I). An Air Quality certification is being coordinated with LDEQ through the 30-day public review period associated with IER # 16.

Section 106 of the National Historic Preservation Act, as amended, requires consultation with SHPO and Native American tribes. SHPO reviewed the proposed action and determined that it would not adversely affect any cultural resources by letter dated 11 December 2007. Eleven Federally recognized tribes that have an interest in the region were given the opportunity to review and comment on the proposed action.

The USFWS reviewed the proposed action in accordance with the Fish and Wildlife Coordination Act and prepared a draft Coordination Act Report for IER # 16 dated 13 March 2009. A final report was prepared after the 30-day review period and received on 8 June 2009. All comments related to USFWS trust resources have been resolved. The USFWS also provided programmatic recommendations, in the "Draft Fish and Wildlife Coordination Act Report for the Individual Environmental Reports (IER), Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)" in November 2007. The uncertainties in the design of several projects prohibited a complete evaluation of the impacts to fish and wildlife species and the reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.). Therefore, a subsequent final supplemental report will be provided by the USFWS at a later date. The draft (programmatic) Fish and Wildlife Coordination Act Report for the IERs dated November 2007, can be accessed through the www.nolaenvironmental.gov website.

The USFWS' programmatic recommendations applicable to this project will be incorporated into project design studies to the extent practicable, consistent with engineering and public safety requirements. The USFWS' programmatic recommendations, and the CEMVN's response to them, are listed below:

Recommendation 1: To the greatest extent possible, situate flood risk reduction so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.

CEMVN Response 1: The project would utilize the authorized level of risk reduction footprint to avoid and minimize impacts to wetlands.

Recommendation 2: Minimize enclosure of wetlands with new levee alignments. When enclosing wetlands is unavoidable, acquire non-development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

CEMVN Response 2: The proposed action would enclose approximately 350 acres of wetlands and open water areas south of Hwy 90 and enclose an additional 2,400 acres of previously segmented wetlands north of Hwy 90. The USACE has designed project features to maintain hydrologic connections and retain wetland function in these areas. A cut will be constructed in the Davis Pond east guide levee that would open 60 of the 350 acres to water exchange, the Davis Pond Freshwater Diversion discharge and reconnect the area to Mississippi River freshwater and sediments. The remaining approximately 290 acres of newly enclosed wetland and open water would retain water exchange, although with a reduced cross sectional area, through the Bayou Verret and Bayou Verret bypass closure structures. Although enclosed within the levee system, the same cross sectional area of water exchange would be maintained with the 2,400 acres of wetlands north of Hwy 90 by replacing one culvert under Hwy 90 and by adding water control structures to the perimeter of the project. The Bayou Verret and Bayou Verret bypass closure structures remain open except during storm events to minimize changes to existing hydrologic patterns and to allow for the continued interchange of water, nutrients, and aquatic organisms minimizing impacts to wetlands and wetlands functions.

Recommendation 3: Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction.

CEMVN Response 3: No known bald eagle nesting locations or wading bird colonies exist within the scope of this project.

Recommendation 4: 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 4: This recommendation will be considered in the design and implementation of the project to the greatest extent practicable.

Recommendation 5: The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features.

CEMVN Response 5: USACE Project Partnering Agreements (PPA) do not contain language mandating the availability of funds for specific project features, but require the non-Federal sponsor to provide certification of sufficient funding for the entire project. Further, mitigation components are considered a feature of the entire project. The non-Federal sponsor is responsible for Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) of all project features in accordance with the OMRR&R manual that the USACE provides upon completion of the project.

Recommendation 6: Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the USFWS, NMFS, LDWF, USEPA, and LDNR. The USFWS shall be provided an opportunity to review and submit recommendations on all the work addressed in those reports.

CEMVN Response 6: Concur.

Recommendation 7: The CEMVN should avoid impacts to public lands, if feasible. If not feasible, the CEMVN should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance. Points of contacts for the agencies overseeing public lands potentially impacted by project features are: Kenneth Litzenberger, Project Leader for the USFWS' Southeast National Wildlife Refuges, and Jack Bohannan (985)822-2000, Refuge

Manager for the Bayou Sauvage National Wildlife Refuge (NWR), Office of State Parks contact Mr. John Lavin at (888)677-1400, National Park Service (NPS) contact Superintendent David Luchsinger, (504)589-3882, extension 137 (david_luchsinger@nps.gov), or Chief of Resource Management David Muth (504)589-3882, extension 128 (david_muth@nps.gov) and for the 404(c) area contact the previously mentioned NPS personnel and Ms. Barbara Keeler (214)665-6698 with the USEPA.

CEMVN Response 7: Concur.

Recommendation 8: If applicable, a General Plan should be developed by the CEMVN, the USFWS, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

CEMVN Response 8: Concur.

Recommendation 9: If mitigation lands are purchased for inclusion within a NWR, those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A (to the Draft Fish and Wildlife Coordination Act Report.) Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore, if they are proposed as a manager of a mitigation site, they should be contacted early in the planning phase regarding such requirements.

CEMVN Response 9: Concur.

Recommendation 10: If a proposed project feature is changed significantly or is not implemented within one year of the date of the Endangered Species Act consultation letter, the USFWS recommended that the Corps reinitiate coordination to ensure that the proposed project would not adversely affect any Federally-listed threatened or endangered species or their habitat.

CEMVN Response 10: Concur.

Recommendation 11: In general, larger and more numerous openings in a risk reduction levee better maintain estuarine-dependent fishery migration. Therefore, as many openings as practicable, in number, size, and diversity of locations should be incorporated into project levees.

CEMVN Response 11: Concur.

Recommendation 12: Flood risk reduction water control structures in any watercourse should maintain pre-project cross-sections in width and depth to the maximum extent practicable, especially structures located in tidal passes.

CEMVN Response 12: Concur.

Recommendation 13: Flood risk reduction water control structures should remain completely open except during storm events. Management of those structures should be developed in coordination with the USFWS, NMFS, LDWF, and LDNR.

CEMVN Response 13: Concur.

Recommendation 14: Any flood risk reduction water control structure sited in canals, bayous, or a navigation channel which does not maintain the pre-project cross-section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.

CEMVN Response 14: Concur.

Recommendation 15: The number and citing of openings in flood risk reduction levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.

CEMVN Response 15: Concur.

Recommendation 16: Flood risk reduction structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

CEMVN Response 16: Concur.

Recommendation 17: To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 ft per second. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.

CEMVN Response 17: Concur.

Recommendation 18: To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts selected should maintain sufficient flow to prevent siltation.

CEMVN Response 18: Concur.

Recommendation 19: Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one 24-inch culvert placed every 500 ft and one at natural stream crossings. If the depth of water crossings allow, larger-sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500 feet long and an area would hydrologically be isolated without that culvert.

CEMVN Response 19: Concur.

Recommendation 20: Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

CEMVN Response 20: Concur.

Recommendation 21: Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.

CEMVN Response 21: Concur.

Recommendation 22: Operational plans for water control structures should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

CEMVN Response 22: Concur.

Recommendation 23: The CEMVN shall fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

CEMVN Response 23: Concur.

Recommendation 24: Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the CEMVN shall provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

CEMVN Response 24: Construction of the project features are cost shared between the Government and the non-Federal sponsor. However, costs for operation, maintenance, repair, replacement, and rehabilitation would be the responsibility of the non-Federal sponsor.

Recommendation 25: Any proposed change in mitigation features or plans should be coordinated in advance with the USFWS, NMFS, LDWF, USEPA, and LDNR.

CEMVN Response 25: Mitigation for the impacts caused by this project will be coordinated through a mitigation IER. Any changes to the mitigation plan in this IER would be coordinated in advance.

Recommendation 26: A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the CEMVN, USFWS, NMFS, USEPA, LDNR, and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

CEMVN Response 26: Concur.

The USFWS' project-specific recommendations in their Draft Coordination Act Report dated 13 March 2009, and the CEMVN's response to the recommendations are listed below:

Recommendation 1: The Corps shall provide mitigation for impacts.

CEMVN Response 1: Mitigation for the impacts caused by this project will be coordinated through the mitigation IER.

Recommendation 2: Flood protection and ancillary features such as staging areas and access roads should be designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.

CEMVN Response 2: Staging areas and access roads have been sighted to avoid a variety of features including existing structures, businesses, and canals. The size of the staging areas and access roads has been sized to minimize impacts of the features.

Recommendation 3: The enclosure of wetlands within new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-developmental easements on enclosed wetlands should be acquired, and hydrologic connections with adjacent, un-enclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.

CEMVN Response 3: USACE policy is that the CEMVN would mitigate, to the extent justified, for the adverse direct environmental impacts of projects. Indirect impacts such as land development are subject to compliance with local and state permit and zoning requirements and therefore, local and state interests are responsible for defining the appropriate mitigation requirements for land development activities. (See appendix G for a copy of USACE Headquarters Policy on Mitigation for Induced Development). As such, the recommended action of the purchase of non-development easements for wetlands enclosed by the project could not be purchased as part of the project because the conservation easement is not a part of the authorized purpose or need of the project that is flood damage reduction. At the time of the development those responsible for the development themselves, the developers, would be responsible for mitigating those impacts.

To minimize the impacts to 2,485 acres of wetlands located north of Hwy 90, the combined cross section at the perimeter of the project is sized to equal the combined cross section of the openings through Hwy 90 prior to project construction. The approximately 265 acres of wetlands located south of Hwy 90 would continue to have hydrologic connections, but with a reduced cross sectional area.

Recommendation 4: The Service recommends that the previous induced development study examine potential development over the period of analysis (i.e., 50 years) to be consistent with the planning process. Information about potential development of the area in question derived from this analysis would be used to determine mitigation requirements.

CEMVN Response 4: The St. Charles Parish Development Study acknowledges the potential for development to occur within the study area. The CEMVN believes the period of analysis for the induced development is appropriate. See CEMVN response to Recommendation 3 regarding the USACE policy on the mitigation of effects from induced development. Addressing the environmental effects of induced development, resulting from choices, decisions, and actions of others (such as states, communities, businesses, and individuals) becomes a non-Federal responsibility. Regulation of land development is under the purview of the local and state government; those entities retain the responsibility for managing development. The USACE does not mitigate for indirect impacts such as inducted development, where local and state entities regulate and would able to assign mitigation requirements directly to the developer. (See also, appendix G).

Recommendation 5: Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to pre-storm levels.

CEMVN Response 5: Although the final plan for water control structures has not been finalized, possible designs include sluice gates that can be opened rapidly after a storm and could be opened manually without a power source.

Recommendation 6: Flood protection structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated contract mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered and coordination should continue with the natural resources agencies to ensure fish passage features are fully incorporated to the extent practicable.

CEMVN Response 6: Although the plan has not been finalized, a typical design for a closure structure would include rock or other erosion protection sloped down from the invert of the structure. Final designs would incorporate these attributes to the extent practicable.

Recommendation 7: Flood protection water control structures would remain fully open except during storm events, unless otherwise determined by the natural resource agencies.

CEMVN Response 7: The plan of operations for the water control structures would be outlined in the OMRR&R manual that would be developed by the CEMVN and turned over to the local sponsors. The structures are to remain open except during tropical events. Any changes to the OMRR&R manual recommended by either the local sponsor or the resources agencies would have to be approved by the CEMVN.

Recommendation 8: Any proposed changes in plan features or mitigation should be coordinated in advance with the Service, NMFS, LDWF, EPA, and LDNR

CEMVN Response 8: Mitigation for the impacts caused by this project would be coordinated through a mitigation IER. Any material changes to the mitigation plan in this IER would be coordinated in advance.

Recommendation 9: If a proposed feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species of their habitat.

CEMVN Response 9: Concur.

In the USFWS' Final Coordination Act Report (CAR) dated 8 June 2009 one additional project-specific recommendation was included that had not been previously included in the draft CAR, The USFWS' recommendation, and the CEMVN's response, is listed below:

Recommendation 8: Due to some of the proposed feature, the drainage capacity of the area between Hwy 90 and the proposed levee will be reduced. The Service is concerned about the potential for ponding in the area and subsequent impacts to wetlands vegetation and to Hwy 90. The Service recommends that the Corps undertake additional hydrologic studies to determine the effects of those drainage capacity reductions.

CEMVN Response 8: As stated in the draft IER the 289 acre area below Hwy 90 the 164 acres of wetlands would experience reduced water exchange. During rainfall, wave or wind driven events water may pond within this 289 acre area. However with the reduced combined cross sectional area into the 289 acres area the amount of water entering this area from the south would also be reduced. Additionally, as stated on page 13 of the draft IER the discharge lines from the Highway 90 Pumping Station would be extended so that the pumping station discharge would be on the flood side of the new levee alignment, thereby eliminating that input of water into the 289 acre area. The H & H analysis also included an evaluation of water surface elevations that would occur with the project in place verses without project construction, specifically when the drainage structures would be closed. The water surface evaluation analyses indicate that increases in water surface elevations within the project area including the 289 acre area south of Hwy 90 would be less than half a foot in smaller storm events and approximately a 1 foot increase in extreme storm events. Potential impacts to Hwy 90 would only be likely during very extreme storm events. Since the drainage control structures would not be closed except during storm events, changes in water surface elevation due to structure closure would be infrequent and of a short duration. Based on this information and the significant amount of research already done to investigate impacts to coastal marshes caused by hydrologic management for marsh management activities, we believe additional hydrologic studies of this area are unnecessary.

7.0 MITIGATION

Mitigation for unavoidable impacts to the human and natural environment described in this and other IERs will be addressed in separate mitigation IERs. The CEMVN has partnered with Federal and state resource agencies to form an interagency mitigation team that is working to assess and verify these impacts, and to look for potential mitigation sites in the appropriate hydrologic basin. This effort is occurring concurrently with the IER planning process in an effort to complete mitigation work and construct mitigation projects expeditiously. As with the planning process of all other IERs, the public will have the opportunity to give input about the proposed work. These mitigation IERs will, as described in section 1 of this IER, be available for a 30-day public review and comment period.

Quantitative analysis utilizing existing methodologies for water resource planning has identified the acreages and habitat type for the direct or indirect impacts of implementing the proposed action. 216.4 acres have been identified that would require compensatory mitigation

On 16-17 January 2008, an interagency field trip was conducted to obtain raw field data for the IER #16 project. The methodology being utilized in determining appropriate mitigation, which would include no net loss of wetland values, is the interagency Wetland Value Assessment (WVA). The WVA computes the Average Annualized Habitat Units (AAHUs) lost by project implementation. The AAHUs are converted to acres needed to meet the nation’s no-net-loss of wetlands policy once the mitigation site is selected.

Areas of marsh habitat directly impacted by the proposed project construction are along the east-west portion of the proposed action. The WVA model concluded that mitigation for 66.3 AAHUs would be required for this area. In addition, 78.6 acres of bottomland hardwoods would be destroyed such that mitigation for 36.18 AAHUs would be required. When combined, a total of 102.5 AAHUs will be included in the overall totals for the HSDRRS projects.

A complementary comprehensive mitigation IER or IERs will be prepared documenting and compiling these unavoidable impacts and those for all other proposed actions within the HSDRRS that are being analyzed through other IERs. Mitigation planning is being carried out for groups of IERs, rather than within each IER, so that large mitigation efforts could be taken rather than several smaller efforts, increasing the relative economic and ecological benefits of the mitigation effort. This forthcoming mitigation IER will implement compensatory mitigation as early as possible. All mitigation activities will be consistent with standards and policies established in appropriate Federal and state laws and USACE policies and regulations.

8.0 COMPLIANCE WITH ENVIRONMENTAL LAWS AND REGULATIONS

Construction of the proposed action would not commence until the proposed action achieves environmental compliance with all applicable laws and regulations, as described below.

Environmental compliance for the proposed action would be achieved upon coordination of this IER with appropriate agencies, organizations, and individuals for their review and comments; USFWS and NMFS confirmation that the proposed action would not adversely affect any threatened or endangered species or require completion of Endangered Species Act Section 7 consultation; LDNR concurrence with the determination that the proposed action is consistent, to the maximum extent practicable, with the LCRP; receipt of a Water Quality Certification from the State of Louisiana; public review of the Section 404(b)(1) Public Notice and signature of the Section 404(b)(1) Evaluation; coordination with the Louisiana SHPO; receipt and acceptance or resolution of all Fish and Wildlife Coordination Act recommendations; and receipt and acceptance or resolution of all Essential Fish Habitat recommendations.

Executive Order (E.O.) 11988. E.O. 11988, Floodplain Management, addresses minimizing or avoiding adverse impacts associated with the base floodplain unless there are no practicable alternatives. It also involves giving public notice of proposed actions that may affect the base floodplain. The proposed action would not accelerate development of the floodplain for the following reasons: development of the study area is more closely related to access routes and the need for affordable housing space than flooding potential and conditions conducive for development were established initially when the area was levied and forced drainage was initiated in the middle 1960s.

Executive Order 11990. E.O. 11990, Protection of Wetlands, has been important in project planning. It is acknowledged that much of the area being enclosed by the proposed alignment consists of wetlands, but other linear features have previously enclosed these wetlands. The construction of the drainage canal integral to the alignment would have essentially no indirect effect on the rate of drainage from the area. Increased pumping station capacities are not a part of this action.

Consistency with Coastal Zone Management (CZM) Program. The CEMVN has determined that construction and maintenance of 100-year level of risk reduction along the WBV, Western Tie-in is consistent, to the maximum extent practicable, with the guidelines of the State of Louisiana's approved Coastal Zone Management Program. A CZM consistency determination was prepared and provided to the LDNR. The consistency determination, C20080324, was dated 14 April 2009. The consistency letter of approval from the LDNR completes the consistency requirements.

Clean Air Act. The original 1970 Clean Air Act (CAA) authorized the USEPA to establish National Ambient Air Quality Standards (NAAQS) to limit levels of pollutants in the air. USEPA has promulgated NAAQS for six criteria pollutants: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone, lead, and particulate matter (PM-10). All areas of the United States must maintain ambient levels of these pollutants below the ceilings established by the NAAQS; any area that does not meet these standards is considered a "non-attainment" area (NAA). The 1990 Amendments require that the boundaries of serious, severe, or extreme ozone or CO non-attainment areas located within Metropolitan Statistical Areas (MSAs) or Consolidated Metropolitan Statistical Areas (CMSAs) be expanded to include the entire MSA or CMSA unless the governor makes certain findings and the Administrator of the USEPA concurs. Consequently, all urban counties included in an affected MSA or CMSA, regardless of their attainment status, will become part of the NAA. The project is located in Jefferson Parish and St. Charles Parish, which are both classified as attainment areas; therefore NAAQS are not applicable to this project.

Clean Water Act. The Clean Water Act (CWA; 33 *U.S.C.* 1251-1387; Act of June 30, 1948, as amended) is a very broad statute with the goal of maintaining and restoring waters of the United States. The CWA authorizes water quality and pollution research, provides grants for sewage treatment facilities, sets pollution discharge and water quality standards, addresses oil and hazardous substances liability, and establishes permit programs for water quality, point source pollutant discharges, ocean pollution discharges, and dredging or filling of wetlands. The intent of the CWA's §404 program and it's §404(b)(1) "Guidelines" is to prevent destruction of aquatic ecosystems including wetlands, unless the action will not individually or cumulatively adversely affect the ecosystem.

Section 404(b)(1) guidelines were used to evaluate the discharge of dredged or fill material for adverse impacts to the aquatic ecosystem. The following actions would be taken to minimize the potential for adverse environmental impacts. All sloped areas would be seeded. Non-forested wetlands, consisting of mown levee grasses or grazed pasture, were not mitigated because of their low value to fish and wildlife resources. The proposed project complies with the requirements of the guidelines. The LDEQ Water Quality Certification letter, WQC 090212-06/AI 163172/CER20090002, dated 20 April 2009, completes the certification process.

Endangered Species Act. The Endangered Species Act (16 *U.S.C.* 1531-1543; P.L. 93-205, as amended) was enacted in 1973 to provide for the conservation of species that are in danger of extinction throughout all or a significant portion of their range. "Species" is defined by the Act to mean either a species, a subspecies, or, for vertebrates *(i.e.*, fish, reptiles, mammals, etc.) only, a distinct population. No threatened or endangered species or their critical habitat would be impacted by the proposed action. The USFWS concurred with our determination in their letter dated 28 November 2007 and in the draft Coordination Act Report dated 13 March 2009.

Fish and Wildlife Coordination Act. The Fish and Wildlife Coordination Act (16 *U.S.C.* 661-666c; Act of March 10, 1934, as amended) requires that wildlife, including fish, receive equal consideration and be coordinated with other aspects of water resource development. This is accomplished by requiring consultation with the USFWS and NMFS whenever modifications are proposed to a body of water and a Federal permit or license is required. This consultation determines the possible harm to fish and wildlife resources, and the measures that are needed to both prevent the damage to and loss of these resources, and to develop and improve the resources, in connection with water resource development. NMFS submits comments and recommendations to Federal licensing and permitting agencies, and to Federal agencies conducting construction projects on the potential harm to living marine resources caused by proposed water development projects, and suggests recommendations to prevent harm. The USFWS provided the "Draft Fish and Wildlife Coordination Act Report for the Individual Environmental Reports (IER), Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)" in November 2007 (USFWS, 2007). To fulfill the responsibilities of the Fish and Wildlife Coordination Act, the USFWS will provide a post-authorization final supplemental 2(b) report to the draft programmatic report. A draft project-specific Coordination Act Report was received from USFWS by letter dated 13 March 2009. A final report was prepared after the 30-day public review period and received on 8 June 2009. All comments regarding USFWS trust resources have been resolved.

Migratory Bird Treaty Act. The Migratory Bird Treaty Act of 1918 (MBTA) is the domestic law that affirms, or implements, the United States' commitment to four international conventions with Canada, Japan, Mexico, and Russia for the protection of shared migratory bird resources. The MBTA governs the taking, killing, possessing, transporting, and importing of migratory birds, their eggs, parts, and nests. The take of all migratory birds is governed by the MBTA's regulation of taking migratory birds for educational, scientific, and recreational purposes and requiring harvest to be limited to levels that prevent over-utilization. Section 704 of the MBTA states that the Secretary of the Interior is authorized and directed to determine if, and by what means, the take of migratory birds should be allowed and to adopt suitable regulations permitting and governing take. The MBTA prohibits the take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase or barter, of any migratory bird, their eggs, parts, and nests, except as authorized under a valid permit (50 CFR §21.11). The USFWS addressed compliance with this Act in the "Draft Fish and Wildlife Coordination Act Report for the IER, Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)" in November 2007 (USFWS, 2007). To fulfill the responsibilities of the Fish and Wildlife Coordination Act, the USFWS will provide a post-authorization final supplemental 2(b) report to the draft programmatic report.

National Environmental Policy Act. The National Environmental Policy Act (NEPA; 42 *U.S.C.* 4321-4347; Pub. L. 91-190, as amended) requires Federal agencies to analyze the potential effects of a proposed Federal action that would significantly affect historical, cultural, or natural aspects of the environment. It specifically requires agencies to use a systematic, interdisciplinary approach in planning and decision-making, to insure that environmental values may be given appropriate consideration, and to provide detailed statements on the environmental impacts of proposed actions including: (1) any adverse impacts; (2) alternatives to the proposed action; and (3) the relationship between short-term uses and long-term productivity. The agencies use the results of this analysis decision-making. The preparation of this IER is a part of compliance with NEPA.

National Historic Preservation Act. Congress established the most comprehensive national policy on historic preservation with the passage of the National Historic Preservation Act of 1966 (NHPA). In this Act, historic preservation was defined to include "the protection, rehabilitation, restoration and reconstruction of districts, sites, buildings, structures, and objects significant in American history, architecture, archaeology, or culture." The Act led to the creation of the National Register of Historic Places, a file of cultural resources of national, regional, state, and local significance. The act also established the Advisory Council on Historic Preservation (the Council), an independent Federal agency responsible for administering the protective provisions of the act. The major provisions of the NHPA are Sections 106 and 110. Both sections aim to ensure that historic properties are appropriately considered in planning Federal initiatives and actions. Section 106 is a specific, issue-related mandate to which Federal agencies must adhere. It is a reactive mechanism that is driven by a Federal action. Section 110, in contrast, sets out broad Federal agency responsibilities with respect to historic properties. It is a proactive mechanism with emphasis on ongoing management of historic preservation sites and activities at Federal facilities. Coordination of this project with SHPO fulfills the requirements to comply with the NHPA, and the SHPO letter dated 2 January 2009, concludes this process.

9.0 CONCLUSION

9.1 FINAL DECISION

The proposed action would require construction of approximately 23,600 linear feet of levee, floodwall, and closure structures constructed to an elevation of +13.5 feet to +15.5 feet NAVD88.

- Reach 1 would begin at the Lake Cataouatche Levee and proceed 2,400 feet westward including an earthen closure of the Outer Cataouatche Canal and earthen levee to the eastern side of Bayou Verret. On the eastern side of Bayou Verret, the levee would transition to approximately 300 feet of floodwall before transitioning to a closure structure on Bayou Verret,

- Reach 2 would be begin as floodwall on the western side of the Bayou Verret closure structure transitioning to earthen levee continuing in a western direction for approximately 9,600 feet long to a point approximately 850 feet east of the western end of the Outer Cataouatche Canal. The levee would then turn north, cross, and close the Outer Cataouatche Canal. Between the Outer Cataouatche Canal and Hwy 90 the levee would transition to a floodwall prior to crossing Hwy 90,

- Reach 3 would be a floodwall crossing of Hwy 90 with the roadway's grade changed so traffic would cross the floodwall on a very gradual grade change to allow the safe flow of traffic; the transition for Hwy 90 traffic would be approximately 2,000 feet long from both directions,

- Reach 4 would proceed on the north side of Hwy 90 where the floodwall (from reach 3) would continue for approximately 400 feet in length in a northern direction before turning to the west and transitioning to a levee on a west northwestern direction for approximately 2,700 feet long to the Davis Pond Freshwater Diversion Canal's eastern construction ROW, and

- Reach 5 would have the levee turn north to the BNSF Railroad. Between the BNSF Railroad and high ground of the Mississippi River Levee the alignment would alternate between floodwall (to accommodate closure structures for the two railroad crossings and the River Road crossing) and levee. The alignment would then continue to the north and tie in to the high ground at the Mississippi River Levee. The combined length of reach 5 would be approximately 5,050 feet.

The CEMVN has assessed the environmental impacts of the proposed action and has determined that the proposed action would have the following impacts:

- Short-term impact to air quality from heavy equipment and trucks used during the 23-month construction and maintenance thereafter of the 100-year level of risk reduction,

- Short-term direct impact to water quality in the Outer Cataouatche Canal from construction and the placement of fill into the Outer Cataouatche Canal,

- Short-term direct impact to water quality in Bayou Verret from the dredging and construction of the Bayou Verret closure structure and the Bayou Verret bypass canal and closure structures,

- Long term indirect impact to the water quality of 60 acres of aquatic habitat enclosed by the western levee crossing of the Outer Cataouatche Canal and reconnected to the Davis Pond Freshwater Diversion flows through the 50-foot cut in the guide levee,

- Short-term disturbance to nearby habitat from construction noise,

- Permanent loss of 211 acres of vegetated wetlands (clearing, grubbing and filling and excavation),

- Permanent loss of 10 acres of aquatic habitat,

- Creation of approximately 8 acres of new aquatic habitat (excavating wetlands),

- Permanent displacement of fish and temporary displacement of wading birds, waterfowl, or other wildlife within the footprint of construction, and

- Significant risk reduction for the residences and businesses between Hwy 90 and the Outer Cataouatche Canal.

9.2 PREPARED BY

The point of contact and responsible manager for the preparation of this IER is Beth Nord, CEMVN. The address of the preparers is: U.S. Army Corps of Engineers, New Orleans District; Planning, Programs, and Project Management Division, CEMVN-PM; P.O. Box 60267; New Orleans, Louisiana 70160-0267. Table 5 lists the preparers of the various sections and topics in this IER.

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10.0 APPENDICES

APPENDIX A - LIST OF ACRONYMS AND DEFINITIONS OF COMMON TERMS

AAHUs	Annual Average Habitat Units
AD	Anno Domini
ASTM	American Society for Testing and Materials
BFI	Browning-Ferris Industries Landfill
BLH	Bottomland Hardwood Forest
BNSF	Burlington Northern Santa Fe
BOD	Biological Oxygen Demand
CED	Comprehensive Environmental Document
CEMVN	Corps of Engineers, Mississippi Valley Division, New Orleans District
CEQ	The President's Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CFS	Cubic Ft Per Second
CW	Civil Works Program
CWA	Clean Water Act
CY	Cubic Yard
CSMA	Consolidated Metropolitan Statistical Area
CZM	Coastal Zone Management
dBA	Decibels
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EM	Engineering Manual
EO	Executive Order
EPW	Evaluation Of Planned Wetlands
ER	Engineering Regulation
ESA	Environmental Site Assessment
FCU	Functional Capacity Units
FCI	Functional Capacity Index
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FWCA	Fish and Wildlife Coordination Act
DPR	Detailed Project Report
DPR/EA	Detailed Project Report/Environmental Assessment
FHWA	Federal Highway Administration
FONSI	Finding of No Significant Impact
FPPA	Farmland Protection Policy Act
FTA	Federal Transit Administration
FWCA	Fish and Wildlife Coordination Act
HSDRRS	Greater New Orleans Hurricane and Storm Damage Risk Reduction System
HTRW	Hazardous, Toxic, and Radioactive Waste
HPS	Hurricane Protection System
IER	Individual Environmental Report
LCRP	Louisiana Coastal Resources Program
LDEQ	Louisiana Department of Environmental Quality
LDNR	Louisiana Department of Natural Resources

LDWF	Louisiana Department of Wildlife and Fisheries
LPV	Lake Ponchartrain and Vicinity
MBTA	Migratory Bird Treaty Act
ML	Milliliters
MPH	Miles per Hour
MSA	Metropolitan Statistical Area
NAA	Non Attainment Area
NAAQS	National Ambient Air Quality Standards
NAVD	North American Vertical Datum of 1988
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NHP	Natural Heritage Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NRCS	National Resources Conservation Service
NWR	National Wildlife Refuge
O&M	Operations And Maintenance
OMRR&R	Operations, Maintenance, Repair, Replacement, & Rehabilitation
OSE	Other Social Effects
PA	Programmatic Agreement
PDT	Project Delivery Team
PL	Public Law
PPA	Project Partnering Agreements
PSI	Pounds Per Square Inch
P&G	Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RED	Regional Economic Development
ROD	Record of Decision
ROW	Right-of-Way
SCORP	State Comprehensive Outdoor Recreation Plan
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SPH	Standard Project Hurricane
TMDL	Total Maximum Daily Load
USACE	United States Army Corps Of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish And Wildlife Service
USGS	United States Geological Survey
VOC	Volatile Organic Compounds
WBV	West Bank and Vicinity
WRDA	Water Resources Development Act
WVA	Wetlands Value Assessment

APPENDIX B - PUBLIC COMMENT AND RESPONSE SUMMARY

Nord, Beth P MVN

From: Owen, Gib A MVN on behalf of MVN Environmental
Sent: Friday, May 29, 2009 7:32 PM
To: Nord, Beth P MVN
Cc: renee.pollet@mail.house.gov
Subject: FW: Comments on draft IER #16 Dated May 2009

Beth,
IER 16 comment.
Gib

Gib Owen
US Army Corps of Engineers
Chief, Ecological Planning and Restoration Section/ HSDRRS Environmental Team Leader New Orleans District
504 862-1337

-----Original Message-----
From: jeffnjara [mailto:jeffnjara@roux.org]
Sent: Friday, May 29, 2009 2:23 PM
To: MVN Environmental
Cc: Manina Dubroca; George Williamson; 'Cecil Sumners'; 'Nuss, Dennis'
Subject: Comments on draft IER #16 Dated May 2009

Gib Please pass to Rene I lost his card. Jeff

General Comments:

Hwy 18 (River Road) should be raised from one guide levee to the other at the height determined for the east guide levee (13.5 ft) vice a closure gate.

The impact to the overall effectiveness of the Davis Pond Diversion Project (after construction of the Tie In) needs to be defined.

The ponding (Appendix F) expected in area 2 needs to be revisited given that the Union Pacific Railroad embankment has culverts and the Sellers Pump Station may not be able to keep the area dewatered either from capacity or water not getting to the mouth of the pump (drainage ditches inadequate or blocked). The hwy 90 Pump Station should be able to help in reducing the ponding level in Area 2.

Specific Comments:

Page 1 1.0 Introduction The phrasing of the sentence "The term "100-year level of risk reduction…" should probably end "… that the New Orleans metropolitan area has a 1 per cent chance of experiencing each year."

The Ama and Luling communities should also be included as communities near the project area.

Page 11 2.3 Proposed Action Appendix H does not clearly demonstrate the selection rational. For example a meeting was held on 3 Oct 08 and alt 3 was selected as the proposed action. Another meeting was held on 06 April 09 with Alt 1 being selected. There is no further explanation given to explain the disconnect (even in section 5.0).

Page 14 2.3.1.1 Reach 1 "…the structure would be closed and remain closed until the storm has passed and emergency operations were concluded". The opening needs to be decided on some other criteria than "emergency operations".

Page 17 2.3.1.3 Reach 3 DOTD needs to have some electronic signage a distance to the east and west of the hwy 90 crossing the floodwall. Detours will need to be established if hwy 90 becomes impassable to the west of the diversion due to flooded conditions.

Page 18 2.3.1.5 Reach 5 Hwy 18 should be raised vice a closure structure. Evacuations for Katrina and Gustav showed that it was a valuable secondary evacuation route (the only one) on the Westbank. Hwy 18 should be raised from one guide levee to the other of the diversion in order to increase the amount of time that the hwy could possibly be used. An incoming surge would have to be at a higher height to top the west guide levee and the railroad embankment.

If there is a need for a bypass route, the levee itself should be used. The road at the top could be reinstated which is presently closed.

Page 35 2.5.1.4 Alternative 7 "Improvements to the Davis Pond east guide levee… improvement to the west guide levee." The east guide levee is improved in alt 3 with no mention of impact on west guide levee.

Page 87 3.3.2.1 Existing Conditions ADM is located west of the main portion of Ama.

Page 94 3.3.4.2.4 Alt 3 "Traffic would be maintained… two-lane shift…" To be consistent should be four-lane shift.

Page 99 3.3.7.2.4 Alt 3 Ama depends on the upriver portion of the parish for all of its services/utilities except for a local fire dept. If the event occurs, there is presently no in place alternatives from neighboring Jefferson Parish except for possibly electricity to aid in rescue and recovery.

Appendix F Page 24 Assumptions made All runoff to Area 2 is ponded in Area 2. Sluice gates will be opened midpoint of storm.

The Union Pacific Railroad embankment has culverts (some are blocked and others not). No matter what the source of water, given a certain level, water comes to the north of the tracks. Local residents see this with tides coupled with strong winds from the south and recently with the surge from Ike. The modeling does not reflect this water to the north and for higher water levels in area 2, some residences in low lying areas in area 1(north of the RR Tracks) may have water in their homes. The culverts need to be blocked to aid in the risk reduction.

At the briefing the sluice gates were not going to be opened until after the event vice what the modeling is predicated on - midpoint of the storm.

Additionally the Hwy 90 pump station should be able to take a suction on the outer Cat canal in order to reduce the water level in area 2 if required/practical. This would reduce the risk to the homes south of Hwy 90 and to the residences north of the Union Pacific tracks.

Jeffrey Roux

10391 River Road

Ama, LA 70031

504 431 0399

APPENDIX C - INSTITUTIONAL, ECOLOGICAL, AND PUBLIC SIGNIFICANCE OF RESOURCES

SIGNIFICANCE OF RESOURCES

The National Environmental Policy Act (NEPA) requires Federal agencies to analyze the impacts of proposed actions on those resources that are considered "significant." Table 6 provides a list of resources that are commonly found in the vicinity of the Lake Pontchartrain and Vicinity and West Bank and Vicinity Hurricane Protection Projects. In providing a list of some of the key laws and regulations governing these resources, as well as a short description of some of their ecological and human environment value, this table offers a rationale for why these resources are considered significant for the purposes of NEPA analysis.

Table 6. Institutional, Ecological, and Public Significance of Resources

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Agriculture	Farmland Protection Policy Act of 1981; Food Security Act of 1985; Prime and Unique Farmlands, 1980 CEQ Memorandum	Provision or potential for provision of forest products and human and livestock food products
Air	Clean Air Act of 1963, as amended; Deepwater Port Act of 1974 Louisiana Air Control Act; Louisiana Environmental Quality Act of 1983 National Ambient Air Quality Standards (NAAQS)	Clean air is important for human health and safety
Coastal Zones	Coastal Barrier Resources Act of 1982, 1990, as amended; Coastal Zone Management Act of 1972; Coastal Zone Protection Act of 1996; Deepwater Port Act of 1974 Federal Water Project Recreation Act of 1965; Outer Continental Shelf Lands Act of 1953; Submerged Land Act of 1953	Barrier islands: Protect mainland and associated fish, wildlife, and other natural resources. Coastal zones: Protect wetlands*, floodplains*, estuaries*, beaches, dunes, barrier islands, reefs, bays, ponds, bayous, dunes, and fish and wildlife* and their habitats *See specific resources for additional regulations
Cultural and Historic	Abandoned Shipwreck Act of 1987; American Folklife Preservation Act of 1976; American Indian Religious Freedom Act of 1978; Antiquities Act of 1906 Archaeological Resources Protection Act of 1979; Archaeological and Historical Preservation Act of 1974; Consultation and Coordination with Indian Tribal Governments (EO 13175) of 2000; Historic Sites Act of 1935; Historic and Archaeological Data-Preservation of 1974; Indian Sacred Sites (EO 13007) of 1996 National Historic Preservation Act of 1966; Native American Graves Protection and Repatriation Act of 1990; Protection and Enhancement of the Cultural Environment (EO 11593) of 1971; Protection of Cultural Property (EO 12555) of 1986; Reclamation Projects Authorization and Adjustments Act of 1992	Their association or linkage to past events, to historically important persons, and to design and/or construction values Their ability to yield important information about prehistory and history

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Economic Resources	Deepwater Port Act of 1974; Environmental Review of Trade Agreements (EO 13141) of 1999	Strong economies enhance human standards of living and can allow for greater expendability of funds for the protection and enhancement of ecological resources Trade agreements and international trade can have both positive and negative environmental effects Positive effects can include greater cooperation between nation states in preserving species which cross political boundaries
Endangered/Threatened Species	Bald Eagle Protection Act of 1940; Endangered Species Act of 1973; Marine Mammal Protection Act of 1972	The status of such species provides an indication of the overall health of an ecosystem. US Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Louisiana Department of Wildlife and Fisheries (LDWF), and USACE cooperate to protect endangered and threatened species; Audubon Blue List recognizes rare species
Environmental Justice	American Indian Religious Freedom Act of 1978; Civil Rights Act of 1964; Consultation and Coordination with Indian Tribal Governments (EO 13175) of 2000; Executive Order 12898 of 1994; Federal Actions to Address Environmental Justice in Minority Populations & Low-Income Populations (EO 12898, 12948) of 1994, as amended	Ensuring the rights of minority and low-income populations can lead to greater sustainability through less burden on the environment in which these populations live, including better treatment of wastes and building processes
Essential Fish Habitat	Coastal Zone Management Act of 1972; Marine Protected Areas (EO 13158) of 2000; Magnuson-Stevens Fishery Conservation and Management Act of 1976	Shallow intertidal waters provide essential fish habitat in the form of nursery, foraging, and grow out areas. National Marine Fisheries Service recognizes value of essential fish habitat as necessary for continued survival of fisheries resources
Estuaries	Coastal Zone Management Act of 1972; Deepwater Port Act of 1974; Estuaries and Clean Waters Act of 2000; Estuary Protection Act of 1968; Estuary Restoration Act of 2000	Shallow intertidal waters provide essential fish habitat in the form of nursery, foraging, and grow out areas. Protect aquatic nurseries and oyster beds

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Fisheries (Commercial and Recreational)	Anadromous Fish Conservation Act of 1965; Coastal Zone Management Act of 1972; Fish and Wildlife Conservation Act of 1980; Magnuson-Stevens Fishery Conservation and Management Act of 1976; Endangered Species Act of 1973 Federal Water Project Recreation Act of 1965; Fish and Wildlife Coordination Act of 1958; Recreational Fisheries (EO 12962) of 1995; Sustainable Fisheries Act of 1996	Critical element of many valuable freshwater and marine habitats. Indicator of the health of various freshwater and marine habitats USFWS, NMFS, LDWF, Louisiana Department of Natural Resources (LDNR), and USACE recognize value of fisheries and good water quality.
Flood Control/ Hurricane Risk Reduction Levees	Floodplain Management (EO 11988) of 1977; River and Harbor and Flood Control Act of 1970; Watershed Protection & Flood Prevention Act of 1954	Dewatering activities associated with urban floods result in discharge of floodwater potentially containing pollutants associated with residential, commercial, and industrial facilities
Floodplains	Coastal Zone Management Act of 1972; Floodplain Management (EO 11988) of 1977; River and Harbor and Flood Control Act of 1970	Floodplains provide storage of floodwaters and habitat for forest-dwelling wildlife and plant species. The typically linear aspect of floodplains provide important travel routes for wildlife (including insects) and plant species
Forestry	Reservoir Areas – Forest Cover Act of 1960	Managed forests provide cover and travel routes for forest-dwelling wildlife
Habitat (General)	Marine Protected Areas (EO 13158) of 2000; Oil Pollution Act of 1990	Habitat provided for open, forest-dwelling, and aquatic wildlife. Provision or potential for provision of forest products and human and livestock food products
Hazards/ Wastes	Clean Air Act of 1963, as amended; Comprehensive Environmental Response, Compensation, and Liability Act of 1980; Emergency Planning and Community Right-to-Know Act of 1986; Federal Compliance with Pollution Control Standards (EO 12088) of 1978; Federal Facilities Compliance Act of 1992; Federal Insecticide, Fungicide, and Rodenticide Act of 1996; Oil Pollution Act of 1990; Pollution Prevention Act of 1990; Resource Conservation and Recovery Act of 1976; Toxic Substances Control Act of 1976	Pollutants directly affect the health and viability of ecological habitats and all organisms living within them. Laws and regulations such as the Clean Air Act address problems such as acid rain, ground-level ozone, stratospheric ozone depletion, and air toxics. Laws such as the Pollution Prevention Act allow the government to focus on the sources of pollution rather than after-the-fact treatment

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Invasive Species	Exotic Organisms (EO 11987) of 1977; Invasive Species (EO 13112) of 1999; National Invasive Species Act of 1996; Non-indigenous Aquatic Nuisance Prevention and Control Act of 1996	Invasive species alter interactive relationships of plants and wildlife that have developed over long periods of time and can completely alter natural habitats. Control of the introduction of invasive species protects habitats by preserving these relationships.
Lake Pontchartrain	Clean Water Act of 1977; Federal Water Project Recreation Act of 1965	Provides habitat for various species of wildlife, finfish, and shellfish.
Marine Areas	Abandoned Shipwreck Act of 1987; Coastal Zone Management Act of 1972; Federal Water Project Recreation Act of 1965; Marine Protected Areas (EO 13158) of 2000; Marine, Protection, Research, and Sanctuaries Act of 1972	Provides habitat for aquatic plant and wildlife.
Navigable Waters	Clean Water Act of 1977; Federal Water Project Recreation Act of 1965; Rivers and Harbors Acts of 1899, 1956 (Sec. 10); Outer Continental Shelf Lands Act of 1953; Rivers and Harbors Acts of 1899, 1956; River and Harbor and Flood Control Act of 1970; Submerged Land Act of 1953	Regulations and laws allow for protection of aquatic habitats from pollution and development. Regulations and laws maintain habitat for aquatic and water-dependent plants and wildlife. Maintained navigable waterways provide routes for shipping and recreational activity, protecting natural habitat from harmful intrusion.
Noise	Noise Control Act of 1972	High levels can affect the quality of habitat for wildlife and humans.
Oil, Gas, and Utilities Pipelines/ Activities	Deepwater Port Act of 1974	Regulations protects aquatic from pollution and development, including limiting turbidity which decreases aquatic plant growth.
Real Estate	Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646)	Regulations and laws assist in the acquisition of lands for conservation and preservation.
Recreation	Abandoned Shipwreck Act of 1987; Federal Water Project Recreation Act of 1965; Flood Control Act of 1944; Land and Water Conservation Fund Act of 1965; National Trails System Act of 1968; Reclamation Projects Authorization and Adjustments Act of 1992; Wild and Scenic River Act of 1968; Wilderness Act of 1964	Potential for interacting with the natural world. High economic value of recreational activities and their contribution to local, state, and national economies. Many fishing and hunting person-days are logged. Various existing facilities satisfy numerous user-days of recreation annually

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Soils	Watershed Protection & Flood Prevention Act of 1954	Provide the building blocks for habitat for plants and wildlife, including invertebrate species Regulation provides technical and financial assistance for watershed protection, flood mitigation, flood prevention, water quality improvement, soil erosion reduction, sediment control, fish and wildlife habitat enhancement, and wetland and wetland function creation and restoration
Water	Clean Water Act of 1977; Deepwater Port Act of 1974; Estuaries and Clean Waters Act of 2000; Federal Water Pollution Control Act of 1972; Federal Water Project Recreation Act of 1965; Flood Control Act of 1944; Safe Drinking Water Act of 1974; Water Resources Development Acts of 1976, 1986, 1990, and 1992; Water Resources Planning Act of 1965; Watershed Protection & Flood Prevention Act of 1954	Allows for protection of aquatic habitats from pollution and development. Maintains habitat for aquatic and water-dependent plants and wildlife. Provides technical and financial assistance for watershed protection, flood mitigation, flood prevention, water quality improvement, soil erosion reduction, sediment control, fish and wildlife habitat enhancement, and wetland and wetland function creation and restoration
Wetlands	Coastal Wetlands Planning, Protection, and Restoration Act of 1990; Coastal Zone Management Act of 1972; Clean Water Act of 1977; Deepwater Port Act of 1974; Emergency Wetlands Restoration Act of 1986; Estuaries and Clean Waters Act of 2000; Estuary Protection Act of 1968; Estuary Restoration Act of 2000; Floodplain Management (EO 11988) of 1977; Louisiana State and Local Coastal Resources Management Act of 1978; "No Net Loss" Policy of 1988; North American Wetlands Conservation Act of 1989; Protection of Wetlands (EO 11990) of 1977; Rivers and Harbors Acts of 1899, 1956 (Sec. 10); Water Resources Development Acts of 1976, 1986, 1990, and 1992 (Sec. 906); *Wetland Value Assessment (WVA); *Habitat Suitability Index (HSI)	Provide habitat for a number of species of special emphasis (USFWS). Louisiana loses 30 square miles of wetland per year. Provide necessary habitat for various species of plants, fish, and wildlife, many of them commercially important. Serve as ground water recharge areas. Provide storage areas for storm and flood waters. Serve as natural water filtration areas. Provide protection from wave action, erosion, and storm damage. Important source of lumber and other commercial forest products (Bottomland Hardwood Forest).

	GOVERNING LAWS AND REGULATIONS	ECOLOGICAL and HUMAN ENVIRONMENT VALUE
Wildlife & Fish	Endangered Species Act of 1973; Federal Water Project Recreation Act of 1965; Fish and Wildlife Conservation Act of 1980; Fish and Wildlife Coordination Act of 1958; Fish and Wildlife Programs and Improvement and National Wildlife Refuge System Centennial Act of 2000; Migratory Bird Conservation Act of 1929; Migratory Bird Treaty Act of 1918; Migratory Bird Habitat Protection (EO 13186) of 2001; Neotropical Migratory Bird Conservation Act of 2000; Outer Continental Shelf Lands Act of 1953; Reclamation Projects Authorization and Adjustments Act of 1992 Submerged Land Act of 1953; Responsibilities of Federal Agencies to Protect Migratory Birds (EO 13186) of 2001; Wild and Scenic River Act of 1968; *Also see Endangered and Threatened Species, habitats	Habitat for a number of species of special emphasis (USFWS). Critical element of many valuable aquatic and terrestrial habitats. Indicator of the health of various aquatic and terrestrial habitats. Many species are important commercial resources. USFWS, NMFS, LDWF, LDNR, and USACE recognize value of wildlife.

APPENDIX D - MEMBERS OF INTERAGENCY ENVIRONMENTAL TEAM

Kyle Balkum	Louisiana Dept. of Wildlife and Fisheries
Catherine Breaux	U.S. Fish and Wildlife Service
Mike Carloss	Louisiana Dept. of Wildlife and Fisheries
David Castellanos	U.S. Fish and Wildlife Service
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Michelle Fischer	U.S. Geologic Survey
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Mandy Green	Louisiana Department of Natural Resources
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Nancy Walters	U.S. Fish and Wildlife Service
David Walther	U.S. Fish and Wildlife Service
Patrick Williams	NOAA National Marine Fisheries Service

APPENDIX E - ST. CHARLES PARISH DEVELOPMENT PROJECTION STUDY – FINAL REPORT

St Charles Parish Development Projection Study

FINAL REPORT

April 2008

U.S. Army Corps of Engineers
New Orleans District

Prepared By:
URS
Gaithersburg, MD

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LIST OF ACRONYMS

ABFE	Advisory Base Flood Elevation
ADM	Archer Daniels Midland
BFE	Base Flood Elevation
BNSF	Burlington Northern Santa Fe
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FIRM	Flood Insurance Rate Map
HPS	Hurricane Protection System
JEDCO	Jefferson Parish Economic Development Commission
LOMA	Letter of Map Amendment
LOMR-F	Letter of Map Revision based on Fill
NAICS	North American Industry Classification System
NFIP	National Flood Insurance Program
RPC	Regional Planning Commission
RV	Recreational Vehicle
SFHA	Special Flood Hazard Area
USACE	U.S. Army Corps of Engineers

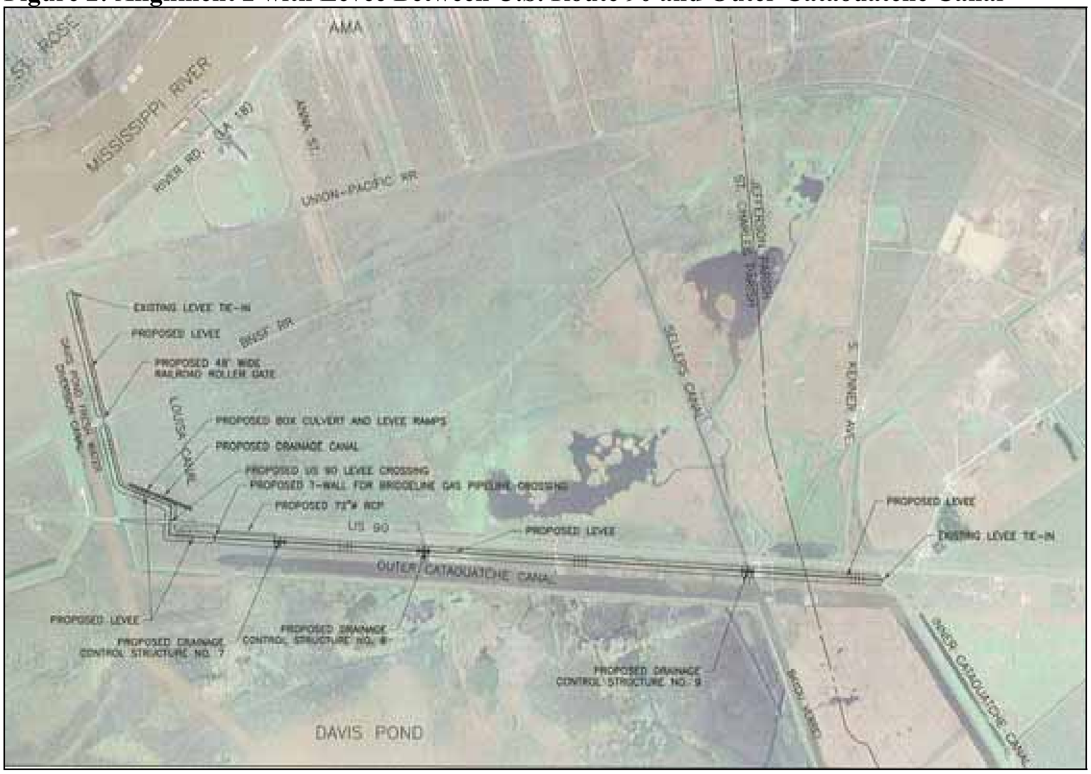
1. INTRODUCTION

The New Orleans District of the U.S. Army Corps of Engineers (USACE) is studying the potential for induced development attributable to the construction of the West Bank Hurricane Protection Project. The West Bank Hurricane Protection Project would be partially located on the west bank of the Mississippi River in St. Charles Parish, Louisiana. The final alignment of the proposed hurricane protection barrier has not been selected and three alternatives are being considered. Figures 1, 2, and 3 present the proposed alternatives under consideration. By providing a Hurricane Protection System (HPS) close to existing and proposed development in Ama near the River, the study area will not be protected from storm surge whereas alignments 2 and 3 would provide protection to the study area from storm surge. The proposed hurricane protection project is not expected to alter stormwater drainage patterns, change the propensity of the area to experience flooding due to heavy rains, or change the anticipated level of flood waters.

Figure 1: Alignment 1 with Levee South of Union Pacific Tracks

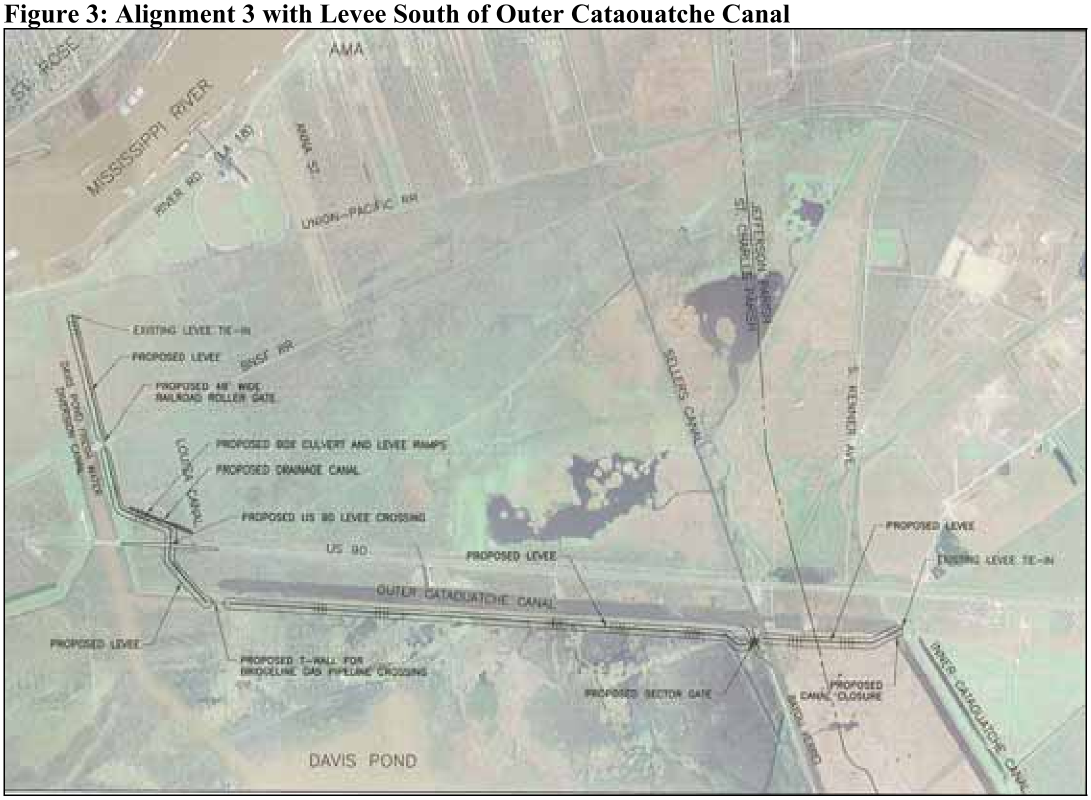
Source: USACE, New Orleans District

Figure 2: Alignment 2 with Levee Between U.S. Route 90 and Outer Cataouatche Canal



Source: USACE, New Orleans District

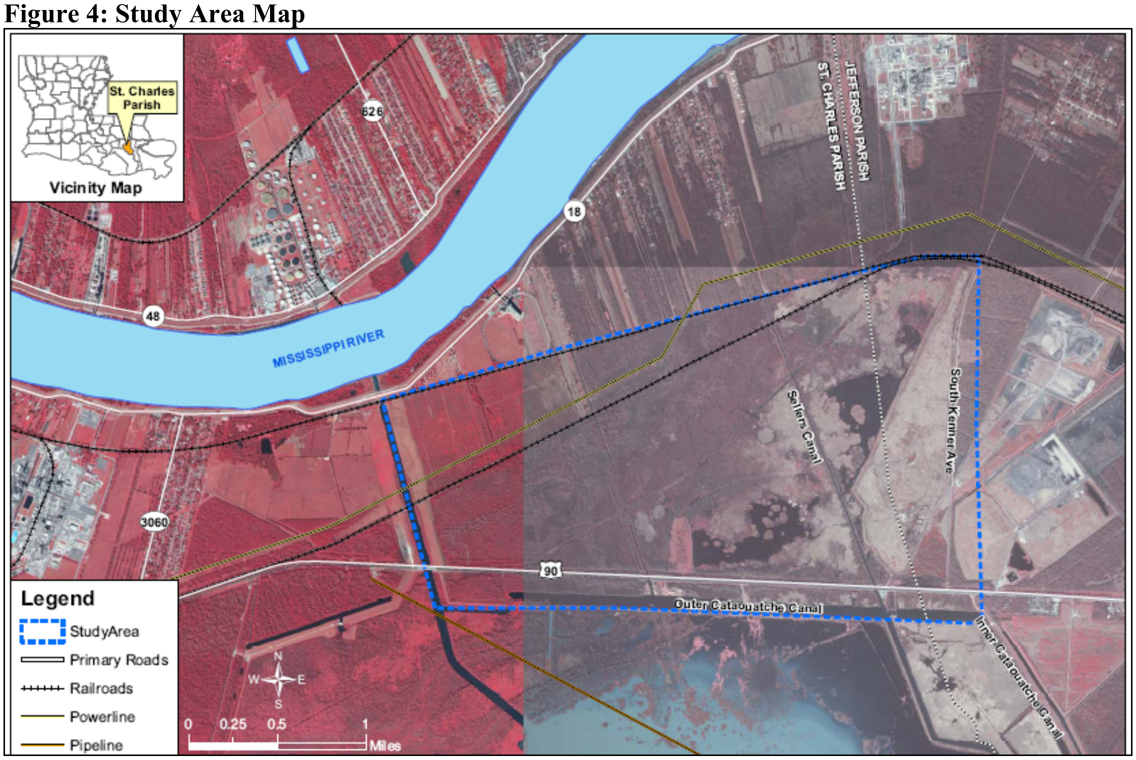
Figure 3: Alignment 3 with Levee South of Outer Cataouatche Canal



Source: USACE, New Orleans District

The primary study area that encompasses all alternatives extends from the western boundary of Jefferson Parish along South Kenner Road westward to the Davis Pond Freshwater Diversion canal in St. Charles Parish, and from the Union Pacific rail road tracks south of Louisiana Highway 18 southward to U.S. Route 90. Figure 4 displays this study area and shows its location in Louisiana.

Figure 4: Study Area Map



Source: URS Corporation

Figures 5 and 6 are photographs of the study area showing areas near the Davis Freshwater Diversion Canal and railroad tracks near the northern edge of the study area.

Figure 5: Davis Freshwater Diversion at Western Edge of Study Area

Figure 6: Union Pacific Railroad Track at Northern Edge of Study Area

2. PURPOSE OF STUDY

The purpose of this study is to identify and describe any changes in the land use and socioeconomic trends that are expected to occur and will affect the study area for a period of 12 years, from 2008 to 2020. In particular, the study was performed to determine the magnitude of residential development occurring in a selected portion of the West Bank of St. Charles Parish relative to what may occur if a storm surge barrier is constructed along U.S. Highway 90. The 12-year period of analysis for the study is appropriate for this type of real estate market study and is typical of the period of study used by real estate research firms in support of requests for financing. Such mid-term forecasts are distinct from Federal projects that represent public investments, which utilize long-term forecasts and a period of analysis of 50 years. The analysis will be used to determine the incremental effects, if any, attributable to a realignment of the West Bank Hurricane Protection Project. This report addresses the question of how the effects of locating a levee closer to U.S. Route 90 differ from the effects of locating a levee closer to the Mississippi River and Louisiana State Highway 18.

Methodology

Data used in the study were gathered through document review, field reconnaissance, and interviews. Printed resources included St. Charles Parish zoning and subdivision regulations and U.S. Census and parish economic development and land use data. Observation of the study area took place in February 2008. Interviews were conducted in February 2008 with parish officials, local real estate agents, and land developers. The perceptions and experience relayed through interviews were consistent with one another, indicating that qualitative data collection was reasonably complete.

Findings are limited because land use decisions are made by private sector developers and land owners and depend upon a host of factors, including national economic conditions.

3. DEMOGRAPHIC CHARACTERISTICS

As the major portion of the study area is located in St. Charles Parish, this section provides an overview of the socioeconomic characteristics of the parish along with the study area in particular. The portion of the study area that is beyond the St. Charles Parish border is limited to the River Birch and Jefferson

Parish landfills and adjacent land areas. The old St. Charles Parish landfill is in the south central section of the study area (Figure 7).

Figure 7: Entrance to Old St. Charles Parish Landfill Along U.S. Route 90

The 2000 U.S. Census reported a parish-wide population of 48,072 persons comprising 16,422 households and 13,088 families. Nearly 30 percent of the total population of the parish was under 18 years of age, and another 30 percent of the population was between 25 and 44 years of age. The median household income in the parish was reported to be $45,139, and the per-capita income was reported as $19,054. Parish residents exhibited higher median household incomes compared to residents in the State ($32,566) and the Nation ($41,994). Per-capita incomes of parish residents ($19,054) were higher than the incomes of State residents ($16,912), but lower than nationwide figures ($21,587).

Population projections developed by the Regional Planning Commission (RPC) for St. Charles Parish are presented in Table 1, showing that the population within the parish is estimated to increase 15% from 48,072 in 2000 to 55,299 in 2010, with a projected total population of 61,799 by 2020.

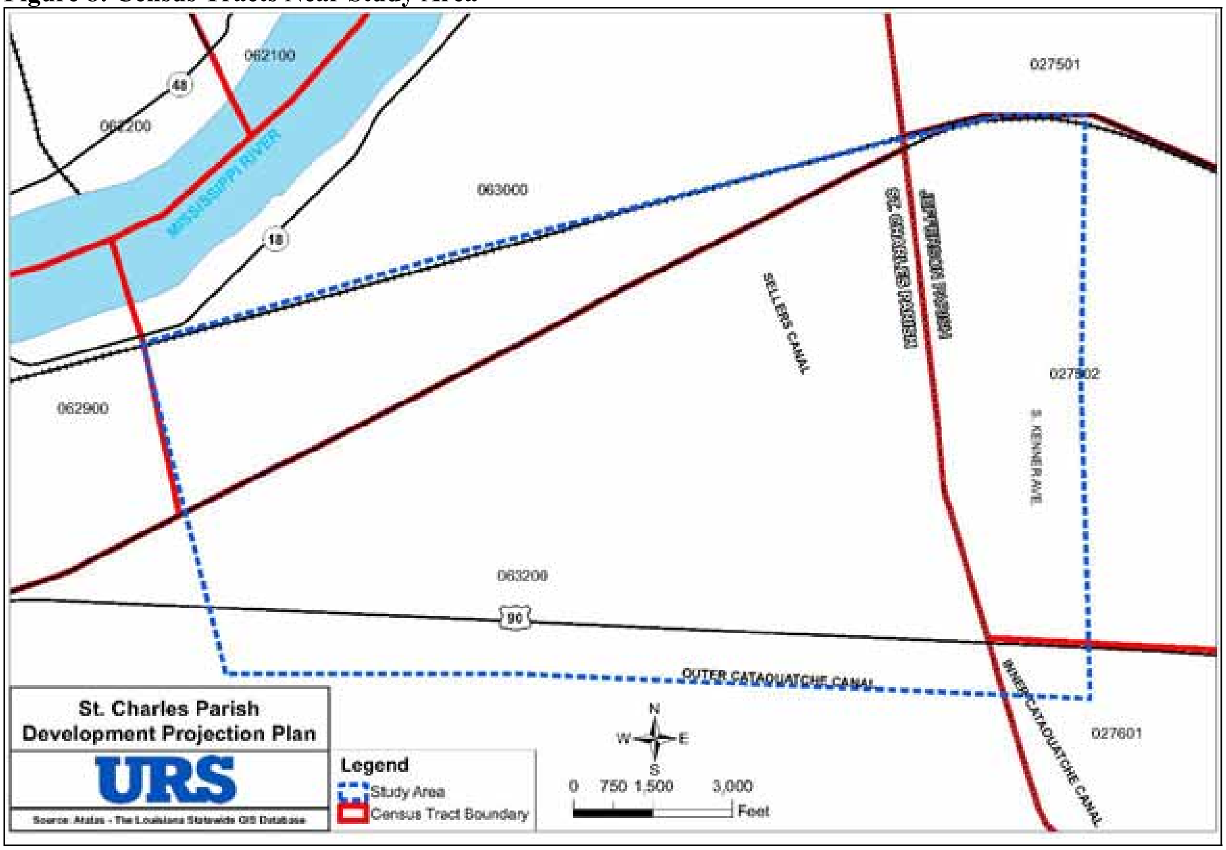
Table 1: Population Projections - St. Charles Parish and Study Area

Area	Population (2000)	Population (2008)	Population (2010)	Population (2015)	Population (2020)
St. Charles Parish	48,072	53,772	55,299	58,713	61,799
		(2000 – 2008)	(2008 – 2010)	(2010 – 2015)	(2015 – 2020)
Percent Change		11.9%	2.8%	6.2%	5.3%
New Population		5,700	1,527	3,414	3,086
Census Tract 630	6,929	7,382	7,513	7,878	8,259
		(2000 – 2008)	(2008 – 2010)	(2010 – 2015)	(2015 – 2020)
Percent Change		6.5%	1.8%	4.9%	4.8%
New Population		453	131	365	381

Source: Regional Planning Commission, February 2008

The study area is part of census tracts 630 and 632 (Figure 8). Based on field reconnaissance visits and review of aerial photography, the population within tract 630 resides just north of the study area near the Mississippi River. Within tract 632, nearly all the population is located at least 8 miles away from the study area, and therefore not considered an affected population for the purposes of this study. Some information about the population within tract 630 is presented below, showing that the area is not heavily populated.

Figure 8: Census Tracts Near Study Area



The projections developed by the RPC show that census tract 630 is expected to grow at a slightly lower rate than the entire parish. Between 2008 and 2020, total growth in population within the parish is expected to be 15 percent, compared to a 12 percent increase for the census tract that includes the study area.

4. PATTERNS OF LAND USE AND ZONING

The study area is generally vacant with no structures for commercial or residential use north of U.S. Route 90 and seven scattered sites with buildings between U.S. Route 90 and the Outer Cataouatche Canal. Just north of the study area is the community of Ama. Ama is characterized by small- to medium-sized single-family homes with some commercial and industrial uses located along River Road (Louisiana Highway 18). Like Ama, residential units in St. Charles Parish that are being permitted are single-family detached homes (Figure 9).

Figure 9: New Development in Ama Just North of Study Area

A large, private industrial complex operated by Archer Daniels Midland (ADM) is located north of the Union Pacific and Burlington Northern Santa Fe (BNSF) railroad lines, and east of Ama. A small portion (approximately 9 percent) of the study area is zoned for industrial uses. This is in the northwestern corner of the study area, between the railroad lines, and is adjacent to the ADM facility.

A review of zoning classifications developed by the St. Charles Parish Planning Department shows that the major portion of the study area is zoned as Wetlands (W). Given this W zoning classification, the area does not have any of the infrastructure, roadways, water and sewer services, or other utilities necessary to support development. Figure 10 is a map showing the zoning codes effective in the study area and the surrounding area of St. Charles Parish and Table 2 provides a definition of the different zoning codes.

Figure 10: Zoning Map

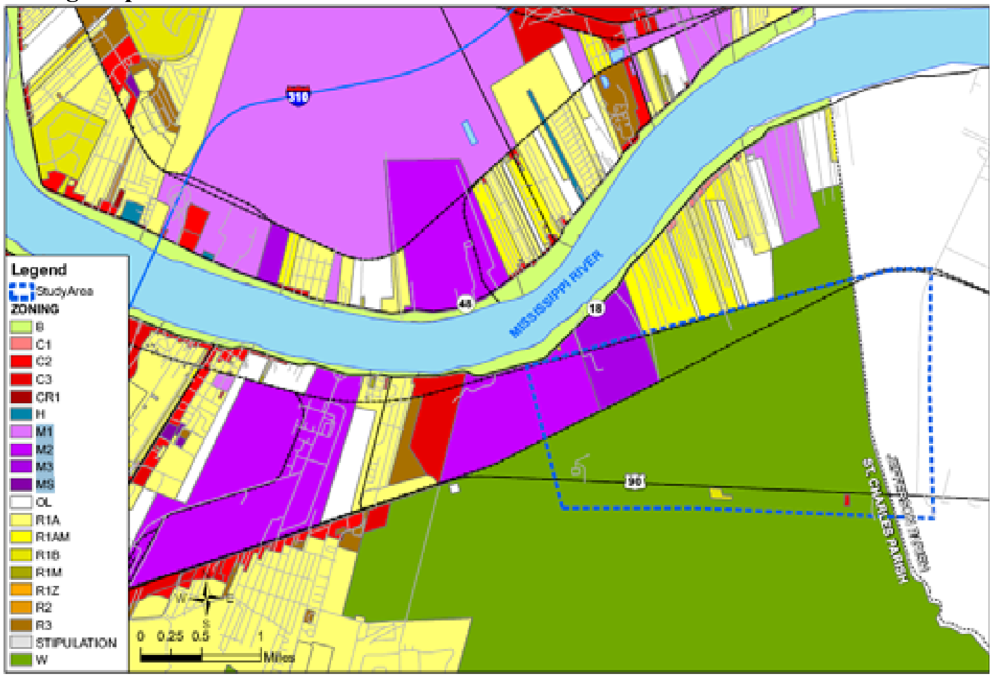


Table 2: Identification of St. Charles Parish Zoning Codes

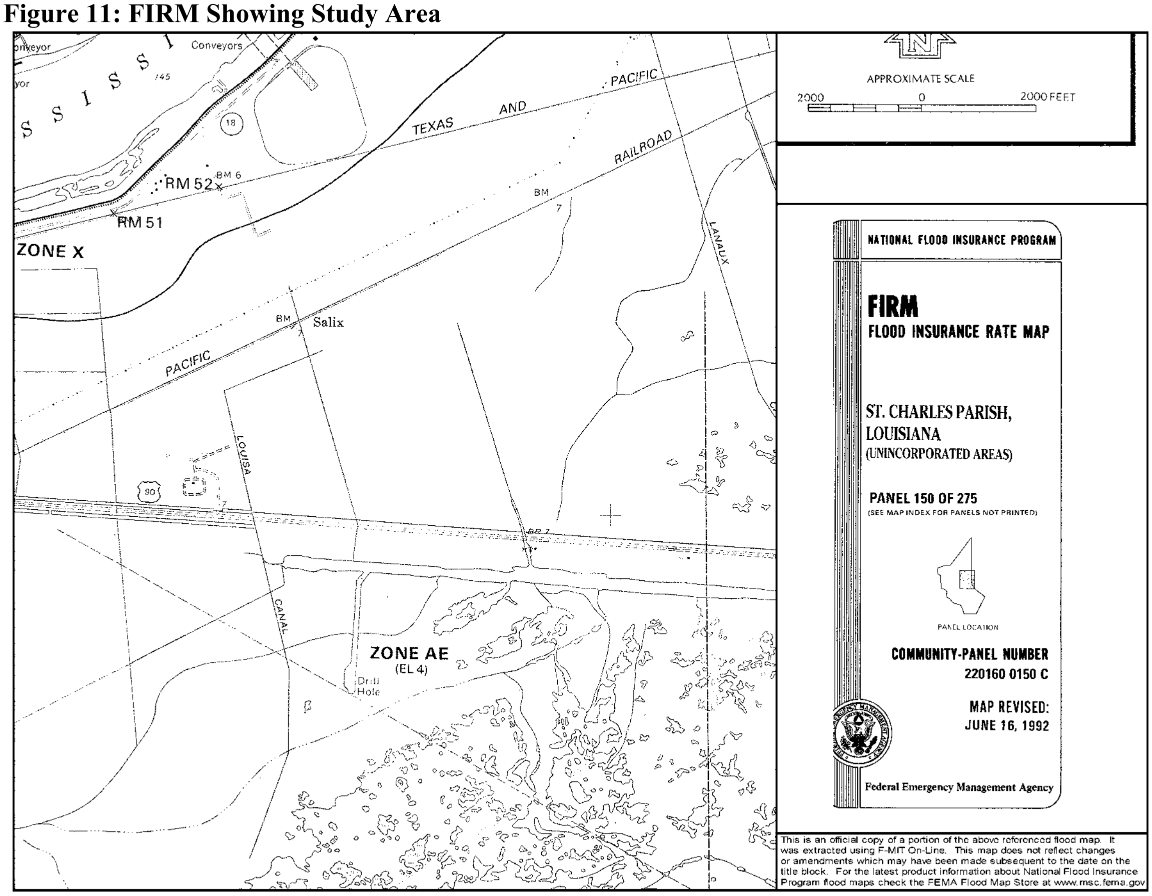
Code	Definition
B	Batture district (river side of levee)
C1	General commercial district - Commercial offices
C2	General commercial district - Retail sales
C3	Highway commercial district - Wholesale and retail sales
CR1	Residential/commercial transitional (commercial in residential neighborhood)
H	Historic preservation district
M1	Light manufacturing and industry district
M2	Heavy manufacturing and industry
M3	Heavy manufacturing (grain elevators)
MS	Medical service district
OL	Open land district
R1A	Single-family residential, detached conventional homes - Medium density
R1AM	Single-family residential, detached conventional homes, manufactured homes, and mobile homes - Medium density
R1B	Single-family residential, detached conventional homes - Light to medium density
R1M	Manufactured home/recreational vehicle (RV) park
R1Z	Single-family residential detached homes - Zero lot line (this code is no longer in use)
R2	Two-family residential
R3	Multi-family residential
W	Wetlands district

No development is automatically permitted in wetlands districts. Special exceptions may be made for low-intensity development with no direct, significant impact to the wetlands; such a determination can be made by the Louisiana Department of Natural Resources, or USACE. Special permits uses for coastal dependent uses may be approved by the St. Charles Parish Coastal Zone Advisory Committee, with the support of the Parish Council. Thus, the current zoning code eliminates the possibility that the study area will be developed for residential or commercial uses.

The trend has been for development to occur just off River Road (Louisiana Highway 18), because that is the naturally high ground and the only ground in the parish that is not in a Special Flood Hazard Area (SFHA).

The study area is entirely within an SFHA, as indicated on the flood insurance rate map (FIRM) developed by the Federal Emergency Management Agency (FEMA, Figure 11). An SFHA has at least a 1 percent chance of inundation in any given year.

Figure 11: FIRM Showing Study Area



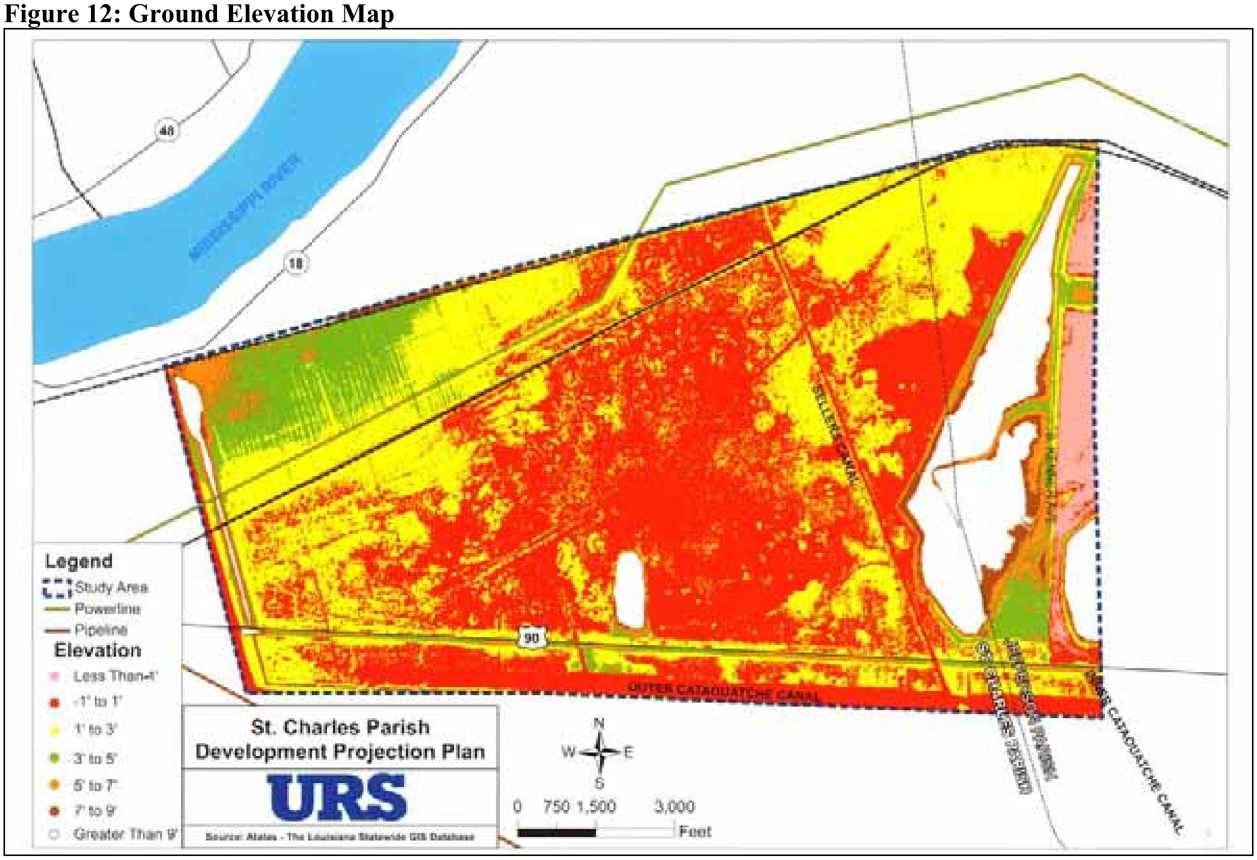
The term “EL 4” on the FIRM indicates that the base flood elevation (BFE) in the study area is 4 feet above mean sea level. Because St. Charles Parish participated in the National Flood Insurance Program (NFIP), the parish enforces a flood damage prevention regulation, included in Section XX of the St. Charles Parish Zoning Ordinance of 1981, that the first floor elevation of all new structures be at or above the BFE. The map designates the area as “Zone AE,” which means that a BFE was calculated for the area and that wave action, as occurs in coastal areas, is not a hazard here. The BFE was calculated as part of a flood insurance study completed by engineers in 1992. However, the base flood elevation which the parish currently enforces in that area, which is now the effective base flood elevation, is 5 feet above mean sea level, in accordance with the advisory base flood elevation (ABFE) provided by FEMA subsequent to Hurricanes Katrina and Rita in 2005 because the hurricanes demonstrated that the BFE generated by the flood study in 1992 was too low.

This means that the first floor elevation of new structures in the study area would have to be elevated to at least 5 feet above mean sea level, either on piers or on fill. According to developers, raising a foundation using a mixture of river sand and clay is the typical way of elevating a structure in the parish. Developers have, in the past, chosen to develop floodplain areas; however, developers interviewed as part of this study process indicated that the cost of fill has increased tremendously since 2005, making filling to a depth of several feet cost prohibitive.

The primary source of flooding in the study area is excessive rainwater, but wind-driven storm surge from Lake Cataouatche and Lake Salvador to the south of the area is also a threat. A FEMA report cites a slight rise in lake elevations subsequent to Hurricanes Rita and Katrina in 2005 that resulted in minor flooding in some parts of St. Charles Parish, but not within the study area. [1]

The ground elevation in the study area is generally well below the effective BFE as shown on the map below (Figure 12). The ground elevation map was developed using the most recent available LIDAR[2] data.

Figure 12: Ground Elevation Map



Source: URS Corporation

[1] Available online at http://www.fema.gov/pdf/hazard/flood/recoverydata/rita/rita_la_hwm_public.pdf
[2] LIDAR (Light Detection And Ranging) systems use lasers to gather data to create digital elevation models

The only section of the study area that is outside of the SFHA and above BFE is in the western edge north of the railroad tracks, which is zoned industrial. There are about 37 acres in this area that are above or just slightly below BFE, with elevations from 3 feet to 7 feet above mean sea level shown by the brown and green colors. This piece of relatively high ground is surrounded by another 138 acres with elevations from 3 feet to 5 feet above mean sea level shown in green, meaning that it is slightly below BFE.

The map shows some high elevations in white. These are the now-closed St. Charles Parish landfill in the south central portion of the study area, the now-closed Greater New Orleans landfill, and the currently active River Birch and Jefferson Parish landfills at the eastern end of the study area. These landfills have unnaturally high ground elevations because of the practice of piling up sand and clay to form a protective barrier around the active landfill sites and to cap closed landfill sites. Other than the landfills, 2,587 acres out of a total of 2,607 acres or 99.2% of the ground within the study area is below the effective BFE of 5 feet.

Table 3: Study Area Elevations

Elevation in Feet Above Mean Sea Level	Approximate Number of Acres	Percentage of Study Area
5 to 7	20	0.8%
3 to 5	155	5.9%
1 to 3	952	36.5%
-1 to 1	1,480	56.8%
	2,607	

Source: URS Corporation

Because development has concentrated on higher ground of the West bank in St. Charles Parish and, because the study area is generally well below BFE, study area land is not expected to be an attractive location for future development.

5. ECONOMIC CHARACTERISTICS OF STUDY AREA

Due to the absence of current and active land uses within the boundaries of the study area, there are no employment generators present in the study area. However, 2000 U.S. Census Data at the census tract level indicates that nearly 30 percent of the population within census tract 630 and about 23 percent of the population within census tract 632 are employed in the manufacturing sector. Other major employment sectors within both St. Charles and Jefferson Parish, which is immediately east of St. Charles Parish include the educational, health, and social services sectors, and construction.

The largest employment sectors of St. Charles Parish in 2005 were manufacturing (16.3 percent); construction (12.7 percent), and waste management and remediation services, 9.2 percent (see Table 4).

Table 4: Employment by Sector - St. Charles Parish (2005)

NAICS[3] Code	Employment Sector	Number of Workers	Percentage of Workers
11	Agriculture, forestry, fishing, hunting	97	0.3%
21	Mining	59	0.2%
22	Utilities	729	2.6%
23	Construction	3554	12.7%
31-33	Manufacturing	4563	16.3%
42	Wholesale trade	2260	8.1%
44, 45	Retail trade	1862	6.6%
48, 49	Transportation and warehousing	1501	5.4%
51	Information	166	0.6%
52	Finance and insurance	512	1.8%
53	Real estate	842	3.0%
54	Professional, scientific, and technical services	1036	3.7%
55	Management of companies and enterprises	115	0.4%
56	Waste management and remediation services	2575	9.2%
61	Educational services	300	1.1%
62	Health care and social assistance	1292	4.6%
71	Arts, entertainment, and recreation	352	1.3%
72	Accommodation and food services	1071	3.8%
81	Other services, except public administration	1237	4.4%
	Total represented by NAICS code	24,123	100%

Source: U.S. Census Bureau available online at http://censtats.census.gov/cgi-bin/usac/usatable.pl

Other employment data developed by RPC compares the retail sector to all other sectors. These data indicate that employment growth in the retail category, within just the study area census tract 630, is expected to increase from 98 jobs in 2008 to 111 jobs by 2020, an addition of 13 jobs over a 12-year period. Within non-retail category in the same area, employment is expected to increase from 534 jobs in 2008 to 614 jobs in 2020, an increase of 80 jobs over the same period. This increase in employment may be attributed to the presence of a number of major employers identified within tract 630, including ADM grain silos, Monsanto, Azalea, Cytec Industries, PHS industries, JP & Sons, and Turner Industries. Employment growth may also be affected by future employment opportunities expected to develop within commuting distance of the study area.

[3] North American Industry Classification System

Table 5: Employment Projections - St. Charles Parish and Study Area

	Year Employment Category									
	2000		2008		2010		2015		2020	
Area	Retail	Other	Retail	Other	Retail	Other	Retail	Other	Retail	Other
St. Charles Parish	2,278	19,330	2,863	22,211	2,924	22,810	3,070	24,177	3,219	25,439
			(2000 – 2008)		(2008 – 2010)		(2010 – 2015)		(2015 – 2020)	
Percent Change			25.7%	14.9%	2.1%	2.7%	5.0%	6.0%	4.9%	5.2%
Study Area	70	447	98	534	101	549	106	583	111	614
			(2000 – 2008)		(2008 – 2010)		(2010 – 2015)		(2015 – 2020)	
Percent Change			40.0%	19.5%	3.1%	2.8%	5.0%	6.2%	4.7%	5.3%

Source: Regional Planning Commission, February 2008

Review of journey to work travel patterns for the parish indicates that nearly 45 percent of the 21,593 people employed in St. Charles Parish live within the parish. About 19 percent of the workers in the parish live in Jefferson Parish, and about 11 percent commute from St. John the Baptist Parish. Table 6 summarizes these data.

Table 6: Journey to Work Patterns – Employment in St. Charles Parish

County of Residence	County of Employment	Percent of Workforce
Jefferson Parish	St. Charles Parish	18.8%
Lafourche Parish	St. Charles Parish	4.5%
St. Charles Parish	St. Charles Parish	44.6%
St. John the Baptist Parish	St. Charles Parish	10.7%
Orleans Parish	St. Charles Parish	4.9%
Other places of residence		16.5%

Source: Census Transportation Planning Package (CTPP) County-to-County Worker Flow Files, U.S. Census 2000

A similar review shows that while a large portion of the residents of St. Charles Parish work within the parish, more than half of the 21,134 employed parish residents commute to work outside of the parish for employment.

Table 7: Journey to Work Patterns – Residents of St. Charles Parish

Residence County	Work County	Percent of Workforce
St. Charles Parish	St. Charles Parish	45.5%
St. Charles Parish	Jefferson Parish	33.6%
St. Charles Parish	Orleans Parish	11.5%
St. Charles Parish	Other LA Parishes	4.1%
St. Charles Parish	Out of State	0.7%

Source: Census Transportation Planning Package (CTPP) County-to-County Worker Flow Files, U.S. Census 2000

These data suggest that the study area would be an attractive location for residential development because it would be within commuting distance not only to jobs in St. Charles Parish, but also to jobs in Jefferson and Orleans Parishes.

Future Development Potential

Interviews with local officials and real estate developers in the area revealed that three large development projects bordering Jefferson Parish and St. Charles Parish are expected to change the landscape and development potential of the area. These projects are:

- Churchill Technology and Business Park
- Huey P. Long Bridge Expansion Project
- I-49 Corridor Project

The Churchill Technology and Business Park promoted by the Jefferson Parish Economic Development Commission (JEDCO) is proposed to be located close to Highway 90 near the intersection of Lapalco and Nicole Boulevards. The 500-acre technology park will be located on the 3,000-acre Churchill Farms property. A local developer has expressed interest in constructing residential units on a portion of the property, but no formal subdivision proposal has been submitted for approvals and no schedule has been set for such a construction project. In addition to the technology and business park, new offices for JEDCO, and an educational facility specializing in secondary science and math, are also expected to be located onsite. All of these facilities combined are expected to generate several hundred jobs in the area.[4] As the Technology and Business Park is located approximately 12 miles from the study area, these additional jobs may make the study area more attractive for housing.

Opened to traffic on December 16, 1935, the U.S. 90-Huey P. Long Bridge is a combined railroad/highway bridge, and one of the three primary Mississippi River bridge crossings in the Greater New Orleans area.[5] Currently the bridge carries two railroad tracks and four highway lanes of U.S. 90. Approximately 50,000 vehicles now travel across the bridge daily.[6] The bridge expansion project, proposed to be completed in 2013, will result in the addition of a travel lane and inside and outside shoulders to each side of the bridge, improving traffic safety conditions for bridge users. The proposed expansion will improve connectivity between the West bank of St. Charles Parish and employment centers in Jefferson and Orleans Parishes. The study area is approximately 10 miles from the bridge, and may become more attractive to developers given its proximity and bridge capacity and operations.

Another roadway project that will improve access to the area is the Future I-49 Corridor project. U.S. Highway 90 on the West Bank of the parish is the planned future corridor of Interstate 49. Sponsored by the Louisiana Department of Transportation and Development in cooperation with the Federal Highway Administration (FHWA), an ongoing environmental and engineering study is analyzing the impacts of upgrading the U.S. 90 corridor from Lafayette to New Orleans. Bordering the southern extent of the study area, improvements to U.S. 90 will enhance the attractiveness of the study area and the overall development potential of the study area. No schedule for initiation or completion of this project has been developed.

The three projects highlight favorable trends in future development for the larger region and the study area in particular. Due to its proximity to the three projects, portions of the west bank of St. Charles Parish may experience beneficial impacts and increased development activity leading to growth in employment and the need for additional housing.

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[4] Based on interviews conducted with staff at JEDCO, February 2008

[5] The Greater New Orleans Bridge is downstream, and the Interstate 310 bridge is upstream from the Huey P. Long bridge

[6] Accessed online http://www.timedla.com/bridge/long/history/, February 2008

6. DEMAND AND SUPPLY OF HOUSING AND LAND

Housing Demand

Future demand for housing is based on population projections and the average household size. Assuming that the average household size will remain at 2.9 persons per household, as reported by the 2000 U.S. Census and utilizing projections developed by the RPC, the number of occupied housing units will increase by 2,768 between 2008 and 2020, bringing the number of housing units needed to accommodate a population of 61,799 persons to 21,310 units (see Table 5).

Table 8: St. Charles Parish - Housing Demand

Year	Expected Population	Total Number of Housing Units Needed with 2.9 Persons/Unit
2000	48,072	16,577
2008	53,772	18,542
2010	55,299	19,069
2015	58,713	20,246
2020	61,799	21,310

Source: Population Projections developed by RPC, 2008

Housing Supply

The supply of housing is based on the current housing stock and the number of units currently permitted for construction. Based on data provided by St. Charles Parish, an average of 292 new housing units have been added to the supply of housing units in St. Charles Parish each year since 2000. One anomaly in the pattern of housing construction occurred in 2006 when 455 were constructed; this is probably due to the fact that in 2005, Hurricanes Katrina and Rita damaged many homes in nearby Orleans, Jefferson, and St. Bernard Parishes.

Table 9: St. Charles Parish Housing Supply 2000 – 2008

Year of Final Approval	Number of New Housing Units
2000	129
2001	230
2002	222
2003	285
2004	155
2005	299
2006	455
2007	270
Total	2,045

Source: St. Charles Parish Planning Department, 2008

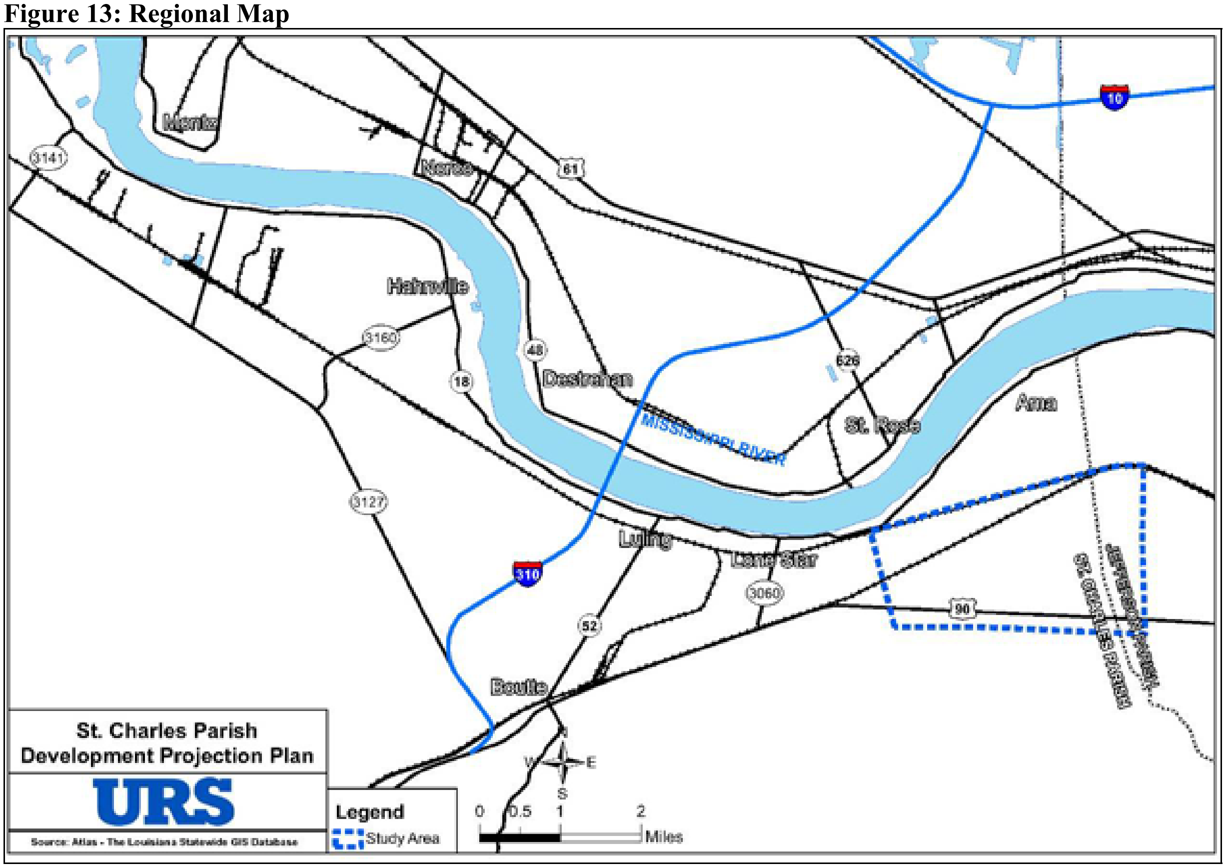
St. Charles Parish provided data showing 862 new single-family detached housing units that are currently permitted for construction or have received preliminary plat approval. However, the effects of the current nationwide slowdown in the housing market are evident in the parish; plans to construct a 113-unit and an 83-unit subdivision that received approval have been discontinued by developers, and these permits are no longer effective. Table 10 shows the number of units permitted in different subdivisions in St. Charles Parish communities and Figure 13 shows the location of these communities relative to the study area.

Table 10: New Housing Units Permitted or Platted in St. Charles Parish

Location of Different Subdivisions	Number of Single-Family Detached Units Anticipated
Boutte	63
Boutte	28
Hahnville	44
Hahnville	10
Hahnville	26
Hahnville	95
Hahnville	125
Luling	14
Luling	85
Luling	142
Luling	119
Luling	45
Montz	66
Total new units	862

Source: St. Charles Parish Planning Department, 2008

Figure 13: Regional Map



Assuming that all units currently permitted or platted are built and available for occupancy by 2010, the average number of new housing units added annually to the supply of housing units will be 291. Because this is very close to the annual average number of new, single-family detached units completed in St. Charles Parish each year between 2000 and 2007, it is assumed conservatively that 290 units is a good representation of the number of housing units that will be added to the supply each year between 2008 and 2020. It is further assumed that the economic slowdown affecting housing construction will not continue indefinitely, and that the historic averages can be used to project future development. Thus, the total number of housing units expected to be available in 2020 may be as high will be 21,717; however with some units being removed from the supply due to poor condition, this suggests that St. Charles Parish should meet the projected demand for 21,310 units.

Demand for Residential Land

Some of the new housing units will be infill properties replacing older homes or on vacant lots in already developed areas; while others will be on agricultural or undeveloped land.

Characteristics of land that will be in demand for new housing will be land that is on relatively high ground where great amounts of fill are not necessary to elevate to at least the base flood elevation. The average selling price for a single-family detached housing unit in St. Charles Parish in 2007 was $195,651;[7] because moderately priced homes sell well in St. Charles Parish, developers must keep construction costs to these levels so that new homes remain affordable. Figure 14 shows a typical newer home in the parish.

Figure 14: Example of Newer Home Just North of Study Area Boundary

[7] Source: Brookings Institute. 2008. The New Orleans Index.

Parish zoning regulations stipulate that a lot for medium-density housing must be at least 6,000 square feet, and at least 60 feet wide. In order to estimate the amount of land needed for the additional housing units, it is assumed conservatively that meeting these space requirements allows a minimum of four new housing units to be built on 1 acre. Because the projected number of housing units needed in the parish by 2020 is 21,717, the number of housing units in 2008 is 18,542, sufficient land to accommodate an additional 3,175 (21,717-18,542) units is necessary. Thus, at four housing units per acre, about 794 (3,175 / 4) acres will be required.

Development in the study area can only occur if the building sites and roadways are elevated approximately 5 feet, which one developer explained increases construction prices to the point where it is unreasonable. With setback requirements, it is reasonable to estimate that the footprint of a housing unit will be approximately 3,000 square feet. Assuming that the cost of fill material is $35 per cubic yard,[8] the cost of filling a 3,000 square foot area an additional 1 foot is approximately $11,690 and the cost of filling a 3,000 square foot area an additional 5 feet is about $58,000. Developers pass the cost of construction and site development on to consumers; this means that with four housing units per acre, a house in the study area would cost at least $50,000 more than an identical house in another area with a naturally higher elevation. In a market where the average selling price in 2007 was less than $200,000, real estate agents explain that consumers would not be interested in paying such a high site development premium for homes.

Supply of Residential Land

There are more than 794 acres of unoccupied ground generally above the BFE, west of Ama on the west bank of St. Charles Parish. There is also much undeveloped land that is less than 5 feet below the BFE that will require less fill than the bulk of the land in the study area, with elevations 5 feet below BFE.

While much of the higher vacant land is zoned for industrial development, some is zoned for medium-density residential development. Aerial photography and flood mapping indicate that areas west of Luling along River Road and near the Interstate 310 Bridge are located on higher ground, and would likely be the first choice for future residential development in the area.

In fact, two new subdivisions were recently constructed in this area: Fashion Plantation and Avalon. The Ashton Plantation subdivision is also being developed in this area—6 miles from the study area. While 559 lots in the Ashton Plantation subdivision have been permitted or platted, according to parish planners, sufficient space for another 1,500 houses exists. Figure 15 shows the location of these new subdivisions, and Figure 16 shows a home under construction in the Ashton Plantation subdivision. In addition, an existing subdivision, Willowdale, which is about 2.5 miles southwest of the study area, will be expanded into a low-lying area with the construction of a new levee.

[8] Estimate provided during interview with local engineer.

Figure 15: Map Showing Location of New Subdivisions

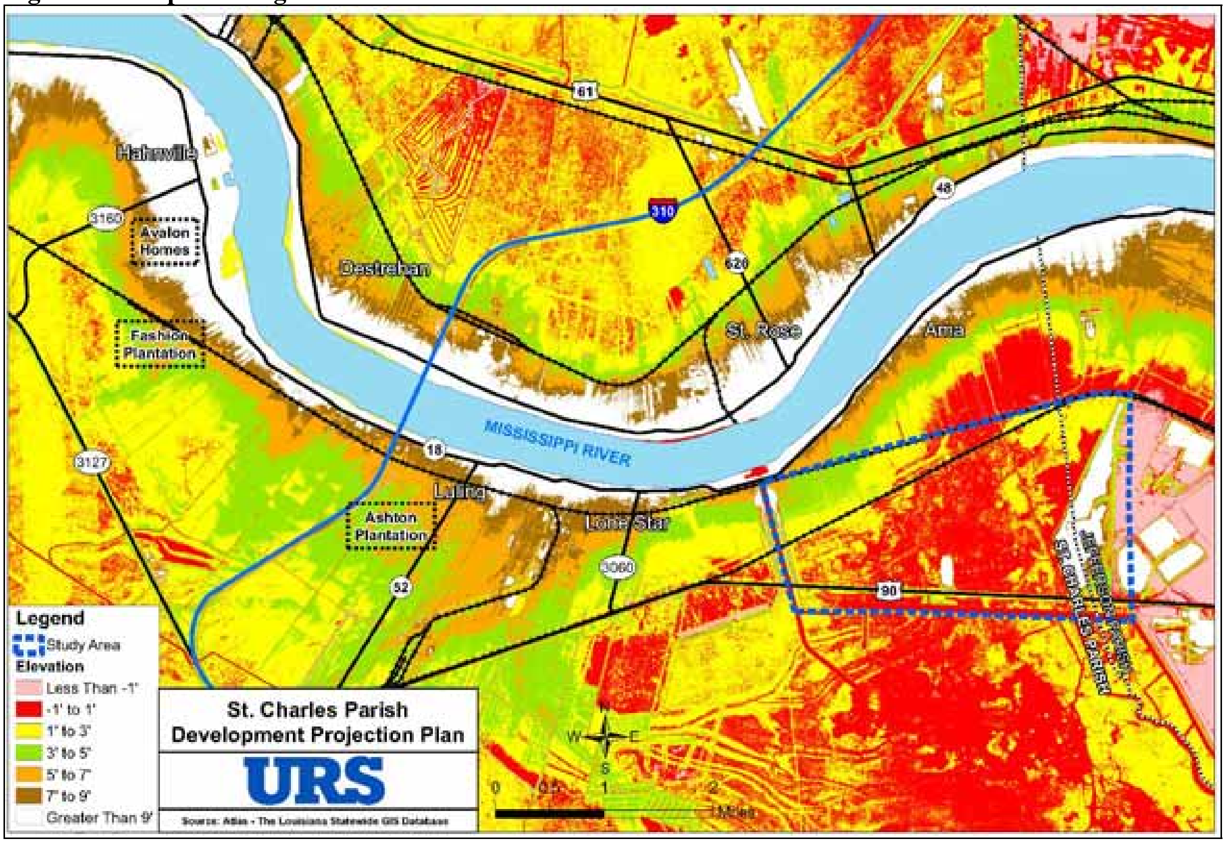


Figure 16: New Housing Development in Ashton Plantation - 6 Miles West of Study Area

According to St. Charles Parish planners, two additional large subdivisions near Avalon are being considered at this time. There appears to be sufficient land on the west bank of St. Charles Parish to meet the anticipated demand for residential land that will be experienced between 2008 and 2020.

Commercial Development

The study has focused on the demand for and supply of land for residential development. It is assumed that retail development will follow housing and the customer base. However, there is, according to land developers interviewed for this project, very little land remaining on the West bank of St. Charles Parish that is zoned for commercial uses. A narrow strip of commercial zoning along U.S. Route 90 west of the study area is fully developed. Land along U.S. 90 and in the study area is zoned as wetlands, has a low elevation, and would, like residential development, need to be filled to at least the effective BFE if construction were to be allowed.

7. FEMA INSURANCE REQUIREMENTS

Being located in a SFHA indicated on a FIRM means that residents of the area will be required to obtain Federal flood insurance to qualify for a mortgage, and will pay higher premiums than someone located outside of the SFHA will pay for a similar insurance policy. While this alone will not deter development, the additional cost of flood insurance, as well as the increased cost of homeowner's insurance experienced by residents of Louisiana since 2005, does increase the cost of homeownership in the area relative to other areas.

FEMA does offer a procedure for removing a structure from the SFHA if fill is used to elevate it above the effective BFE. This procedure is for a property owner to request of FEMA a Letter of Map Revision Based on Fill (LOMR-F) using a set of forms titled "MT-1." The current cost of submitting a request for a LOMR-F to FEMA is $425 for a single structure, and, should an individual or developer choose to use fill to elevate a single structure in the study area above the BFE, application for a LOMR-F would be appropriate.[9]

When requesting a LOMR-F, the property owner provides documentation to FEMA showing that the property is at or above the BFE. Proof of elevation is generally provided using a FEMA Elevation Certificate,[10] which must be completed by a licensed land surveyor or registered professional engineer.

Obtaining a LOMR-F does not mean that a structure is safe from all flooding; it means that the risk of flooding is less than if the structure were below the BFE. With the issuance of a LOMR-F, the Federal flood insurance purchase requirement as a condition of obtaining Federal or federally backed financing is eliminated; however, the mortgage lender retains the prerogative to require flood insurance as a condition of providing financing, regardless of the location of a structure. The flood insurance premium rate for structures located outside of the SFHA are lower than premiums for structures located in the SFHA.

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[9] If the natural elevation of property shown on the FIRM as below the BFE is actually at or above the BFE, a somewhat simpler procedure is available in which a property owner applies to FEMA for a Letter of Map Amendment (LOMA) using a set of forms titled "MT-EZ." There is no cost for submitting a request for a LOMA. This situation does not apply to the study area.

[10] Available at http://www.fema.gov/business/nfip/elvinst.shtm.

The community acknowledgement form is another part of the MT-1 LOMR-F application procedure. The form must be signed by a community official saying that based on the community's review of the application, the structure meets all of the community floodplain management requirements and that the land and structure will be reasonably safe from flooding. According to St. Charles Parish officials, application for a LOMR-F is rare in the parish, having occurred no more than 6 times in the past 16 years.[11] Local officials do not encourage this practice because as additional fill is brought into the floodplain, drainage becomes more complicated and there is less space for flood water storage. Before signing the community acknowledgement part of the MT-1 LOMR-F application, parish officials must inspect a site; officials have not signed a community acknowledgement form in the past 16 years.

8. SUMMARY OF FINDINGS

Amenities

The study area would be an attractive location for new residential and associated commercial development because of its proximity to key employment centers and to U.S. 90. The study area is located about 15 miles from Metairie and 28 miles from downtown New Orleans. Both I-310 Bridge and the Huey P. Long Bridge provide access to jobs on the east bank of the Mississippi River. As described above, the study area is also close to the future Technology and Business Park on the west bank of Jefferson Parish.

In addition, the study area in St. Charles Parish would be an attractive location for new development, because St. Charles Parish provides a "high quality of life with good schools, low crime rates, and abundant recreational opportunities" touted by at least one developer, i.e., Ashton Plantation Estates,[12] a new subdivision currently in construction. Recreational opportunities available to residents of the area include hunting, fishing, and boating in the Salvador-Timken Wildlife Management area in southern St. Charles Parish. With a hurricane protection barrier protecting the south side of the study area, there may be the perception of greater safety. This may make the area more attractive to developers and potential home buyers.

Disamenities

There are a number of reasons why the study area is unattractive to developers for new projects. Disamenities may add to the cost of construction or deter potential home buyers.

Some disadvantages specific to the study are its proximity to the active Jefferson Parish and River Birch landfill sites along South Kenner Road. Along the southern boundary of the study area, on U.S. Route 90, is the closed St. Charles Parish landfill. Developers familiar with the area indicated in interviews that they would not want to live near the landfills, and anticipated problems selling homes near landfills. However, just to the north of the landfill site are some newer homes.

Another site-specific disamenity is the presence of the BNSF and Union Pacific rail lines. While access to most of the site is possible from U.S. Route 90, development of at-grade crossings of either rail line will likely be a time-consuming and costly process. It has traditionally been very difficult to obtain permission from railroad companies to develop roads across tracks, and very costly to prepare a crossing when permission is granted. A recent railroad crossing permitted in Jefferson Parish cost the developer $1 million. These active rail lines also result in nuisance, dust, and noise in the vicinity of the tracks.

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[11] Based on written communication from Earl Matherne, St. Charles Parish Planning Department.
[12] Available online at www.ashtonplantation.com.

The low-lying study area requires that ground elevation be brought up to the area-wide BFE of 5 feet above mean sea level before permission to build is granted. Fill from river sand or a mixture of sand and clay is costly and adds to the cost of a structure. When the amount of fill required is in excess of a few of feet, as is the case in much of the study area, it is not economically feasible for development. While some low-lying areas were developed prior to Hurricanes Katrina and Rita, the cost of fill has increased five-fold since 2005, making similar development cost-prohibitive, according to developers. Figures 17 and 18 show different views of the study area. In addition to the above listed disamenities, additional efforts may be required in obtaining the approval of a LOMR-F application from FEMA and Parish staff.

Figure 17: View of Abandoned Road Between Railroad Tracks in Study Area

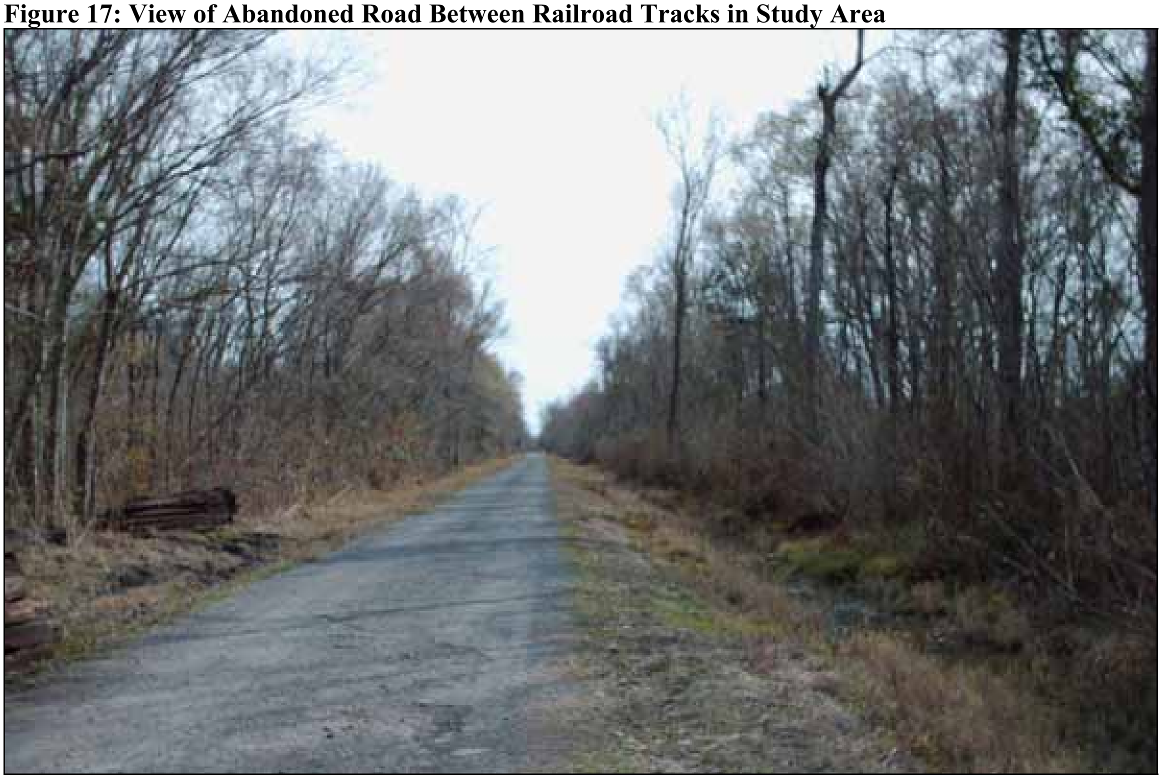

Figure 18: View of Study Area from U.S. Route 90

9. CONCLUSIONS

In order to make the study area suitable for development, it must be raised to the area-wide BFE of 5 feet above mean sea level, and the cost of doing this is prohibitive for developing the medium-priced homes that typically sell in St. Charles Parish.

The analysis indicates that there is sufficient land in close proximity to the study area which would be more economically feasible to develop compared to the study area. The parish will contain an adequate number of housing units to absorb the projected increase in population, and there is no immediate need to develop the study area parcel for residential uses.

By providing an HPS close to existing and proposed development in Ama near the River, the study area will not be protected from storm surge but will benefit the area by providing a place for storage of excessive amounts of storm water and storm surge.

By providing an HPS close to U.S. Route 90, the study area will be protected from storm surge. However, the land will still be extremely low-lying and prone to flooding from excessive storm water.

There is always the potential for development to occur in the study area because there are many variables that affect development decisions. Nevertheless, it appears that development is unlikely in the next 12 years because it is more likely that other available land on the west bank of St. Charles Parish will be developed before the study area becomes an attractive location for new development. No condition of excess demand exists within the market area over the period of analysis such that the subject area would readily absorb additional demand for residential housing.

10. SOURCES

Along with conducting a review of published reports and materials available for this particular area, the following persons were interviewed, either in-person or via telephone:

Amber Bergeron, Sunrise Homes Development Corporation
Barry Burkart, Jack Stumpf & Associates
Chuck Sheefel, Latter and Blum Incorporated
Earl J. Matherne, CFM, Coastal Zone Management Administrator, St. Charles Parish Planning Department
Ed Durrab, Jefferson Parish Planning Department
Kevin Belanger, CEO, South Central Planning and Development Commission
Kim Marousek, St. Charles Parish Planning Department
Lynn E. Dupont, Senior Planner, Regional Planning Commission
Percy Wilson, Tridum Construction and Development
Pete Chocheles, Director of Port and Public Affairs, Jefferson Parish Economic Development Commission
Terri Wilkinson, Jefferson Parish Planning Department
Vic Culpepper, Sc. D, Technical Director, River Birch Incorporated
Walter Brooks, Executive Director Regional Planning Commission

Population projections provided by Regional Planning Commission

Photos: Mary Shaw, February 2008

APPENDIX F - HYDROLOGY AND HYDRAULICS STUDY

Hurricane and Storm Damage Risk Reduction System

Western Tie In
Hydraulics and Hydrologic Analysis
28 April 2009

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Background:

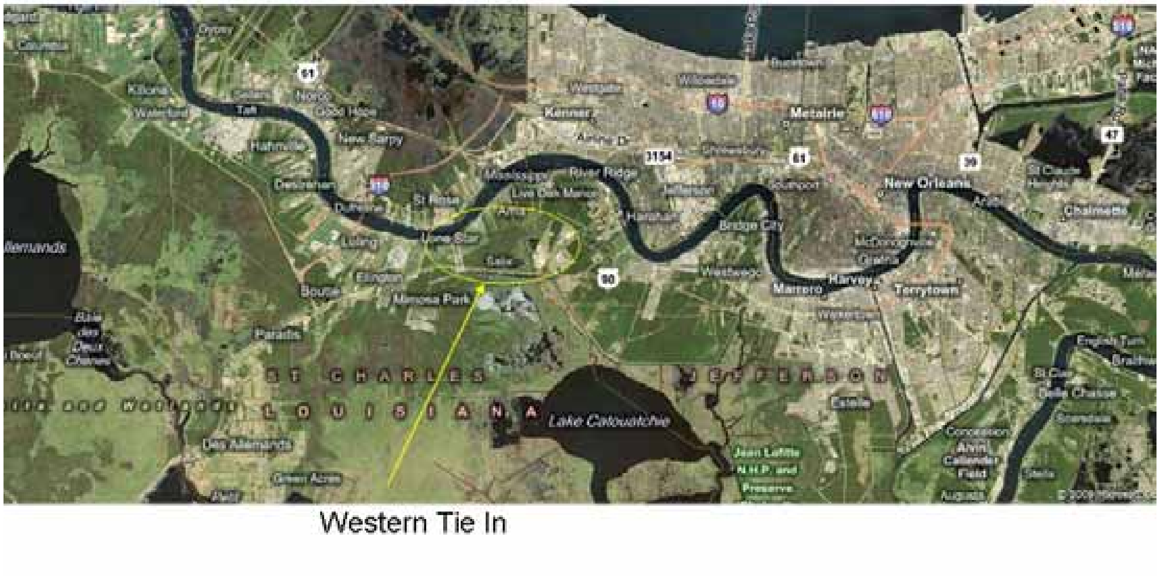


Figure 1. Location of the Western Tie in in the HSDRRS

Figure 2. Landmarks in the Western Tie In.

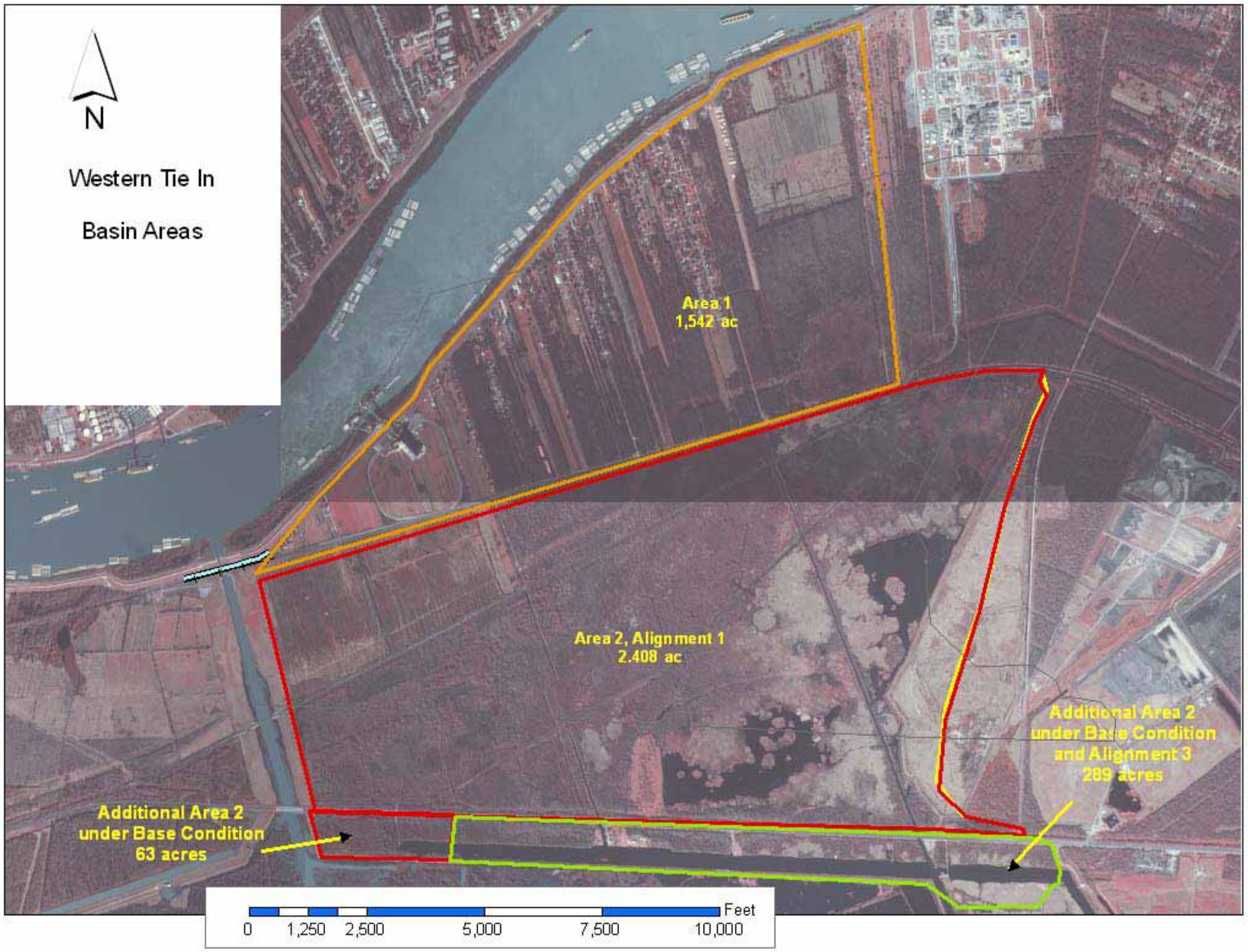


Figure 3. Areas – Western Tie In.

Three alignments studied in the Feasibility Analysis (Engineering Alternatives Report, Reference 1), two discussed in this analysis:

Figure 3. Approximate Levee Alignment for Alignment #2.

Figure 4. Approximate Levee Alignment for Alignment #3.

Problem Identification:

Three main issues needed to be addressed.

(1) Definition of base condition inundation levels in the area above Highway 90 (Area 2).
(2) Project construction could cause changes in ponding elevations and durations to Area 2. One purpose of this document is to define those changes.
(3) The construction of the project may restrict the connection (as defined by cross sectional area) of the project area to tidal surges from the Gulf. Highway 90 is the current constriction. This report defines the connection, changes to the connections due to project construction, and recommends project alternations to maintain flow area.
(4) Evaluation of sedimentation impacts to the Bayou Verret Structure
(5) Summary of Davis Pond project water levels

Hydrology

Table 1
Rainfall Frequencies provided by MVN*

Frequency (yr)	Rainfall (Inches) for Given Duration 12 hour	24 hour	2 day	4 day	7 day	10 day
2	4.9	5.7	6.6	7.6	8.8	9.6
5	6.5	7.7	8.5	9.5	11	12
10	7.6	9.1	10.2	11.1	12.7	13.8
25	9	10.6	12.1	13.3	15.3	16.7
50	10	12	13.8	15.2	17.3	18.5
100	11.1	13.2	15.1	17	19.1	20.5
200	12.3	14.7	16.7	18.7	20.8	22.5
500	13.7	16.7	18.7	20.9	23.2	25
1000	14.8	18	20.2	22.5	25	27

*Rainfalls of 12 to 24 hours were derermined from Technical Paper 40, Rainfall Frequency Atlas of the United States for durations from 30 minutes to 24 hours. Rainfalls of 2 to 10 days were determined from Technical Paper 49, Two-to Ten-day precipitations.

Area 1 drains to Ama Sellers pump station, which has a pumping capacity of 204 cfs. Area 2 has 4 distinct drainage canals, Sellers Canal, and 3 unnamed canals to the west of Sellers Canal. LIDAR data is available of the area (Reference 2). Survey data of channels in the study area is also available from New Orleans District. These two data sets are combined, contoured, and plotted as shown below in Figure 5.

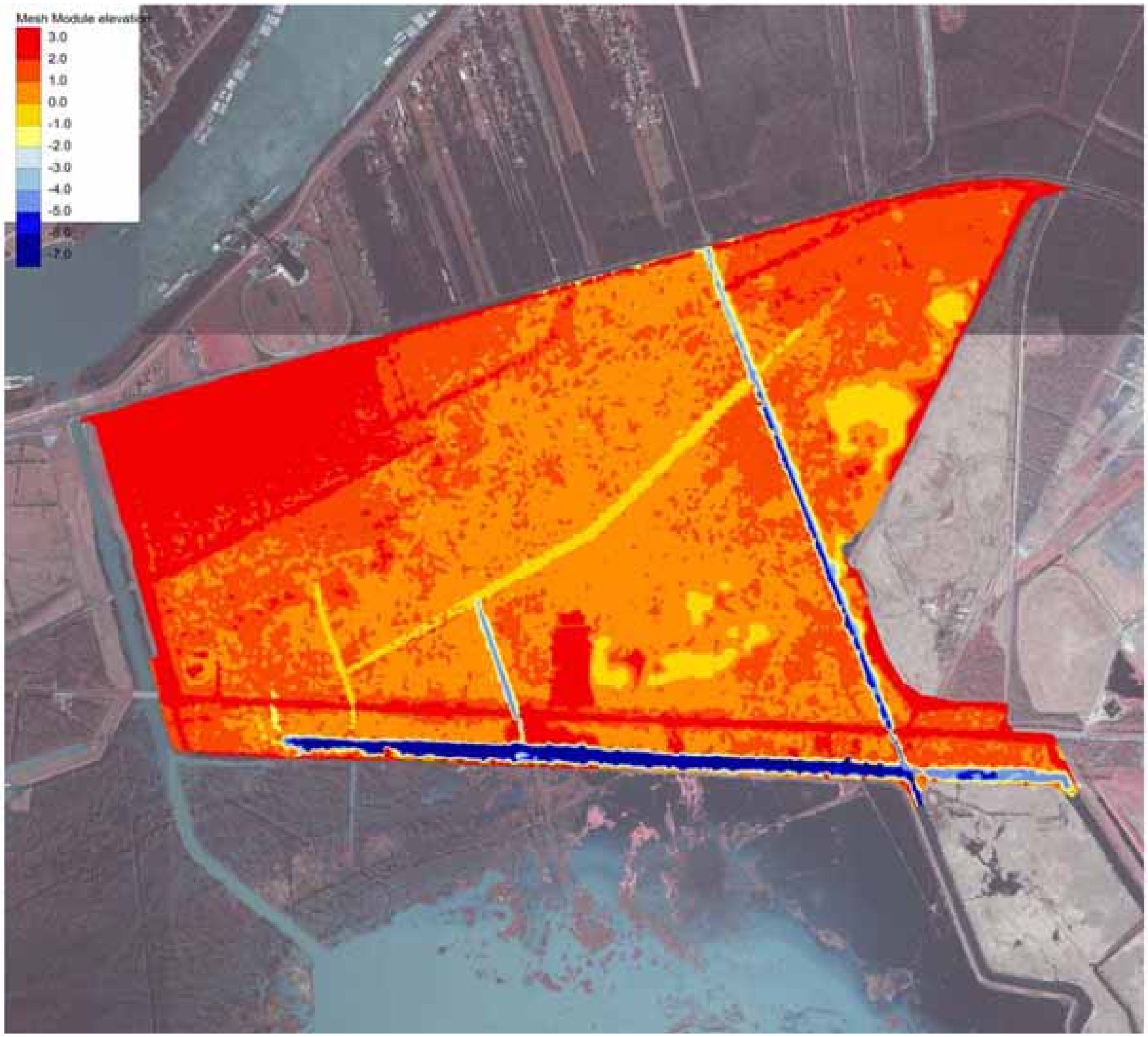


Figure 5. Channel Survey and LIDAR Data (NAVD88) of Area 2, Contoured in 1 ft Intervals

Drainage basins for each of the four canals in Area 2 were delineated as shown below in Figure 6.

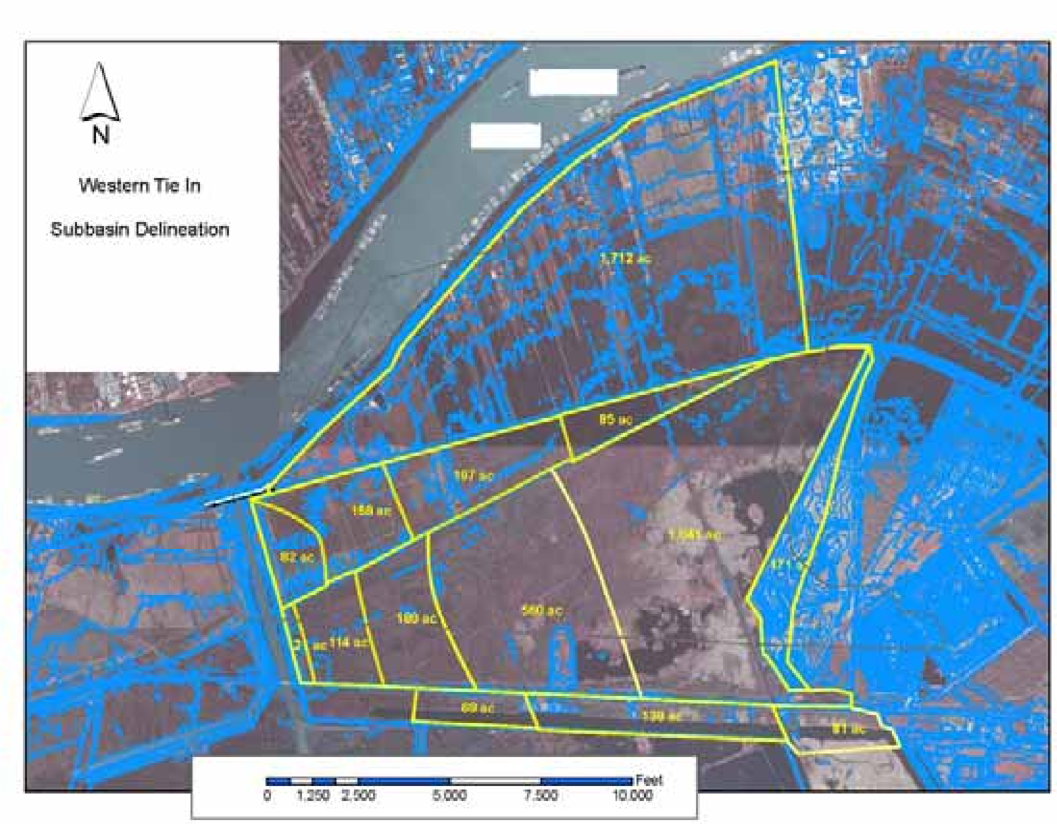


Figure 6. Area 2 Drainage Basin Delineation.

Elevation Storage Curves for Areas 1 and 2

Elevation storage and elevation area relationships were established by MVN Engineering Control Branch. These applied to Area 2 under Alignment 2. This was modified to develop the Area 2, Alignment 3 relationship by computing volumes in the Outer Cataouache Canal from channel survey data. The relationship is shown below in Figures 7 and 8, respectively.

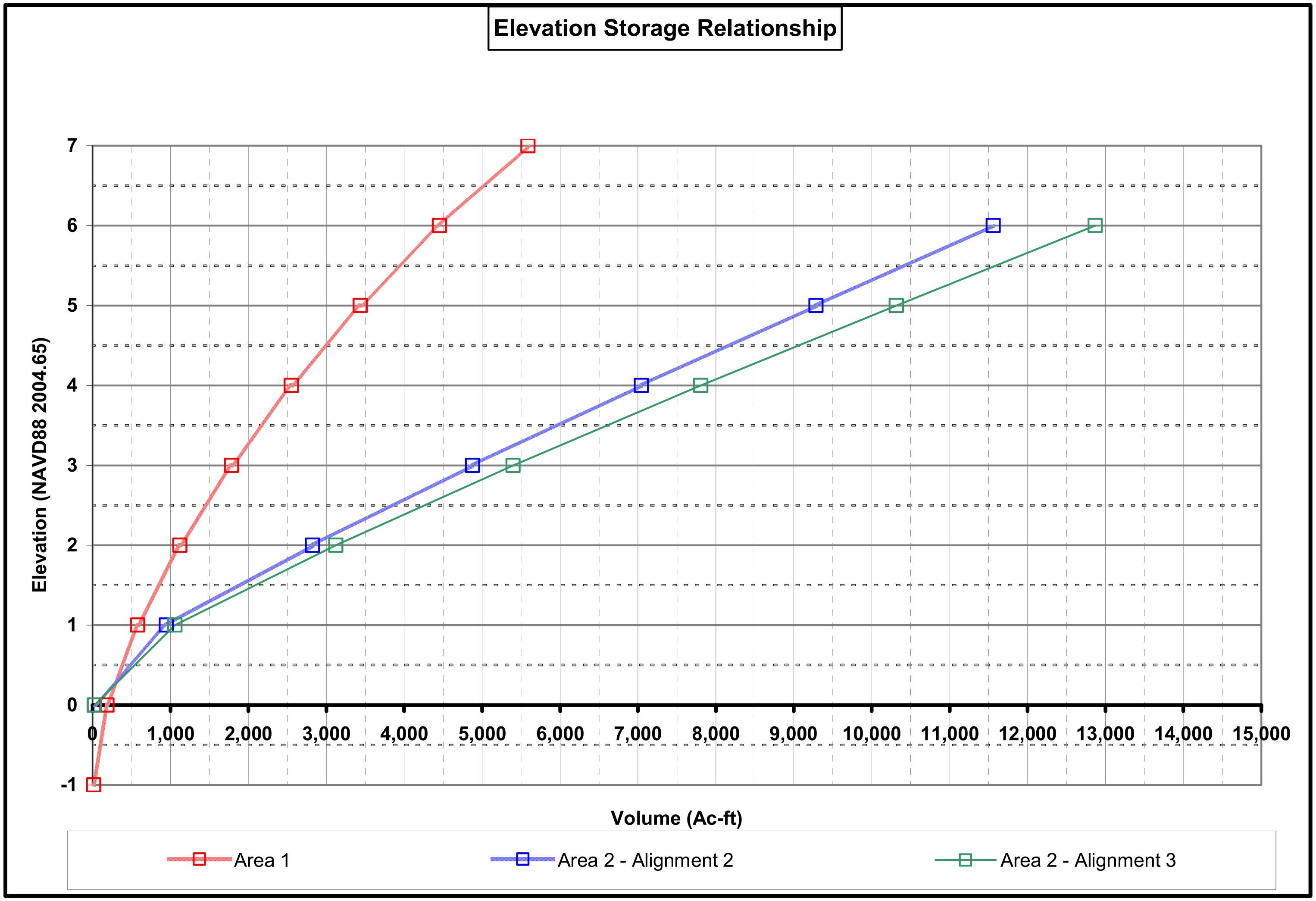


Figure 7. Elevation-Storage Relationship for Areas 1 and 2.

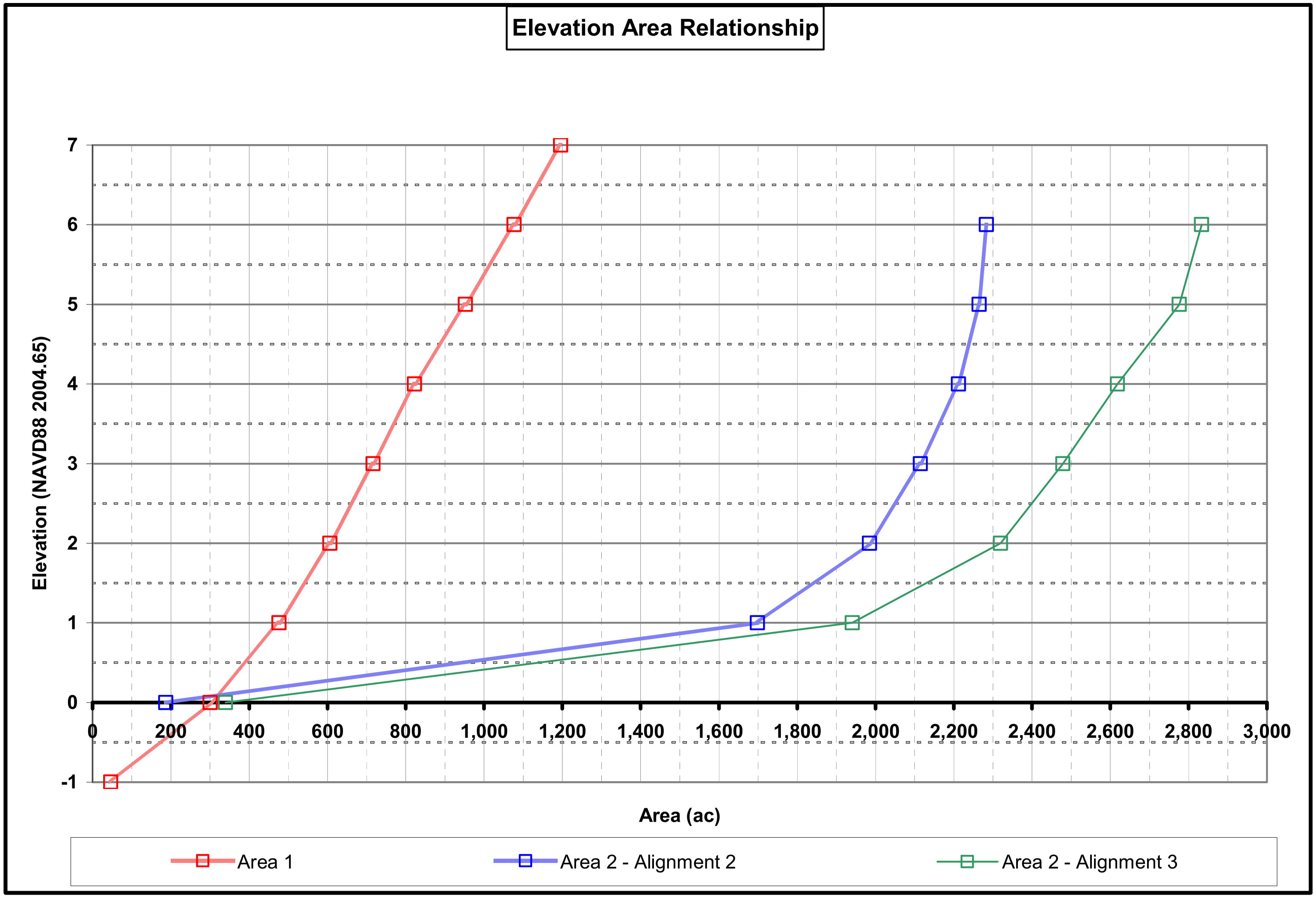


Figure 8. Elevation-Area Relationship for Areas 1 and 2.

Table 2 gives peak flows at the mouths of each of the canals as they drain into the Outer Cataouache Canal. These flows assume a 70% runoff of rainfall, and a 12 hour time of concentration. This is the justification for using a 12 hour storm for computation of peak flows.

Table 2
Area 2 Peak Flows

Location	Rainfall frequency (yrs)	Rainfall duration (hrs)	Inches	Rainfall (ft/hr)	Runoff %	Rainfall exceedence (ft/hr)	Area (acres)	Pump Inflow (cfs)	Peak Flow (cfs)
Mouth of Sellers Canal, Includes Area 1 Pumping	10	12	7.6	0.053	70	0.037	1126	204	707
	25	12	9	0.063	70	0.044	1126	204	800
	50	12	10	0.069	70	0.049	1126	204	866
	100	12	11.1	0.077	70	0.054	1126	204	939
Mouth of Unnamed Canal #1	10	12	7.6	0.053	70	0.037	757	0	338
	25	12	9	0.063	70	0.044	757	0	401
	50	12	10	0.069	70	0.049	757	0	445
	100	12	11.1	0.077	70	0.054	757	0	494
Mouth of Unnamed Canal #2	10	12	7.6	0.053	70	0.037	347	0	155
	25	12	9	0.063	70	0.044	347	0	184
	50	12	10	0.069	70	0.049	347	0	204
	100	12	11.1	0.077	70	0.054	347	0	227
Mouth of Unnamed Canal #3	10	12	7.6	0.053	70	0.037	198	0	89
	25	12	9	0.063	70	0.044	198	0	105
	50	12	10	0.069	70	0.049	198	0	116
	100	12	11.1	0.077	70	0.054	198	0	129

Gage Data. A gage is located near the mouth of Sellers Canal (Reference 3). This information is useful in determining typical water levels and volumes of water ponded in Area 2 at the initiation of hydraulic analyses. Figure 9 presents available data.

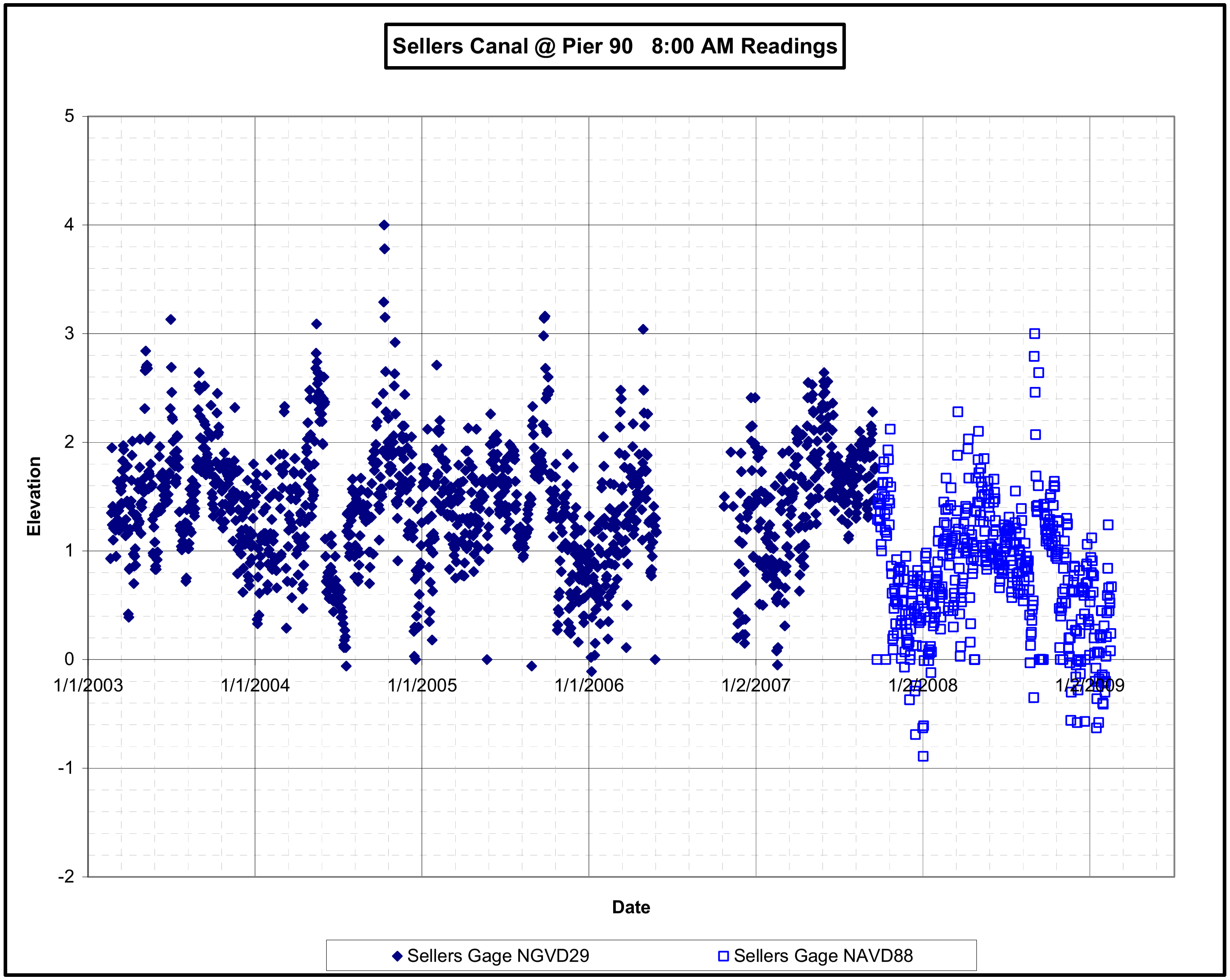


Figure 9. Sellers Canal Stage Data.

Hydraulics

Water Levels / Ponding Conditions in Area 2.

Comparison of water levels/ponding conditions are presented here for the base condition vs. project conditions.

Base condition water surface elevations were computed as follows. An assumption was made that Area 2 outlets do not restrict outflow, that is, water levels in Area 2 are based on water flowing in and out of Area 2, and not from ponding because of tailwater confinements. Determination of Area 2 water levels were based on a HEC-RAS model of Area 2. The Area 2 HEC-RAS model layout is shown in Figure 10.

Figure 10. HEC-RAS Model Structure of Area 2.

Emphasis was placed on the Sellers Canal. Sections were developed in Sellers Canal based on LIDAR Data and channel surveys at the mouth. A channel bottom elevation of -5 and width of 70 feet was assumed for the entire channel. Sellers Canal flows were developed for every cross section and were based on 12-hour rainfall amounts, 70% runoff, and Area 1 pumped inflow of 204 cfs. The water surface profile computed for Sellers Canal was assumed to represent the profiles for each of the other three Unnamed Canals.

Water surface profiles for Sellers Canal are presented below in Figure 11:

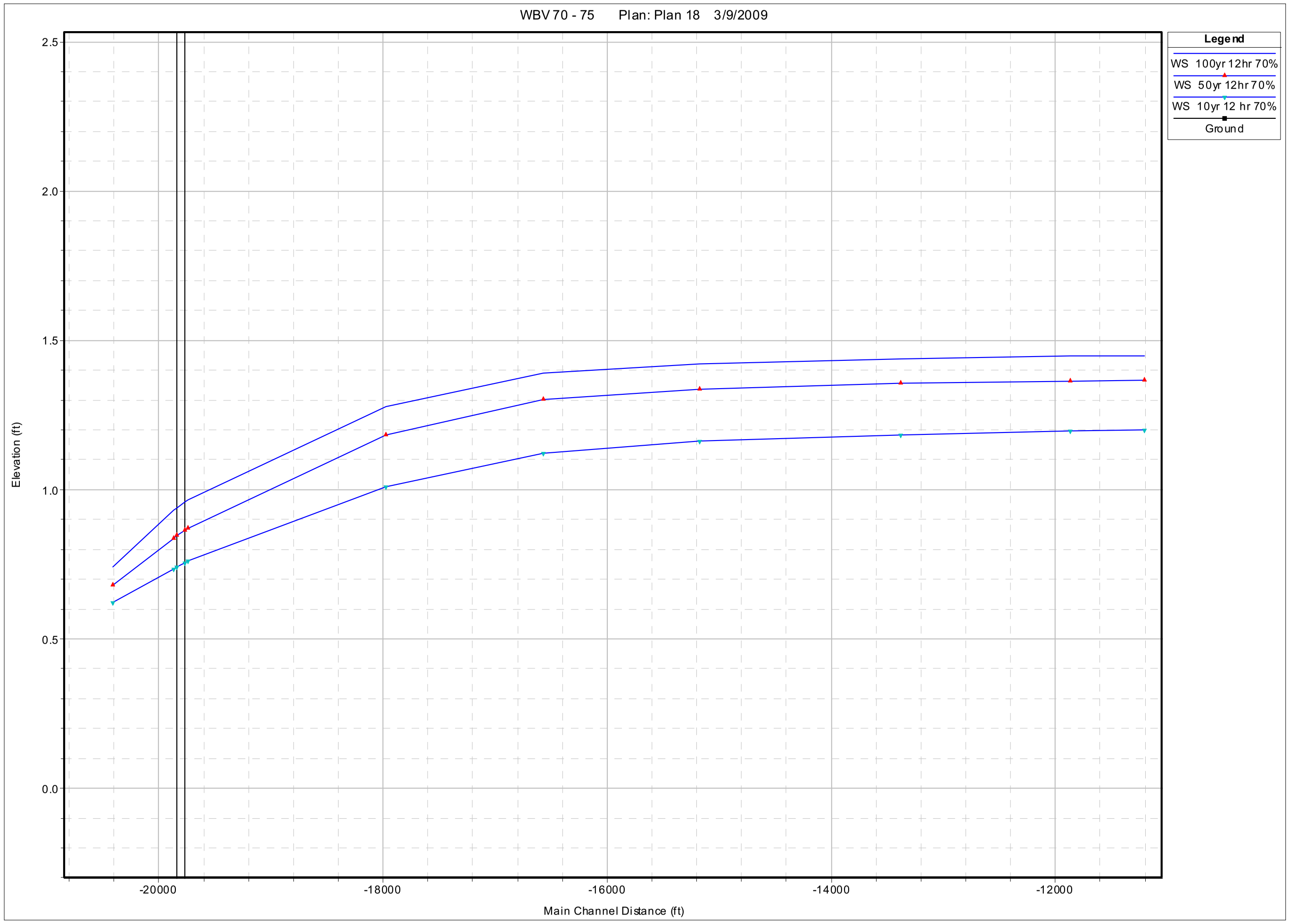


Figure 11. Sellers Canal Water Surface Profiles (Elevations NAVD88).

Project condition water surface levels were predicted by applying volumes of runoff into Area 2 to the Area 2 Elevation Storage curves. This gives Area 2 ponding elevations at the outlet under project conditions.

A comparison of water surface elevations for the base and project (Alignments 2 and 3) conditions for various storms are presented in Figures 12-14. All evaluations used a starting water surface elevation of 0.0.

Figure 12 shows base condition water levels at Highway 90 and at the upstream limits of Area 2.

Figure 13 shows project condition water levels at Highway 90 for Alignment 2.

Figure 14 shows project condition water levels at Highway 90 for Alignment 3.

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Water Surface Elevation in Area 2 just upstream of Hwy 90, at Peak Inflow to System (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Base	Existing	70	0.5	10	7.6	5.32	1.2	1.4
		70	1	10	9.1	6.37	1.2	1.4
		70	2	10	10.2	7.14	1.2	1.4
		70	4	10	11.1	7.77	1.2	1.4
		70	7	10	13.8	9.66	1.2	1.4
		70	0.5	50	10	7	1.3	1.6
		70	1	50	12	8.4	1.3	1.6
		70	2	50	13.8	9.66	1.3	1.6
		70	4	50	15.2	10.64	1.3	1.6
		70	7	50	18.5	12.95	1.3	1.6
		70	0.5	100	11.1	7.77	1.4	1.6
		70	1	100	13.2	9.24	1.4	1.6
		70	2	100	15.1	10.57	1.4	1.6
		70	4	100	17	11.9	1.4	1.6
		70	7	100	20.5	14.35	1.4	1.6

Figure 12. Base Condition Water Surface Levels (NAVD88).

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Area 1 Area (ac)	Runoff to Area1 (ac-ft)	Area 2 Area (ac)	Runoff to Area 2 (ac-ft)	Area 1 to Area 2 Pump Capacity (af-day)	Area 1 to Area 2 Total Pump Capacity (ac-ft)	Inflow - Area 1 to Area 2 (ac-ft)	Outflow from Area 2 (ac-ft) (Assumes TW elev = 0.0)	Net Ponding in Area 2 (ac-ft)	Ponding Elevation in Area 2 (NAVD88)	Water Surface Elevation in Area 2 just upstream of Hwy 90 (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Alignment 2	Existing Runoff Conditions	70	0.5	10	7.6	5.32	1,542	684	2,408	1,068	405	203	203	0	1,270	1.16	1.2	
		70	1	10	9.1	6.37	1,542	819	2,408	1,278	405	405	405	0	1,683	1.39	1.4	
		70	2	10	10.2	7.14	1,542	917	2,408	1,433	405	810	810	0	2,243	1.7	1.7	
		70	4	10	11.1	7.77	1,542	998	2,408	1,559	405	1,620	998	0	2,558	1.86	1.9	
		70	7	10	13.8	9.66	1,542	1,241	2,408	1,938	405	2,835	1,241	0	3,180	2.18	2.2	
		70	0.5	50	10	7	1,542	900	2,408	1,405	405	203	203	0	1,607	1.35	1.4	
		70	1	50	12	8.4	1,542	1,079	2,408	1,686	405	405	405	0	2,091	1.63	1.6	
		70	2	50	13.8	9.66	1,542	1,241	2,408	1,938	405	810	810	0	2,748	1.96	1.9	
		70	4	50	15.2	10.64	1,542	1,367	2,408	2,135	405	1,620	1,367	0	3,502	2.33	2.3	
		70	7	50	18.5	12.95	1,542	1,664	2,408	2,599	405	2,835	1,664	0	4,263	2.7	2.7	
		70	0.5	100	11.1	7.77	1,542	998	2,408	1,559	405	203	203	0	1,762	1.43	1.5	
		70	1	100	13.2	9.24	1,542	1,187	2,408	1,854	405	405	405	0	2,259	1.7	1.7	
		70	2	100	15.1	10.57	1,542	1,358	2,408	2,121	405	810	810	0	2,931	2.08	2.0	
		70	4	100	17	11.9	1,542	1,529	2,408	2,388	405	1,620	1,529	0	3,917	2.57	2.5	
		70	7	100	20.5	14.35	1,542	1,844	2,408	2,880	405	2,835	1,844	0	4,724	2.92	2.9	

Figure 13. Project Condition (Alignment 2) Water Surface Levels (NAVD88)

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Area 1 Area (ac)	Runoff to Area1 (ac-ft)	Area 2 Area (ac)	Runoff to Area 2 (ac-ft)	Area 1 to Area 2 Pump Capacity (af-day)	Area 1 to Area 2 Total Pump Capacity (ac-ft)	Inflow - Area 1 to Area 2 (ac-ft)	Outflow from Area 2 (ac-ft) (Assumes TW elev = 0.0)	Net Ponding in Area 2 (ac-ft)	Ponding Elevation in Area 2 (NAVD88)	Water Surface Elevation in Area 2 just upstream of Hwy 90 (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Alignment 3	Existing Runoff Conditions	70	0.5	10	7.6	5.32	1,542	684	2,697	1,196	405	203	203	0	1,398	1.18	1.1	
		70	1	10	9.1	6.37	1,542	819	2,697	1,432	405	405	405	0	1,837	1.38	1.3	
		70	2	10	10.2	7.14	1,542	917	2,697	1,605	405	810	810	0	2,415	1.56	1.5	
		70	4	10	11.1	7.77	1,542	998	2,697	1,746	405	1,620	998	0	2,745	1.8	1.7	
		70	7	10	13.8	9.66	1,542	1,241	2,697	2,171	405	2,835	1,241	0	3,412	2.12	1.9	
		70	0.5	50	10	7	1,542	900	2,697	1,573	405	203	203	0	1,776	1.33	1.3	
		70	1	50	12	8.4	1,542	1,079	2,697	1,888	405	405	405	0	2,293	1.6	1.5	
		70	2	50	13.8	9.66	1,542	1,241	2,697	2,171	405	810	810	0	2,981	1.92	1.8	
		70	4	50	15.2	10.64	1,542	1,367	2,697	2,391	405	1,620	1,367	0	3,759	2.28	2.1	
		70	7	50	18.5	12.95	1,542	1,664	2,697	2,911	405	2,835	1,664	0	4,575	2.63	2.4	
		70	0.5	100	11.1	7.77	1,542	998	2,697	1,746	405	203	203	0	1,949	1.43	1.4	
		70	1	100	13.2	9.24	1,542	1,187	2,697	2,077	405	405	405	0	2,482	1.69	1.6	
		70	2	100	15.1	10.57	1,542	1,358	2,697	2,376	405	810	810	0	3,186	2	1.8	
		70	4	100	17	11.9	1,542	1,529	2,697	2,675	405	1,620	1,529	0	4,204	2.5	2.3	
		70	7	100	20.5	14.35	1,542	1,844	2,697	3,225	405	2,835	1,844	0	5,069	2.83	2.6	

Figure 14. Project Condition (Alignment 3) Water Surface Levels (NAVD88

Extent of Area Inundated for Various Ponding Levels are shown below in Figures 15 to 22.

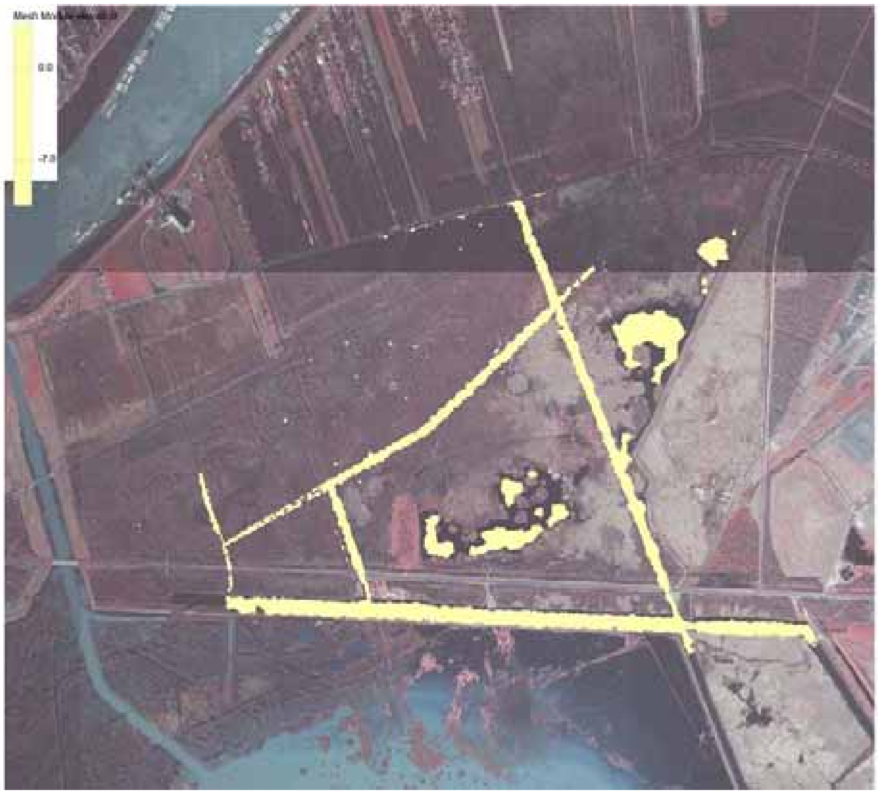


Figure 15. Alignment 3, Area Inundated at Ponding Elevation of 0.0 (NAVD88).

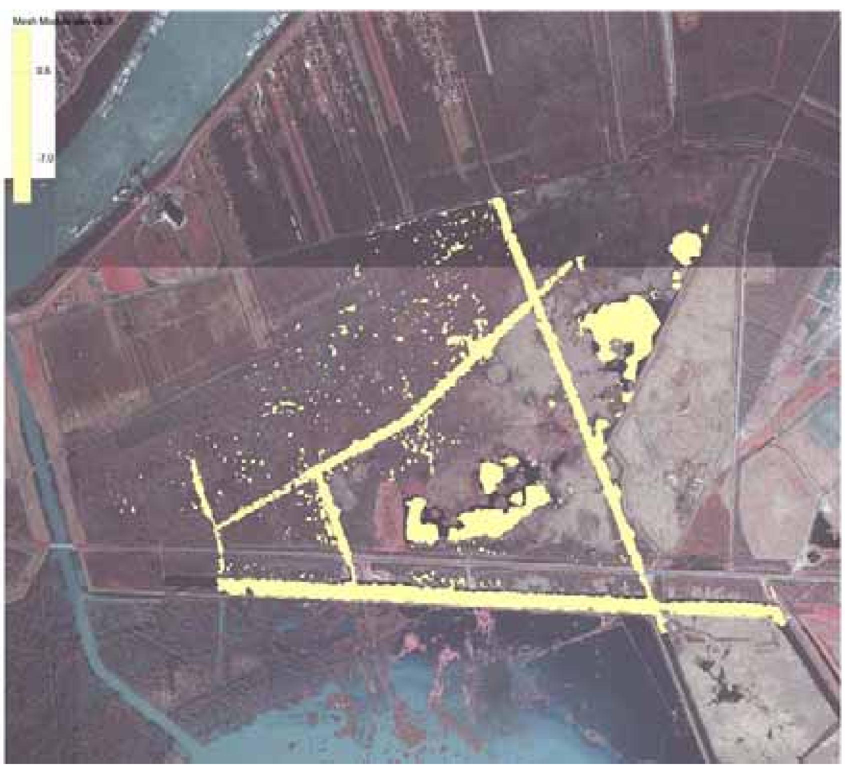


Figure 16. Alignment 3, Area Inundated at Ponding Elevation of 0.5 (NAVD88).

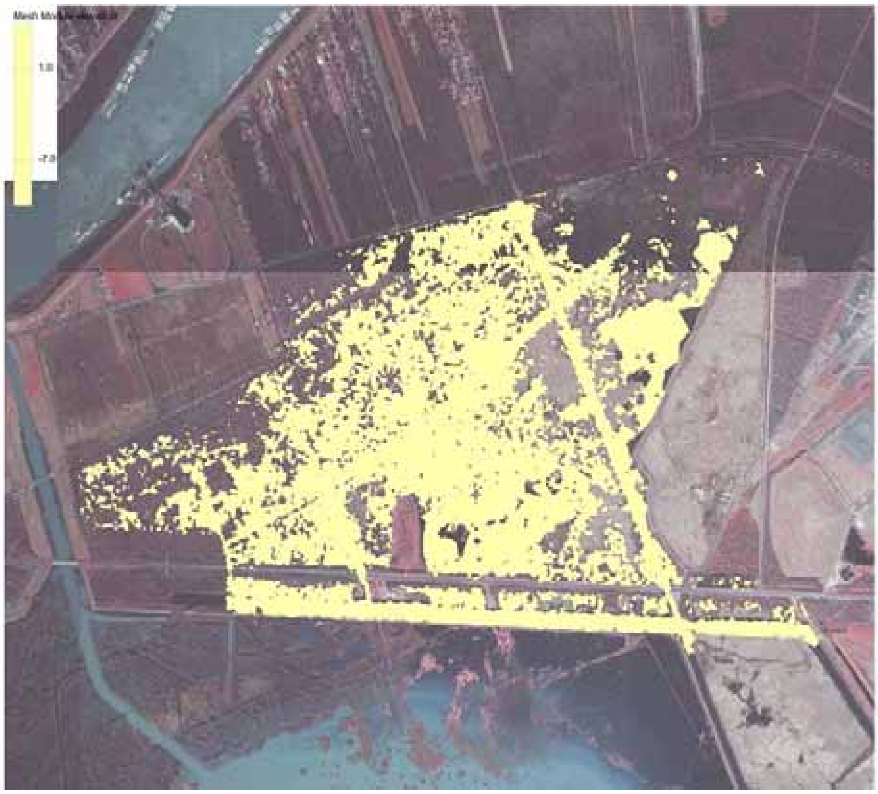


Figure 17. Alignment 3, Area Inundated at Ponding Elevation of 1.0 (NAVD88).

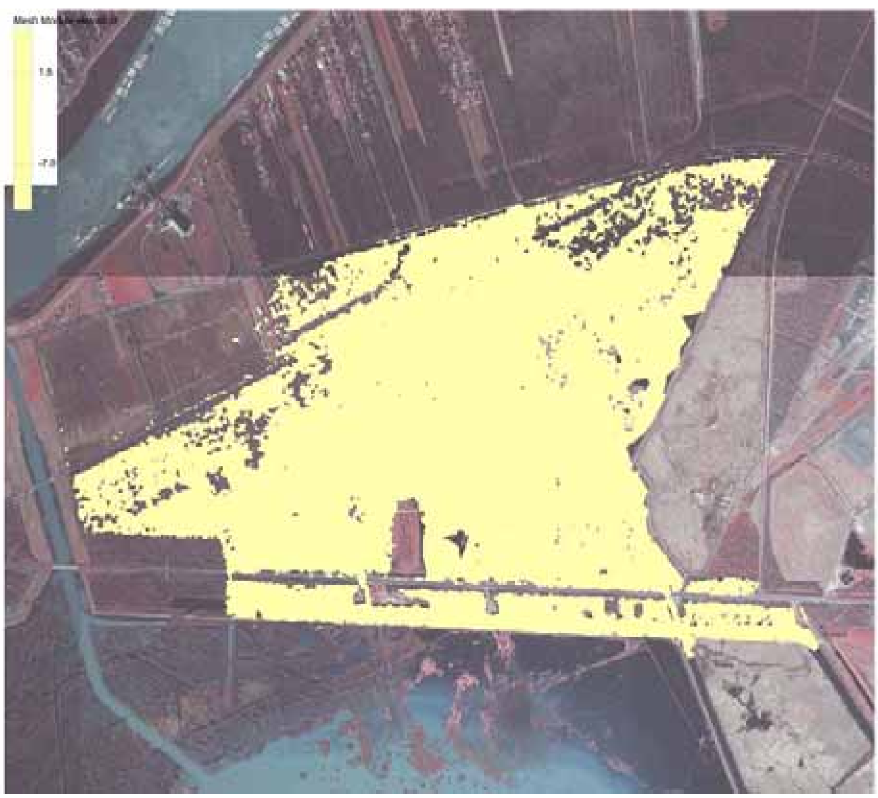


Figure 18. Alignment 3, Area Inundated at Ponding Elevation of 1.5 (NAVD88).

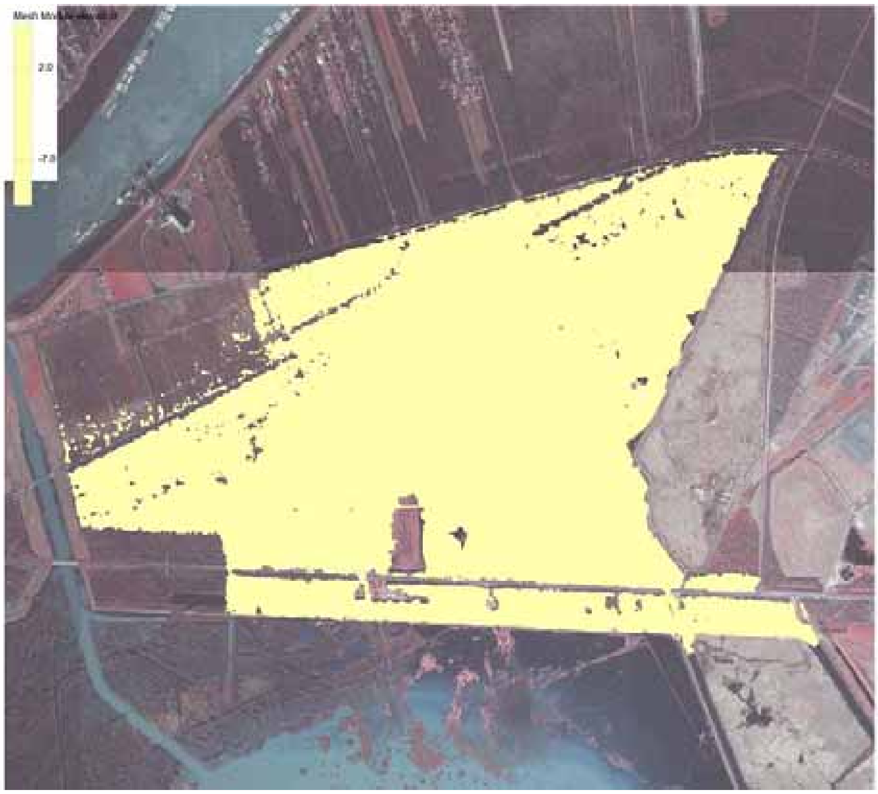


Figure 19. Alignment 3, Area Inundated at Ponding Elevation of 2.0 (NAVD88).

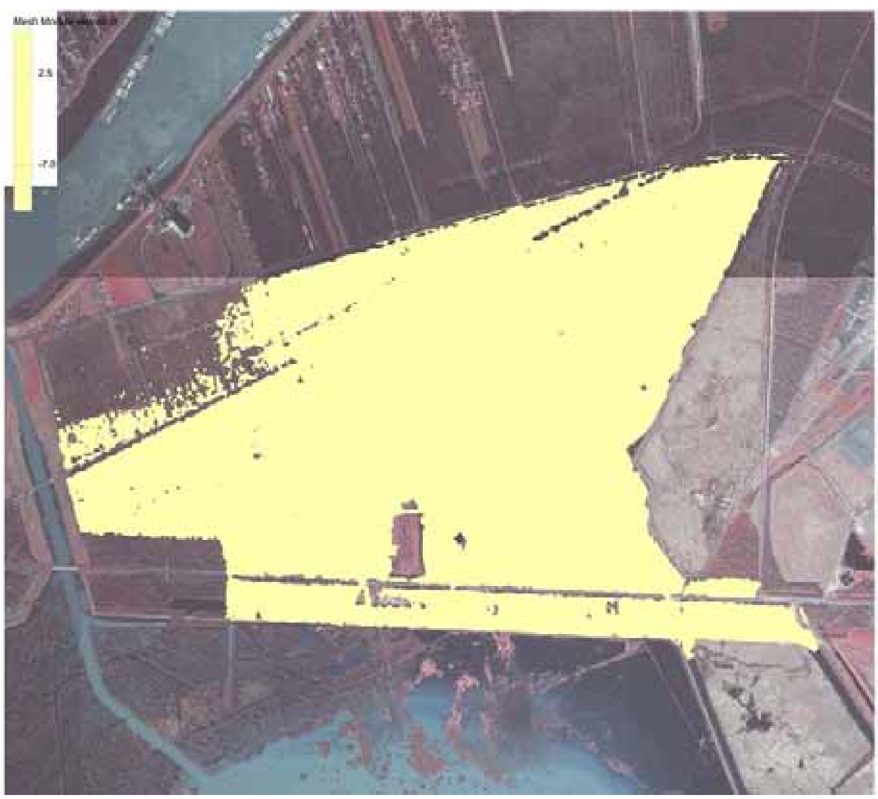


Figure 20. Alignment 3, Area Inundated at Ponding Elevation of 2.5 (NAVD88).

Figure 22. Alignment 3, Area Inundated at Ponding Elevation of 3.0 (NAVD88).

Figure 23. Alignment 3, Area Inundated at Ponding Elevation of 4.0 (NAVD88).

Duration of inundation or inundation elevation in Area 2 could be reduced by incorporating additional structures into the parameters of the project.

The above analysis assumes that the gate will be closed for the length of the storm. All runoff to Area 2 is ponded in Area 2. The Bayou Verret Gate structure could be a sector gate or stop log structure. The stop log structure will take longer to open post-storm.

Implementation of sluice gates will enable the ponded water to be excavated sooner after the storm is passed. Ponding levels were modified using the following assumptions:

(1) Vary starting water surface elevation when gates closed
(2) Sluice gates will be 6'x6'
(3) Sluice gates will be opened midpoint of storm
(4) Sluice gate sill is the same as the gate sill (elevation -10)

The sluice gate was rated in the HEC-RAS model for various heads. Figure 24 shows a rating curve for 1-6x6 sluice gate.

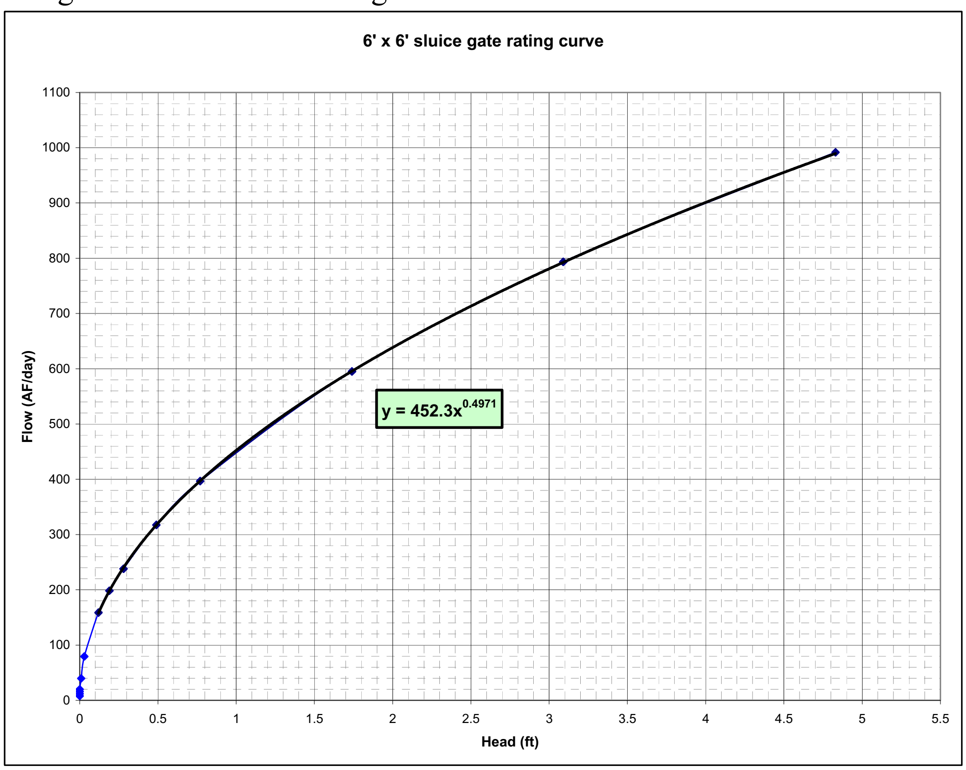


Figure 24. One - 6' x 6' Sluice Gate Rating Curve

Table 3 shows peak ponding elevation (NAVD88) for various storm durations, # of sluice gates, storm frequencies, and starting water surface elevations (WSEL) (NAVD88).

Table 3

10-yr Storm				50-yr Storm				100-yr Storm			
Duration (days)	Starting WSEL	# of Sluice Gates	Peak Elevation	Duration (days)	Starting WSEL	# of Sluice Gates	Peak Elevation	Duration (days)	Starting WSEL	# of Sluice Gates	Peak Elevation
0.5	0.0	0	1.13	0.5	0.0	0	1.28	0.5	0.0	0	1.35
		1	1.08			1	1.22			1	1.29
		2	1.04			2	1.18			2	1.24
		3	1.02			3	1.13			3	1.19
	1.0	0	2.13		1.0	0	2.28		1.0	0	2.35
		1	2.08			1	2.23			1	2.29
		2	2.03			2	2.18			2	2.24
		3	1.98			3	2.13			3	2.19
	1.5	0	2.63		1.5	0	2.78		1.5	0	2.85
		1	2.58			1	2.72			1	2.79
		2	2.53			2	2.68			2	2.72
		3	2.48			3	2.63			3	2.69
2	0.0	0	1.54	2	0.0	0	1.76	2	0.0	0	1.85
		1	1.31			1	1.53			1	1.6
		2	1.11			2	1.31			2	1.38
		3	1.06			3	1.17			3	1.21
	1.0	0	2.54		1.0	0	2.76		1.0	0	2.85
		1	2.31			1	2.53			1	2.6
		2	2.11			2	2.31			2	2.38
		3	2.06			3	2.17			3	2.21
	1.5	0	3.04		1.5	0	3.26		1.5	0	3.35
		1	2.81			1	3.03			1	3.1
		2	2.61			2	2.81			2	2.88
		3	2.36			3	2.67			3	2.71
4	0.0	0	1.92	4	0.0	0	2.18	4	0.0	0	2.29
		1	1.44			1	1.67			1	1.77
		2	1.25			2	1.37			2	1.43
		3	1.25			3	1.37			3	1.43
	1.0	0	2.92		1.0	0	3.18		1.0	0	3.29
		1	2.44			1	2.67			1	2.77
		2	2.26			2	2.37			2	2.45
		3	2.26			3	2.37			3	2.45
	1.5	0	3.42		1.5	0	3.68		1.5	0	3.79
		1	2.92			1	3.16			1	3.27
		2	2.76			2	2.89			2	2.95
		3	2.76			3	2.89			3	2.95
10	0.0	0	3.06	10	0.0	0	3.34	10	0.0	0	3.48
		1	1.83			1	1.98			1	2.04
		2	1.83			2	1.96			2	2.04
		3	1.83			3	1.96			3	2.04
	1.0	0	4.06		1.0	0	4.36		1.0	0	4.48
		1	2.84			1	2.96			1	3.03
		2	2.84			2	2.96			2	3.03
		3	2.84			3	2.96			3	3.03
	1.5	0	4.56		1.5	0	4.86		1.5	0	4.98
		1	3.34			1	3.49			1	3.56
		2	3.34			2	3.48			2	3.56
		3	3.34			3	3.48			3	3.56

From the above analysis, it is recommended that two 6’x6’ sluice gates be included in the design. For most storms, if these gates are opened at the midpoint of the storm, the peak ponding elevation will begin to decrease at the time of sluice gate opening.

Flooding impacts. Local drainage facilities designed for 25-yr, 24 hr storm. From Figure 12 above, under project conditions (Alignment 3), peak ponding levels for the design storm will be elevation 1.4 (assuming a starting water surface elevation of 0.0). This would be the level at the outlet (Bayou Verret Gate). Water surface elevations at the upstream end of Area 2 will not be different base vs project conditon.

Cross Section Comparison Analysis

A condition of the project design is that the flow connection to the Gulf must be maintained in terms of cross sectional area. The bridge openings under Highway 90 were surveyed 6-8 March 2009. Cross sections were taken upstream and downstream of each opening. Bridge features such as piers and abutments were also recorded. A summary of the measured values are shown below.

Culvert #2 (Between Unnamed Canal and Culvert #1)

Survey Data Points:

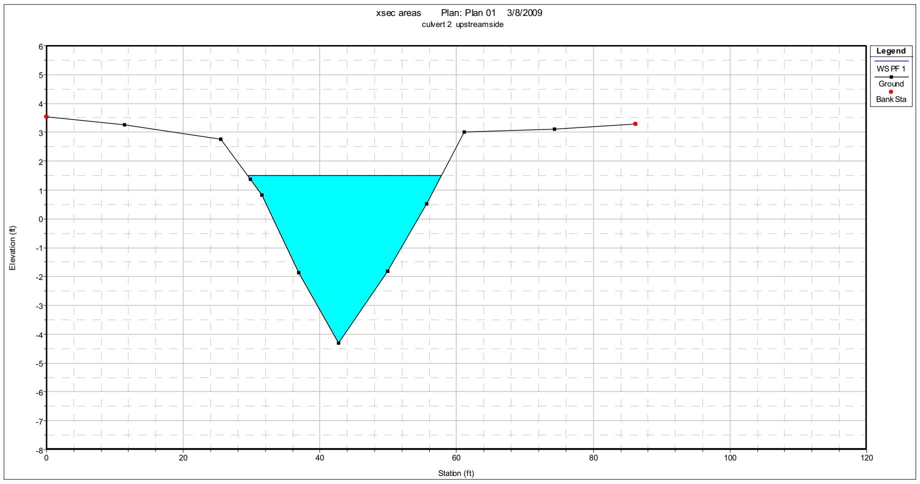


Figure 25. Culvert #2, Upstream Side, Area under elevation 1.5 (NAVD88) = 87.6 ft^2

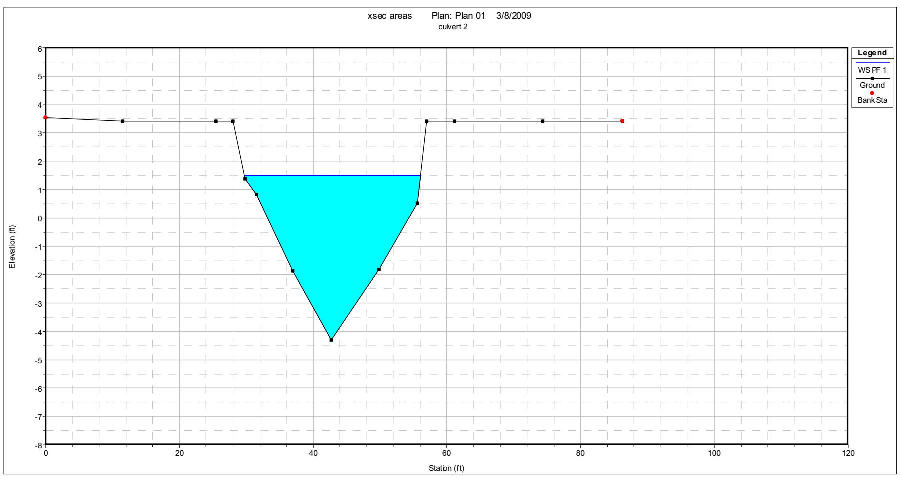


Figure 26. Culvert #2, Culvert Section, Area under elevation 1.5 (NAVD88) = 83.2 ft^2
This cross sectional area was used for the comparison analysis.

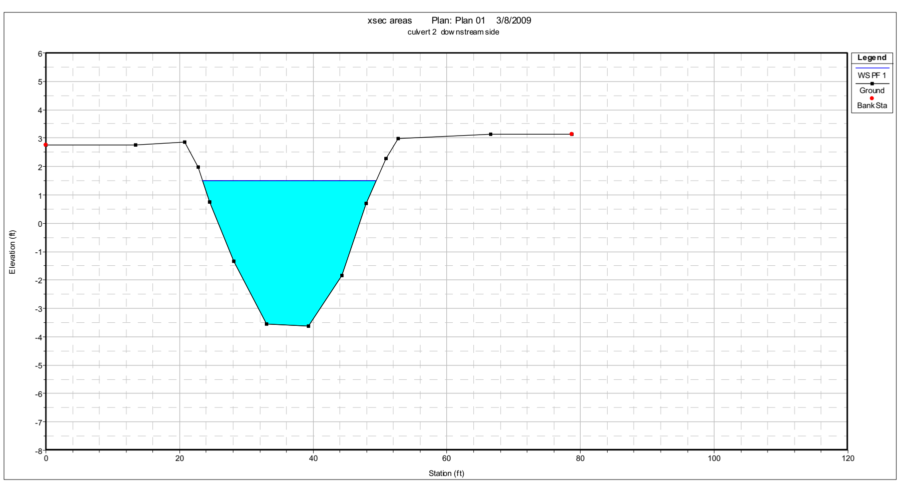


Figure 27. Culvert #2, Downstream Side, Area under elevation 1.5 (NAVD88) = 84.1 ft^2

Culvert #1 (Westernmost Culvert)

Survey Data Points:

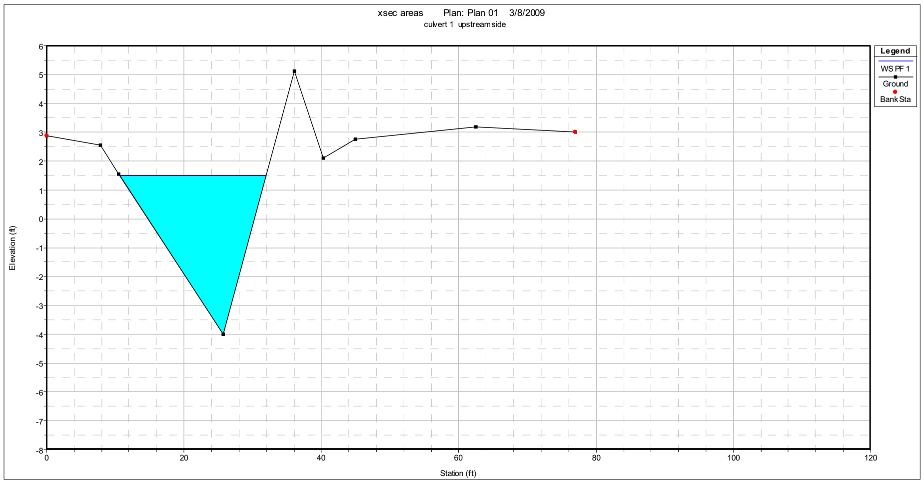


Figure 28. Culvert #1, Upstream Side, Area under elevation 1.5 (NAVD88) = 58.8 ft^2

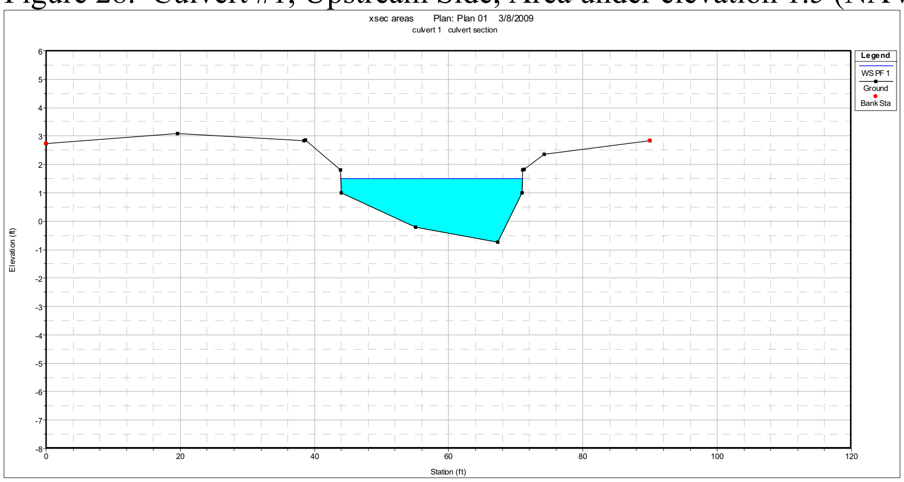


Figure 29. Culvert #1, Culvert Section, Area under elevation 1.5 (NAVD88) = 41.3 ft^2
This cross sectional area was used for the comparison analysis.

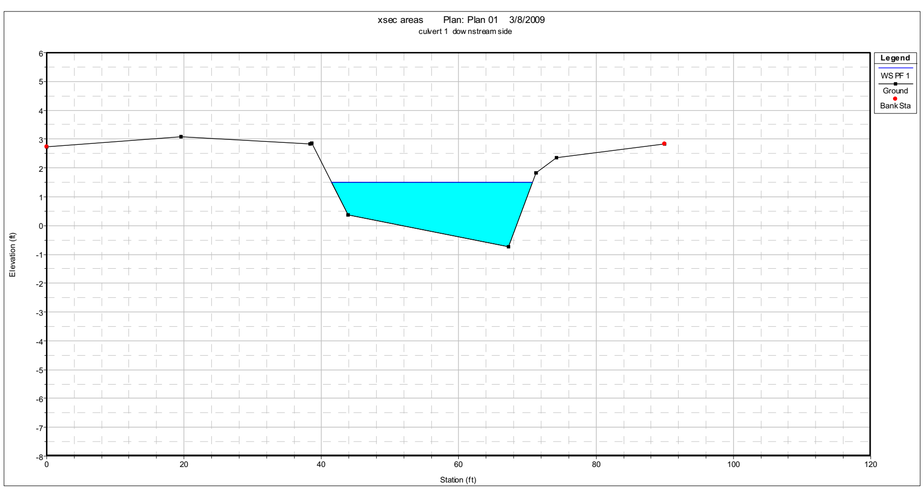
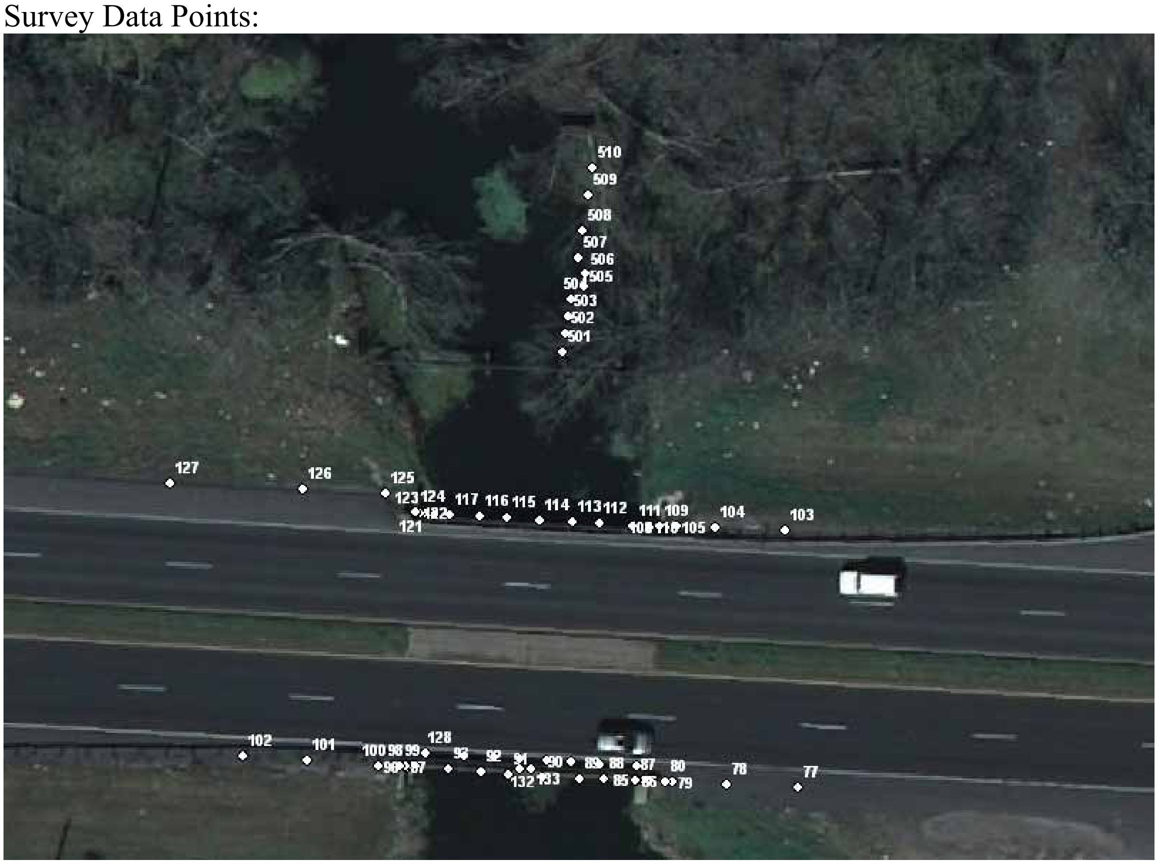


Figure 30. Culvert #1, Downstream Side, Area under elevation 1.5 (NAVD88) = 44.6 ft^2

Unnamed Canal:

Survey Data Points:



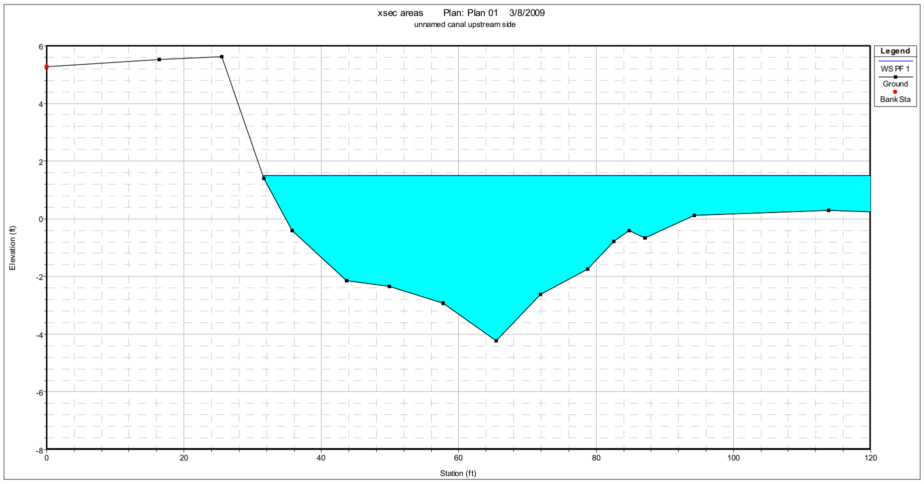


Figure 31. Unnamed Canal, Upstream Side of Bridge, Area under elevation 1.5 (NAVD88) = 277.2 ft^2

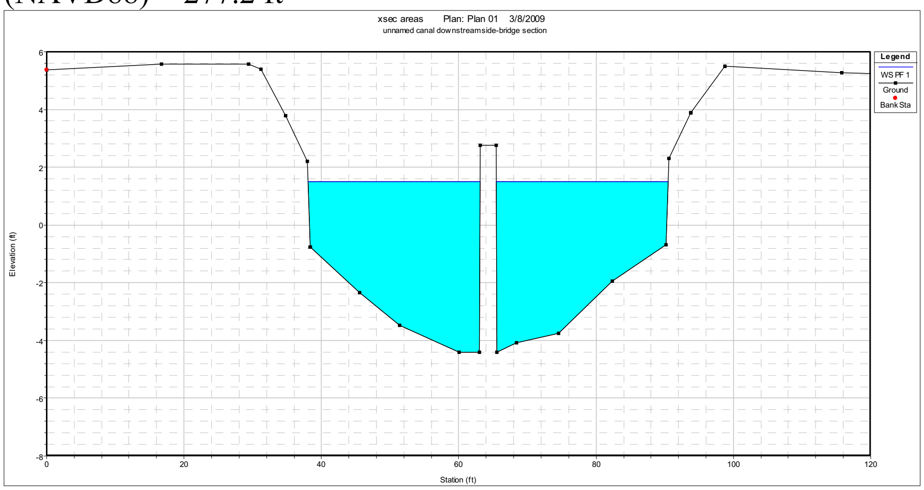


Figure 32. Unnamed Canal, Bridge Section, Area under elevation 1.5 (NAVD88) = 219.3 ft^2

This cross sectional area was used for the comparison analysis.

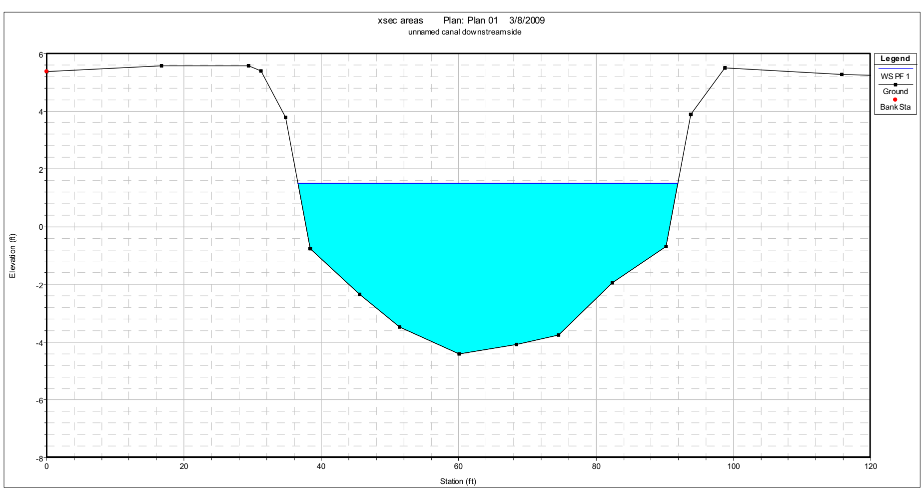


Figure 33. Unnamed Canal, Downstream Side of Bridge, Area under elevation 1.5 (NAVD88) = 236.0 ft^2

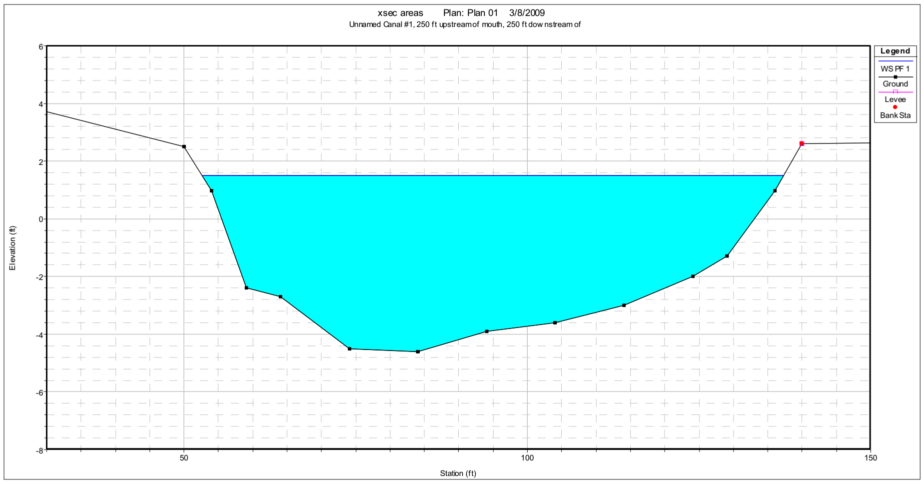
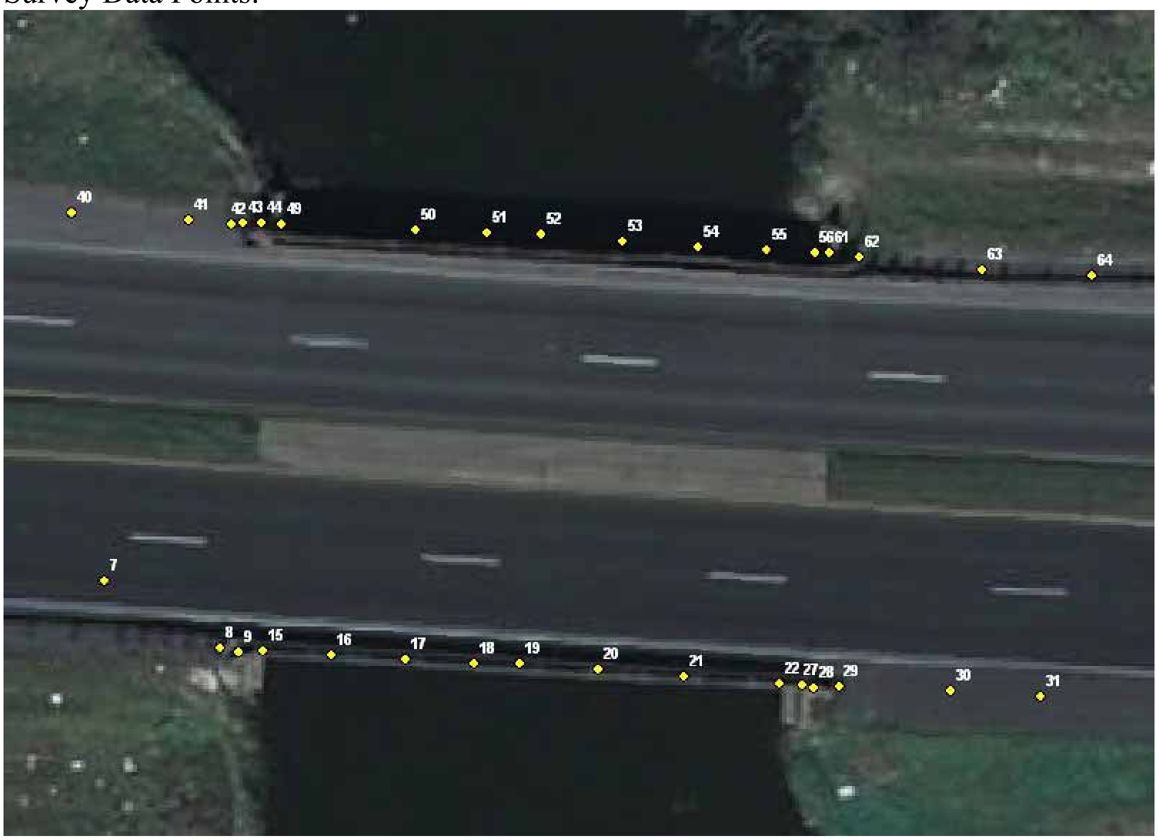


Figure 34. Unnamed Canal, Between Outer Cataouache and Hwy 90 Bridge, Area under elevation 1.5 (NAVD88) = 369.0 ft^2

Sellers Canal

Survey Data Points:



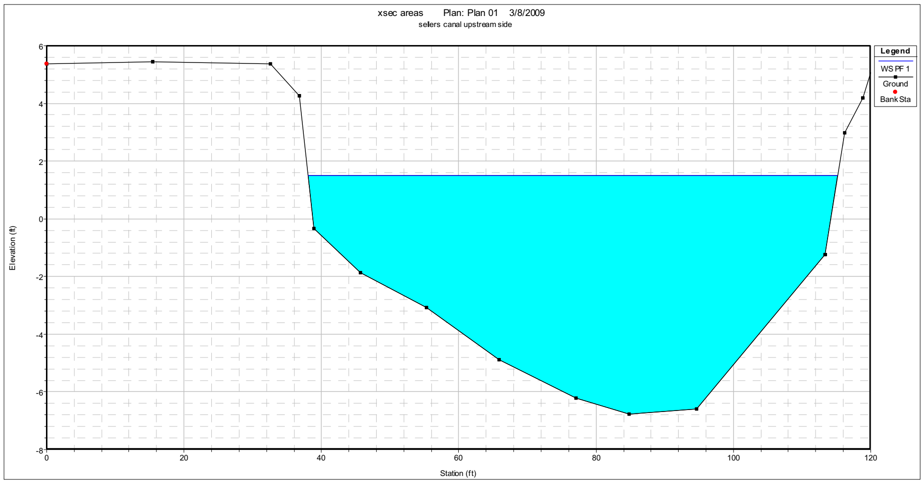


Figure 35. Sellers Canal, Upstream Side of Bridge, Area under elevation 1.5 (NAVD88) = 439.5 ft^2

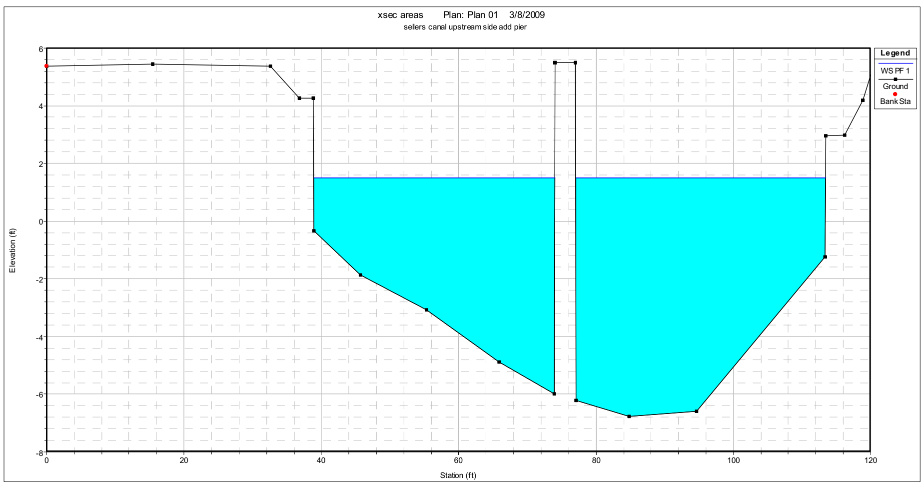


Figure 36. Sellers Canal, Bridge Section, Area under elevation 1.5 (NAVD88) = 413.6 ft^2

This cross sectional area was used for the comparison analysis.

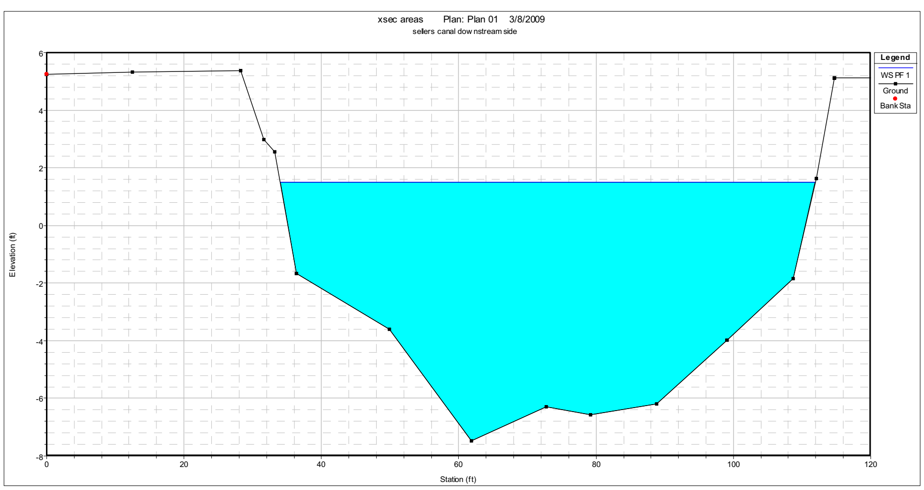


Figure 37. Sellers Canal, Downstream Side of Bridge, Area under elevation 1.5 = 477.5 ft^2

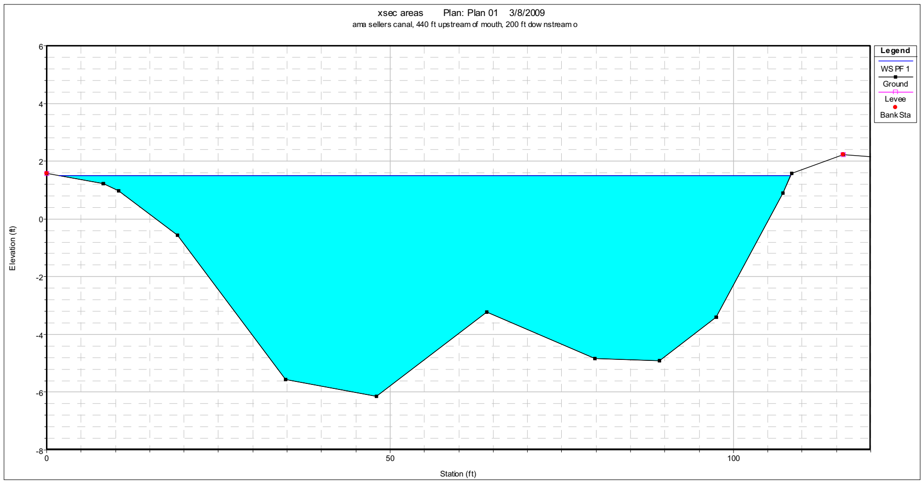


Figure 38. Sellers Canal, Between Outer Cataouache and Hwy 90 Bridge, Area under elevation 1.5 (NAVD88) = 502.5 ft^2

Bayou Verret Gate Location:

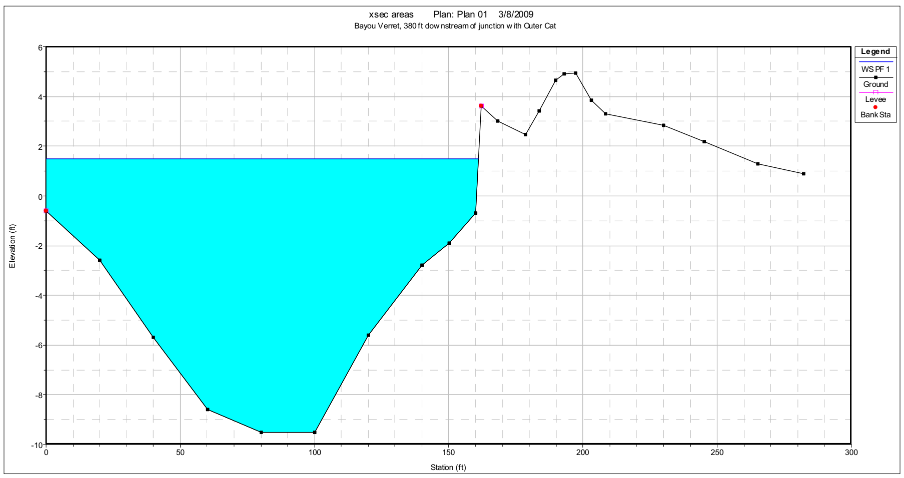


Figure 39. Bayou Verret Cross Section @ Gate Location, Area under elevation 1.5 (NAVD88) = 1141.9 ft^2

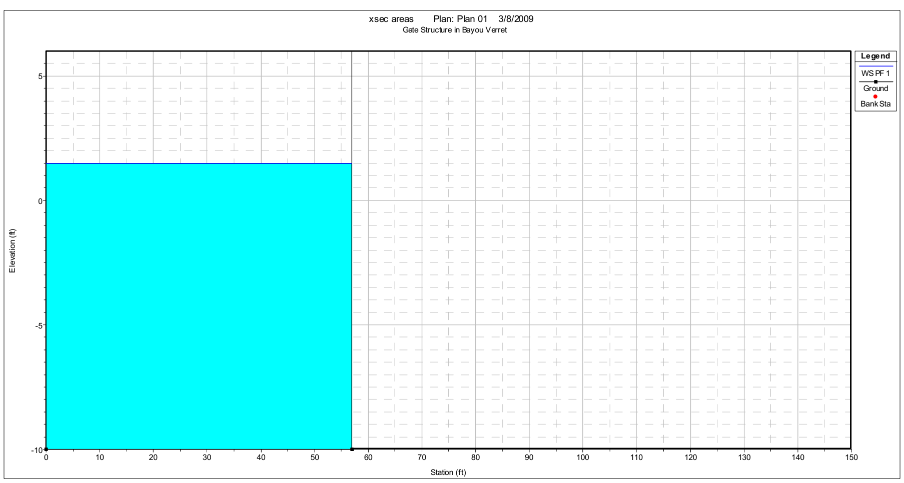


Figure 40. Gate Structure in Bayou Verret, Area under elevation 1.5 (NAVD88)= 646.6 ft^2

This cross sectional area was used for the comparison analysis.

Table 4
Summary of Existing Flow Openings vs Project Condition Flow Opening

Location	Flow Area (ft^2)
Bayou Verret Gate Opening	**646.6**
Hwy 90 Openings:	
Culvert #1	41.3
Culvert #2	83.2
Unnamed Canal	219.3
Sellers Canal	413.6
Sum Hwy 90:	**757.4**

Cross sectional area openings are referenced to area below elevation 1.5 NAVD88. The combined cross sectional area for the Bayou Verret Structure opening is approximately 646 ft^2. The combined cross sectional area for the openings under Hwy 90 total approximately 757 ft^2. An additional 110 ft^2 of cross sectional area would need to be added to the Bayou Verret Structure to ensure water exchange to Area 2 is not reduced. Three 6' x 6' sluice gates incorporated in the project design would provide the additional 110 ft^2 of cross sectional area.

This design should maintain existing tidal exchage characteristics.

Sedimentation Analysis

A operability concern of the project is the possibility of the gate sill filling in causing problems is closing the system. Nancy Powell, Chief of Hydraulics, MVN, composed the following to address this issue:

Western Tie-In Sedimentation Analysis

For the Western Tie-In HSDDRS project, there will be a structure on Bayou Verret, which will be closed during tropical events. Possible designs for the closure structure include a sector gate or a stoplog structure. Sluice gates may also be added to maintain proper tidal exchange. The navigation structure will have a usable navigation opening of approximately 56 feet and a sill elevation of -10 ft NAVD88. The total width of the navigation structure would depend on the final design selected. However, the maximum width would be approximately 135 feet (not including the sluice gates).

The Bayou Verret channel in the vicinity of the structure is approximately 6 ft deep. With a sill elevation lower than the channel bottom, there is a question as to the potential for sedimentation. This sedimentation analysis addresses the questions of effects of the structure on sediment movement and deposition.

A layout of the Western Tie-In HSDDRS project is shown on Figure 41.

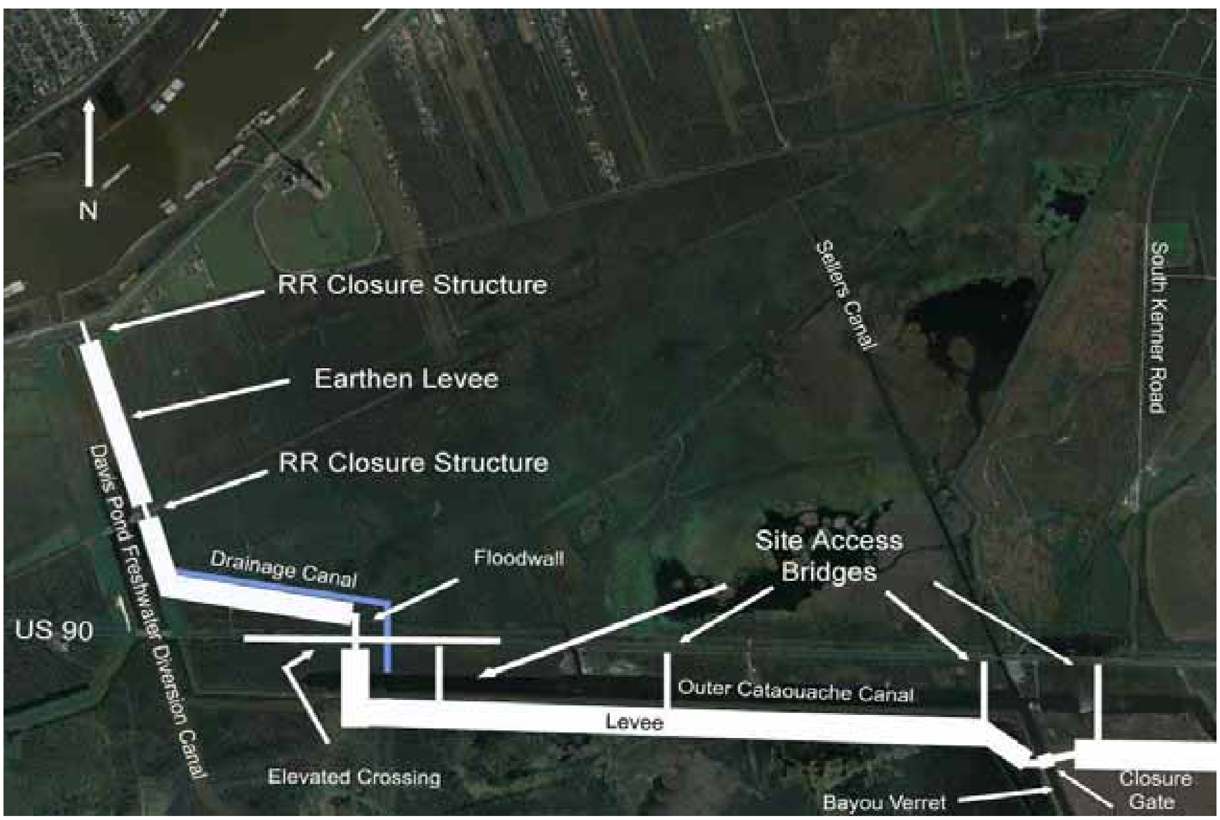


Figure 41

Sediment samples were taken of the channel bottom material on the protected side of the HSDDRS system in Sellers Canal, Outer Cataouatche Canal, and Bayou Verret. In addition, a sample was taken in Bayou Verret, south of the site for the structure, outside the proposed protection system. The location of the sampling sites is shown on Figure 42.

Preliminary analyses of these samples indicated that the material is clay, with significant organic material and high water content. Final analyses of the sediment samples are located in Appendix A.

Figure 42

Runoff within the project area presently drains through a series of culverts along Highway 90. The area is also drained by Sellers Canal. Drainage can presently exit the area via Bayou Verret and the Outer Cataouatche Canal. A pump station is located in the area that pumps drainage into the Outer Cataouatche Canal. With the project in place, the Outer Cataouatche Canal will be closed, and Bayou Verret will serve as the only drainage outlet.

A sedimentation analysis was performed for the Western Closure Complex in the eastern portion of the West Bank and Vicinity project area (USACE, 2008). Both areas are similar in hydrology and morphology, with the presence of low-velocity canals with sediments consisting of fine clays and fine silts. Typical sediment concentrations are 200 mg/l or less. Settling velocities for these materials are about 0.1 mm/sec or less. The Western Closure Complex area contains more pumping stations and experiences higher discharges during rainfall events than the Western Tie In area. Both areas experience similar surge elevations from tropical events.

Source of Sediment

As the project is located at the headwaters of Bayou Verret and the drainage area is a combination of developed land and wetlands, it is likely that the volume of sediment entering the project area is low. Sources include material from the adjacent wetlands and runoff from local drainage. Boat traffic can also cause scour of the channel banks. Resuspension of bottom material is another source.

Transport and Deposition of Sediment

Because these are low-velocity channels, transport of the material into and out of the project area is likely to be event driven. Hurricane Gustav and Hurricane Ike did not appear to cause coarser sediments to be moved into the project area, as evident by the lack of coarse sediment in the samples. Hurricanes can cause resuspension and transport of the bottom material. Boat traffic can resuspend material and move it short distances.

The hydrodynamic model runs for the Western Closure Complex indicate there is a high depositional probability during extreme events; mean depositional probabilities were above 50% on the recession side of the hydrograph. Yet, there has been no significant shoaling, as evident by the lack of dredging that has occurred over a 15 year or more period. Particles may be settling but are more likely to be resuspended instead of consolidating on the bed.

With the similarity of the Western Tie In project area to the Western Closure Complex, it can be inferred that similar deposition patterns are likely to occur.

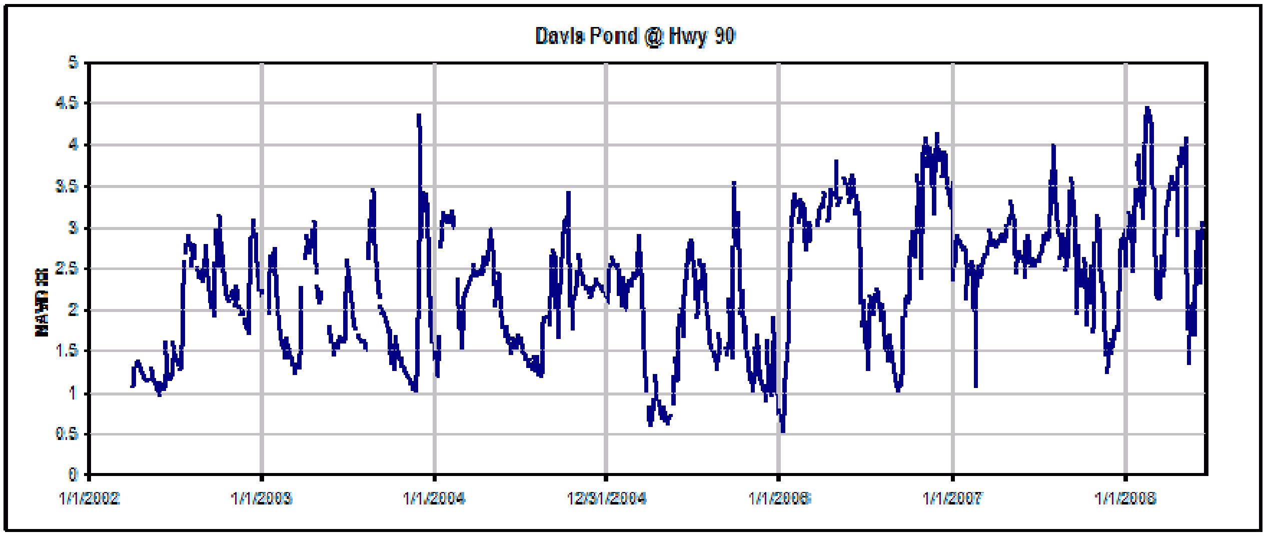
Deposition of Sediment with Project in Place

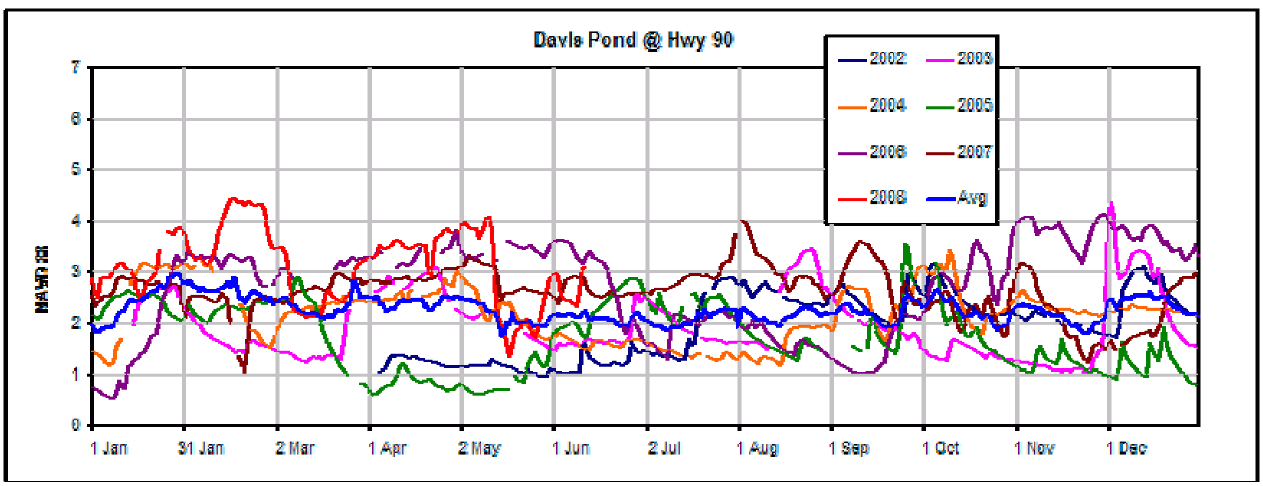
Due to the greater depth within the gate sill area, as compared to the adjacent channel bottom, sediments that are transported into the gate sill area are less likely to be transported from the sill area. More energy will be required to move the material. The probability of consolidation of the material is presumably low, particularly with the absence of a salinity environment. The concentration of cohesive material is likely to be greater in this area than the adjacent channel areas. The presence of this material does not appear to significantly impact the operation of sector gates; similar environments occur in other locations in Louisiana where sector gates are present.

Davis Pond Ponding Area Water Level Analysis

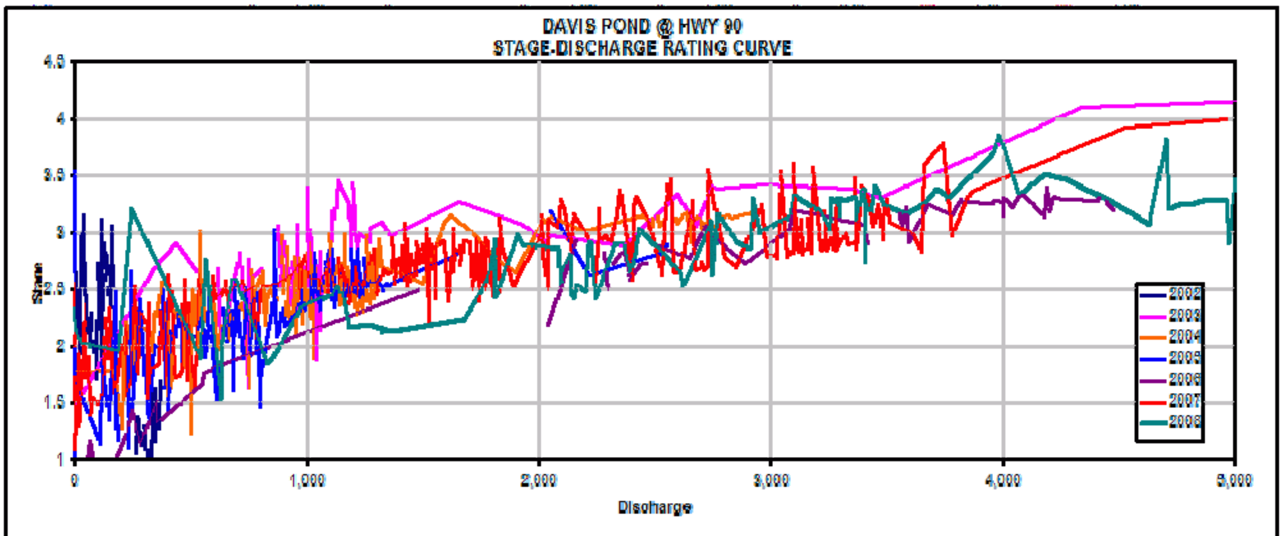
The Davis Pond facility exists to the west of the project area. The following writeup from MVN presents water levels in that project.

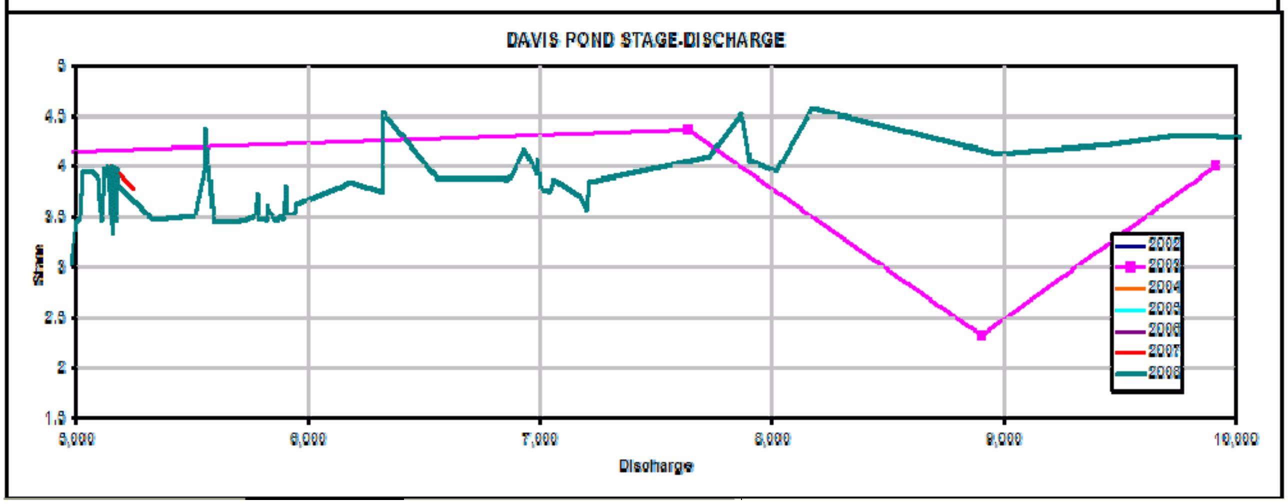
Historic data show that the stages at the USGS Hwy 90 gage in the Davis Pond outflow channel rarely exceed 4.0 ft. NAVD88. The graphs below show water surface elevations for the period of record up to mid – June 2008. The top graph shows water surface elevations for the entire period. The bottom graph is an annual overlay showing each year's data. Both graphs show that the water surface elevation seldom exceeds 4.0 ft NAVD88.



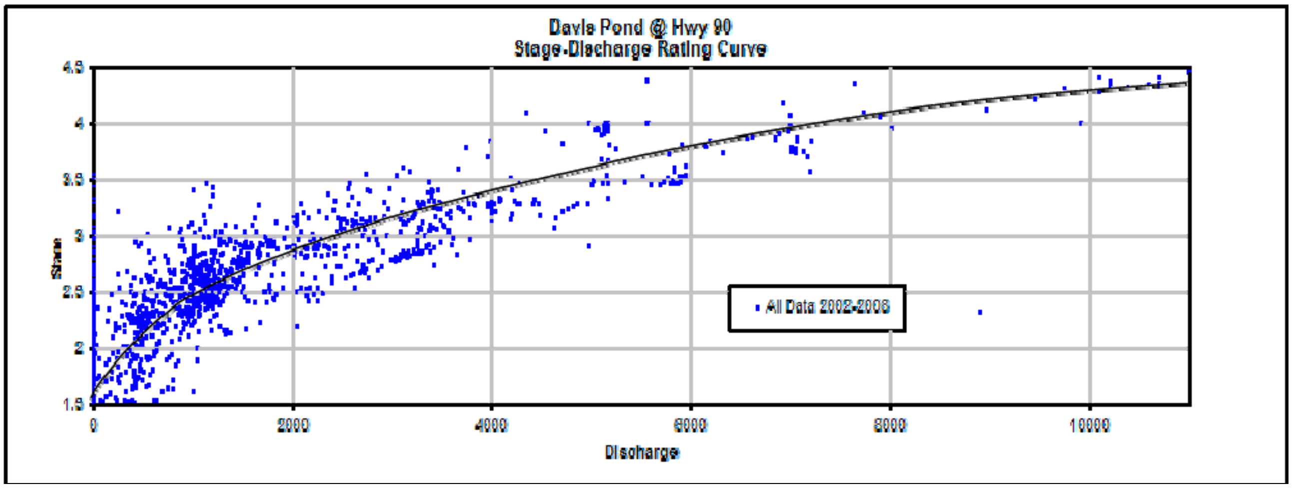


Rating curves were generated using these same water surface elevation data. The graph below shows rating curves for each individual year.





The graph below shows a rating curve based on all the data. It can be seen that, at the Davis Pond Diversion Structure's maximum capacity of 10,650 cfs, the water surface elevation at the Hwy 90 gage would be approximately 4.4 ft. NAVD88. In order to maintain a water surface elevation of 4.0 ft. or less at the Hwy 90 gage, the maximum allowable Davis Pond discharge would be approximately 7000 cfs.



In order to meet operational salinity targets, it is seldom necessary to operate the Davis Pond structure at discharges greater than 7000 cfs. Therefore, as long as a water surface elevation of up to 4.0 ft. NAVD88 at the Hwy 90 gage is allowed, operation of the Structure should be minimally impacted.

References

1. West Bank and Vicinity Lake Cataouatche Hurricane Protection Levee, Reconnaissance Level Study for 3 Hurricane Protection Alignments, Western Tie In, NY Associates.
2. LIDAR Data, http://atlas.lsu.edu/lidar/, 2002.
3. Sellers Canal Stage Data, www.rivergages.com, http://www2.mvr.usace.army.mil/WaterControl/stationinfo2.cfm?sid=82720&fid=&dt=S

Appendix A
Analysis of Sediment Samples

COPY

NANCY POWELL

WATER CONTENT - GENERAL

DATE 13 FEB 2009

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA.

BORING NO.

Sample or Specimen No.			SITE 1	29°54'48.7"	90°16'29.3"	(7.5)		
Tare No.			394	√So; BK; (CH₂ OC) lge ars ml; rts				
Weight in grams	Tare plus wet soil		156.8	rt; few SI; SLF; PCS stone;				
	Tare plus dry soil		45.7	slurry;				
	Water	W_w	111.1					
	Tare		12.1					
	Dry soil	W_s	33.6					
Water content		w	331 %	%	%	%	%	%

Sample or Specimen No.			SITE 2	29°54'44.7" 90°16'24.9"		(7.5)		
Tare No.			485	√So; BK; (CH₂ OC) lge ars ml; rt				
Weight in grams	Tare plus wet soil		165.6	PCS wd; rts; slurry				
	Tare plus dry soil		36.8					
	Water	W_w	128.8					
	Tare		12.2					
	Dry soil	W_s	24.6					
Water content		w	524 %	%	%	%	%	%

Sample or Specimen No.			SITE 3	29°54'45.5"	90°16'42.247"	(10.5)		
Tare No.			C-344	√So; dGr; (CH₃ OC) ars ml;				
Weight in grams	Tare plus wet soil		176.3	few PCS wd; few rt; slurry				
	Tare plus dry soil		44.1					
	Water	W_w	132.2					
	Tare		11.5					
	Dry soil	W_s	32.6					
Water content		w	406 %	%	%	%	%	%

$$w\% = \frac{\text{(tare plus wet soil)} - \text{(tare plus dry soil)}}{\text{(tare plus dry soil)} - \text{(tare)}} \times 100 = \frac{W_W}{W_s} \times 100$$

Remarks

Technician J. McC. Computed by JMC Checked by

ENG FORM 1 JUN 65 3835 , (EM 1110-2-1906)

WATER CONTENT - GENERAL

DATE 13 FEB 2009

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA.

BORING NO.

Sample or Specimen No.		SITE 4	29°54'43.8"	90°16'13.7"		(8.21)	
Tare No.		420	VSo; dGr;	(CH2 OC)		arsml;	rts
Weight in grams	Tare plus wet soil		172.4	rt; slurry)				
	Tare plus dry soil		33.8					
458	Water	W_w	138.6					
	Tare		12.4					
	Dry soil	W_s	21.4					
Water content		w	648 %	%	%	%	%	%

Sample or Specimen No.		SITE 5	29°54'40.14"	90°16'25.7"		(11.5)	
Tare No.		541	VSo; dGr;	(CH3OC)		arsml;	
Weight in grams	Tare plus wet soil		166.7	few rt; slurry				
	Tare plus dry soil		40.3					
	Water	W_w	126.4					
	Tare		12.1					
	Dry soil	W_s	28.2					
Water content		w	448 %	%	%	%	%	%

Sample or Specimen No.		SITE 6	29°54'31.2"	90°16'21.8"		(12)	
Tare No.		619	VSo; dGr;	(CH3OC)		arsml;	few
Weight in grams	Tare plus wet soil		176.6	rt; slurry)				
	Tare plus dry soil		43.0					
	Water	W_w	133.6					
	Tare		11.7					
	Dry soil	W_s	31.3					
Water content		w	427 %	%	%	%	%	%

$$w\% = \frac{(\text{tare plus wet soil}) - (\text{tare plus dry soil})}{(\text{tare plus dry soil}) - (\text{tare})} \times 100 = \frac{W_w}{W_s} \times 100$$

Remarks

Technician J.M^c. Computed by J.M^c. Checked by

ENG FORM 1 JUN 65 3835 , (EM 1110-2-1906)

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE 13 FEB 2009

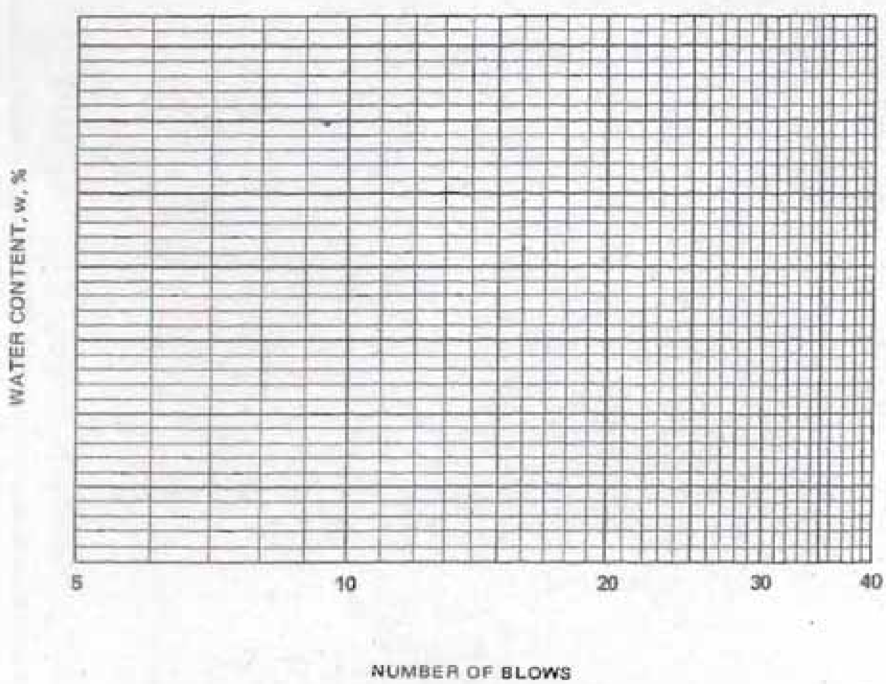
BORING NO. ______ SAMPLE NO. SITE 1

LIQUID LIMIT

		RUN NO.	1	2	3	4	5	6
		TARE NO.	335	327				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.50	33.24				
	TARE PLUS DRY SOIL		26.03	26.36				
	WATER	W_w	6.47	6.88				
	TARE		23.19	23.29				
	DRY SOIL	W_s	2.84	3.07				
	WATER CONTENT, %	w	227.82	224.10				
	NUMBER OF BLOWS		21	22				

Cup: 23

WATER DEPTH: 7.5



LL 223 - 221

PL 100 - 98

PI 123

Symbol from plasticity chart CHOC

PLASTIC LIMIT

		RUN NO.	1	2	3	4	5	NATURAL WATER CONTENT
		TARE NO.	309	311				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.16	32.94				
	TARE PLUS DRY SOIL		27.30	28.77				
	WATER	W_w	4.86	4.17				
	TARE		22.46	24.50				
	DRY SOIL	W_s	4.84	4.27				
	WATER CONTENT, %	w	100.41	97.66				
	PLASTIC LIMIT		100	98				

REMARKS ______

TECHNICIAN J.Mc. COMPUTED BY J.Mc. CHECKED BY ______

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE 13 FEB 2009

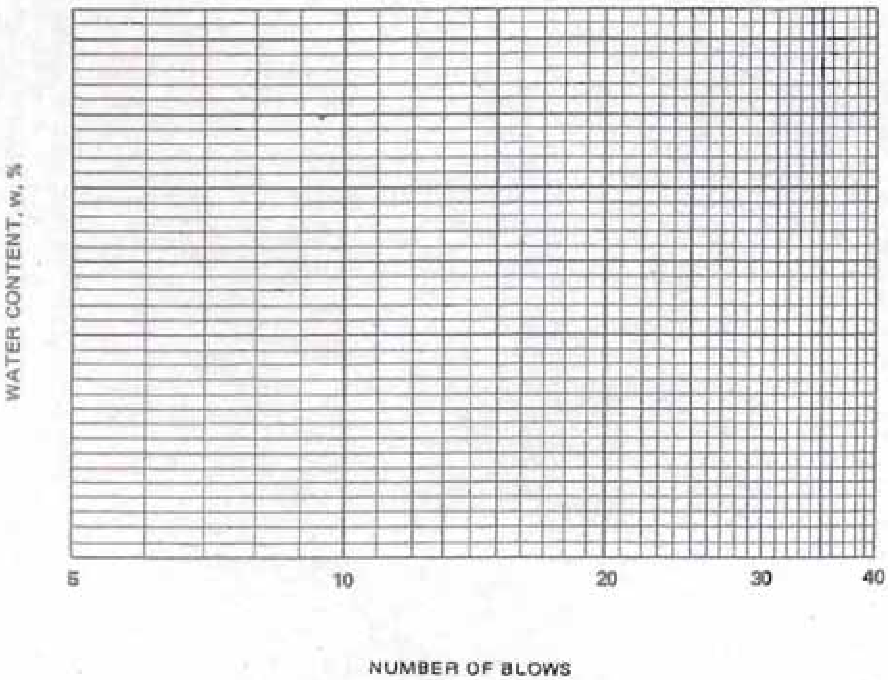
BORING NO. ______ SAMPLE NO. SITE 2

LIQUID LIMIT

	RUN NO.		1	2	3	4	5	6
	TARE NO.		328	326				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		34.83	33.89				
	TARE PLUS DRY SOIL		27.46	26.14				
	WATER	W_w	7.37	7.75				
	TARE		24.68	23.22				
	DRY SOIL	W_s	2.78	2.92				
	WATER CONTENT, %	w	265.11	265.41				
	NUMBER OF BLOWS		28	29				

Cup: 60

WATER DEPTH: 7.5



LL 269 – 270

PL 130 – 130

PI 140

Symbol from plasticity chart CHOC

PLASTIC LIMIT

	RUN NO.		1	2	3	4	5	NATURAL WATER CONTENT
	TARE NO.		304	315				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.79	32.60				
	TARE PLUS DRY SOIL		26.83	27.29				
	WATER	W_w	5.96	5.31				
	TARE		22.26	23.19				
	DRY SOIL	W_s	4.57	4.10				
	WATER CONTENT, %	w	130.42	129.51				
	PLASTIC LIMIT		130	130				

REMARKS ______

TECHNICIAN J.Mc. COMPUTED BY J.Mc. CHECKED BY ______

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE 13 FEB 2009

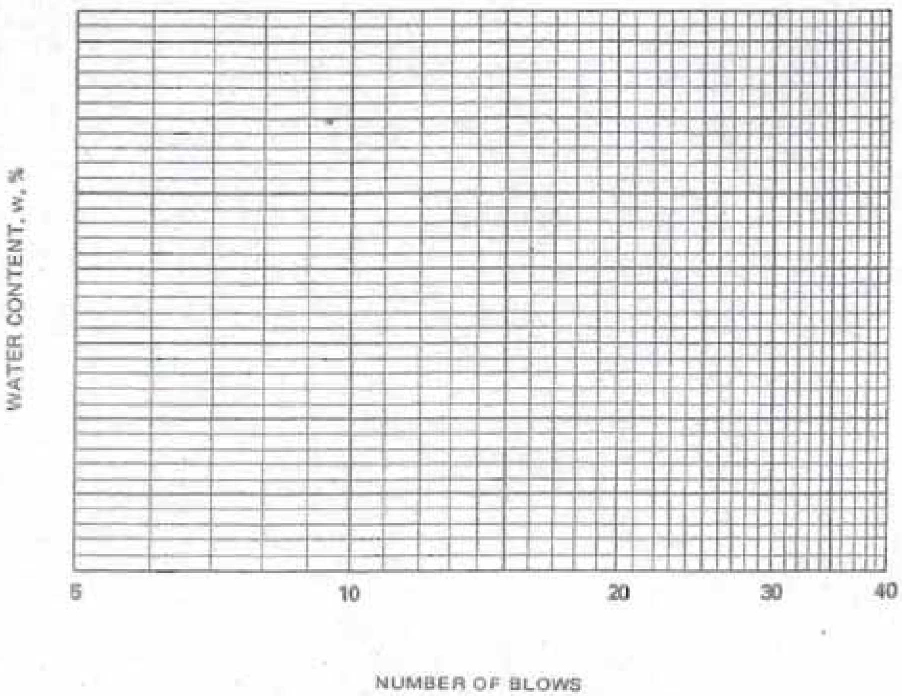
BORING NO. ______ SAMPLE NO. SITE 3

LIQUID LIMIT

			1	2	3	4	5	6
RUN NO.			1	2	3	4	5	6
TARE NO.			300	314				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		34.28	32.86				
	TARE PLUS DRY SOIL		27.57	26.20				
	WATER	W_w	6.71	6.66				
	TARE		24.53	23.17				
	DRY SOIL	W_s	3.04	3.03				
WATER CONTENT, %		w	220.72	219.80				
NUMBER OF BLOWS			27	29				

Cup: 21

WATER DEPTH: 10.5



LL 223 – 224

PL 79 – 78

PI 145

Symbol from plasticity chart CHoc

PLASTIC LIMIT

			1	2	3	4	5	NATURAL WATER CONTENT
RUN NO.			1	2	3	4	5	
TARE NO.			323	306				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.18	33.16				
	TARE PLUS DRY SOIL		27.98	29.45				
	WATER	W_w	4.20	3.71				
	TARE		22.66	24.71				
	DRY SOIL	W_s	5.32	4.74				
WATER CONTENT, %		w	78.95	78.27				
PLASTIC LIMIT			79	78				

REMARKS ______

TECHNICIAN J. Mc COMPUTED BY J. Mc CHECKED BY ______

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

PROJECT SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE 13FEB2009

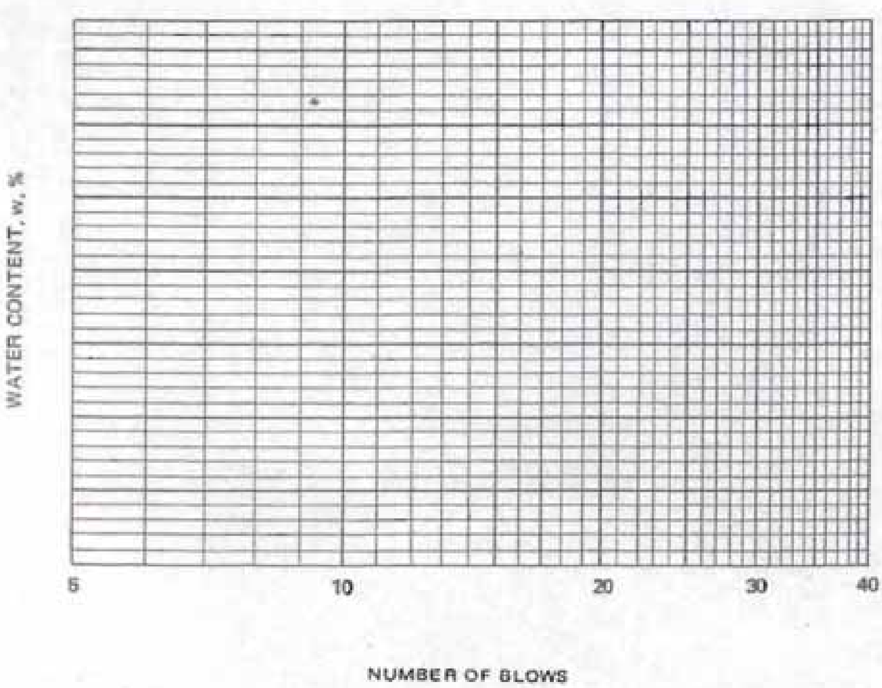
BORING NO. ______ SAMPLE NO. SITE 4

LIQUID LIMIT

			1	2	3	4	5	6
	RUN NO.		1	2	3	4	5	6
	TARE NO.		309	304				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.55	31.65				
	TARE PLUS DRY SOIL		24.76	24.41				
	WATER	W_w	7.79	7.24				
	TARE		22.46	22.26				
	DRY SOIL	W_s	2.30	2.15				
	WATER CONTENT, %	w	338.70	336.74				
	NUMBER OF BLOWS		24	25				

Cup: 56

WATER DEPTH: 8.21



LL 337 - 337

PL 127 - 125

PI 211

Symbol from plasticity chart CHoc

PLASTIC LIMIT

			1	2	3	4	5	NATURAL WATER CONTENT
	RUN NO.		1	2	3	4	5	
	TARE NO.		326	335				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		32.99	31.25				
	TARE PLUS DRY SOIL		27.52	26.78				
	WATER	W_w	5.47	4.47				
	TARE		23.22	23.20				
	DRY SOIL	W_s	4.30	3.58				
	WATER CONTENT, %	w	127.21	124.86				
	PLASTIC LIMIT		127	125				

REMARKS ______

TECHNICIAN J. M^c COMPUTED BY J M^c CHECKED BY ______

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

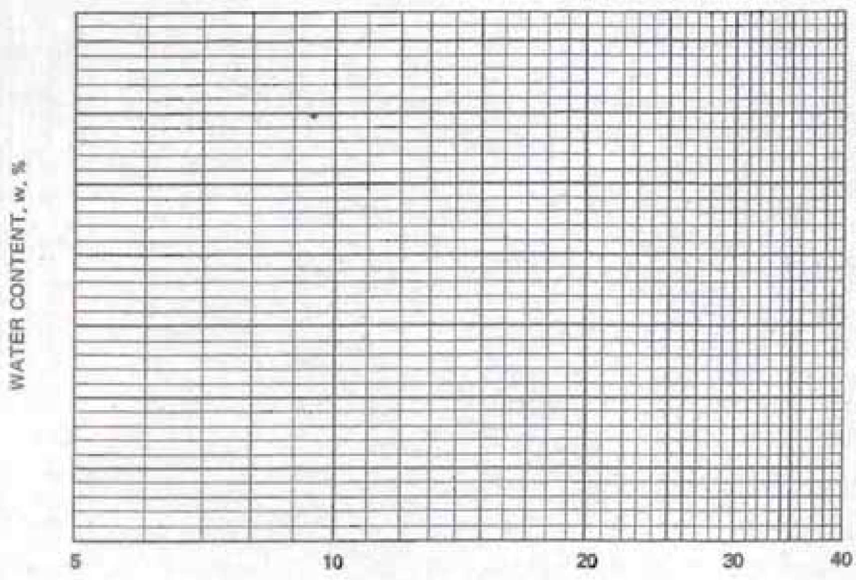
PROJECT: SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE: 13 FEB 2009

BORING NO. ______ SAMPLE NO. SITE 5

LIQUID LIMIT

			1	2	3	4	5	6
RUN NO.			1	2	3	4	5	6
TARE NO.			333	313				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		33.17	34.42				
	TARE PLUS DRY SOIL		26.02	27.23				
	WATER	W_w	7.15	7.19				
	TARE		23.14	24.32				
	DRY SOIL	W_s	2.88	2.91				
WATER CONTENT, %		w	248.26	247.08				
NUMBER OF BLOWS			25	26				

CUP: 24
WATER DEPTH: 11.5



LL 248 – 248

PL 83 – 84

PI 164

Symbol from plasticity chart CH OC

PLASTIC LIMIT

			1	2	3	4	5	NATURAL WATER CONTENT
RUN NO.			1	2	3	4	5	
TARE NO.			315	319				
WEIGHT IN GRAMS	TARE PLUS WET SOIL		33.11	30.16				
	TARE PLUS DRY SOIL		28.61	26.44				
	WATER	W_w	4.50	3.72				
	TARE		23.21	21.99				
	DRY SOIL	W_s	5.40	4.45				
WATER CONTENT, %		w	83.3	83.60				
PLASTIC LIMIT			83	84				

REMARKS ______

TECHNICIAN J.Mc COMPUTED BY J.Mc CHECKED BY ______

LIQUID AND PLASTIC LIMIT TESTS

For use of this form, see EM 1110-2-1906.

PROJECT: SECTOR GATE CLOSURE JEFF. PARISH, LA. DATE: 13 FEB 2009

BORING NO. ______ SAMPLE NO. SITE 6

LIQUID LIMIT

	RUN NO.	1	2	3	4	5	6
	TARE NO.	330	302				
WEIGHT IN GRAMS	TARE PLUS WET SOIL	33.03	32.54				
	TARE PLUS DRY SOIL	26.14	25.39				
	WATER W_w	6.89	7.15				
	TARE	23.11	22.26				
	DRY SOIL W_s	3.03	3.13				
	WATER CONTENT, % w	227.39	228.43				
	NUMBER OF BLOWS	29	29				

CUP: 86
WATER DEPTH: 12

WATER CONTENT, w, %

5 10 20 30 40

NUMBER OF BLOWS

LL 232 — 233

PL 80 — 79

PI 153

Symbol from plasticity chart CHoc

PLASTIC LIMIT

	RUN NO.	1	2	3	4	5	NATURAL WATER CONTENT
	TARE NO.	316	324				
WEIGHT IN GRAMS	TARE PLUS WET SOIL	32.91	31.20				
	TARE PLUS DRY SOIL	28.64	27.34				
	WATER W_w	4.27	3.86				
	TARE	23.29	22.43				
	DRY SOIL W_s	5.35	4.91				
	WATER CONTENT, % w	79.81	78.62				
	PLASTIC LIMIT	80	79				

REMARKS ______

TECHNICIAN J.M^c. COMPUTED BY J.M^c CHECKED BY ______

Particle Size Distribution Report

% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	44.6	41.9	13.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#80	85.5		
#120	70.9		
#200	55.4		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.178 D_{60}= 0.0883 D_{50}= 0.0624
D_{30}= 0.0126 D_{15}= 0.0058 D_{10}= 0.0013
C_u= 69.44 C_c= 1.41

Classification

USCS= AASHTO=

Remarks

JMC

Sample No.: S-1 **Source of Sample:** **Date:**
Location: SECTOR GATE CLOSURE SITE 1 **Elev./Depth:**

US Army Corps of Engineers New Orleans District	**Client:** **Project:** SECTOR GATE CLOSURE SITE **Project No:** SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: SECTOR GATE CLOSURE SITE
Project Number: SECTOR GATE CLOSURE

Sample Data

Source:
Sample No.: S-1
Elev. or Depth: **Sample Length (in./cm.):**
Location: SECTOR GATE CLOSURE SITE 1
Description: FAT CLAY CH
Date: 8MARCH2009
PL: **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks: JMC

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	29.02	13.84
Tare =	0.00	0.00
Dry sample weight =	29.02	13.84

Minus #200 from wash= 52.3 %
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 60	0.00	100.0
# 80	4.21	85.5
# 120	8.46	70.9
# 200	12.94	55.4

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 29.02
Calculated biased weight= 29.02
Automatic temperature correction
Composite correction at 20 deg C = 0

Meniscus correction only= 0.5
Specific gravity of solids= 2.65
Hydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0090	1.0095	0.0130	9.5	13.8	0.0685	52.8
0.75	23.7	1.0080	1.0085	0.0130	8.5	14.0	0.0564	47.2
1.00	23.7	1.0075	1.0080	0.0130	8.0	14.2	0.0491	44.5
2.00	23.7	1.0070	1.0075	0.0130	7.5	14.3	0.0349	41.7
5.00	23.7	1.0060	1.0065	0.0130	6.5	14.6	0.0223	36.2
15.00	23.5	1.0050	1.0055	0.0131	5.5	14.8	0.0130	30.4
45.00	23.5	1.0035	1.0040	0.0131	4.0	15.2	0.0076	22.1
60.00	23.4	1.0030	1.0035	0.0131	3.5	15.4	0.0066	19.3
90.00	23.4	1.0020	1.0025	0.0131	2.5	15.6	0.0055	13.7

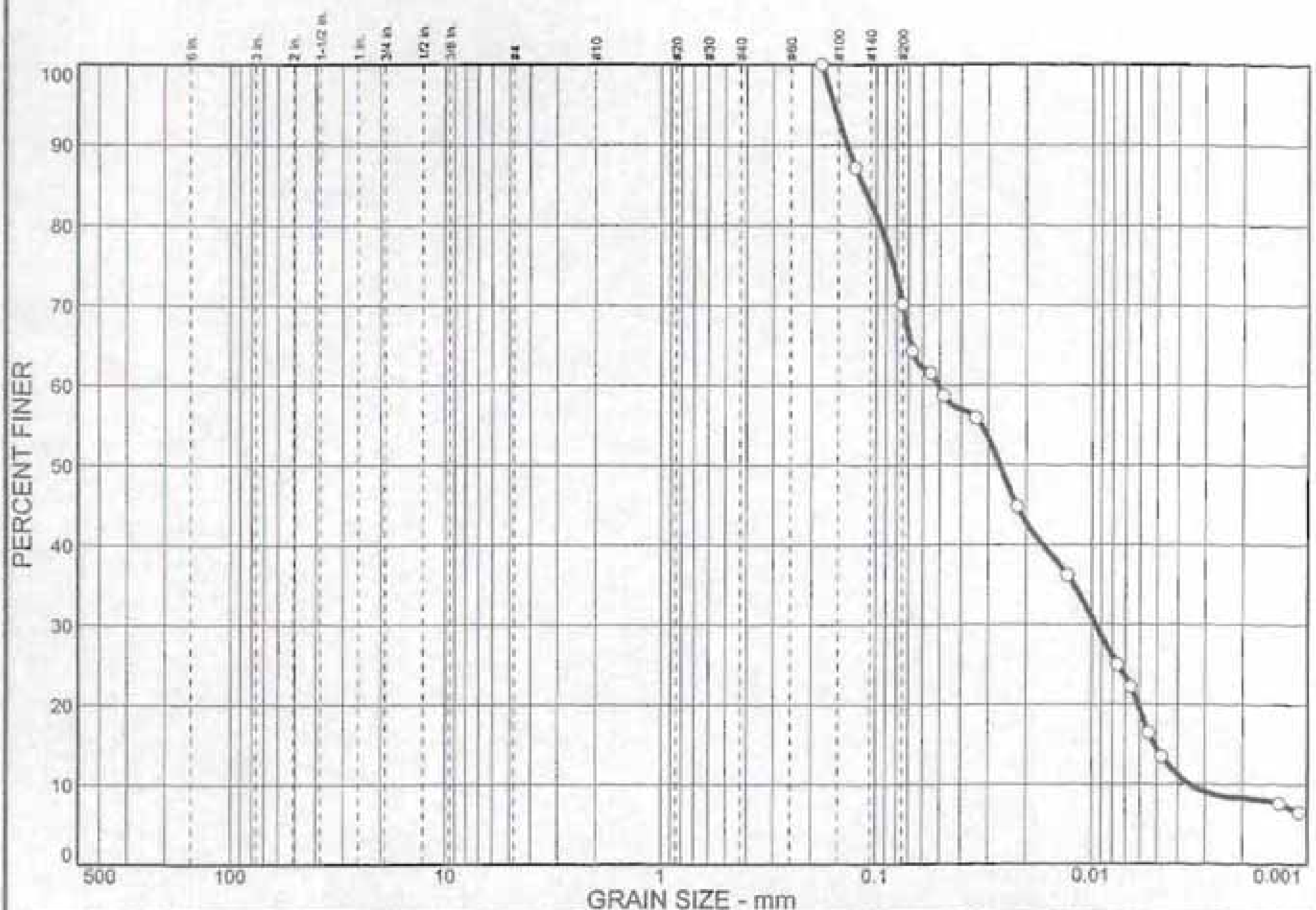
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
120.00	23.1	1.0020	1.0024	0.0131	2.5	15.6	0.0047	13.4
1500.00	22.7	1.0015	1.0019	0.0132	2.0	15.8	0.0014	10.3
2245.00	24.4	1.0010	1.0017	0.0129	1.5	15.9	0.0011	9.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = **% GRAVEL =** **% SAND =** 44.6
% SILT = 41.9 **% CLAY =** 13.5

$D_{85}=$ 0.18 $D_{60}=$ 0.09 $D_{50}=$ 0.06
$D_{30}=$ 0.01 $D_{15}=$ 0.01 $D_{10}=$ 0.00
$C_c=$ 1.4142 $C_u=$ 69.44

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	29.9	55.7	14.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#80	100.0		
#120	87.2		
#200	70.1		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.115 D_{60}= 0.0510 D_{50}= 0.0265
D_{30}= 0.0096 D_{15}= 0.0051 D_{10}= 0.0035
C_u= 14.47 C_c= 0.51

Classification

USCS= AASHTO=

Remarks

JMC

Sample No.: S-2 **Source of Sample:** **Date:** 8MARCH2009
Location: SECTOR GATE CLOSURE SITE 2 **Elev./Depth:**

US Army Corps of Engineers **New Orleans District**	**Client:** **Project:** SECTOR GATE CLOSURE SITE **Project No:** SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

lient:
roject: SECTOR GATE CLOSURE SITE
roject Number: SECTOR GATE CLOSURE

Sample Data

ource:
ample No.: S-2
lev. or Depth: Sample Length (in./cm.):
ocation: SECTOR GATE CLOSURE SITE 2
escription: FAT CLAY CH
ate: 8MARCH2009 PL: LL: PI:
SCS Classification: AASHTO Classification:
esting Remarks: JMC

Mechanical Analysis Data

	Initial	After wash
ry sample and tare=	28.81	10.04
'are =	0.00	0.00
ry sample weight =	28.81	10.04

inus #200 from wash= 65.2 %
'are for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 80	0.00	100.0
# 120	3.68	87.2
# 200	8.63	70.1

Hydrometer Analysis Data

eparation sieve is #10
ercent -#10 based upon complete sample= 100.0
eight of hydrometer sample: 28.81
alculated biased weight= 28.81
utomatic temperature correction
Composite correction at 20 deg C = 0

eniscus correction only= 0.5
pecific gravity of solids= 2.65
ydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0110	1.0115	0.0130	11.5	13.3	0.0672	64.3
0.75	23.7	1.0105	1.0110	0.0130	11.0	13.4	0.0551	61.5
1.00	23.7	1.0100	1.0105	0.0130	10.5	13.5	0.0480	58.7
2.00	23.7	1.0095	1.0100	0.0130	10.0	13.6	0.0341	55.9
5.00	23.7	1.0075	1.0080	0.0130	8.0	14.2	0.0220	44.8
15.00	23.5	1.0060	1.0065	0.0131	6.5	14.6	0.0129	36.2
45.00	23.4	1.0040	1.0045	0.0131	4.5	15.1	0.0076	25.0
60.00	23.4	1.0035	1.0040	0.0131	4.0	15.2	0.0066	22.2
90.00	23.2	1.0025	1.0029	0.0131	3.0	15.5	0.0054	16.4
120.00	23.1	1.0020	1.0024	0.0131	2.5	15.6	0.0047	13.5
1500.00	22.7	1.0010	1.0014	0.0132	1.5	15.9	0.0014	7.6

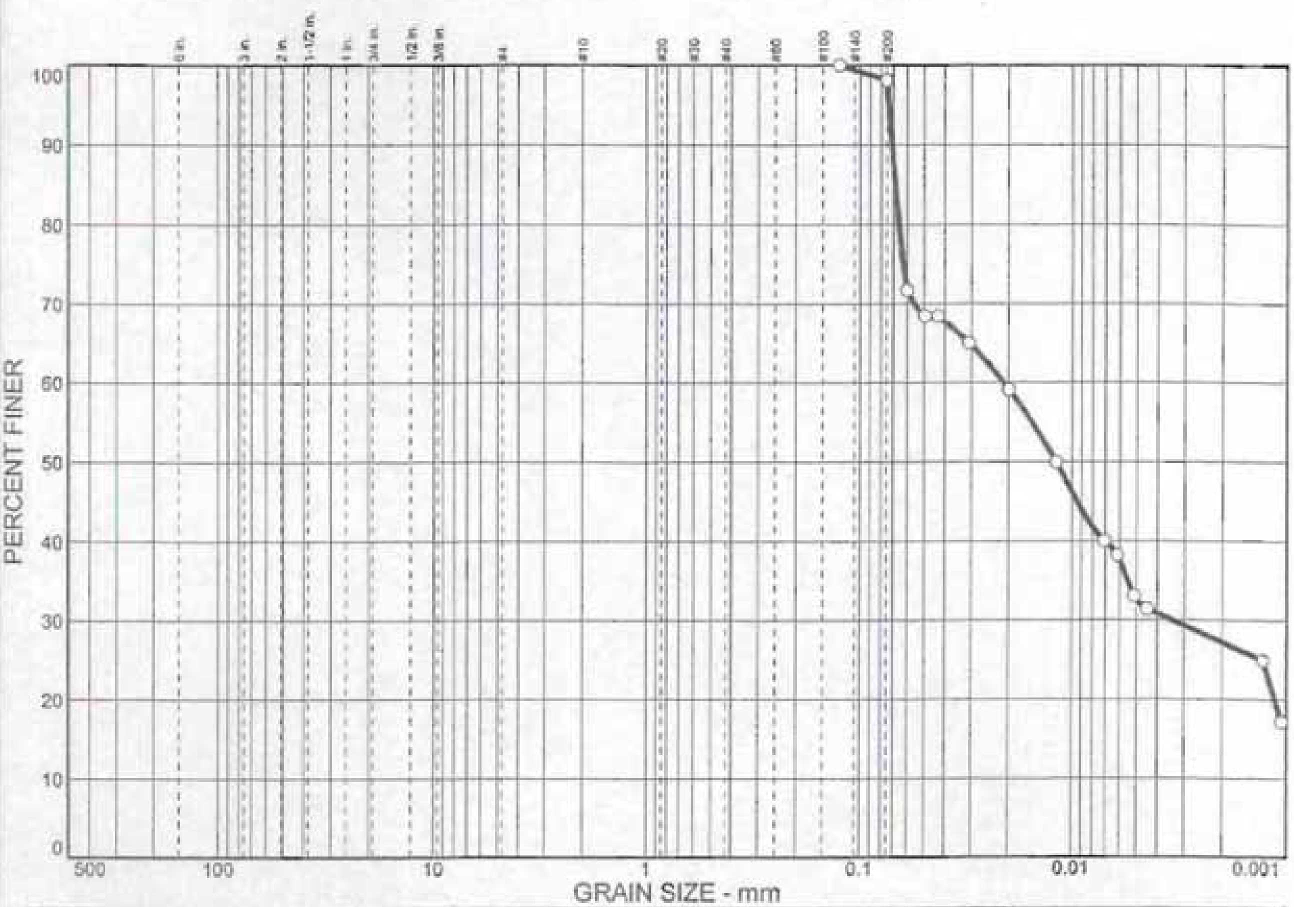
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
2245.00	24.4	1.0005	1.0012	0.0129	1.0	16.0	0.0011	6.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 29.9
% SILT = 55.7 % CLAY = 14.4

D_{85}= 0.12 D_{60}= 0.05 D_{50}= 0.03
D_{30}= 0.01 D_{15}= 0.01 D_{10}= 0.00
C_c= 0.5124 C_u= 14.4689

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	1.9	65.4	32.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#120	100.0		
#200	98.1		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0684 D_{60}= 0.0211 D_{50}= 0.0119
D_{30}= 0.0034 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

JMC

Sample No.: S-3 **Source of Sample:** **Date:** 08MARCH2009
Location: SECTOR GATE CLOSURE SITE 3 **Elev./Depth:**

US Army Corps of Engineers **New Orleans District**	**Client:** **Project:** SECTOR GATE CLOSURE SITE **Project No:** SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: SECTOR GATE CLOSURE SITE
Project Number: SECTOR GATE CLOSURE

Sample Data

Source:
Sample No.: S-3
Elev. or Depth: **Sample Length (in./cm.):**
Location: SECTOR GATE CLOSURE SITE 3
Description: FAT CLAY CH
Date: 08MARCH2009 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks: JMC

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	48.23	0.95
Tare =	0.00	0.00
Dry sample weight =	48.23	0.95

Minus #200 from wash= 98.0 %
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 120	0.00	100.0
# 200	0.91	98.1

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 48.23
Calculated biased weight= 48.23
Automatic temperature correction
Composite correction at 20 deg C = 0

Meniscus correction only= 0.5
Specific gravity of solids= 2.65
Hydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

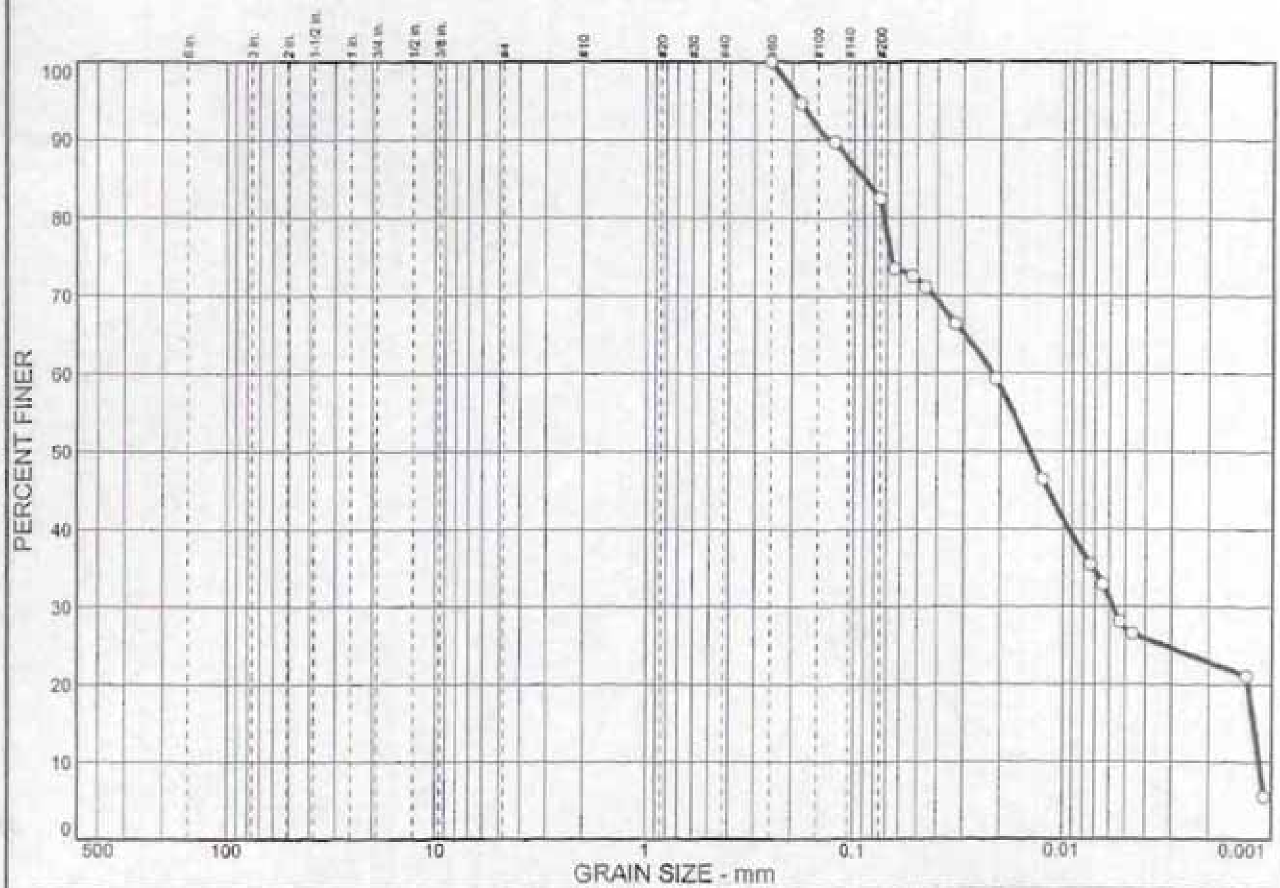
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0210	1.0215	0.0130	21.5	10.6	0.0601	71.7
0.75	23.7	1.0200	1.0205	0.0130	20.5	10.9	0.0497	68.4
1.00	23.7	1.0200	1.0205	0.0130	20.5	10.9	0.0430	68.4
2.00	23.7	1.0190	1.0195	0.0130	19.5	11.1	0.0308	65.0
5.00	23.7	1.0172	1.0177	0.0130	17.7	11.6	0.0199	59.1
15.00	23.5	1.0145	1.0150	0.0131	15.0	12.3	0.0119	49.9
45.00	23.5	1.0115	1.0120	0.0131	12.0	13.1	0.0071	40.0
60.00	23.3	1.0110	1.0115	0.0131	11.5	13.3	0.0062	38.2
90.00	23.2	1.0095	1.0099	0.0131	10.0	13.6	0.0051	33.1
120.00	23.1	1.0090	1.0094	0.0131	9.5	13.8	0.0045	31.4
1500.00	22.7	1.0071	1.0075	0.0132	7.6	14.3	0.0013	24.9
2245.00	24.4	1.0045	1.0052	0.0129	5.0	15.0	0.0011	17.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 1.9
% SILT = 65.4 % CLAY = 32.7

D_{85}= 0.07 D_{60}= 0.02 D_{50}= 0.01
D_{30}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	17.5	55.4	27.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#80	94.7		
#120	89.7		
#200	82.5		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0894 D_{60}= 0.0218 D_{50}= 0.0144
D_{30}= 0.0057 D_{15}= 0.0012 D_{10}= 0.0012
C_u= 18.85 C_c= 1.31

Classification

USCS= AASHTO=

Remarks

ECS

Sample No.: S-4 **Source of Sample:** **Date:** 08MAR2009
Location: SECTOR GATE CLOSURE SITE 4 **Elev./Depth:**

US Army Corps of Engineers

New Orleans District

Client:
Project: SECTOR GATE CLOSURE SITE
Project No: SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

ient:
oject: SECTOR GATE CLOSURE SITE
oject Number: SECTOR GATE CLOSURE

Sample Data

urce:
mple No.: S-4
ev. or Depth: Sample Length (in./cm.):
cation: SECTOR GATE CLOSURE SITE 4
scription: FAT CLAY CH
te: 08MAR2009 PL: LL: PI:
CS Classification: AASHTO Classification:
sting Remarks: ECS

Mechanical Analysis Data

	Initial	After wash
y sample and tare=	33.95	6.83
re =	0.00	0.00
y sample weight =	33.95	6.83
nus #200 from wash=	79.9 %	

re for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 60	0.00	100.0
# 80	1.79	94.7
# 120	3.51	89.7
# 200	5.94	82.5

Hydrometer Analysis Data

eparation sieve is #10
ercent -#10 based upon complete sample= 100.0
eight of hydrometer sample: 33.95
alculated biased weight= 33.95
utomatic temperature correction
Composite correction at 20 deg C = 0

eniscus correction only= 0.5
pecific gravity of solids= 2.65
ydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0150	1.0155	0.0130	15.5	12.2	0.0644	73.5
0.75	23.7	1.0148	1.0153	0.0130	15.3	12.2	0.0527	72.5
1.00	23.7	1.0145	1.0150	0.0130	15.0	12.3	0.0458	71.1
2.00	23.7	1.0135	1.0140	0.0130	14.0	12.6	0.0327	66.4
5.00	23.7	1.0120	1.0125	0.0130	12.5	13.0	0.0210	59.3
15.00	23.5	1.0093	1.0098	0.0131	9.8	13.7	0.0125	46.4
45.00	23.5	1.0070	1.0075	0.0131	7.5	14.3	0.0074	35.5
60.00	23.3	1.0065	1.0070	0.0131	7.0	14.4	0.0064	32.9
90.00	23.2	1.0055	1.0059	0.0131	6.0	14.7	0.0053	28.1
120.00	23.0	1.0052	1.0056	0.0132	5.7	14.8	0.0046	26.5

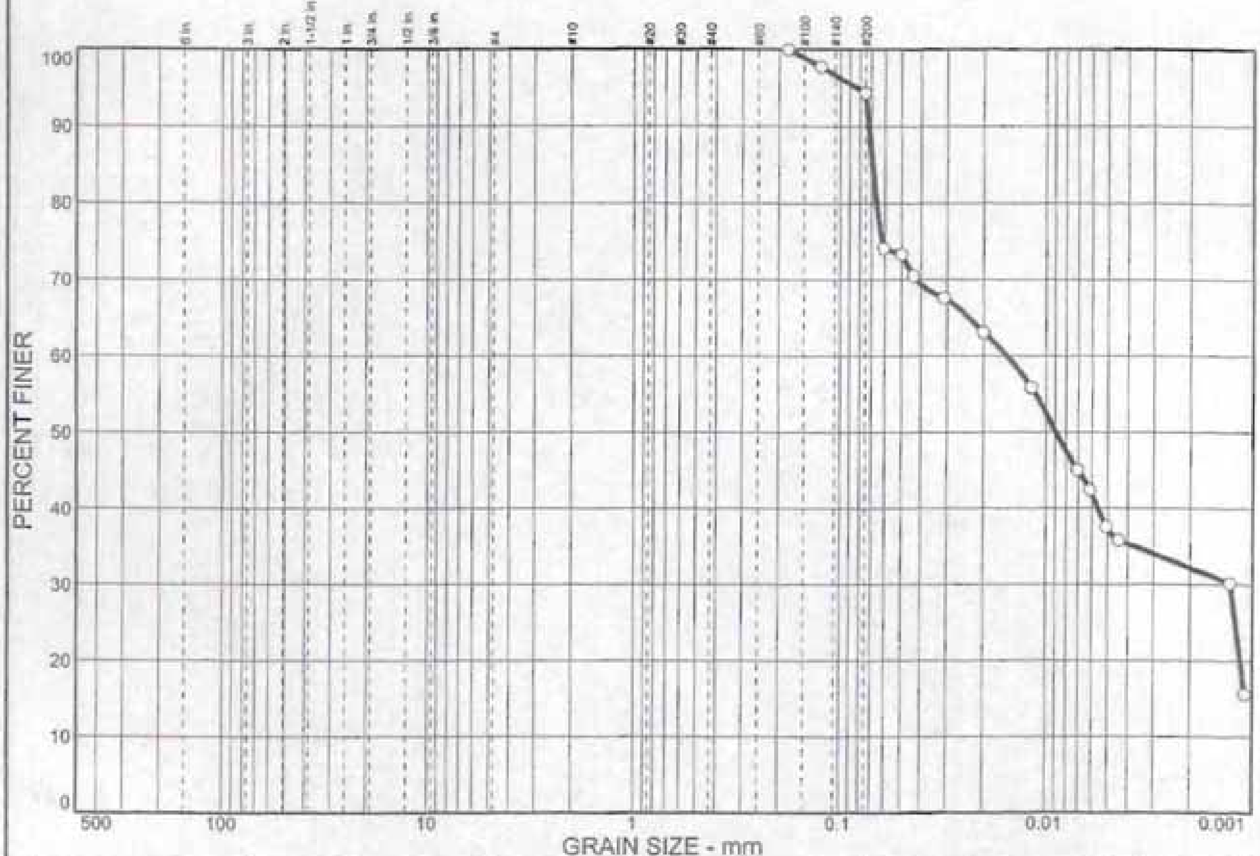
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1500.00	22.7	1.0041	1.0045	0.0132	4.6	15.1	0.0013	21.1
2245.00	24.4	1.0005	1.0012	0.0129	1.0	16.0	0.0011	5.5

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 17.5
% SILT = 55.4 % CLAY = 27.1

D_{85}= 0.09 D_{60}= 0.02 D_{50}= 0.01
D_{30}= 0.01 D_{15}= 0.00 D_{10}= 0.00
C_c= 1.3137 C_u= 18.8506

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	5.7	57.1	37.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#80	100.0		
#120	97.7		
#200	94.3		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0694 D_{60}= 0.0154 D_{50}= 0.0089
D_{30}= 0.0013 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

JMC

Sample No.: S-5 **Source of Sample:** **Date:** 08MAR2009
Location: SECTOR GATE CLOSURE SITE 5 **Elev./Depth:**

US Army Corps of Engineers

New Orleans District

Client:
Project: SECTOR GATE CLOSURE SITE
Project No: SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: SECTOR GATE CLOSURE SITE
Project Number: SECTOR GATE CLOSURE

Sample Data

Source:
Sample No.: S-5
Elev. or Depth: **Sample Length (in./cm.):**
Location: SECTOR GATE CLOSURE SITE 5
Description: FAT CLAY CH
Date: 08MAR2009 **PL:** **LL:** **PI:**
USCS Classification: **AASHTO Classification:**
Testing Remarks: JMC

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	44.53	2.86
Tare =	0.00	0.00
Dry sample weight =	44.53	2.86
Minus #200 from wash=	93.6 %	

Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 80	0.00	100.0
# 120	1.03	97.7
# 200	2.54	94.3

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 44.53
Calculated biased weight= 44.53
Automatic temperature correction
Composite correction at 20 deg C = 0

Meniscus correction only= 0.5
Specific gravity of solids= 2.65
Hydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0200	1.0205	0.0130	20.5	10.9	0.0608	74.1
0.75	23.7	1.0198	1.0203	0.0130	20.3	10.9	0.0498	73.3
1.00	23.7	1.0190	1.0195	0.0130	19.5	11.1	0.0435	70.5
2.00	23.7	1.0182	1.0187	0.0130	18.7	11.3	0.0311	67.6
5.00	23.5	1.0170	1.0175	0.0131	17.5	11.7	0.0200	63.1
15.00	23.5	1.0150	1.0155	0.0131	15.5	12.2	0.0118	55.9
45.00	23.3	1.0120	1.0125	0.0131	12.5	13.0	0.0070	45.0
60.00	23.3	1.0113	1.0118	0.0131	11.8	13.2	0.0061	42.4
90.00	23.1	1.0100	1.0104	0.0131	10.5	13.5	0.0051	37.6
120.00	23.1	1.0095	1.0099	0.0131	10.0	13.6	0.0044	35.8
1500.00	22.7	1.0080	1.0084	0.0132	8.5	14.0	0.0013	30.2

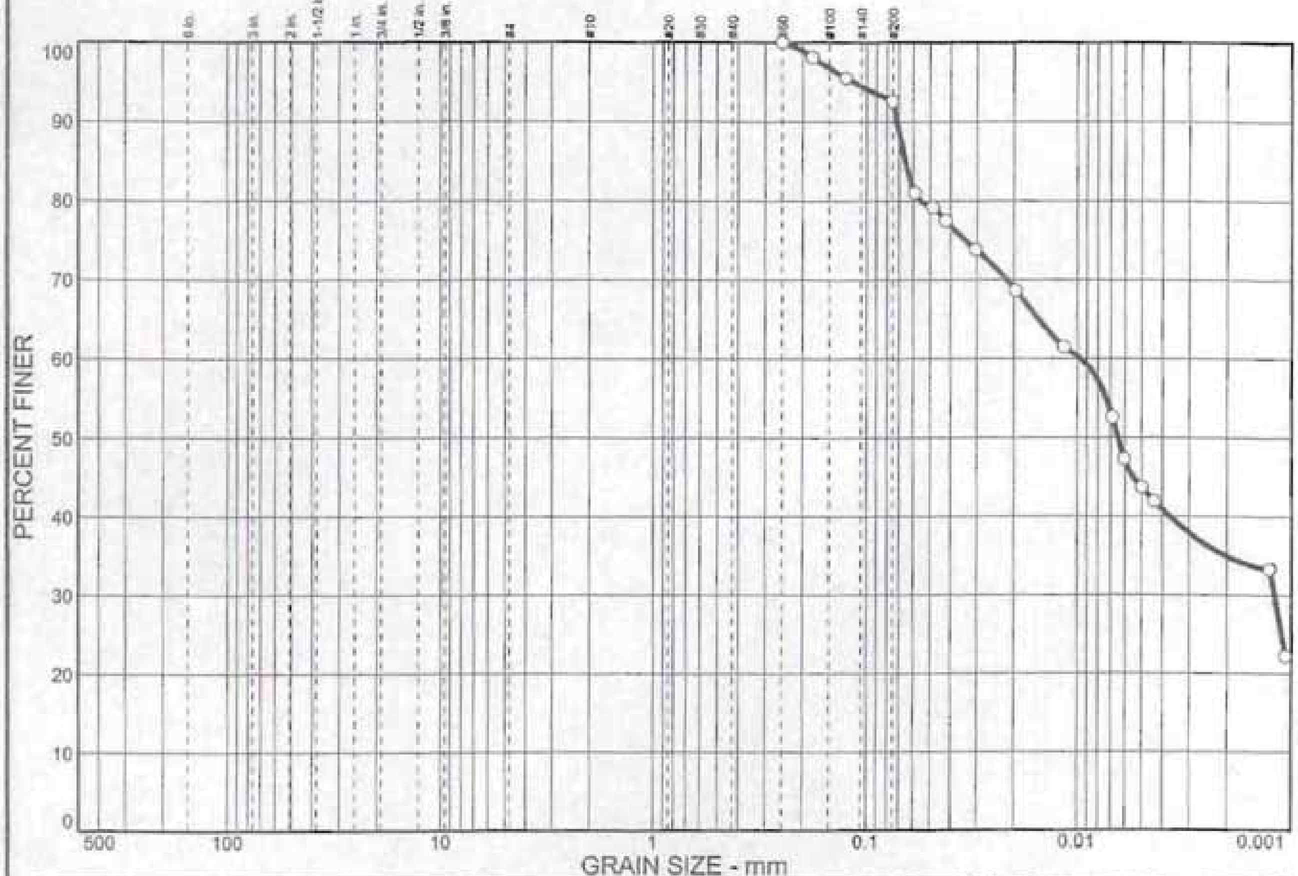
Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
2245.00	22.4	1.0040	1.0043	0.0132	4.5	15.1	0.0011	15.6

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 5.7
% SILT = 57.1 % CLAY = 37.2

D_{85}= 0.07 D_{60}= 0.02 D_{50}= 0.01
D_{30}= 0.00

Particle Size Distribution Report



% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY
0.0	0.0	7.4	48.9	43.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#60	100.0		
#80	98.1		
#120	95.5		
#200	92.6		

* (no specification provided)

Soil Description

FAT CLAY CH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 0.0655 D_{60}= 0.0097 D_{50}= 0.0065
D_{30}= 0.0012 D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= AASHTO=

Remarks

ECS

Sample No.: S-6 **Source of Sample:** **Date:** 08MAR2009
Location: SECTOR GATE CLOSURE SITE 6 **Elev./Depth:**

US Army Corps of Engineers

New Orleans District

Client:
Project: SECTOR GATE CLOSURE SITE
Project No: SECTOR GATE **Plate**

GRAIN SIZE DISTRIBUTION TEST DATA

Client:
Project: SECTOR GATE CLOSURE SITE
Project Number: SECTOR GATE CLOSURE

Sample Data

Source:
Sample No.: S-6
Elev. or Depth: Sample Length (in./cm.):
Location: SECTOR GATE CLOSURE SITE 6
Description: FAT CLAY CH
Date: 08MAR2009 PL: LL: PI:
USCS Classification: AASHTO Classification:
Testing Remarks: ECS

Mechanical Analysis Data

	Initial	After wash
Dry sample and tare=	45.68	3.49
Tare =	0.00	0.00
Dry sample weight =	45.68	3.49

Minus #200 from wash= 92.4 %
Tare for cumulative weight retained= .00

Sieve	Cumul. Wt. retained	Percent finer
# 60	0.00	100.0
# 80	0.89	98.1
# 120	2.04	95.5
# 200	3.39	92.6

Hydrometer Analysis Data

Separation sieve is #10
Percent -#10 based upon complete sample= 100.0
Weight of hydrometer sample: 45.68
Calculated biased weight= 45.68
Automatic temperature correction
Composite correction at 20 deg C = 0

Meniscus correction only= 0.5
Specific gravity of solids= 2.65
Hydrometer type: 151H
Effective depth L= 16.294964 - 0.2645 x Rm

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
0.50	23.7	1.0225	1.0230	0.0130	23.0	10.2	0.0589	81.0
0.75	23.7	1.0220	1.0225	0.0130	22.5	10.3	0.0484	79.2
1.00	23.7	1.0215	1.0220	0.0130	22.0	10.5	0.0422	77.5
2.00	23.5	1.0205	1.0210	0.0131	21.0	10.7	0.0303	73.8
5.00	23.5	1.0190	1.0195	0.0131	19.5	11.1	0.0195	68.6
15.00	23.5	1.0170	1.0175	0.0131	17.5	11.7	0.0115	61.5
45.00	23.3	1.0145	1.0150	0.0131	15.0	12.3	0.0069	52.6
60.00	23.3	1.0130	1.0135	0.0131	13.5	12.7	0.0060	47.3
90.00	23.1	1.0120	1.0124	0.0131	12.5	13.0	0.0050	43.7
120.00	23.1	1.0115	1.0119	0.0131	12.0	13.1	0.0043	41.9

Elapsed time, min	Temp, deg C	Actual reading	Corrected reading	K	Rm	Eff. depth	Diameter mm	Percent finer
1500.00	22.7	1.0091	1.0095	0.0132	9.6	13.8	0.0013	33.3
2245.00	22.4	1.0060	1.0063	0.0132	6.5	14.6	0.0011	22.2

Fractional Components

Gravel/Sand based on #4
Sand/Fines based on #200
% COBBLES = % GRAVEL = % SAND = 7.4
% SILT = 48.9 % CLAY = 43.7

D_{85}= 0.07 D_{60}= 0.01 D_{50}= 0.01
D_{30}= 0.00

Appendix B
ITR Comments and Resolution of Comments

Comment Report: All Comments
Project: Western Tie In H&H Analysis
Review: ITR 75%
Displaying 19 comments for the criteria specified in this report.

735 ms to run this page

Id	Discipline	Section/Figure	Page Number	Line Number
2368026	Environmental	n/a'	n/a	n/a

General Comment: Recommend Report Include Table of Contents. purpose or questions asked for report have expanded throughout this process making the document a combination of many different evaluations. Table of contents would help to separate different evaluations for report readers.

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** Table of Contents has been added to the report Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** concur Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
2368035	Environmental	n/a'	n/a	n/a

General Comments Datum used should be included in all tables where applicable and throughout document in the text.

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** I attempted to add datum definition throughout the report Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** concur Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
2368050	Hydraulics	n/a'	n/a	n/a

I have no major comments on the Analysis. The report is thorough and a very usefull tool in the Alternative Evaluation Process.

Submitted By: Reynold Broussard ((504)862-2428). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** appreciated Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Reynold Broussard ((504)862-2428) Submitted On: 13-Mar-09
	Current Comment Status: **Comment Closed**

Id	Discipline	Section/Figure	Page Number	Line Number
2368072	Hydraulics	n/a'	n/a	n/a

Figure 3. Drainage Areas - The figure has two Area 1's. I think Area 1, Alignment 1 2,408 ac is supposed to be Area 2, Aligment 1 2,408 ac. Submitted By: Reynold Broussard ((504)862-2428). Submitted On: 12-Mar-09				
1-0	Evaluation **Concurred** agreed this figure has been corrected Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Reynold Broussard ((504)862-2428) Submitted On: 13-Mar-09			
	Current Comment Status: **Comment Closed**			
2368091	Environmental	n/a'	n/a	n/a
Page 4 Problem definition. General Comment In general the goal of the H and H report was to develop technical information to determine base conditions and determine impacts with project. Saying we are conducting this work because of restriction for the resource agencies is not accurate. USACE is the action agency that is conducting this work as part of our NEPA (National Environment Policy Act compliance it is up to us the action agency to describe impacts and then attempt to specifically related to wetlands avoid, minimize, reduce and mitigate. We have made the commitment to maintain water exchange because that should avoid impacts to the wetlands above Hwy 90 because we are effectively not changing the condition from the base (except during a storm event and then we accept that impact because without that impact we are not meeting the intent of the project which is flood control) . No references to resource agencies should be included in this document as we are presenting technical information that describes impacts. Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09				
1-0	Evaluation **Concurred** The page 4 problem identification has been changed - references to state and federal agencies have been removed. I do not believe that there are any other references to "agencies" or "resource agencies" or "IER" in the report. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09			
1-1	Backcheck Recommendation **Close Comment** concur Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09			
	Current Comment Status: **Comment Closed**			
2368122	Hydraulics	n/a'	n/a	n/a
Table 1 Hydrology - You might mention that rainfalls of 12 to 24 hours were derermined from Technical Paper 40 Rainfall Frequency Atlas of the United States for durations from 30 minutes to 24 hours, and rainfalls of 2 to 10 days were determined from Technical Paper 49 Two-to Ten-day precipitations. Submitted By: Reynold Broussard ((504)862-2428). Submitted On: 12-Mar-09				
1-0	Evaluation **Concurred** this explanation has been added to the report Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09			
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Reynold Broussard ((504)862-2428) Submitted On: 13-Mar-09			
	Current Comment Status: **Comment Closed**			

2368145	Hydraulics	n/a'	n/a	n/a

You might indicate in the write-up that the sluice gates structures in addition to providing better drainage also provides tidal exchange. I don't know if I saw this mentioned in the report.

Submitted By: Reynold Broussard ((504)862-2428). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** a statement has been added to the end of the cross sectional area analysis that tidal exchange characteristics should be maintained by adding sluice gates Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: Reynold Broussard ((504)862-2428) Submitted On: 13-Mar-09
	Current Comment Status: **Comment Closed**

2368604	Environmental	n/a'	n/a	n/a

General Comment Problem Definition: Recommend problem definition or goals of H& H study be revised. Recommend the following be the study goals in report. 1) Compute base (existing conditions) of the combined cross section of the opening under Hwy 90, and the openings at Bayou Verret and the East end of the Outer Cataouatche Canal. 2) Define base (existing ponding) inundation of area above Hwy 90 without rainfall event and with various rainfall event senarios 3)Define ponding/inundation above Hwy 90 4) Evaluate sedimentation impacts for the Bayou Verret Structure 5) Summary of Davis Pond Ponding Area Water Levels

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** The problem identification paragraph was changed to the intent recommended by this comment. Was not used word for word. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368621	Environmental	n/a'	n/a	n/a

Page 13. First Sentence. I disagree that this is describing impacts to Area 2 Wetlands. This document is providing technical information about water levels within wetland areas and is not making a determination about impacts. To make a determination about impact we would need to discuss the biology/ecology of a wetlands and discusses the functions of the wetland system. Recommend we replace first sentence with "Water levels/ponding conditions in Area 2." Recommend that we replace sentence 2 with "Comparison of water levels/ponding conditions in the base condition verses after project construction.

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** agreed - the report has been changed to reflect this recommendation Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09

1-2	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368649	Environmental	n/a'	n/a	n/a
Page 22 Again we are not dicussing impacts to wetlands to do that we would fully need to discuss how changes in inundation impact wetlands functions and value of habitat. Recommend First paragraph be revised to read " Duration of inundation or inundation elevation to area 2 could be reduced by incorporating additional structures into the parameter of the the project. Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09				

1-0	Evaluation **Concurred** concur the report has been changed as recommended Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368651	Environmental	n/a'	n/a	n/a
page 24 Table 3 define abbreviation WSEL in figure title. Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09				

1-0	Evaluation **Concurred** change made in report Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368658	Environmental	n/a'	n/a	n/a
Pages 28-40 There are multiple cross sections for each canal or outlet which becomes confusing. Since these cross sections are used to determine the combined cross section recommend either in table title or write up on cross section that you just indicate that to calcuation cross section you utilized Figures 22, etc. Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09				

1-0	Evaluation **Concurred** The cross sections that were used in the area comparison analysis had a note added to the Figure that this was so. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368681	Environmental	n/a'	n/a	n/a

Page 42 Recommend that Paragraph be rewritten "The combined cross sectional area for the Bayou Verret Structure opening is approximately 646 ft2. The combined cross sectional area for the openings under Hwy 90 is approximately 757 ft2. An additional 110 ft 2 of cross sectional area would need to be added to the parameter of the of the project to ensure water exchange is not reduced to Area 2. Three 6 X 6 sluice gates incorporated in the project design would provide the additional 110 ft2 of cross section.

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** The paragraph has been changed per this recommendation. A revised report will be provided. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
1-2	Backcheck Recommendation **Close Comment** Closed without comment. Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2368694	Environmental	n/a'	n/a	n/a

Page 24 Semantics total width of "structure". From original write up and question we were only discussing whatever the navigable structure would be in Bayou Verret. If the stoplog "structure was incorporated and the sluice gates were constructed adjacent to stoplog structure does this become one structure and is that structure width still only 135 ft.

Submitted By: beth nord (504-862-2167). Submitted On: 12-Mar-09

1-0	Evaluation **Concurred** This part of the report has been edited for clarification. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 12-Mar-09
1-1	Backcheck Recommendation **Close Comment** Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
1-2	Backcheck Recommendation **Close Comment** Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
1-3	Backcheck Recommendation **Close Comment** Submitted By: beth nord (504-862-2167) Submitted On: 20-Mar-09
	Current Comment Status: **Comment Closed**

2383991	Hydraulics	n/a'	4	n/a

Entered for George Staley I would make clear at the beginning of the report that you are not comparing alternatives but are looking at the performance of Alternative 3 using three criterion.

Submitted By: Mark Anderson (309-794-5925). Submitted On: 19-Mar-09

1-0	Evaluation **Concurred**

	Problem Definition revised based on comment 2368091 Submitted By: Mark Anderson (309-794-5925) Submitted On: 19-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment per George Staley Submitted By: Mark Anderson (309-794-5925) Submitted On: 23-Mar-09
	Current Comment Status: **Comment Closed**

2383994	Hydraulics	n/a'	8	n/a

Entered for George Staley The sentence "Drainage basins for each of four canals in area 2 were delineated as shown below in Figure 5" should be changed to Figure 6.

Submitted By: Mark Anderson (309-794-5925). Submitted On: 19-Mar-09

1-0	Evaluation **Concurred** Report revised per comment Submitted By: Mark Anderson (309-794-5925) Submitted On: 19-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment per George Staley Submitted By: Mark Anderson (309-794-5925) Submitted On: 23-Mar-09
	Current Comment Status: **Comment Closed**

2383997	Hydraulics	n/a'	13	n/a

Entered for George Staley Some Figure 0 data given in NGVD and some in NAVD88. Is there a significant difference in elevation between datums at this location?

Submitted By: Mark Anderson (309-794-5925). Submitted On: 19-Mar-09

1-0	Evaluation **Concurred** The source of the data for this plot is the New Orleans District's water control web site. It is stated on the web site that "Gage reset to vertical datum NAVD88 (2004.65) on Sept 24, 2007. ALL prior stage data is referenced to gage zero NGVD. " I checked the "Corpscon" program to determine the difference in elevation for the conversion from NGVD29 ti NAVD88 in this area, and NAVD88 is about 0.3' lower than NGVD29. However, with settlement and subsidence having such an impact in this area, I did not want to make the 0.3' adjustment to convert NGVD29 data to NAVD88, because I suspect that this might provide incorrect stage readings. I decided to just plot data as presented on web site. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 23-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment per George Staley Submitted By: Mark Anderson (309-794-5925) Submitted On: 23-Mar-09
	Current Comment Status: **Comment Closed**

2384000	Hydraulics	n/a'	18	n/a

Entered for George Staley Figure 12 was difficult to understand I would recommend making it simpler.

Submitted By: Mark Anderson (309-794-5925). Submitted On: 19-Mar-09

1-0	Evaluation **Concurred** Figure 12 will be altered and attempted to make more understandable. A new version of the report will be provided to reviewers by COB 23Mar09 that includes these changes.

	Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 23-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment per George Staley Submitted By: Mark Anderson (309-794-5925) Submitted On: 23-Mar-09
	Current Comment Status: **Comment Closed**

2384002	Hydraulics	n/a'	17	n/a

Entered for George Staley The text says all elevations were based on a starting water surface elevation of 0.0. Was this elevation selected because of river conditions, tide conditions, or what reason?

Submitted By: Mark Anderson (309-794-5925). Submitted On: 19-Mar-09

1-0	Evaluation **Concurred** This was an assumed normal water surface elevation. However, as shown in Figure 9 (Sellers Canal Stage Hydrograph), a higher number would have been more appropriate. Table 3 does show Project Condition ponding elevations for different starting water surface elevations. I am hesitant to use a starting water surface elevation much higher that 0.0, as I suspect that some of the higher stages shown in the Figure 9 are a result of a storm, and to then add on a simulated storm on top of a stage that is a result of a storm would be too conservative. Submitted By: Thomas Kirkeeng (309-794-5735 x6111) Submitted On: 23-Mar-09
1-1	Backcheck Recommendation **Close Comment** Closed without comment per George Staley Submitted By: Mark Anderson (309-794-5925) Submitted On: 23-Mar-09
	Current Comment Status: **Comment Closed**

There are currently a total of 522 users online as of 03:02 PM 30-Mar-09.

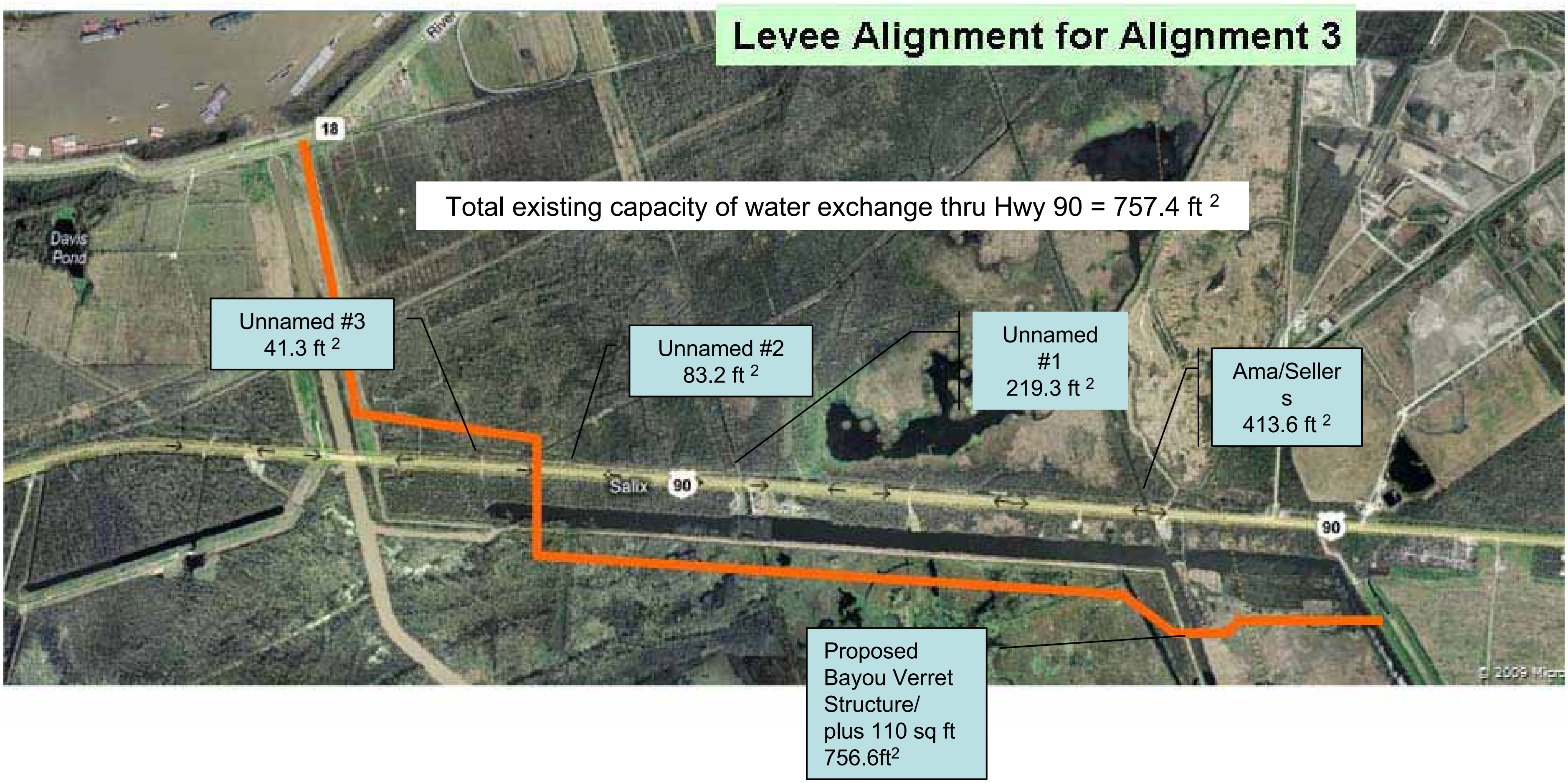
Review of Topics from

23 March 2009

H & H Analysis

Figure 3. Areas – Western Tie In.

Proposed Closure Structure plus 110 sq ft across Bayou Verret/Sellers Canal is sized equal to the existing combined cross section through Hwy 90 to maintain water exchange to avoid/minimize secondary impacts to wetland Areas north of Hwy 90



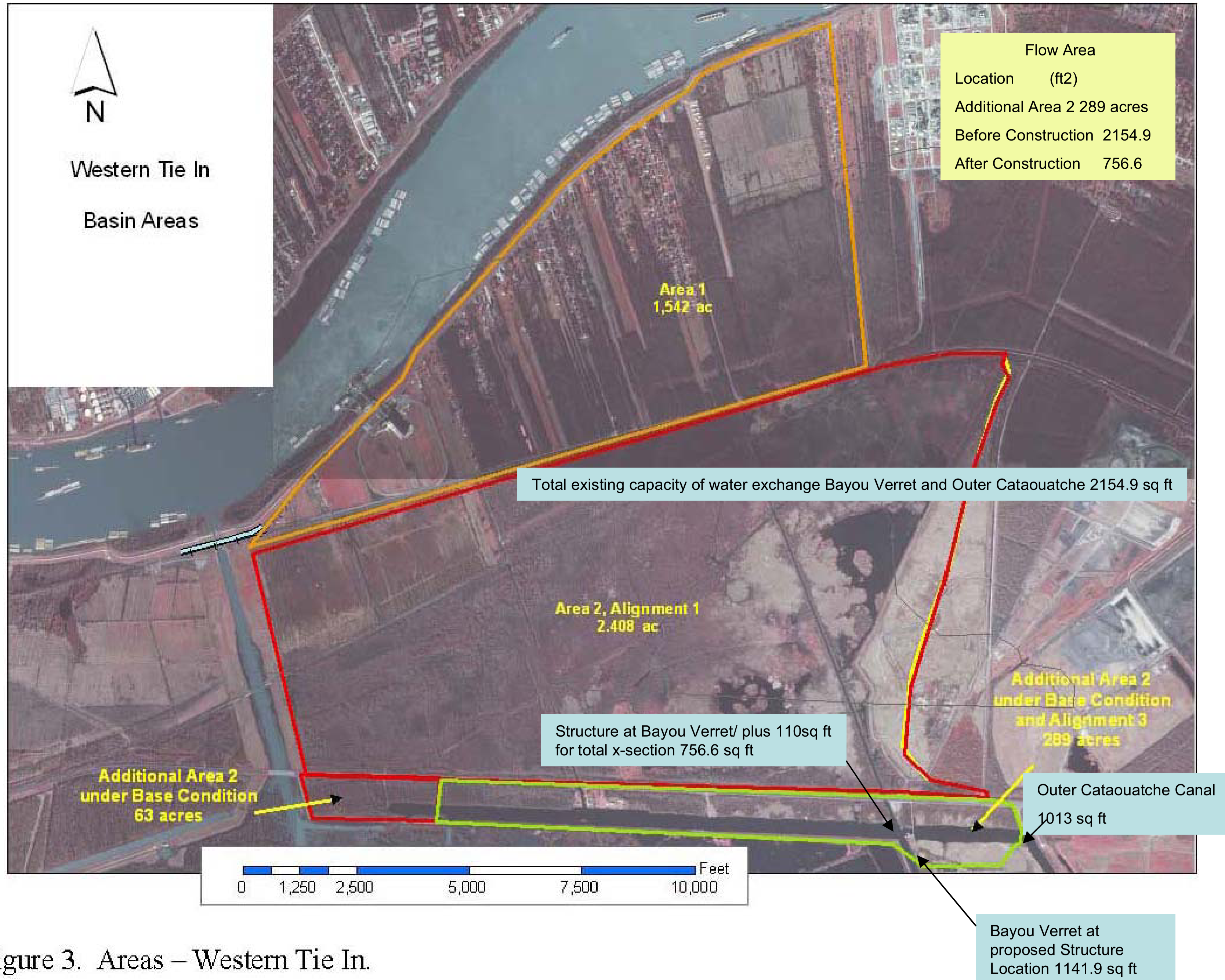


Figure 3. Areas – Western Tie In.

10-Year Event – 2 Hour Duration

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Water Surface Elevation in Area 2 just upstream of Hwy 90, at Peak Inflow to System (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Base	Existing	70	0.5	10	7.6	5.32	1.2	1.4
		70	1	10	9.1	6.37	1.2	1.4
		70	2	10	10.2	7.14	1.2	1.4
		70	4	10	11.1	7.77	1.2	1.4
		70	7	10	13.8	9.66	1.2	1.4
		70	0.5	50	10	7	1.3	1.6
		70	1	50	12	8.4	1.3	1.6
		70	2	50	13.8	9.66	1.3	1.6
		70	4	50	15.2	10.64	1.3	1.6
		70	7	50	18.5	12.95	1.3	1.6
		70	0.5	100	11.1	7.77	1.4	1.6
		70	1	100	13.2	9.24	1.4	1.6
		70	2	100	15.1	10.57	1.4	1.6
		70	4	100	17	11.9	1.4	1.6
		70	7	100	20.5	14.35	1.4	1.6

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Area 1 Area (ac)	Runoff to Area1 (ac-ft)	Area 2 Area (ac)	Runoff to Area 2 (ac-ft)	Area 1 to Area 2 Pump Capacity (af-day)	Area 1 to Area 2 Total Pump Capacity (ac-ft)	Inflow - Area 1 to Area 2 (ac-ft)	Outflow from Area 2 (ac-ft) (Assumes TW elev = 0.0)	Net Ponding in Area 2 (ac-ft)	Ponding Elevation in Area 2 (NAVD88)	Water Surface Elevation in Area 2 just upstream of Hwy 90 (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Alignment 3	Existing Runoff Conditions	70	0.5	10	7.6	5.32	1,542	684	2,697	1,196	405	203	203	0	1,398	1.18	1.1	
		70	1	10	9.1	6.37	1,542	819	2,697	1,432	405	405	405	0	1,837	1.38	1.3	
		70	2	10	10.2	7.14	1,542	917	2,697	1,605	405	810	810	0	2,415	1.56	1.5	
		70	4	10	11.1	7.77	1,542	998	2,697	1,746	405	1,620	998	0	2,745	1.8	1.7	
		70	7	10	13.8	9.66	1,542	1,241	2,697	2,171	405	2,835	1,241	0	3,412	2.12	1.9	
		70	0.5	50	10	7	1,542	900	2,697	1,573	405	203	203	0	1,776	1.33	1.3	
		70	1	50	12	8.4	1,542	1,079	2,697	1,888	405	405	405	0	2,293	1.6	1.5	
		70	2	50	13.8	9.66	1,542	1,241	2,697	2,171	405	810	810	0	2,981	1.92	1.8	
		70	4	50	15.2	10.64	1,542	1,367	2,697	2,391	405	1,620	1,367	0	3,759	2.28	2.1	
		70	7	50	18.5	12.95	1,542	1,664	2,697	2,911	405	2,835	1,664	0	4,575	2.63	2.4	
		70	0.5	100	11.1	7.77	1,542	998	2,697	1,746	405	203	203	0	1,949	1.43	1.4	
		70	1	100	13.2	9.24	1,542	1,187	2,697	2,077	405	405	405	0	2,482	1.69	1.6	
		70	2	100	15.1	10.57	1,542	1,358	2,697	2,376	405	810	810	0	3,186	2	1.8	
		70	4	100	17	11.9	1,542	1,529	2,697	2,675	405	1,620	1,529	0	4,204	2.5	2.3	
		70	7	100	20.5	14.35	1,542	1,844	2,697	3,225	405	2,835	1,844	0	5,069	2.83	2.6	

Figure 14. Project Condition (Alignment 3) Water Surface Levels (NAVD88

100-Year Event – 7 Day Duration

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (Inches)	Rainfall Exceedence (inches)	Water Surface Elevation in Area 2 just upstream of Hwy 90, at Peak Inflow to System (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Base	Existing	70	0.5	10	7.6	5.32	1.2	1.4
		70	1	10	9.1	6.37	1.2	1.4
		70	2	10	10.2	7.14	1.2	1.4
		70	4	10	11.1	7.77	1.2	1.4
		70	7	10	13.8	9.66	1.2	1.4
		70	0.5	50	10	7	1.3	1.6
		70	1	50	12	8.4	1.3	1.6
		70	2	50	13.8	9.66	1.3	1.6
		70	4	50	15.2	10.64	1.3	1.6
		70	7	50	18.5	12.95	1.3	1.6
		70	0.5	100	11.1	7.77	1.4	1.6
		70	1	100	13.2	9.24	1.4	1.6
		70	2	100	15.1	10.57	1.4	1.6
		70	4	100	17	11.9	1.4	1.6
		70	7	100	20.5	14.35	1.4	1.6

Condition	Comments	Runoff %	Length of Storm (days)	Rainfall Frequency (yrs)	Rainfall (inches)	Rainfall Exceedence (inches)	Area 1 Area (ac)	Runoff to Area1 (ac-ft)	Area 2 Area (ac)	Runoff to Area 2 (ac-ft)	Area 1 to Area 2 Pump Capacity (af-day)	Area 1 to Area 2 Total Pump Capacity (ac-ft)	Inflow - Area 1 to Area 2 (ac-ft)	Outflow from Area 2 (ac-ft) (Assumes TW elev = 0.0)	Net Ponding in Area 2 (ac-ft)	Ponding Elevation in Area 2 (NAVD88)	Water Surface Elevation in Area 2 just upstream of Hwy 90 (NAVD88)	Water Surface Elevation in Area 2 @ upper end, just downstream of RR, at Peak Inflow to System (NAVD88)
Alignment 3	Existing Runoff Conditions	70	0.5	10	7.6	5.32	1,542	684	2,697	1,196	405	203	203	0	1,398	1.18	1.1	
		70	1	10	9.1	6.37	1,542	819	2,697	1,432	405	405	405	0	1,837	1.38	1.3	
		70	2	10	10.2	7.14	1,542	917	2,697	1,605	405	810	810	0	2,415	1.56	1.5	
		70	4	10	11.1	7.77	1,542	998	2,697	1,746	405	1,620	998	0	2,745	1.8	1.7	
		70	7	10	13.8	9.66	1,542	1,241	2,697	2,171	405	2,835	1,241	0	3,412	2.12	1.9	
		70	0.5	50	10	7	1,542	900	2,697	1,573	405	203	203	0	1,776	1.33	1.3	
		70	1	50	12	8.4	1,542	1,079	2,697	1,888	405	405	405	0	2,293	1.6	1.5	
		70	2	50	13.8	9.66	1,542	1,241	2,697	2,171	405	810	810	0	2,981	1.92	1.8	
		70	4	50	15.2	10.64	1,542	1,367	2,697	2,391	405	1,620	1,367	0	3,759	2.28	2.1	
		70	7	50	18.5	12.95	1,542	1,664	2,697	2,911	405	2,835	1,664	0	4,575	2.63	2.4	
		70	0.5	100	11.1	7.77	1,542	998	2,697	1,746	405	203	203	0	1,949	1.43	1.4	
		70	1	100	13.2	9.24	1,542	1,187	2,697	2,077	405	405	405	0	2,482	1.69	1.6	
		70	2	100	15.1	10.57	1,542	1,358	2,697	2,376	405	810	810	0	3,186	2	1.8	
		70	4	100	17	11.9	1,542	1,529	2,697	2,675	405	1,620	1,529	0	4,204	2.5	2.3	
		70	7	100	20.5	14.35	1,542	1,844	2,697	3,225	405	2,835	1,844	0	5,069	2.83	2.6	

APPENDIX G - USACE HEADQUARTERS POLICY ON MITIGATION FOR INDUCED DEVELOPMENT

CELMV-PE-F (CELMN-PD-FG/22 Dec 94) (1105-2-10c) 3d End
Mr. Stuart/bab/5827
SUBJECT: Westwego to Harvey Canal Hurricane Protection Project, Post Authorization Change Study (Lake Cataouatche)

CDR, Lower Mississippi Valley Division, Vicksburg, MS 39181-0080
09 MAY '95

FOR Commander, New Orleans District, ATTN: CELMN-PD-F

1. Forwarded herein for your guidance and appropriate action is the HQUSACE endorsement to the MFR for subject study and guidance on the issue paper, "Mitigation for Induced Development."

2. Please note, as indicated in paragraph 2 of 2nd endorsement, that the policy guidance on mitigation for induced development provided by HQ is intended to apply not only to the project, but to all projects for which this becomes an issue.

3. The LMVD point of contact for this study is Richard Stuart, CELMV-PE-F, telephone (601) 634-5827.

FOR THE COMMANDER:

3 Encls
nc

JAMES R. TUTTLE
Acting Director of Planning
and Engineering

CECW-PC (CELMN-PD-FG/22 Dec 94) (1105-2-10c) 2nd End
Rasgus/jer/1974
SUBJECT: Westwego to Harvey Canal Hurricane Protection Project, Post Authorization Change Study (Lake Cataouatche)

C 3 MAY 1995

HQUSACE, Washington, DC 20314-1000

FOR Commander, Lower Mississippi Valley Division, Vicksburg, MS 39181-0080

1. The memorandum for record (MFR) for the recent In-Progress Review meeting for subject project is approved.

2. The issue paper "Mitigation for Induced Development" has been reviewed within HQUSACE and the following guidance is provided. This guidance applies not only to this specific project but to all other projects where this may become an issue.

3. In any future discussions, the issue needs to be relabeled as mitigation for "indirect impacts" or "indirect effects". Induced development should be used in reference to development that is an unavoidable direct effect caused by projects.

4. The Lake Cataouatche project is being constructed to protect "existing" development in accordance with Corps planning principles. Therefore, while one possible "indirect effect" would be relocated or additional development, addressing the environmental effects of such development resulting from choices, decisions, and actions of others (such as States, communities, businesses, and individuals) becomes a non-Federal responsibility. A policy of mitigating for indirect project effects might, in and of itself, constitute an adverse environmental effect. It is possible that Federal mitigation for these kinds of effects would remove the individual burden from the developer and the upfront mitigation would encourage development where it otherwise might not occur at all. If after implementation of a Federal project, development occurs, then the localities which reap the economic benefits should be responsible for adressing the environmental impacts.

5. ER 1105-2-100 (para 4-12(a)(8) states that local entities should provide guidance and leadership to prevent unwise development in flood plains. Paragraph 4-11b(1) of ER 1105-2-100 states that the Corps is required to minimize adverse impacts such as induced new development or improvements in flood plains that would increase potential flood damages. Reports must address the detrimental effect of induced activities on natural flood plain values. The problem is in determining what is "induced" versus what is the result of choices made by non-Federal entities.

6. The Lake Cataouatche project is really no different from most civil works projects in that once protection is provided State

and local entities may choose to expand development. We do not believe that the Federal government should be responsible for mitigating for environmental impacts resulting from the actions and choices of others.

7. In your issue paper, you argue that since we take credit for "induced" beneficial effects before determining mitigation requirements, it likewise makes sense to mitigate for any uncompensated adverse induced effects. We disagree. Induced and incidental environmental benefits are only claimed for purposes of offsetting project losses when the effects can be described, verified and measured using habitat based analysis methods or adequate qualitative discussions about outputs. Estimates are generally conservatively defined and environmental resource agencies serve as a check against improper use of induced beneficial environmental effects to reduce mitigation requirements.

8. In summary, current Corps of Engineers policy is that we will mitigate to the extent justified, for the adverse direct environmental impacts of our projects. Indirect impacts such as land development are subject to compliance with local and state permit and zoning requirements and, therefore, local and state interests are responsible for defining the appropriate mitigation requirements for land development activities. The direct causative agents of indirect impacts and the beneficiaries are the developers themselves. It is not equitable to allow State and local governments to avoid assuming responsibility for managing development and resources by placing the burden of local environmental protection on the national taxpayer.

Encls wd

G. EDWARD DICKEY
Chief, Planning Division

CELMV-PE-F (CELMN-PD-FG/22 Dec 94) (1105-2-10c) 1st End
Mr. Stuart/bab/5827
SUBJECT: Westwego to Harvey Canal Hurricane Protection Project, Post Authorization Change Study (Lake Cataouatche)

CDR, Lower Mississippi Valley Division, Vicksburg, MS 39181-0080
10 JAN '95

FOR HQUSACE (CECW-PC), WASH DC 20314-1000

1. A memorandum for record (MFR) for the recent In-Progress Review (IPR) meeting for subject study is forwarded. We believe that the MFR accurately documents the discussions and agreements reached at the IPR meeting.

2. As indicated in the MFR, agreement could not be reached at the IPR meeting on Issue No. 2, "Mitigation for induced development." Therefore, this office has prepared an issue paper on this subject for your consideration (encl 3). We request that you respond to this issue paper by providing official guidance on the question of mitigation for project induced development. An official Corps policy will not only provide guidance for this study but for all other ongoing and future studies which must address this question.

3. The LMVD point-of-contact for this study is Richard Stuart, CELMV-PE-F, telephone 601-634-5827.

FOR THE COMMANDER:

JAMES R. HANCHEY
Director of Planning and Engineering

3 Encls
1-2. nc
Added 1 encl
3. as

CF:
CELMN-PD-F

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

REPLY TO ATTENTION OF:

December 22, 1994

CELMN-PD-FG (10-1-7a)

MEMORANDUM FOR Commander, Lower Mississippi Valley Division, Attn: CELMV-PE-F

SUBJECT: Westwego to Harvey Canal Hurricane Protection Project, Post Authorization Change Study (Lake Cataouatche)

1. An In-Progress Review (IPR) meeting for the Westwego to Harvey Canal Hurricane Protection Project, Post Authorization Change Study (Lake Cataouatche), was held at the New Orleans District on 1-2 November 1994. The meeting was attended by representatives of CECW, CELMV, and CELMN. A copy of the attendance record is provided as Encl. 1.

2. The purpose of the IPR meeting was to provide a forum to discuss issues that had not been resolved from the reconnaissance study or that had surfaced during the post authorization change (PAC) study. The preliminary results of the study were also discussed at this meeting.

3. To facilitate discussions at the IPR meeting, a total of four issue papers were prepared. These issue papers were submitted to CECW and CELMV for review prior to the meeting. A response to the issue papers was prepared by CECW in which one additional issue was recommended for discussion.

4. A memorandum for record (MFR) has been prepared to document the agreements reached at the IPR meeting (Encl 2). The major topics contained in the MFR correspond to the issue papers submitted prior to the meeting.

5. The draft PAC report is currently scheduled for submission in July 1995.

FOR THE COMMANDER

Encls

R. H. SCHROEDER, JR.
Chief, Planning Division

scenario where the levee fails at the PNP (3.5 ft NGVD). The non-failure damages represent a scenario where the levee does not fail until stages reach the PFP (5.5 ft NGVD). At stages below 3.5 ft NGVD, the failure and non-failure damages are the same due to interior flooding from wave run-up and rainfall. At a stage of 3.5 ft NGVD (the PNP), event damages were computed as the non-failure damages plus 15 percent of the difference between the failure damages and the non-failure damages. This accounts for interior flooding without a failure and the probability that the levee would fail at the PNP. At a stage of 5.5 ft NGVD (the PFP), event damages were computed as the non-failure damages plus 85 percent of the difference between the failure and non-failure damages. For stages between 3.5 and 5.5 ft NGVD, similar computations were made to account for the increasing probability of failure above the PNP. For stages above 5.5 ft NGVD, damages were computed using the failure damage curve. Support for and documentation of the PNP, PFP, and without project damage values will be included in the PAC report.

The without-project damages were determined using the above procedure for the study year (1994), base year (1999), and base year plus 50 years (2048). A Lotus spreadsheet was used to interpolate expected annual damages that will occur between the study year and the base year, and that will occur for the 50 years following the base year. The expected annual damages were assumed to be constant between the year 2048 and the year 2101. An 8 percent interest rate and a 100-year amortization factor was used to convert the expected annual damages to equivalent annual damages. This resulted in base year without-project damages of $9.3 million. A spreadsheet showing the computations is provided as attachment 1.

ISSUE NO. 2 Mitigation for induced development:

During the reconnaissance study it was determined that providing increased levels of hurricane protection to the Lake Cataouatche area would create the potential for induced development to occur. The proposed mitigation plan presented in the reconnaissance report included the impacts due to this induced development. The costs for the additional mitigation were included as a project cost. During review of the reconnaissance report, a comment was received from CECW that stated the corps mitigates for environmental impacts directly related to the construction of the project but does not mitigate for future induced development impacts to the environment, unless location benefits have been claimed for these lands.

PROPOSED ACTION Any development that could occur in wetland areas as a result of the proposed project is not an issue because the impacts and necessary mitigation would be described and administered by regulatory procedures of the Clean Water Act.

This will be described in the EIS as an indirect impact of the Federal project, but would not be mitigated as a feature of the Federal project since impacts would be mitigated, if warranted, under Section 404 if and when development occurs.

There did not appear to be a unified position regarding mitigation for development occurring in non-wetland areas. As a result, an issue paper is being prepared by LMVD and will be attached to this MFR prior to submission to CECW. A policy statement will then be prepared in response to the issue paper. The issue of a Federal project having no responsibility for mitigation of induced development of both wetland and non-wetland areas has not been accepted by the USFWS at this time.

ISSUE NO. 3 Incorporating risk analysis into the selection of the recommended plan:

Two alternatives are being considered for providing increased levels of hurricane protection to the Lake Cataouatche study area. The exterior alignment (Plan 1) would follow the existing levee and the interior alignment (Plan 2) would follow an existing interior drainage canal. Both alignments would provide protection to essentially the same residential and commercial structures. As stated in the IPMP and further agreed to at a technical conference held at the New Orleans District on 2-3 Feb 94, risk analysis techniques will only be used to size the protection once the recommended alignment is determined using a traditional analysis. The Lake Cataouatche study area has been broken into 11 storage basins each of which would likely have a different stage for a given frequency event. This will require the development of a unique elevation-damage with error relationship for each storage basin. The risk-based software will also have to be run for each of the 11 storage basins. These procedures will be followed for both existing and future conditions. The expected values and ranges for each storage basin will then be added together.

The risk based programs that have been demonstrated at recent workshops have all dealt with riverine conditions where there is a stage-discharge relationship. Although HEC agreed at the technical conference to modify their program to accommodate the stage-frequency relationships used in coastal areas, a program has not yet been received by the New Orleans District.

PROPOSED ACTION Based on discussions at the IPR, a program that will perform risk analysis for coastal areas has been developed. This program, along with technical assistance from LMVD and HEC, if needed, will be employed by the New Orleans District to perform the analysis in a risk-based framework. The results of the risk based analysis will be used to determine the optimum levee height for the study area. A traditional analysis will

Issue Paper
on Mitigation for Induced Development

1. At a 2 November 1994 In Progress Review (IPR) meeting held at the New Orleans District, considerable discussion took place concerning the issue of how mitigation of adverse fish and wildlife impacts resulting from Corps project induced development should be dealt with within the framework of the ongoing Post Authorization Change study for the Lake Cataouatche area.

2. It is the position of HQ that the recommended plan for the Lake Cataouatche area should only include requirements to mitigate for direct project impacts caused by the "footprint" of the project. HQ does state, however that the study environmental documents will address indirect impacts. This policy position is based upon actions taken in conjunction with a Corps planning study in California that involved a flood control project along the American river. The proposed Corps project would have reduced flooding and induced development of floodplain habitat. It was determined that the State of California had legal means available to control such development in this case.

3. Indirect impacts of Corps projects may take various forms. Induced development is one form of indirect impacts and includes such things as forest clearing and conversion of land to agricultural use following reduced flooding brought about by a Corps project. It may also include similar conversion of forestlands to a housing development following completion or in anticipation of a Corps project. In the Lake Cataouatche case, it is anticipated that completion of a federal Hurricane Protection project would make the protected area more attractive for housing, light industrial, and commercial development and existing bottomland hardwood forest within the protected area would be lost at a more rapid rate than would be the case in the without project condition. If such forestland loss occurs in a federally designated wetland area, traditionally, the loss would likely be mitigated as a part of any needed federal regulatory permit action (Section 404). In non-wetland forested areas within the proposed protected area, the mitigatory actions of the federal permit program would not take place and any loss of forest above that anticipated in the without project condition would be an indirect, or induced, result of the federal Hurricane Surge Protection project. As such, the loss should be appropriately mitigated as a part of the federal project in manner that is analogous to the way a federal project compensates landowners through purchase of a flowage easement in areas where a project feature such as a levee that intercepts drainage may cause induced damages from flooding.

4. It has long been the policy of the Corps to recommend and implement mitigation for indirect impacts, of the induced development type, due to its water resource projects in the Lower Mississippi Valley Division (see enclosure 1 for several examples where induced development was taken into account in mitigation

formulation). We know of no law, regulation, or precedent that indicates that mitigation of this type is anything other than appropriate and should not be included as a part of any recommended plan submitted to higher authority for approval. On the contrary, we believe that law and precedent mandate that induced development impacts be made an integral part of any water resource project recommendation. For example, Section 906 (d) of the WRDA '86 mandates that "Specific mitigation plans shall ensure that impacts to bottomland hardwood forest are mitigated in-kind, to the extent possible". This law does not restrict our action to mitigation only of direct construction impacts caused by the "footprint" of the project. It requires mitigation of all impacts instead. Additionally, we believe our existing guidance and related technical documents mandate that we include induced development impacts in any computations of mitigation requirements. ER 1105-2-100 specifically directs in Part 7-35. a. that "District commanders shall ensure that project-caused adverse impacts to fish and wildlife resources have been avoided or minimized to the extent practicable, and that remaining, unavoidable impacts have been compensated to the extent justified". No indication is provided that the "unavoidable impacts" category should not include the indirect impacts of actions such as induced development. Moreover, in Part 7-35.c. of the same ER, we are specifically directed to account for beneficial aspects of an alternative plan before consideration is given to adding separable mitigation features. Presumably this means that any indirect or induced beneficial effect must be identified. If we must take credit for beneficial induced effects then it would seem logical that we should mitigate for any uncompensated adverse induced impacts such as those due to project induced development. An examination of technical documents such as the Lower MS Valley Division's Habitat Evaluation System (HES) manual or the Fish and Wildlife Service's Habitat Evaluation Procedures Manual, which have been routinely used for many years to compute mitigation needs, also supports our belief that mitigation for induced development impacts is appropriate and required. These documents specifically indicate that induced development impacts must be taken into account when habitat evaluation impact studies are conducted to identify mitigation needs.

5. In conclusion, it is obvious to us that in the present era where environmental protection has been made one of the primary missions of the Corps of Engineers (WRDA 1990), and where law and precedent support full mitigation of both direct and indirect adverse impacts of Corps water resource projects, there should be no question regarding the appropriateness of mitigation for impacts of induced development. This should be done as a standard operating procedure unless there are other mechanisms in place (state or federal) that would mitigate those impacts that are the indirect result of implementation of the federal project.

Some Examples of Induced Development Impacts in the Lower MS Valley Division
For Which Fish and Wildlife Mitigation was Approved

Project	Year	Loss Category	Acres Lost
Upper Yazoo	1993	Forest Clearing for Agriculture	2,360
Upper Steele Bayou	1992	Forest Clearing for Agriculture	2,100
LaRose to Golden Meadow	1987	Forest Clearing and Marshland Drainage for Agriculture, Residential and Commericial Development	361
Westwego to Harvey Canal	1986	Forest Clearing and Marshland Drainage for Residential Development	97
Red River Waterway	1983	Forest Clearing for Agriculture	5,280
Bushley Bayou	1977	Forest Clearing for Agriculture	563

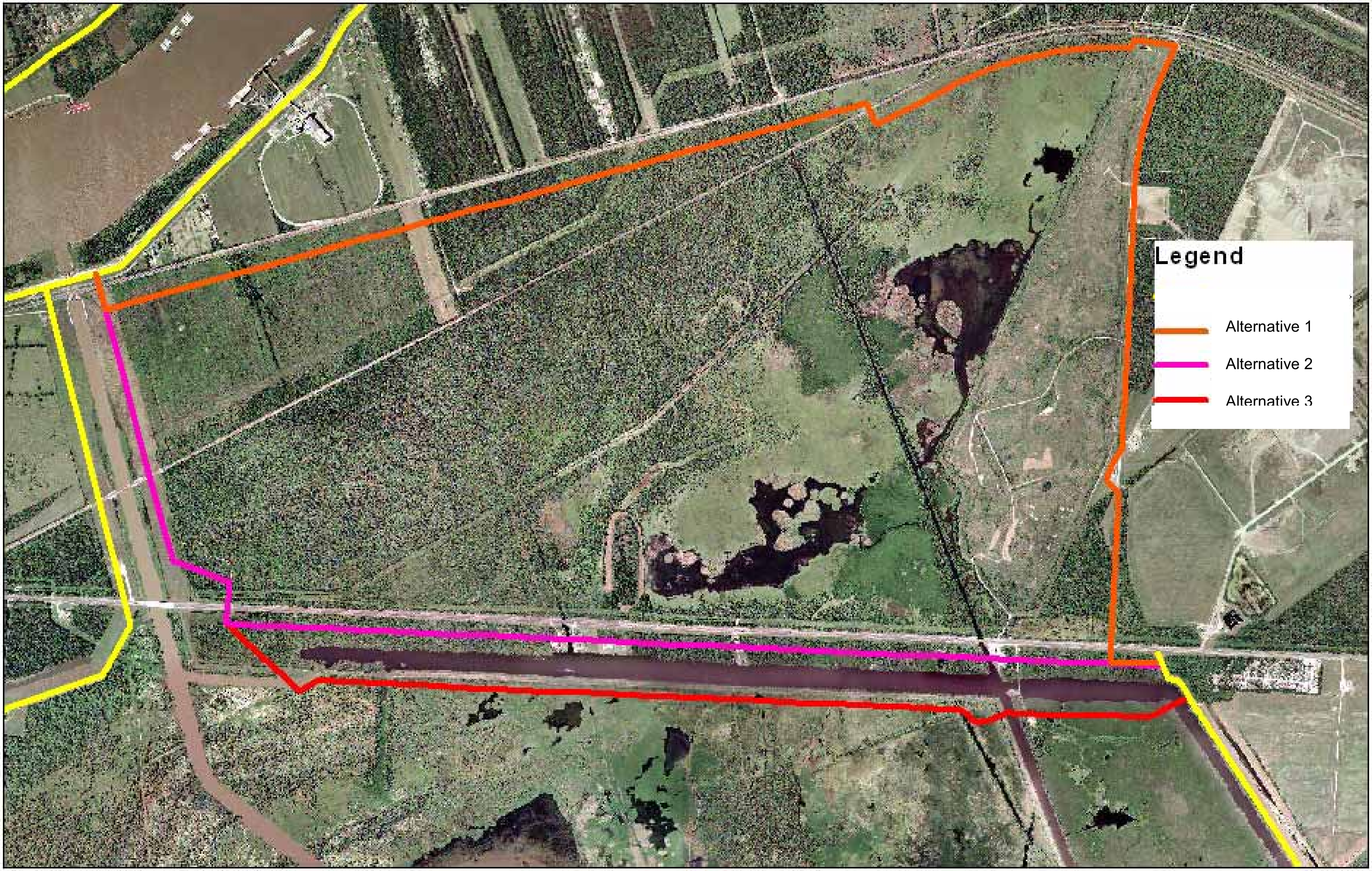
APPENDIX H - INTERAGENCY COORDINATION BRIEFINGS

Summary of Western Tie-In Alternative Evaluation Process (AEP)

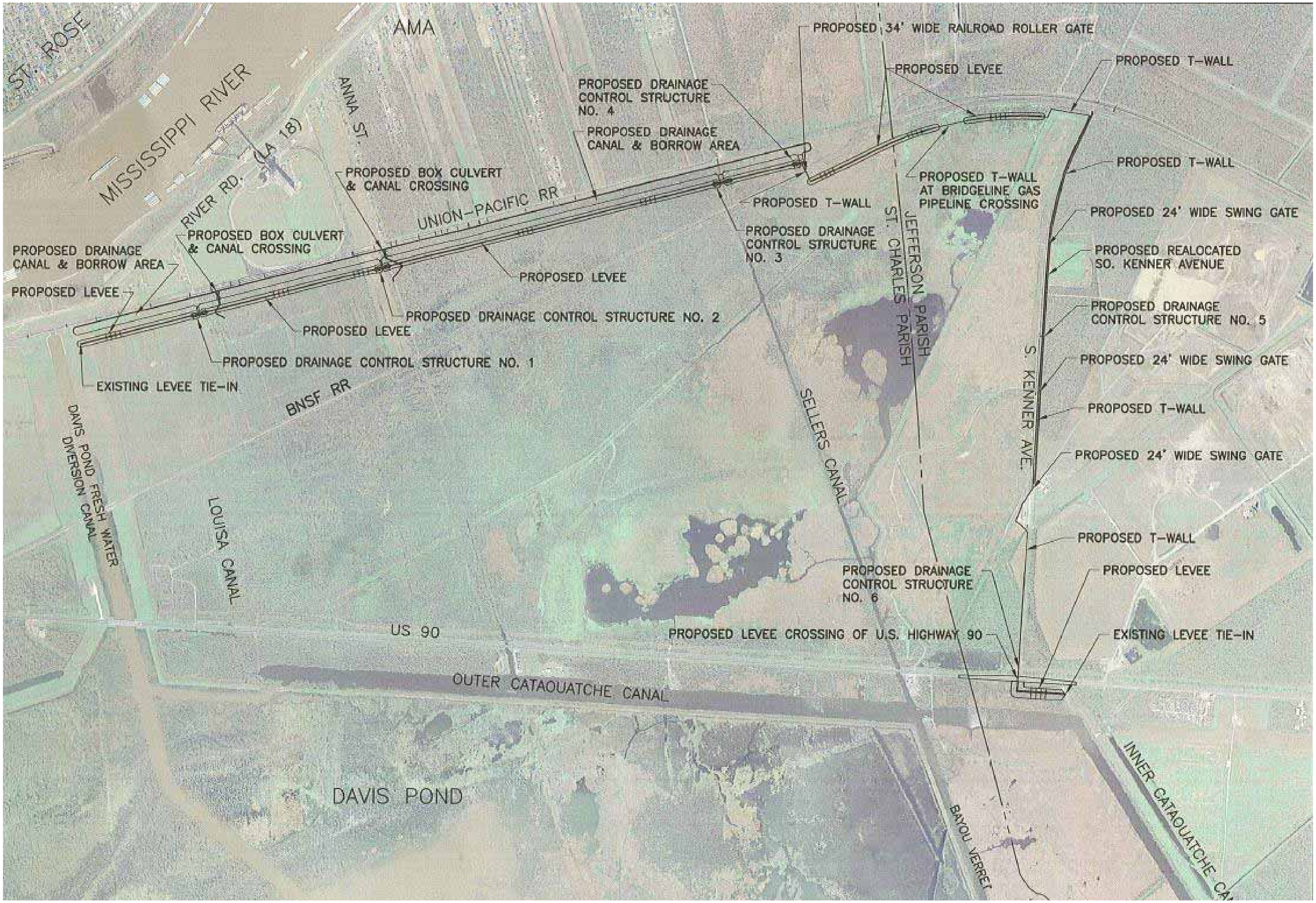
PDT AEP Meeting
3 Oct 08

Western Tie-In

3 Alternative Alignments Evaluated in AEP

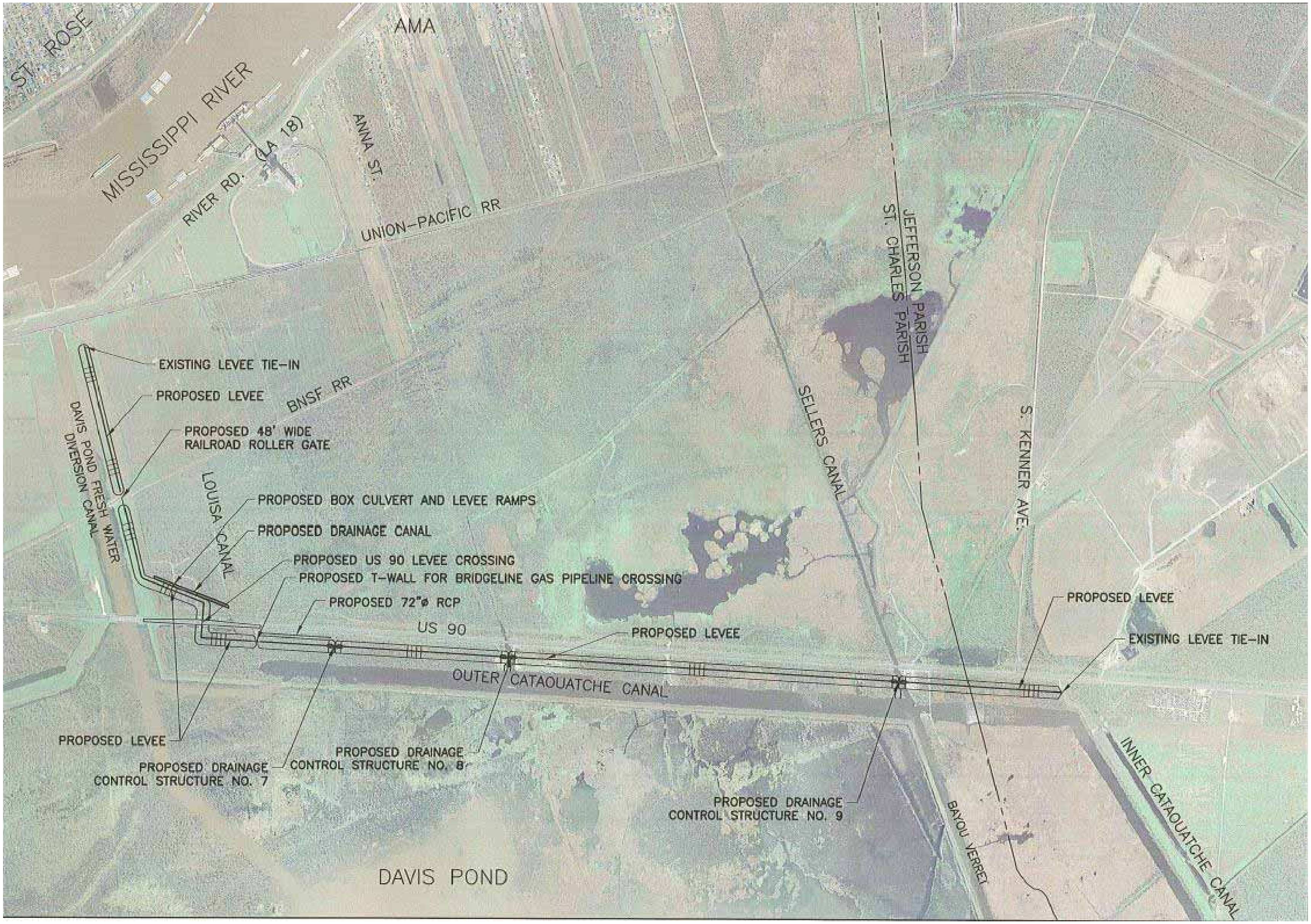


Alternative 1



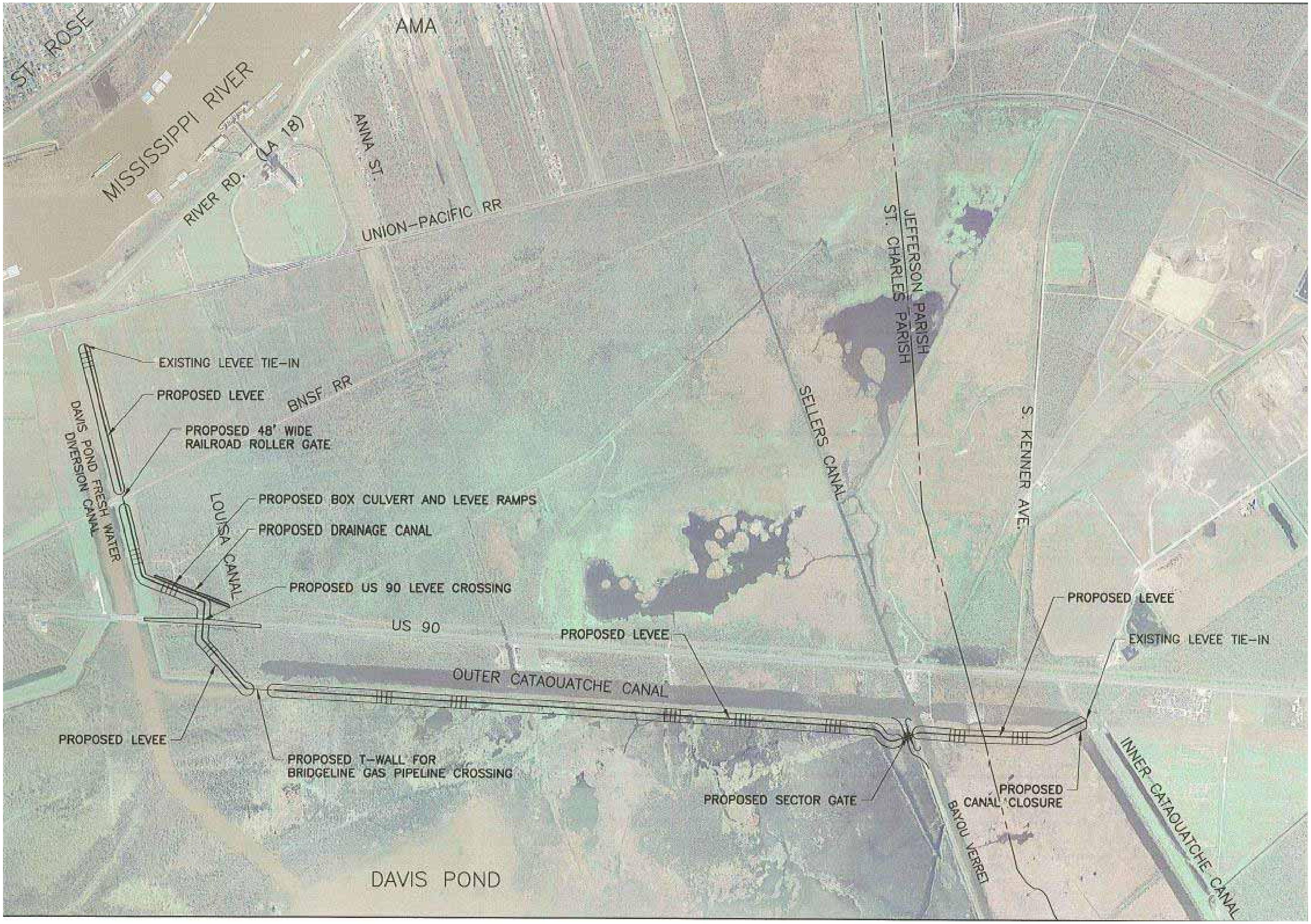
Earthen levee and T walls along South Kenner Road and railroad embankment.

Alternative 2



This alignment consists of the construction of a levee starting just south of Highway 90.

Alternative 3



Similar to Align. 2, however, the levee that parallels Highway 90 will be constructed South of the Outer Cataouatche Canal.

AEP Evaluation Criteria

3 Alternatives were evaluated against the following criteria:

- Risk Reduction and Reliability
- Environmental
  - Human
  - Natural
- Cost
- Time and Constructability
- Operations and Maintenance Considerations

Based on programmatic system guidance for weighting criteria, and PDT considerations of site specific information, risk reduction and reliability carried the highest weight, environmental, cost and time were weighed equal and with the second highest weight and operations and maintenance considerations had the least weight.

Western Tie In - Alternative Evaluation (Summary)

Criteria	Alternative 1	Alternative 2	Alternative 3
Risk Reduction/ Reliability	Assessed by PDT with lower reliability than Alts 2 and 3 due primarily to increased number of sluice gates, valves, etc requiring human/mechanical dependency	Alt 2's reliability was assessed slightly lower than Alt 3 due primarily to Alt 2 having more sluice gates and valves to accommodate water exchange thru Hwy 90. Alt 2 protects Hwy 90, a hurricane evacuation route	Determined by PDT to have the greatest reliability based on project features, avoidance of landfill encroachment, and protection on Hwy 90
Environmental (Human)	Like Alt 3 does not require the relocation of residents or businesses; however, does not protect area just south of Hwy 90 and does expose GNO landfill outside of protected area	Has the most adverse impact on the human environment; requires relocation of residential and at least one business facilities	Has the least adverse impact on the human environment as it does not require relocation of residential or business facilities; protects the residents immediately south of Hwy 90
Environmental (Natural)	Direct wetland impacts: 194 acres land impacted 2.3 acres open water impact Little to no secondary impacts	Direct wetland impacts: 233 acres land impacted 35 acres open water impacted Potential secondary impacts; above Hwy 90 mitigated (avoided/minimized) by drainage structures in Bayou Verret	Direct wetland impacts: 280 acres land impacted 16 acres open water impacted Potential secondary impacts; mitigated above Hwy 90 (avoided/minimized) by drainage structures in Bayou Verret Two areas below HWY 90 will have reduced water exchange 160 acres of wetlands and 100 acres of open water and a 63 acre area west of west closure will be connected to Davis Pond via 50 ft gap
Time/ Constructability	Longest estimated construction duration at 700 days; ROW acquisition duration estimated w/in design schedule. Est Completion ~ Jun 2011	Shortest estimated construction duration at 500 days; however, most difficult and most time for ROW acquisition. Est Completion ~ Jun 2011	Estimated construction duration ~ 660 days; also the least time for ROW acquisition. Est Completion ~ Jun 2011
Cost *	Total Project Cost (to include RE, mitigation and construction) $200M to $220M	Total Project Cost (to include RE, mitigation and construction) $130M to $150M	Total Project Cost (to include RE, mitigation and construction) $155M to $175M
Operations and Maintenance	Most operations and maintenance considerations due to # of structures requiring operation and concern for encroachment due to proximity to landfill and railroad	Less number of operable structures than Alt 1 and some consolidation of State's O&M responsibilities (WBV & DP)	Least overall operations and maintenance considerations and most consolidation of State's responsibilities (WBV & DP)

* Recon to Feasibility Level Cost Estimates

PDT AEP Recommended Proposed Action: **Alternative 3**

Major Project Features

- Levee tie ins at Lake Cataouatche Levee
- Bayou Verret Closure Structure
  - Structure with 56-ft wide navigation opening
  - Additional structures with 110 square feet of cross section
- East/West levee along Davis Pond East Guide Levee alignment
- Hwy 90 Crossing
  - Floodwalls
  - Elevated Roadway
- North/South levee along Davis Pond East Guide Levee alignment
- Railroad Crossing Floodgates (2; BNSF and UP)
- LA 18 (River Road) Floodgate w/Emergency Bypass route

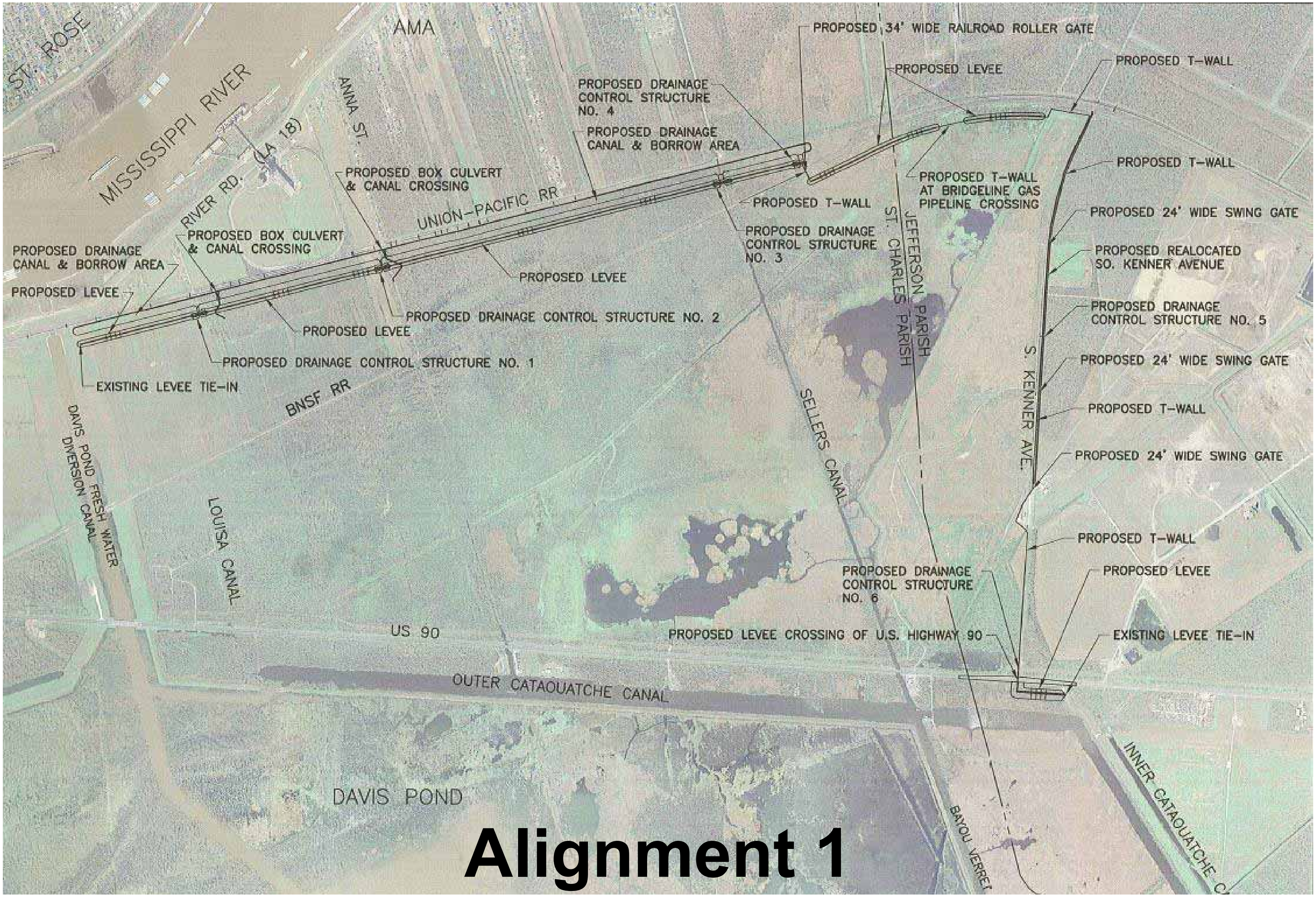
MVN PDT has determined that based on risk reduction and reliability, environmental impacts, cost, time and constructability and operations and maintenance considerations; Alternative 3 is the least damaging practicable alternative to provide the 100 year level of protection for the Western Tie In portion of the West Bank hurricane and storm damage risk reduction system.

Western Tie-In Alternative Evaluation Process Environmental Criteria

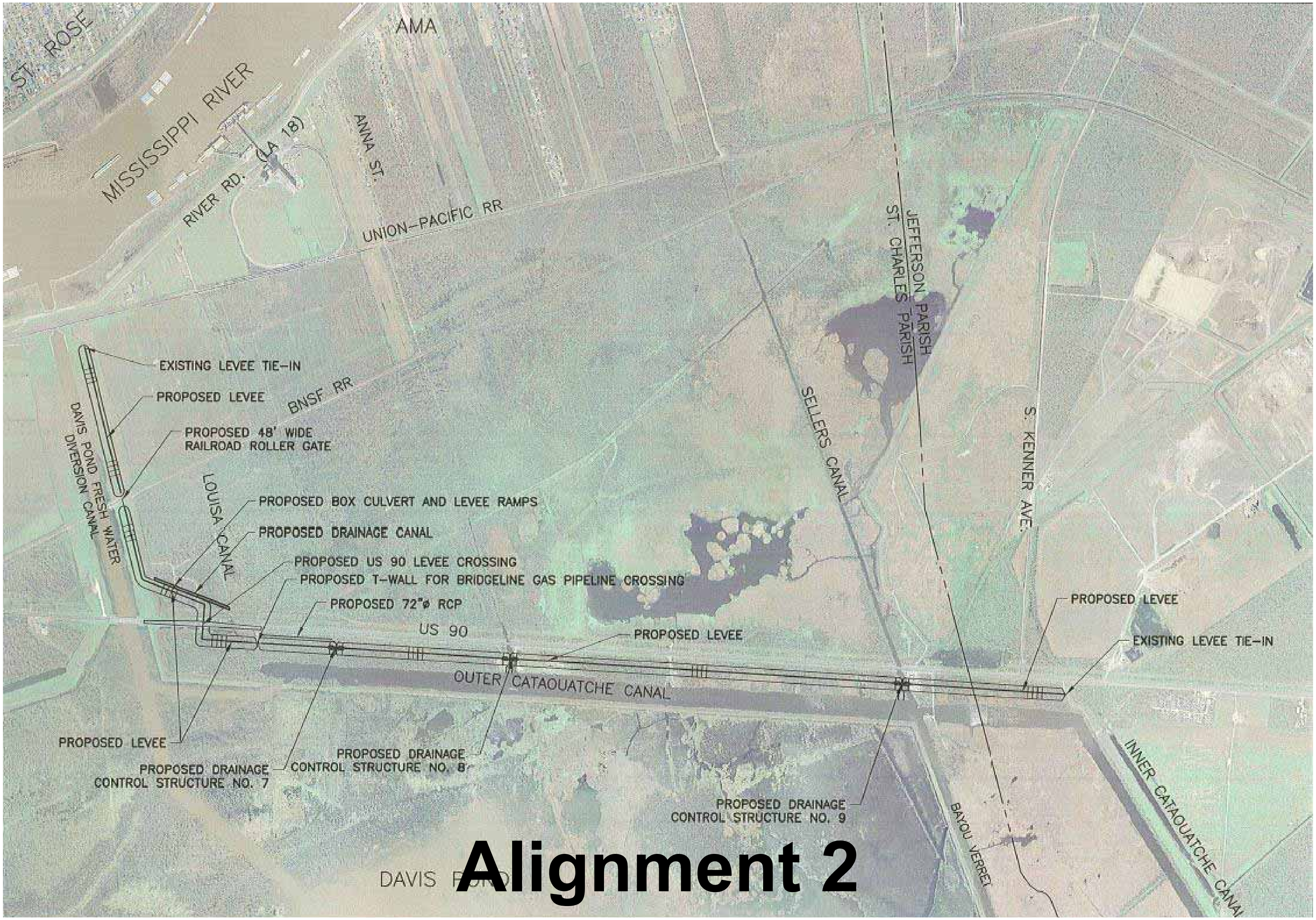
Interagency Meeting
6 April 09

Agenda

- Introduction / Ground Rules
- Maps of each alternative
- Relative Comparison Matrix (Criteria)
- Weighting (Relative Importance)
- Scoring
- Comments
- PDT Recommendation and Selection

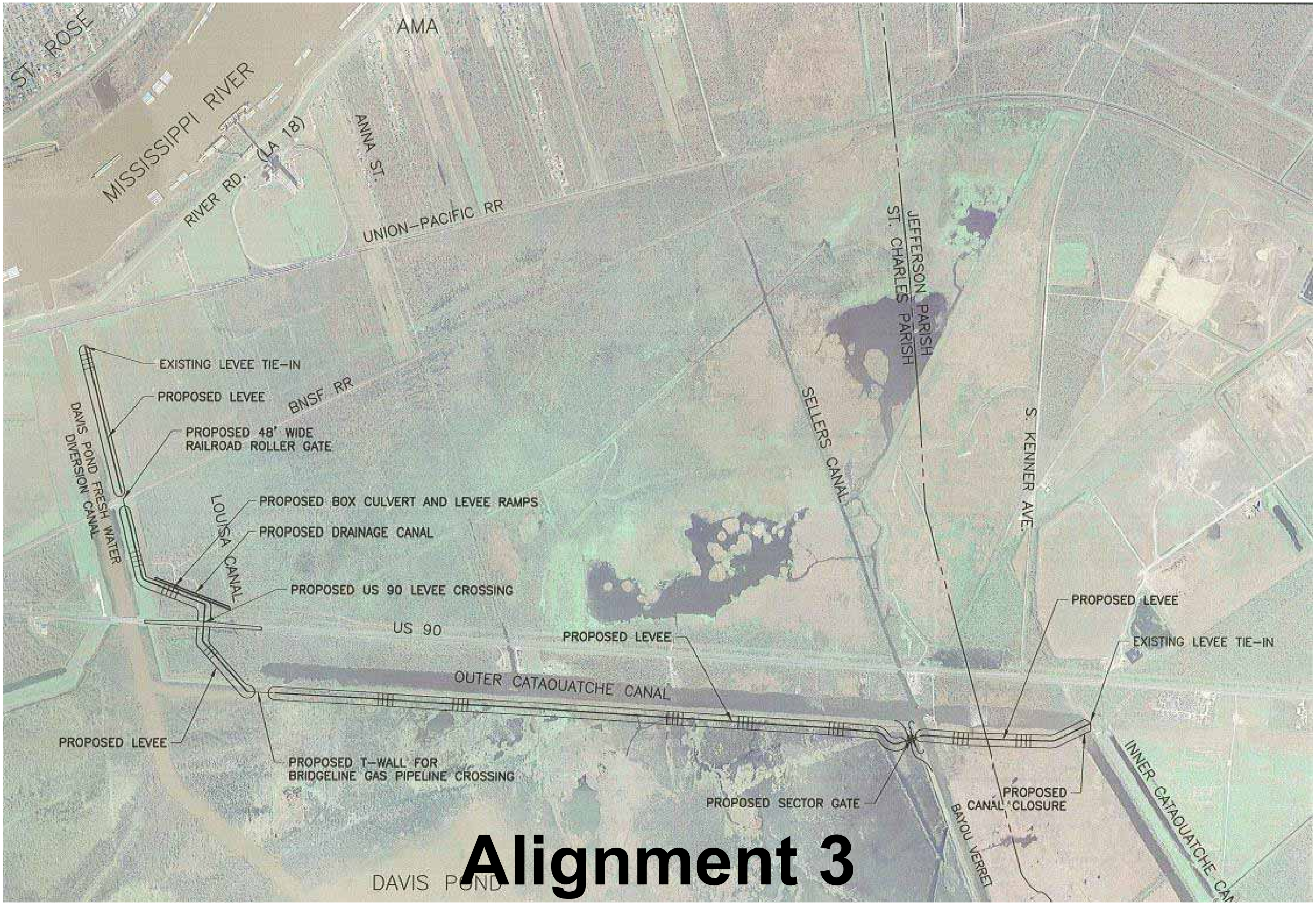


Earthen levee and T walls along South Kenner Road and railroad embankment.



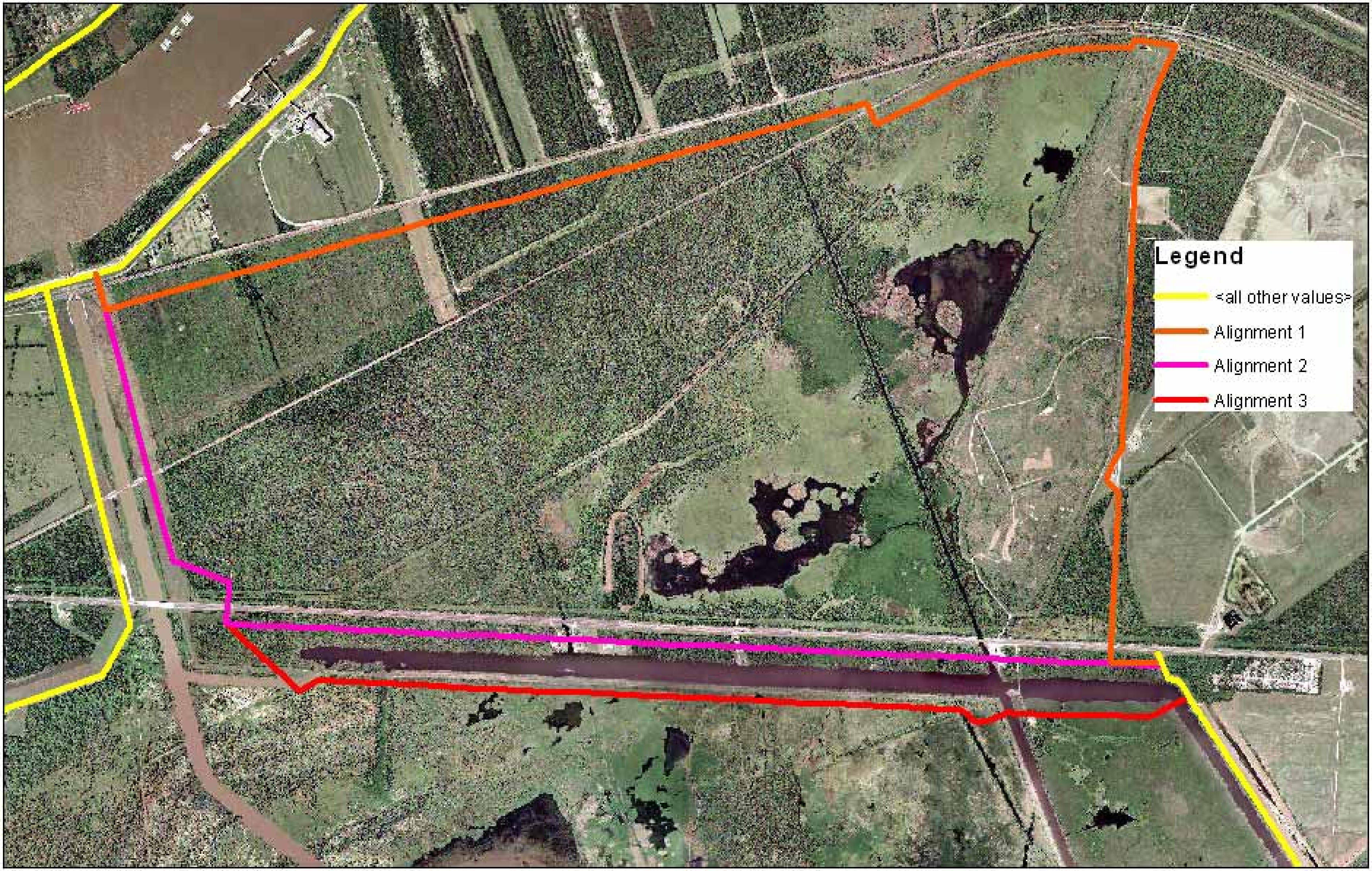
Alignment 2

This alignment consists of the construction of a levee starting just south of Highway 90.



Similar to Align. 2, however, the levee that parallels Highway 90 will be constructed South of the Outer Cataouatche Canal.

Western Tie-In Proposed Alignments



Criteria

Criteria	**Weight**
Total Environmental	20%
Environmental (Natural)	15%
Environmental (Human)	5%

Alternative Analysis
Environmental (Natural)

	Alternative 1	Alternative 2	Alternative 3
Evaluation	**Direct Wetlands Impacts** **194 acres land impacted** **2.3 acres open water impacted** **Does not enclose wetlands hydrology not impacted** **Possible HTRW impacts** **Possible wetland impacts due to pipeline relocation** **Possible cultural impacts** **Potentially facilitates costal restoration**	**Direct Wetlands Impacts** **233 acres land impacted** **35 acres open water impacted** **Combined Cross Section above HWY 90 mitigated (avoided/minimized) by drainage structures in Bayou Verret** **Increases potential for induced development** **Potential decrease in water quality and accelerated wetland loss rates** **Does not facilitate costal restoration** **Requires the relocation of 2 active well heads**	**Direct Wetlands Impacts** **280 acres land impacted** **16 acres open water impacted** **Combined Cross Section above HWY 90 mitigated (avoided/minimized) by drainage structures in Bayou Verret** **Combined Cross Section in area below HWY 90 and above east-west levee alignment reduced (approximately 160 acres of wetlands and 100 acres of open water)** **63 acres west of west closure plug cut off from Outer Cataouatche Canal and connected to Davis Pond through 50 ft gap** **Increases potential for induced development** **Potential decrease in water quality and accelerated wetland loss rates** **Does not facilitate costal restoration** **Improves the Davis Pond Guide Levee**
Score	4	1	1

Alternative Analysis
Environmental (Human)

	Alternative 1	Alternative 2	Alternative 3
Evaluation	Some traffic and noise due to transportation of material to the site	**Relocation of multiple residencies and one business (Pier 90)** Some traffic and noise due to transportation of material to the site	Some traffic and noise due to transportation of material to the site
Score	4	1	1

Rollup

	Weight	Alternative 1		Alternative 2		Alternative 3	
		Raw	Weighted	Raw	Weighted	Raw	Weighted
Environmental (Natural)	15%	4.00	0.60	1.00	0.15	1.00	0.15
Environmental (Human)	5%	4.00	0.20	1.00	0.05	1.00	0.05
TOTAL			0.80		0.20		0.20
% of Total Available			16%		4%		4%

	Weight	Alternative 1		Alternative 2		Alternative 3	
		Raw	Weighted	Raw	Weighted	Raw	Weighted
Environmental (Natural)	15%	4.00	0.60	1.00	0.15	1.00	0.15
Environmental (Human)	5%	2.00	0.10	1.00	0.05	3.00	0.15
TOTAL			0.70		0.20		0.30
% of Total Available			14%		4%		6%

Conclusion

- Alternative Selected was Alternative 1
- Comments

APPENDIX I – INTERAGENCY CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Ave. South
St. Petersburg, FL 33701
(727) 824-5312, FAX (727) 824-5309
http://sero.nmfs.noaa.gov

NOV - 8 2007

F/SER3:TM

Ms. Elizabeth Wiggins
Chief, Environmental Planning and
Compliance Branch
Department of the Army
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267

Dear Ms. Wiggins:

This correspondence responds to the Department of the Army's letter dated October 26, 2007, regarding the proposed Levee and Floodwall Replacement Projects, IERs 15, 16, and 17 in St. Charles and Jefferson Parishes, Louisiana.

As requested, enclosed is a list of federally-protected species under the jurisdiction of the National Marine Fisheries Service for the state of Louisiana.

We look forward to continued cooperation with the Army in conserving our endangered and threatened resources. If you have any questions regarding the ESA consultation process, please contact Mr. Robert Hoffman, fishery biologist, at (727) 824-5312, or by e-mail at Robert.Hoffman@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
Protected Resources Division

Enclosure

File: 1514-22.F.1.LA

Endangered and Threatened Species and Critical Habitats
under the Jurisdiction of the NOAA Fisheries Service

Louisiana

Listed Species	Scientific Name	Status	Date Listed
Marine Mammals			
blue whale	*Balaenoptera musculus*	Endangered	12/02/70
finback whale	*Balaenoptera physalus*	Endangered	12/02/70
humpback whale	*Megaptera novaeangliae*	Endangered	12/02/70
sei whale	*Balaenoptera borealis*	Endangered	12/02/70
sperm whale	*Physeter macrocephalus*	Endangered	12/02/70
Turtles			
green sea turtle	*Chelonia mydas*	Threatened[1]	07/28/78
hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	06/02/70
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	12/02/70
leatherback sea turtle	*Dermochelys coriacea*	Endangered	06/02/70
loggerhead sea turtle	*Caretta caretta*	Threatened	07/28/78
Fish			
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Threatened	09/30/91

Designated Critical Habitat
Gulf Sturgeon: A final rule designating Gulf sturgeon critical habitat was published on March 19, 2003 (68 FR 13370) and 14 geographic areas (units) among the Gulf of Mexico rivers and tributaries were identified. Maps and details regarding the final rule can be found at alabama.fws.gov/gs

Species Proposed for Listing
None

Proposed Critical Habitat
None

[1] Green turtles are listed as threatened, except for breeding populations of green turtles in Florida and on the Pacific Coast of Mexico, which are listed as endangered.

Louisiana

Candidate Species[2]	Scientific Name
None	

Species of Concern[3]	Scientific Name
Fish	
dusky shark	*Carcharhinus obscurus*
night shark	*Carcharinus signatus*
saltmarsh topminnow	*Fundulus jenkinsi*
sand tiger shark	*Carcharias taurus*
speckled hind	*Epinephelus drummondhayi*
Warsaw grouper	*Epinephelus nigritus*
white marlin	*Tetrapturus albidus*
Invertebrates	
ivory bush coral	*Oculina varicosa*

[2] The Candidate Species List has been renamed the Species of Concern List. The term "candidate species" is limited to species that are the subject of a petition to list and for which NOAA Fisheries Service has determined that listing may be warranted (69 FR 19975).

[3] Species of Concern are not protected under the Endangered Species Act, but concerns about their status indicate that they may warrant listing in the future. Federal agencies and the public are encouraged to consider these species during project planning so that future listings may be avoided.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

November 26, 2007

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Lee

Please reference the Individual Environmental Reports (IER) being prepared under the approval of the Council on Environmental Quality (CEQ) that will partially fulfill the U.S. Army Corps of Engineers (Corps) compliance with the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in those IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps to upgrade two existing hurricane protection projects (i.e., Westbank and Vicinity of New Orleans and Lake Pontchartrain and Vicinity) in the Greater New Orleans area in southeast Louisiana. This draft report contains a description of resources in the project area and provides planning objectives and recommendations to minimize project impacts on those resources.

The proposed protection was authorized by Supplemental 4 which directed the Corps to proceed with engineering, design, modification, and construction, where necessary, of the Lake Pontchartrain and Vicinity and the West Bank and Vicinity Hurricane Protection Projects so those projects would provide 100-year hurricane protection. Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has prevented our agencies from following the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval.

Because of the uncertainties regarding the project design, the project's impacts are undetermined at the current stage of planning, therefore, we cannot complete our evaluation of the IER's effects on fish and wildlife resources and cannot entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Accordingly, extensive additional Service involvement during subsequent detailed planning, engineering, design, and construction phase of each IER, along with more-definitive project information that will be available during those planning phases, will be required so that we can fulfill our responsibilities under that Act. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing post-authorization draft and final supplemental 2(b) reports to this programmatic report for each IER. Therefore, this report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. This report has not been reviewed by the Louisiana Department of Wildlife and Fisheries (LDWF) or the National Marine Fisheries Service (NMFS) but their comments on this report will be provided under separate cover.

Should you or your staff have any questions regarding this letter and our attached report, please contact David Walther (337/291-3122) of this office.

Sincerely,

James F. Boggs
Acting Supervisor
Louisiana Field Office

Attachment

cc: National Marine Fisheries Service, Baton Rouge, LA
EPA, Dallas, TX
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources, CMD, Baton Rouge, LA
LA Dept. of Natural Resources, CRD, Baton Rouge, LA

Draft Fish and Wildlife Coordination Act Report
for the
Individual Environmental Reports (IER)

Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
DAVID WALTHER
FISH AND WILDLIFE BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA
NOVEMBER 2007

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

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EXECUTIVE SUMMARY

The Corps of Engineers New Orleans District (Corps) is preparing Individual Environmental Reports (IER) under the approval of the Council on Environmental Quality (CEQ). Those IERs will partially fulfill the Corps compliance with the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in those IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps to upgrade two existing hurricane protection projects (i.e., Westbank and Vicinity of New Orleans and Lake Pontchartrain and Vicinity) in the Greater New Orleans area in southeast Louisiana. This draft report contains a description of resources in the project area and provides planning objectives and recommendations to minimize project impacts on those resources.

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This report incorporates and supplements our FWCA Reports that addressed impacts and mitigation features for the Westbank and Vicinity of New Orleans (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the Lake Pontchartrain and Vicinity Hurricane (dated July 25, 1984, and January 17, 1992) Protection projects. Impacts and mitigation needs resulting from government and contractor provided borrow areas have been addressed in an October 25, 2007, and a November 1, 2007, FWCA reports, respectively. Therefore, this report will not address those borrow impacts and future impacts will be addressed in FWCA supplements to those FWCA reports. In addition, specific recommendations for mitigation will be addressed in separate FWCA reports because mitigation is still within early planning phases and lacks sufficient details to be adequately addressed.

Construction of the increased flood protection would result in un-quantified habitat losses. The Service does not object to providing improved hurricane protection to the Greater New Orleans area provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation:

1. To the greatest extent possible, situate flood protection features so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.

2. Minimize enclosure of wetlands with new levee alignments. When enclosing wetlands is unavoidable, acquire non-development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

3. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction.

4. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

5. The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features.

6. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LDWF, Environmental Protection Agency (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.

7. The Corps should avoid impacts to public lands, if feasible. If not feasible the Corps should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance. Points of contacts for the agencies potentially impacted by project features are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Bayou Sauvage National Wildlife Refuge (NWR), Office of State Parks contact Mr. John Lavin at 1-888-677-1400, National Park Service (NPS), contact Superintendent David Luchsinger, (504) 589-3882 extension 137 (david_luchsinger@nps.gov) or Chief of Resource Management David Muth (504)

589-3882 extension 128, (david_muth@nps.gov) and for the 404(c) area contact the previously mentioned NPS personnel and Ms. Barbara Keeler (214) 665-6698 with the EPA.

8. If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

9. If mitigation lands are purchased for inclusion within a NWR those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A. Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore if they are proposed as a manager of a mitigation site they should be contacted early in the planning phase regarding such requirements.

10. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

11. In general, larger and more numerous openings in a protection levee better maintain estuarine dependent fishery migration. Therefore, as much opening as practicable, in number, size, and diversity of locations should be incorporated into project levees.

12. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.

13. Flood protection water control structures should remain completely open except during storm events. Management of those structures should be developed in coordination with the Service, NMFS, LDWF, and LDNR.

14. Any flood protection water control structure sited in canals, bayous, or navigation channels that does not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.

15. The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.

16. Flood protection structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

17. To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during <u>peak</u> flood or ebb tides do not exceed 2.6 feet

per second. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.

18. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.

19. Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and one at natural stream crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500-feet long and an area would hydrologically isolated without that culvert.

20. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

21. Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.

22. Operational plans for water control structures should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

23. The Corps shall fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

24. Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

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

26. A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, EPA, LDNR and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

INTRODUCTION

The Corps of Engineers New Orleans District (Corps) is preparing Individual Environmental Reports (IER) under the approval of the Council on Environmental Quality (CEQ). Those IERs will partially fulfill the Corps compliance with the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347). IERs are a CEQ approved alternative arrangement for compliance with NEPA that would allow expedited implementation of improved hurricane protection measures. Work proposed in those IERs would be conducted under the authority of Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps to upgrade two existing hurricane protection projects (i.e., Westbank and Vicinity of New Orleans and Lake Pontchartrain and Vicinity) in the Greater New Orleans area in southeast Louisiana. This draft report contains a description of resources in the project area and provides planning objectives and recommendations to minimize project impacts on those resources.

Because of the uncertainties regarding the project design, the project's impacts are undetermined at the current stage of planning, therefore, we cannot complete our evaluation of the IER's effects on fish and wildlife resources and cannot entirely fulfill our reporting responsibilities under Section 2(b) of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). Therefore, extensive additional Service involvement during subsequent detailed planning, engineering, design, and construction phases of each IER, along with more-definitive project information that will be available during those planning phases, will be required so that we can fulfill our responsibilities under that Act. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing post-authorization draft and final supplemental 2(b) reports to this programmatic report for each IER.

This report incorporates and supplements our FWCA Reports that addressed impacts and mitigation features for the Westbank and Vicinity of New Orleans (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the Lake Pontchartrain and Vicinity Hurricane (dated July 25, 1984, and January 17, 1992) Protection projects. Impacts and mitigation needs resulting from government and contractor provided borrow areas have been addressed in an October 25, 2007, and a November 1, 2007, FWCA reports, respectively, therefore this report will not address those project features. This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. It has not be reviewed by the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Marine Fisheries Service (NMFS), but their comments on this report will be forwarded under separate cover.

DESCRIPTION OF THE STUDY AREA

The study area is located within the Mississippi River Deltaic Plain of the Lower Mississippi River Ecosystem. Portions of Jefferson, Orleans, St. Charles, St. Bernard and Plaquemines Parishes are included in the study area. Higher elevations occur on the natural levees of the

Mississippi River and its distributaries. Developed lands are primarily associated with natural levees, but extensive wetlands have been leveed and drained to accommodate residential, commercial, and agricultural development. Federal, State, and local levees have been installed for flood protection purposes, often with negative effects on adjacent wetlands. Navigation channels such as the Gulf Intracoastal Waterway and the Mississippi River – Gulf Outlet are also prominent landscape features, as are extensive oil and gas industry access channels and pipeline canals. Extensive wetlands and associated shallow open waters dominate the landscape outside the flood control levees. Major waterbodies include Lake Pontchartrain located north of the project area, the Mississippi River which bisects the project area, and Lake Borgne which is located on the eastern edge of the project area.

FISH AND WILDLIFE RESOURCES

Description of Habitats

Habitat types in the project area include forested wetlands (i.e., bottomland hardwoods and/or swamps), non-wet bottomland hardwoods, marsh, open water, and developed areas. Due to urban development and a forced-drainage system, the hydrology of most of the forested habitat has been altered. The forced-drainage system has been in operation for many years, and subsidence is evident throughout the areas enclosed by levees.

Wetlands (forested, marsh, and scrub-shrub) within the study area provide plant detritus to adjacent coastal waters and thereby contribute to the production of commercially and recreationally important fishes and shellfishes. Wetlands in the project area also provide valuable water quality functions such as reduction of excessive dissolved nutrient levels, filtering of waterborne contaminants, and removal of suspended sediment. In addition, coastal wetlands buffer storm surges reducing their damaging effect to man-made infrastructure within the coastal area.

Factors that will strongly influence future fish and wildlife resource conditions outside of the protection levees include freshwater input and loss of coastal wetlands. Depending upon the deterioration rate of marshes, the frequency of occasional short-term saltwater events may increase. Under that scenario, tidal action in the project area may increase gradually as the buffering effect of marshes is lost, and use of that area by estuarine-dependent fishes and shellfish tolerant of saltwater conditions would likely increase. Regardless of which of the above factors ultimately has the greatest influence, freshwater wetlands within and adjacent to the project area will probably experience losses due to development, subsidence, and erosion.

The ongoing loss of coastal Louisiana wetlands (approximately 1,149 square miles between 1956 and 2004; average loss rate of 24 square miles per year) was recently exacerbated by Hurricanes Katrina and Rita in 2005. Those hurricanes caused an initial loss of wetlands equivalent to 9 years (approximately 217 square miles) of mean annual losses. Louisiana wetlands provide 26 percent of the seafood landed in the conterminous United States and over 5 million migratory waterfowl utilize those wetlands every year. In addition, those wetlands provide protection to coastal towns, cities and their infrastructure, as well as important infrastructure for the nation's oil and gas industry.

Non-wet bottomland hardwoods within the project area also provide habitat for wildlife resources. Between 1932 and 1984, the acreage of bottomland hardwoods in Louisiana declined by 45 percent (Rudis and Birdsey 1986). By 1970, Jefferson Parish was classified as entirely urban or nonforested in the U.S. Forest Service's forest inventory with most of this loss resulting from development within non-wet areas inside the hurricane protection levees. A large percentage of the original bottomland hardwoods within the Mississippi River floodplain in the Deltaic Plain are located within levees. However, losses of that habitat type are not regulated or mitigated with the exception of impacts resulting from Corps projects as required by Section 906(b) of the Water Resources Development Act of 1986.

As previously mentioned, the Service has provided FWCA Reports for the two-subject protection projects. Those reports contain a through discussion of the significant fish and wildlife resources (including those habitats) that occur within the study area. For brevity, that discussion is incorporated by reference herein but the following brief descriptions are provided to update the previously mentioned information.

Forested Habitats

Forested habitats in the study area are divided into two major types; bottomland hardwood forests and cypress-tupelo swamps. Bottomland hardwood forests found in the project area occur primarily on the natural levees of the Mississippi River or former distributary channels. Dominant vegetation may include sugarberry, water oak, live oak, bitter pecan, black willow, American elm, Drummond red maple, Chinese tallow-tree, boxelder, green ash and elderberry. Most bottomland hardwoods that are located within the constructed hurricane protection projects have been degraded by forced drainage and resultant subsidence. Those areas are also often fragmented by development. Conversely, those bottomland hardwoods located outside the protection levees or in areas where structures through the levees maintain a hydrologic connection, still retain many wetland functions and values.

Cypress-tupelo swamps are located along the flanks of larger distributary ridges as a transition zone between bottomland hardwoods and lower-elevation marsh or scrub-shrub habitats. Cypress-tupelo swamps exist where there is little or no salinity, usually minimal daily tidal action and are usually flooded throughout most of the growing season. Bald cypress-tupelogum are the dominant vegetation within this habitat type, however, Drummond red maple, green ash, and black willow are also common. Cypress swamps that are within the levee system and under forced drainage are often dominated by bald cypress, but vegetative species more typical of bottomland hardwoods will dominate the under- and mid-story vegetation. These sites will often have ecological functions closer to those of a bottomland hardwood. Because of their altered hydrology, these areas can potentially convert to sites dominated by bottomland hardwood species.

Marshes

Marsh types within the project area include fresh, intermediate, brackish, and saline. Fresh marshes occur at the upper ends of interdistributary basins and are often characterized by floating or semi-floating organic soils and minimal daily tidal action. Vegetation may include maidencane, bulltongue, cattail, California bulrush, pennywort, giant cutgrass, American cupscale, spikerushes, bacopa, and alligatorweed. Associated open water habitats may often support extensive beds of floating-leafed and submerged aquatic vegetation including water hyacinth, Salvinia, duckweeds, American lotus, white water lily, water lettuce, coontail, Eurasian milfoil, hydrilla, pondweeds, naiads, fanwort, wild celery, water stargrass, elodea, and others.

Intermediate marshes are a transitional zone between fresh and brackish marshes and are often characterized by organic, semi-floating soils. Typically, intermediate marshes experience low levels of daily tidal action. Salinities are negligible or low throughout much of the year, with salinity peaks occurring during late summer and fall. Vegetation includes saltmeadow cordgrass, deer pea, three-cornered grass, cattail, bulltongue, seashore paspalum, wild millet, fall panicum, and bacopa. Ponds and lakes within the intermediate marsh zone often support extensive submerged aquatic vegetation including southern naiad, Eurasian milfoil, and wigeongrass.

Brackish marshes are characterized by low to moderate daily tidal energy and by soils ranging from firm mineral soils to organic semi-floating soils. Freshwater conditions may prevail for several months during early spring; however, low to moderate salinities occur during much of the year, with peak salinities in the late summer or fall. Vegetation is usually dominated by saltmeadow cordgrass, but also includes saltgrass, three-cornered grass, leafy three-square, and deer pea. Shallow brackish marsh ponds occasionally support abundant beds of wigeongrass.

Saline marshes occur along the fringe of the coastal wetlands. Those marshes usually exhibit fairly firm mineral soils and experience moderate to high daily tidal energy. Vegetation is dominated by saltmarsh cordgrass but may also include saltgrass, saltmeadow cordgrass, black needlerush, and leafy three-square. Submerged aquatic vegetation is rare. Within the study area, intertidal mud flats are most common in saline marshes.

Scrub-Shrub Habitats

Scrub-shrub habitat is often found along the flanks of distributary ridges and in marshes altered by spoil deposition or drainage projects. Typically it is bordered by marsh at lower elevations and by developed areas, cypress-tupelo swamp, or bottomland hardwoods at higher elevations. Typical scrub-shrub vegetation includes elderberry, wax myrtle, buttonbush, black willow, Drummond red maple, Chinese tallow-tree, and groundselbush. Some scrub-shrub habitat is an early successional stage of bottomland hardwood forests.

Open-Water Habitats

Open-water habitat within the project area consists of ponds, lakes, canals, bays, and bayous. Natural marsh ponds and lakes are typically shallow, ranging in depth from 6 inches to over 2 feet. Typically, the smaller ponds are shallow and the larger lakes and bays are deeper. In fresh and low-salinity areas, ponds and lakes may support varying amounts of submerged and/or floating-leaved aquatic vegetation. Brackish and, much less frequently, saline marsh ponds and lakes may support wigeongrass beds.

Canals and larger bayous typically range in depth from 4 or 5 feet, to over 15 feet. Strong tidal flows may occur at times through those waterways, especially where they provide hydrologic connections to other large waterbodies. Such canals and bayous may have mud or clay bottoms that range from soft to firm. Dead-end canals and small bayous are typically shallow and their bottoms may be filled in to varying degrees with semi-fluid organic material. Erosion due to wave action and boat wakes, together with shading from overhanging woody vegetation, tends to retard the amount of intertidal marsh vegetation growing along the edges of those waterways.

Drainage canals enclosed within the hurricane protection project are stagnant except when pumps are operating to remove water. Runoff from developed areas has likely reduced the habitat value of that aquatic habitat by introducing various urban pollutants, such as oil, grease, and excessive nutrients. Clearing and development has eliminated much of the riparian habitat that would normally provide shade and structure for many aquatic species.

Developed Areas

Developed habitats in the study area include residential and commercial areas, as well as roads and existing levees. Those habitats do not support significant wildlife use. Most of the development is located on higher elevations of the Mississippi River natural levees and former distributary channels; however, vast acreages of swamp and marsh have been placed under forced drainage systems and developed. Limited amounts of agricultural lands occur through out the area; agriculture includes sugarcane farming, cattle production, and haying. Some development in wetlands is also occurring as result of permitted fill activities.

Fishery/Aquatic Resources

Drainage canals in the study area do not support significant fishery resources because of dense vegetation, poor water quality, and inadequate depth. Freshwater sport fishes present in the project area, but outside of the levees, include largemouth bass, crappie, bluegill, redear sunfish, warmouth, channel catfish, and blue catfish. Other fishes likely to be present include yellow bullhead, freshwater drum, bowfin, carp, buffalo, and gar. Estuarine-dependent fishes and shellfishes such as Atlantic croaker, red drum, spot, sand seatrout, spotted seatrout, southern flounder, Gulf menhaden, striped mullet, brown shrimp, white shrimp, and blue crab are found in the intermediate to saline marshes.

Some of the waterbodies in the project area meet criteria for primary and secondary contact recreation and partially meets criteria for fish and wildlife propagation, while others do not meet the criteria for fish and wildlife propagation. Causes for not fully meeting fish and wildlife propagation criteria include excessive nutrients, organic enrichment, low dissolved oxygen levels, flow and habitat alteration, pathogens and noxious aquatic plants. Indicated sources of those problems include hydromodification, habitat modification, recreational activities, and unspecified upstream sources. Municipal point sources, urban runoff, storm sewers, and onsite wastewater treatment systems are also known contributors to poor water quality in the area.

Deteriorating water quality in the Barataria Basin, at least partially correlated to wetlands loss and a commensurate reduction in the area's waste assimilation capacity, is a major problem affecting fish and wildlife in that portion of the study area. According to Bahr et al. (1983), factors that currently adversely affect water quality in the Barataria Basin are those generally related to urban development and associated urban pollution, altered land-use patterns, and hydrologic modifications (drainage, etc.) within the watershed. Two major human-related causes of water quality degradation include eutrophication and increased levels of toxic substances.

Essential Fish Habitat

Estuarine wetlands and associated shallow waters within the project area have been identified as Essential Fish Habitat (EFH) for both postlarval, juvenile and sub-adult stages of brown shrimp, white shrimp, and red drum, as well as the adult stages of those species in the nearshore and offshore reaches. EFH has also been designated for various life stages of Spanish mackerel, bluefish, cobia, and mangrove snapper in the nearshore, marine-portion of the project area and in the lower portions of the estuary. EFH requirements vary depending upon species and life stage. Categories of EFH in the project area include estuarine emergent wetlands, estuarine water column, submerged aquatic vegetation, and estuarine water bottoms. Detailed information on Federally managed fisheries and their EFH is provided in the 1998 generic amendment of the Fishery Management Plans for the Gulf of Mexico, prepared by the Gulf of Mexico Fishery Management Council (GMFMC). That generic amendment was prepared in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA); (P.L. 104-297). Estuarine-dependent species such as those listed above also serve as prey for other species managed under the MSFCMA by the GMFMC (e.g., red drum, mackerels, snappers, and groupers) and highly migratory species (e.g., billfishes and sharks) managed by the NMFS. Recommendations to minimize and/or avoid impacts to estuarine fishery species were developed by NMFS along with supporting literature and are included in Appendix B.

Wildlife Resources

Mammals known to occur in the project-area bottomland hardwoods and marshes include mink, raccoon, swamp rabbit, nutria, river otter, and muskrat. Those habitats also support a variety of birds including herons, egrets, ibises, least bittern, rails, gallinules, olivaceous cormorant, white pelican, pied-billed grebe, black-necked stilt, sandpipers, gulls, and terns. Forested and scrub-shrub habitats within the study area also provide habitat for many resident passerine birds and essential resting areas for many migratory songbirds including warblers, orioles, thrushes, vireos, tanagers, grosbeaks, buntings, flycatchers, and cuckoos. Many of these and other passerine birds have undergone a decline in population primarily due to habitat loss.

Given the extent of development and drainage, waterfowl use within the hurricane protection system is likely minimal, except in the adjacent wetlands outside the levees. Swamps, fresh and intermediate marshes usually receive greater waterfowl utilization than brackish and saline marshes because they generally provide more waterfowl food. Migratory species expected to occur in the project area include gadwall, green-winged teal, blue-winged teal, northern shoveler, mallard, pintail, American widgeon, lesser scaup, ring-necked duck, redhead, and canvasback. Resident species expected to occur in that area include mottled duck and wood duck.

The study area also supports resident hawks and owls including the red-shouldered hawk, barn owl, common screech owl, great horned owl, and barred owl. The red-tailed hawk, marsh hawk, and American kestrel are seasonal residents which utilize habitats within the study area.

Amphibians such as the pig frog, bullfrog, leopard frog, cricket frog, and Gulf coast toad are expected to occur in the fresh and low salinity wetlands of the project area. Reptiles such as the American alligator, snapping turtle, softshell turtle, red-eared turtle, and diamond backed terrapin are also expected to occur in the project-area wetlands and waterbodies.

Endangered and Threatened Species

To aid the Corps in complying with their proactive consultation responsibilities under the Endangered Species Act (ESA), the Service provided a list of threatened and endangered species and their critical habitats within the coastal parishes of the New Orleans District in an August 7, 2006, letter to the Corps. The Service recommends that the Corps conduct ESA consultation on each IER as soon as plans are developed and impact locations are identified. If the plans are changed significantly or relocated, or work is not implemented within 1 year following that coordination, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any Federally listed threatened or endangered species or their habitat.

Protected Species

The Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and the Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d) offer additional protection to many bird species within the project area including colonial nesting birds and the bald eagle (*Haliaeetus leucocephalus*).

The project area is located where colonial nesting waterbirds may be present. LDWF currently maintains a database of these colonies locations. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work sites for the presence of undocumented nesting colonies during the nesting season (e.g. February through September depending on the species). If colonies exist work should not be conducted within 1,000 feet of the colony during the nesting season

Forested habitat in the project-area may provide nesting habitat for the bald eagle, which has officially been removed from the List of Endangered and Threatened Species as of August 8,

2007. Although the bald eagle has been removed from the threatened and endangered species list, it continues to be protected under the MBTA and the BGEPA. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. Those guidelines recommend maintaining: (1) a specified distance between the activity and the nest (buffer area); (2) natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. A copy of the NBEM Guidelines is available at:
http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. If after consulting those guidelines you need further assistance in determining the appropriate size and configuration of buffers or the timing of activities in the vicinity of a bald eagle nest, the please contact this office.

National Wildlife Refuges, Parks, 404(c) area

Located within the study area are the Bayou Segnette and the St. Bernard State Parks, which are operated by the Louisiana Department of Culture, Recreation and Tourism, Office of State Parks. Please contact Mr. John Lavin at 1-888-677-1400 regarding work on those areas.

The Barataria Preserve unit of Jean Lafitte National Historical Park and Preserve (JLNHPP) is located on the west bank of the Mississippi River and managed by the National Park Service (NPS). NPS has no authority to enter into agreements with others to allow uses which adversely affect park lands. Therefore, NPS lands cannot be directly utilized or adversely impacted by any flood control project feature unless authorized explicitly by congress. For additional information concerning NPS lands within the area please contact Superintendent David Luchsinger, (504) 589-3882 extension 137 (david_luchsinger@nps.gov) or Chief of Resource Management David Muth (504) 589-3882 extension 128, (david_muth@nps.gov).

An area adjacent to the Jean Lafitte National Historic Park and Preserve (JLNHPP) was subject to an Environmental Protection Agency (EPA) Final Determination under the Clean Water Act (CWA) Section 404(c) in 1985. According to the EPA Final Determination, the discharge of any dredged or fill material within the approximately 3200 acre site, referred to as the Bayou aux Carpes 404(c) area, is restricted. The EPA action allowed for three specific exceptions, none of which appears to apply to the Corps' current hurricane protection proposal. Previous requests which have fallen outside those exceptions have been denied by EPA as being contrary to the CWA 404(c) determination. One such categorical denial prohibited the Corps from altering the alignment of the West Bank Hurricane Protection Levee such that it would encroach upon the Bayou aux Carpes 404(c) area.

The EPA 404(c) action was intended as an advance notification to the public and agencies of the government's determination under the CWA Section 404 for the area, in the sense of planning aid coordination. In light of this existing determination, we would expect the NEPA work on the portion of the levee forming the 404(c) boundary to thoroughly evaluate the range of feasible alternatives and their environmental impacts, as well as documenting the Corps' legal and regulatory authority for any alternative that would entail impacts to the Bayou aux Carpes 404(c) area.

The Bayou aux Carpes 404(c) is one of only 11 such actions ever completed by EPA. Approximately 2,800 acres within the site are in Federal ownership and Congress is considering legislation to adjust the boundary of the Barataria Preserve to include the Bayou aux Carpes within the JLNHPP. In the meantime, the National Park Service (NPS) has constructive possession of the area. Therefore, the Corps should contact both the NPS (see contacts above) and EPA (Ms. Barbara Keeler, 214/665-6698) regarding any proposed project feature that may impact that area.

The NPS also has constructive possession of additional Federal lands located adjacent to WBV14c. Congress is considering legislation to adjust the boundary of the Barataria Preserve to also include those lands (i.e., CIT tract) within the JLNHPP.

The Service's Bayou Sauvage National Wildlife Refuge is located in the eastern portion of the project area. The National Wildlife Refuge System Improvement Act of 1997 authorized that no new or expanded use of a refuge may be allowed unless it is first determined to be compatible. A compatibility determination is a written determination signed and dated by the Refuge Manager and Regional Refuge Chief, signifying that a proposed or existing use of a national wildlife refuge is a compatible use or is not a compatible use. A compatible use is defined as a proposed or existing wildlife-dependent recreational use or any other use of a national wildlife refuge that, based on sound professional judgment, will not materially interfere with or detract from the fulfillment of the National Wildlife Refuge System mission or the purposes of the national wildlife refuge. A compatibility determination is only required when the Service has jurisdiction over the use. For example, proposed uses that deal exclusively with air space, navigable waters or overly refuges where another Federal agency has primary jurisdiction over the area, would not be subject to compatibility.

Federal agencies proposing a project that includes features on a national wildlife refuge are encouraged to contact the Refuge Manager early in the planning process. The Refuge Manager will work with the project proponent to determine if the proposed project constitutes a "refuge use" subject to a compatibility determination. If the proposed project requires a compatibility determination, a concise description of the project (refuge use) including who, what, where, when, how and why will be needed to prepare the compatibility determination. In order to determine the anticipated impacts of use, the project proponent may be required to provide sufficient data and information sources to document any short-term, long-term, direct, indirect or cumulative impacts on refuge resources. Compatibility determinations will include a public review and comment before issuing a final determination.

All construction or maintenance activities (e.g., surveys, land clearing, etc.) on a National Wildlife Refuge (NWR) will require the Corps to obtain a Special Use Permit from the Refuge Manager; furthermore, all activities on that NWR must be coordinated with the Refuge Manager. Therefore, we recommend that the Corps request issuance of a Special Use Permit well in advance of conducting any work on the refuge. Please contact Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Bayou Sauvage National Wildlife Refuge for further information on compatibility of flood control features, and for assistance in obtaining a Special Use Permit. Close coordination by both the Corps and its contractor must be maintained with the Refuge Manager to ensure that construction and maintenance activities are carried out in accordance with provisions of any Special Use Permit issued by the NWR.

If mitigation lands are purchased for inclusion within a NWR, those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A. Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore if they are proposed as a manager of a mitigation site they should be contacted early in the planning phase regarding such requirements.

Future Fish and Wildlife Resources

The combination of subsidence and sea level rise is called submergence or land sinking. As the land sinks the wetlands become inundated with higher water levels, stressing most non-fresh marsh plants, bottomland hardwood plants and even cypress-tupelo swamps leading to plant death and conversion to open water. Other major causes of wetland losses within the study area include altered hydrology, storms, saltwater intrusion (caused by marine processes invading fresher wetlands), shoreline erosion, herbivory, and development activities including the direct and indirect impacts of dredge and fill (Louisiana Coastal Wetlands Conservation and Restoration Task Force and the Wetlands Conservation and Restoration Authority 1998). The continued conversion of wetlands and forested habitat to open water or developed land represent the most serious fish and wildlife-related problems in the study area. Those losses could be expected to cause significant declines in coastal fish and shellfish production and in the study area's carrying capacity for numerous migratory waterfowl, wading birds, other migratory birds, alligators, furbearers, and game mammals. Wetland losses will also reduce storm surge protection of developed lands, and will likely contribute to water quality degradation associated with excessive nutrient inputs.

ALTERNATIVES UNDER CONSIDERATION

The proposed plan involves upgrading the existing flood protection levees, floodwalls, and floodgates around the Greater New Orleans area. Most improvements will be constructed partially, sometimes entirely, within the existing right-of-way (ROW). However, some proposed closures, i.e., the Inner Harbor Navigation Canal and the Gulf Intracoastal Waterway, would require new construction ROWs and may impact high quality habitats. Some alternatives that have been examined include expanding ROWs into the lower quality habitat side of a levee, utilizing floodwalls so that minimal expansion of ROWs would occur and incorporating subsoil mixing that would also reduce the expansion of a levee ROW.

PROJECT IMPACTS

The Corps has not yet selected a recommended plan but is continuing to evaluate plans at several levels of protection for each IER. Although some construction will occur in developed areas and on existing levees, project implementation will also directly impact marshes, bottomland hardwoods, swamps, and shrub-scrub areas that provide low to high habitat values for diverse fish and wildlife resources. Project impacts would result primarily from levee rights-of-way (ROW) expansion and construction of levees, borrow pits, floodwalls, navigable floodgates, and associated features.

Development is ongoing within the hurricane protection levees; therefore, the Service has assumed that, for this specific project, project-induced development within enclosed wetlands will be insignificant. However, project impacts to non-wet bottomland hardwoods as a result of flood protection improvements should be mitigated.

To quantify anticipated project impacts to fish and wildlife resources, the Service will use the Wetland Value Assessment (WVA) methodology. The WVA was developed to evaluate restoration projects proposed for funding under Section 303 of the Coastal Wetlands Planning, Protection and Restoration Act. The WVA version utilized in this evaluation was modified by the Louisiana Department of Natural Resources to better determine impacts and mitigation needs in forested wetlands. Further explanation of how impacts/benefits are assessed with WVA and an explanation of the assumptions affecting HSI values for each target year will be available for review at the Fish and Wildlife Service's (Service) Lafayette, Louisiana, field office. For tidally influenced marshes the National Marine Fisheries Service will have copies of those WVAs at their Baton Rouge, Louisiana office.

FISH AND WILDLIFE CONSERVATION MEASURES

The President's Council on Environmental Quality defined the term "mitigation" in the National Environmental Policy Act regulations to include:

(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process. Based on current and expected future without-project conditions, the planning goal of the Service is to develop a balanced project, i.e., one that is responsive to demonstrated hurricane protection needs while addressing the co-equal need for fish and wildlife resource conservation.

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved. Considering the high value of forested wetlands and marsh for fish and wildlife and the relative scarcity of that habitat type, those wetlands are usually designated as Resource Category 2 habitats, the mitigation goal for which is no net loss of in-kind habitat value. The degraded (i.e., non-wet) bottomland hardwood forest and any wet pastures that may be impacted, however, are placed in Resource Category 3 due to their reduced value to wildlife, fisheries and lost/degraded wetland functions. The mitigation goal for Resource Category 3 habitats is no net loss of habitat value. Project impacts to wetlands will be minimized to some extent by hauling in material for the levee. Because the project is already, avoiding the project impacts altogether (i.e., the "no action" alternative) is not feasible. Therefore, remaining project impacts should be mitigated via compensatory replacement of the habitat values lost.

Toward that end, the Service recommends that the following planning objectives be adopted to guide future project studies.

1. Conserve important fish and wildlife habitat (i.e., bottomland hardwoods, cypress swamps, fresh and estuarine marsh and associated shallow open water habitats) by minimizing the acreage of those habitats directly affected by flood control features.

2. Minimize enclosure of wetlands with new levee alignments. When enclosing wetlands is unavoidable, acquire non-development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

3. Operate water control structures in levees to allow for (or maintain) fish and shellfish access into enclosed wetland areas.

4. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design of levees, other project features and timing of construction.

5. Fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

SERVICE POSITION AND RECOMMENDATIONS

Construction of the increased flood protection would result in un-quantified habitat losses. The Service does not object to providing improved hurricane protection to the Greater new Orleans area provided the following fish and wildlife conservation recommendations are incorporated into future project planning and implementation:

1. To the greatest extent possible, situate flood protection features so that destruction of

wetlands and non-wet bottomland hardwoods are avoided or minimized.

2. Minimize enclosure of wetlands with new levee alignments. When enclosing wetlands is unavoidable, acquire non-development easements on those wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

3. Avoid adverse impacts to bald eagle nesting locations and wading bird colonies through careful design project features and timing of construction.

4. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

5. The project's first Project Cooperation Agreement (or similar document) should include language that includes the responsibility of the local-cost sharer to provide operational, monitoring, and maintenance funds for mitigation features.

6. Further detailed planning of project features (e.g., Design Documentation Report, Engineering Documentation Report, Plans and Specifications, or other similar documents) should be coordinated with the Service, NMFS, LDWF, Environmental Protection Agency (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.

7. The Corps should avoid impacts to public lands, if feasible. If not feasible the Corps should establish and continue coordination with agencies managing public lands that may be impacted by a project feature until construction of that feature is complete and prior to any subsequent maintenance. Points of contacts for the agencies potentially impacted by project features are: Kenneth Litzenberger, Project Leader for the Service's Southeast National Wildlife Refuges and Jack Bohannan (985) 822-2000, Refuge Manager for the Bayou Sauvage National Wildlife Refuge (NWR), Office of State Parks contact Mr. John Lavin at 1-888-677-1400, National Park Service (NPS), contact Superintendent David Luchsinger, (504) 589-3882 extension 137 (david_luchsinger@nps.gov) or Chief of Resource Management David Muth (504) 589-3882 extension 128, (david_muth@nps.gov) and for the 404(c) area contact the previously mentioned NPS personnel and Ms. Barbara Keeler (214) 665-6698 with the EPA.

8. If applicable, a General Plan should be developed by the Corps, the Service, and the managing natural resource agency in accordance with Section 3(b) of the FWCA for mitigation lands.

9. If mitigation lands are purchased for inclusion within a NWR those lands must meet certain requirements; a summary of some of those requirements is provided in Appendix A. Other land-managing natural resource agencies may have similar requirements that must be met prior to accepting mitigation lands; therefore if they are proposed as a manager of a mitigation site they should be contacted early in the planning phase regarding such requirements.

10. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

11. In general, larger and more numerous openings in a protection levee better maintain estuarine dependent fishery migration. Therefore, as much opening as practicable, in number, size, and diversity of locations should be incorporated into project levees.

12. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.

13. Flood protection water control structures should remain completely open except during storm events. Management of those structures should be developed in coordination with the Service, NMFS, LDWF, and LDNR.

14. Any flood protection water control structure sited in canals, bayous, or navigation channels that does not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.

15. The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.

16. Flood protection structures within a waterway should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

17. To the maximum extent practicable, structures should be designed and/or selected and installed such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet per second. However, this may not necessarily be applicable to tidal passes or other similar major exchange points.

18. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.

19. Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and one at natural stream crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500-feet long and an area would hydrologically isolated without that culvert.

20. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.

21. Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.

22. Operational plans for water control structures should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

23. The Corps shall fully compensate for any unavoidable losses of wetland habitat or non-wet bottomland hardwoods caused by project features.

24. Acquisition, habitat development, maintenance and management of mitigation lands should be allocated as first-cost expenses of the project, and the local project-sponsor should be responsible for operational costs. If the local project-sponsor is unable to fulfill the financial mitigation requirements for operation, then the Corps should provide the necessary funding to ensure mitigation obligations are met on behalf of the public interest.

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

26. A report documenting the status of mitigation implementation and maintenance should be prepared every three years by the managing agency and provided to the Corps, the Service, NMFS, EPA, LDNR and LDWF. That report should also describe future management activities, and identify any proposed changes to the existing management plan.

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APPENDIX A

Summary of basic mitigation land requirements before land is transferred to the U.S. Fish and Wildlife Service

SUBJECT: Revised Summary of basic mitigation land requirements before land is transferred over to the Service.

The following represents a summary of basic mitigation land requirements before land is transferred over to the Service. This does not necessarily represent a comprehensive list, but does represent our best effort to identify all land requirements within reason.

1. For inclusion into the National Wildlife Refuge (NWR) system the lands must be located within a refuge's acquisition boundary.

2. The Service must be provided copies of any easements/agreements for right-of-way on the property especially as it pertains to maintenance of such right-of-way, frequency of maintenance and costs associated with that maintenance if the maintenance is to be preformed by the landowner.

3. The area must be surveyed prior to acquisition by the United States or transfer to the Fish and Wildlife Service. The survey will be conducted by the Corps of Engineers (Corps) or an approved contractor. Boundaries must be marked and permanent monuments set at all corners. Copies of the surveyor notes, plats, etc. resulting from such survey must be provided to Service.

4. Language must be placed in the deed dedicating the mitigation land to fish and wildlife conservation in perpetuity.

5. When possible any restrictive covenants or liens shall be removed, especially if they could interfere with mitigation implementation, operation and/or maintenance.

6. Completion of a Level 1 survey for hazardous, toxic, and/or radioactive wastes with a copy being provided to the Service. If the Level 1 survey indicates the need for further investigations/surveys, those investigations/surveys must be completed and a copy provided to the Service. Lands having unremediated hazardous, toxic, and/or radioactive wastes present may not be accepted into a NWR. Remediated sites will be assessed for inclusion on a case-by-case basis. Documentation of the level of remediation is to be provided to the Service.

7. Funding mechanism for operation and maintenance of the mitigation lands and mitigation features (e.g., water control structures, timber stand improvements, etc.).

8. Documentation must be provided to the Service describing the mitigation goals and objectives in addition to a description of necessary operation and maintenance activities needed to accomplish the stated goals and objectives.

9. Mineral rights should be purchased. If it is not possible to purchase, then protection of surface rights via the following language:

> "The vendors reserve for themselves, their successors and assigns, the right to explore, for, operate, produce, remove and transport, oil and gas from the lands herein described. The vendors reserve unto themselves, their successors and assigns, the right of ingress and egress over the said lands in pursuance of the reservations set forth above.
>
> The land is now subject to oil and gas lease in favor of ________________________________, as per lease of record in the records of ____________________, ______________________, pages ____________ of Book ______________, and the conveyance is subject to the rights of the lessee in said lease.
>
> The oil and gas reservations made by the vendors herein in favor of themselves, their successors and assigns, shall be subject to the following stipulations, and any lease made by the vendors, their successors or assigns, subsequent to the date of this deed, shall contain the following stipulations for the protection of the vendee.
>
> The vendors, their successors and assigns, agree that prior to entry upon the land for purposes of exploration, development or production of, oil and/or gas, they shall obtain a Special Use Permit from the U.S. Fish and Wildlife Service, which permit is for the purpose of providing for access and protecting the natural resources of the area for which the land was acquired, and whose terms and conditions will not unreasonably restrain the activities of the vendors, and their successors and assigns.
>
> It is mutually understood between the parties that the intention of the Government in acquiring this area is to create a refuge for, and the protection of, wildlife in the area herein acquired, and the vendors will conform to, and be governed by, and the vendors herein bind themselves, their successors and assigns, agents and employees, to conform to, and be governed by, the rules and regulations pertaining to the protection of wildlife and refuge administration prescribed from time to time by the Secretary of the Interior or his/her authorized agent, the Director of Fish and Wildlife Service, except that such regulations shall not unreasonably restrain the exercise and use by the vendors, their successors and assigns, of the reservation set out in this agreement."

10. The Service would need a title commitment and policy in favor of United States of America that is in the American Land Title Association (ALTA) U.S. Policy 9/28/91 format as provided in Title Standards 2001.

If the title remains with the local-sharer or the Corps a General Plan as provided for under Section 3 of the Fish and Wildlife Coordination Act (48 Stat. 401; 16 U.S.C. 661 et seq.) must be written. However, the Service may chose to not manage lands for which it does not have title.

APPENDIX B

National Marine Fisheries Service Baton Rouge Field Office

Recommendations for Fisheries Friendly Design and Operation of Hurricane and Flood Protection Water Control Structures and Supporting Appendices

SUMMARY

The purpose of this document is to: 1) identify design and operational guiding principles that would optimize passage of estuarine dependent marine fisheries species, or at least, minimize adverse impacts to their passage through hurricane and flood protection water control structures planned for the New Orleans District of the U.S. Army Corps of Engineers; and, 2) provide background literature for environmental justification and documentation. Specific projects for which this guidance should be considered include the Mississippi River and Tributaries, Morganza to the Gulf of Mexico Hurricane Protection Project; Donaldsonville to the Gulf Project; Supplemental Appropriations Projects, and the Louisiana Coastal Protection and Restoration Project (LACPR). However, these guiding principles would also pertain to any civil works projects that could include combinations of levees and/or water control structures. Project delivery teams should remain flexible to adapt these design principles on a case-by-case basis as new fishery resource information and project-specific hydraulics data become available.

In general, the ability of estuarine dependent marine fishery organisms to migrate to and from coastal habitats decreases as structural restrictions increase, thereby reducing fishery production. The physical ability (i.e., swimming speed) to navigate through a structure is not the only factor influencing fish passage. Both behavioral and physical responses govern migration and affect passage of fishery organisms through structures. These responses may vary by species and life stage. In addition, most marine fishery species are relatively planktonic in early life stages and are dependent on tidal movement to access coastal marsh nursery areas. For this reason, in general, the greater the flow through a structure into a hydrologically affected wetland area, the greater the marine fishery production functions provided by that area.

Data on marine fishery species migrations in the Gulf of Mexico are too limited to allow the development of definitive design and operational considerations for water control structures that would guarantee the protection of marine fishery production. Anecdotal comparisons can be made with data from water intake and fish passage studies from the west and east coasts. It should not be assumed that structures that have been determined to provide sufficient drainage capacity also optimize or provide adequate fishery passage. More investigation is warranted to refine and adaptively manage water control structure design and operations to minimize adverse impacts to fishery passage. Case specific recommendations for some features under the Mississippi Tributaries, Morganza to the Gulf of Mexico Hurricane Protection Project and LACPR are provided in the appendices. In addition, biological background information is provided in the appendices to assist in preparation of environmental documents required by the National Environmental Policy Act (NEPA).

Summary of guiding principles for designing and operating flood protection water control structures to maintain marine fishery passage:

- Generally, bigger and more numerous openings in hurricane and flood protection levees better maintain estuarine dependent fishery migration. As much opening as practicable, in number, size, and diversity of location should be considered.
- Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.
- Flood protection water control structures should remain completely open except during storm events.
- Any flood protection water control structure sited in canals, bayous, or navigation channels that do not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.
- The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.
- Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.
- To the maximum extent practicable, structures should be designed and/or culverts selected such that average flow velocities during <u>peak</u> flood or ebb tides do not exceed 2.6 feet/second. This may not necessarily be applicable to tidal passes or other similar major exchange points.
- To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to the existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.
- Culverts should be installed in construction access roads unless otherwise recommended by the natural resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and at natural stream crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary if the road is less than 500-feet long and an area would hydrologically isolated without that culvert.
- Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to normal.
- Levee alignments and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.
- Operational plans should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

INTRODUCTION

Various flood protection and environmental water control structures in hurricane protection levees are being designed and considered for inclusion with ongoing local and federal civil works projects within the boundaries of the New Orleans District. Design purposes of the structures vary and may include maintaining safe navigation and optimizing drainage and passage of fishery organisms. For the Morganza to the Gulf of Mexico hurricane protection project, an interagency Habitat Evaluation Team (HET) and NOAA's National Marine Fisheries Service (NMFS) identified economically important fishery species that should be considered when assessing structure impacts on estuarine fisheries migration. Both the federal and state governments manage some of these species. Primary species that could be affected by flood protection structures in Louisiana include brown shrimp, white shrimp, blue crab, red drum, black drum, spotted seatrout, sand seatrout, southern flounder, and gulf menhaden. Some information is included herein on forage species, the production of which is important to maintain as they serve as important links of the aquatic food web for many of the managed fishery species.

The Baton Rouge office of NMFS has developed preliminary design principles for hurricane and flood protection water control structures to reduce impacts to living marine resources, especially related to migrations of estuarine dependent species. The basis for the following recommended guiding principles is briefly discussed where supporting literature is available. Case specific examples for some features under the Mississippi River and Tributaries, Morganza to the Gulf of Mexico hurricane protection project and the Louisiana Coastal Protection and Restoration Project are provided in the appendices. Basic behavior and physiology effects on the passage of fishery organisms are discussed in detail in appendices C and D, to aid federal agencies in environmental evaluations and descriptions under NEPA.

This document has been developed in consideration of input from the interagency HET, university faculty, fish passage staff of various agencies, and cursory literature reviews. These design considerations are intended to address potential impacts to living marine resources pursuant to the Fish and Wildlife Coordination Act and the Magnuson-Stevens Fishery Conservation and Management Act. Impacts to resources managed under other authorities, such as the Endangered Species Act or the Marine Mammal Protection Act, are not addressed in this document.

GUIDING PRINCIPLES FOR DESIGNING FISHERIES FRIENDLY FLOOD PROTECTION WATER CONTROL STRUCTURES

1. Generally, bigger and more numerous openings in hurricane and flood protection levees better maintain estuarine dependent fishery migration. As much opening as practicable, in number, size, and diversity of location should be considered.

Most of Louisiana's commercial and recreational fishery species must have access to estuarine marshes to successfully complete some part of their life cycle (i.e., they are estuarine-dependent). Estuarine-dependent fishery productivity is a measure of standing crop (the number of fishery organisms present at a point in time) and the turnover rate (the rate at which the population is replaced). All things being equal, fishery production would be lower following levee and water control construction if structures retard turnover rate. This would be the case even while standing crop may appear normal. Restrictions in tidal movement caused by water control structures and levees would result in degraded or substantially changed species composition, which could alter fishery production and/or displace fisheries.

Marine transient species emigrate (i.e., move from coastal marshes towards Gulf waters) towards higher salinity water; therefore, a structure that maintains the greatest degree of opening while allowing the project objectives to be met would be desirable (Rogers et al. 1992).

2. Flood protection water control structures in any watercourse should maintain pre-project cross section in width and depth to the maximum extent practicable, especially structures located in tidal passes.

Water control structures should be designed to have a water flow capacity (and similar dimensions where possible) comparable to the waterway before construction. Restricted water exchange in marshes enclosed by levees and water control structures diminishes recruitment and standing stocks of species that must migrate from coastal spawning sites to marsh nurseries (Rogers et al. 1994). As the amount of hydrologic control increases, the effect on migration and production of marine transients and residents increases. Greater restriction decreases turn over rate of estuarine-dependent fishery organisms, which decreases their production (Rogers et al. 1992[a]). Slotted and fixed crest weirs have been found to delay immigration. As the degree of restriction increased from slotted weirs, to low elevation weir, and to fixed crest weirs, greater impacts to different fisheries species and their emigration were observed.

Design considerations for hurricane and flood protection water control structures should include features to accommodate vertical and horizontal fishery distribution patterns within interior marsh tidal pathways and coastal passes. Fishery organisms exhibit preferences by species, life stage, and in some cases tide cycle, for vertical and horizontal distribution within smaller or interior marsh tidal connections (Table 1). Behavioral and physiological responses, such as diel vertical migration, affect these preferred distribution patterns.

Study of Keith Lake Pass in Texas revealed that all portions of the water column, both vertically and horizontally, are used by fishery organisms (Hartman et al. 1987). Most estuarine-dependent fishery species preferred the bottom or shore zones during flood tides, but were much denser near the shores of the pass, in slower moving water, on ebb tide. This lateral movement on slack to ebb tides appears to be a behavioral action to prevent displacement from the pass during ebb tide to accelerate movement to marsh nursery areas. The study identified the response to light cycles with midday densities greatest at bottom and densities greatest at surface during dawn to dusk. Similar within pass distribution patterns were reported by Sabins and Truesdale at Grand Isle, Louisiana (1974).

Table 1. Table on fishery preference within the water column (Marotz et al. 1990; Herke and Rogers 1985; Hartman et al. 1987; Sabins and Truesdale 1974). "[a]" denotes juveniles; "[b]" denotes immigrating; "[c]" denotes emigrating; "[e]" denotes ebb tide; "[f]" denotes flood tide.

	Vertical Distribution			Horizontal Distribution
Species	Surface	Mid-depth	Bottom	Shore/Nearshore
brown shrimp[b]	X	X		X[e]
white shrimp[b]	X	X		
white shrimp[c]		X		X[e]
blue crab	X			Xe
red drum[a]				X[e]
red drum[b]		X	X	
red drum[c]			X	
bay anchovy	X			
striped mullet	X			
Atlantic croaker[a]	X	X		X[e]
Atlantic croaker		X	X	X[e]
spotted seatrout		X	X	
sand seatrout		X	X	X[e]
gulf menhaden	X	X		
southern flounder				X[f]
black drum				X[e]

3. Flood protection water control structures should remain completely open except during storm events.

Fish passage should be optimized by the duration that structures remain fully open. Rozas and Minello (1999) reported that even when water-control structures were open, the densities of transient species were low inside areas enclosed by levees and water control structures as compared to natural areas.

Fisheries migration that temporarily may be impacted with storm related closures are listed in Table 2. The degree of impact would be influenced by the timing and duration of a structure closure relative to peak migration.

Table 2. Migration of economically important fisheries in Louisiana that temporarily may be impacted with storm related closures.

Species	Migration Period Overlapping with Hurricane Season
brown shrimp	April - mid July
white shrimp	July – November
blue crab	June – September
spotted seatrout	April – October
sand seatrout	April – October
red drum	August - December
black drum	March – July
southern flounder	September - October

4. Any flood protection water control structures sited in canals, bayous, or navigation channels that do not maintain the pre-project cross section should be designed and operated with multiple openings within the structure. This should include openings near both sides of the channel as well as an opening in the center of the channel that extends to the bottom.

Hartman et al. (1987) recommended structures not be constructed in a tidal pass. If a structure was constructed, they recommended the incorporation of several gates at several vertical and horizontal locations, with baffles near shore. Baffles near shore are to direct shore or near shore fish passage on ebb tides through the available structure opening(s) (e.g., gates in wing walls).

Structures should be designed and operated with multiple openings if the pre-project water depth and widths of a channel are not maintained. Multiple openings are necessary to optimize passage of fishery organisms that prefer to migrate along the sides, bottom, and top of channels. For example, Rogers et al. (1992[a]) recommended opening some vertical slots and top, middle, and bottom gates in a structure with multiple slots and gates.

5. The number and siting of openings in flood protection levees should be optimized to minimize the migratory distance from the opening to enclosed wetland habitats.

The location and number of structures likely affects the abundance and distribution of estuarine fishery species within habitats that would be located on the protected side of levees and water control structures. Rogers et al. (1992[c]) determined that marine transient species were most numerous nearest the structures, partially due to the proximity of the openings with respect to the area enclosed. Similarly, other studies have shown there is a decrease in fishery species abundance and diversity the greater the distance from the access point (Peterson and Turner 1994). This can become more pronounced if an environmental gradient (e.g., salinity) exists between an access point and the interior habitat located on the protected side of structures (Cashner 1994).

6. Structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered.

Study of Keith Lake Pass in Texas revealed vertical and horizontal distribution patterns of fishery organisms in the pass (Hartman et al. 1987). Estuarine-dependent fishery organisms preferred the bottom or near shore zones on flood tides. Most organisms appeared near shores of the pass on ebb tide in slower moving water. Baffles near shore are to direct shore or near shore fish passage through the structure.

Many fish migrate along the water bottom. Water control structures with crests or inverts higher than the lower portion of a channel could impede migration through the deep-water portions of channels. Ramps can provide a means to guide organisms over and through structures and increase access of fisheries organisms to enclosed habitat (Lafleur 1994). Various ramp designs need to be investigated.

7. To the maximum extent practicable, structures should be designed and/or culverts selected such that average flow velocities during peak flood or ebb tides do not exceed 2.6 feet/second.

In this preliminary investigation, no studies were located that evaluated the impacts of swimming speeds for the fishery species and life stages of concern in Louisiana. To avoid preventing or reducing ingress or egress of fishery organisms, preliminary guidance on water velocities through structures in Louisiana could be based on anecdotal comparisons with data available on general swimming speeds from studies on the west and east coasts (Tables 3 and 4).

Swimming speeds of estuarine and marine fish and crustaceans is a function of shape, stage of development, length, ambient temperature, light, and duration required for swimming performance. For most species, absolute speed increases as size increases. Generally, fish swimming speeds range from 2-4 body lengths/second with burst speeds up to 5 body lengths/second (Meyers et al. 1986).

Water intake studies have shown that maintaining water velocities less than 0.5 ft/sec would protect most fish and their life stages from being adversely affected by those flows (USEPA 2004). The species and life stages of fish for that study could not be located at this time and further investigation for Gulf of Mexico species is warranted. They also recommended creating horizontal velocity fields to avoid adverse affects on fish because fish are better able to orient to horizontal verses vertical flow. This could allow selective avoidance of water flows not preferred by fish or minimize disorientation or mortality rates caused by flows.

Eberhardt (personal communication) reported velocities exceeding 0.82 feet/second began to impede fish passage. Fish passage was decreased by 50% for velocities exceeding 2.6 feet/second. Based on evaluation of freshwater species, Gardner (2006) recommends keeping velocities through round culverts less than 1.8 ft/sec during 90% of the fish migration season. To improve fish passage through culverts, installing baffles within culverts should be considered to reduce flow velocity barriers for fish (Pacific Watershed Associates 1994).

Table 3. Water flow velocity thresholds for affecting fish passage or avoiding impingement within flows or on screens.

Source	Water Flow Velocity (ft/sec)	
Alyson Eberhardt, personal communication	0.82	Begin to impede
	2.62	Decreased fish passage by 50%
Gardner 2006	1.8	Critical velocity (freshwater fish)
Meyers et al. 1986	<0.49	To avoid impingement

USEPA 2004	<0.50	Protected 96% of the fish tested from impingement

Table 4. Sustained fish swimming speeds. Adapted from Meyers et al. (1986). Note that no data was located for the fisheries species and life stages for the Gulf of Mexico.

Fish/life stage	Swimming Speeds (ft/sec)
Atlantic herring	0.19 – 0.3
Mullet	4.19
Horse mackerel	4.46
Sole	0.19 - 0.3
most larvae	0.82 – 0.98

Based on these limited data, larval fish could be adversely impacted by water flow rates exceeding 0.82 feet/second. Post-larval and juvenile stages of flounders could be impacted by flow rates around 1.0 ft/sec. Other species or larger life stages likely would not be adversely impacted until flow rates exceed 2.62 feet/second based on inferences from these data. Water flow velocity monitoring in the Terrebonne Basin by the U.S. Fish and Wildlife Service has found maximum flows through existing open channels exceeding 1.0 feet /second and in larger saline marsh channels and passes exceeding 2.0 feet/second.

If the spatial extent of flow velocity fields exceed the distance that can be traveled with sustained or burst swimming speeds of fishery organisms, those flows could prevent or reduce ingress or egress during the time which those flows exist. However, the degree of mortality from not being able to access nursery and foraging habitat is not known. High flow rates may aid passage of larval fish that primarily depend on passive transport for migratory distribution and access to estuarine habitat on the protected side of levees, if the high flows do not induce mortality from injury or fatigue. Water flow could exceed the fish swimming rates for short periods and still provide passage during low flows or during still water.

8. To the maximum extent practicable, culverts (round or box) should be designed, selected, and installed such that the invert elevation is equal to existing water depth. The size of the culverts should be selected that would maintain sufficient flow to prevent siltation.

Design considerations should include installing baffles within culverts to reduce flow velocity barriers (Pacific Watershed Associates 1994). Passage of salmon and herring species has been shown to be impaired by culverts. With baffles or other similar features, still water areas could be created to enhance fish passage.

If water control structures include plunge pools, the invert elevation of the structure could be equal to the depth of the plunge pool if the plunge pool is deeper than the pre-project water depth. This deeper invert would optimize passage of fisheries species, in particular bottom dweller species.

Fish often require visual cues for orientation and exhibit faster swimming speeds at increased light levels. Herring type fish (e.g., gulf menhaden) are particularly sensitive to light levels. However, although herring exhibited a preference for unshaded portions of treatments during both day and night periods, as little as 1.4% of the ambient light was necessary for their passage through a culvert (Mosser and Terra 1999).

9. Culverts should be installed in construction access roads unless otherwise recommended by the resource agencies. At a minimum, there should be one, 24-inch culvert placed every 500 feet and at all water crossings. If the depth of water crossings allow, larger sized culverts should be used. Culvert spacing should be optimized on a case-by-case basis. A culvert may be necessary, even if the road is less than 500 feet long, if an area would be hydrologically isolated without that culvert.

10. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after storm passage and return of normal water levels.

Regardless of structure size, designs and contingency plans should include means to rapidly open the water control structures when flooding risks subside after a storm. Designs and plans should include infrastructure, equipment, and staff necessary to open the structures even if offsite electricity is not available. Design safeguards should be developed to protect the structures from being damaged rendering them inoperable and locked in a closed configuration after passage of a storm.

11. Levee alignment and water control structure alternatives should be selected to avoid the need for fishery organisms to pass through multiple structures (i.e., structures behind structures) to access an area.

12. Operational plans should be developed to maximize the cross-sectional area open for as long as possible. Operations to maximize freshwater retention or redirect freshwater flows could be considered if hydraulic modeling demonstrates that is possible and such actions are recommended by the natural resource agencies.

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APPENDIX C

BEHAVIOR

The physical ability (i.e., swimming speed) to navigate a structure is not the only factor influencing fish passage, especially for small structures. Behavioral responses to stimuli individually or interactively affect passage with physiological constraints or responses. Behavior generally can be categorized as schooling and non-schooling behavior.

SCHOOLING BEHAVIOR

Schooling behavior consists of strategies that provide hydrodynamic efficiency, reduced predation, increased efficiency in finding food, and increased reproductive success. Water control structures for flood protection impact large numbers of fishery organisms due to this group response. This could be because fish exhibit the tendency to approach and orient to other members of the species (i.e., biotaxis). This orientation confers a hydrodynamic advantage that is more efficient than individuals due primarily to vortices setup by lead fish. Schools function as a living organism where the group reacts to stimuli as an individual. It is this group reaction that influences greater affect on passage through water control structures.

NON-SCHOOLING BEHAVIOR

Agonistic, territorial, and hierarchical behaviors are examples of non-schooling behavior exhibited by fish. Agonistic and territorial behaviors are largely unknown for the listed estuarine and marine fishery species of concern and their life stages. Structures that create physically taxing water flow velocities and some low flow areas may encourage these behaviors as fish compete for resting areas similar to competition seen with fish competing for resting areas within shrimp trawls or behind rocks in river riffle/pool habitat. It is possible these behavioral responses overall may not be that influential on fish passage through a structure, but may come more into play during low flow conditions such as lower tides or slack tide. Hierarchical behavior can often be driven by a combination of physiological responses and will be discussed in that section. Overall, investigation on behavioral responses to water control structures is needed to avoid and minimize adversely impacting fishery passage if not optimizing it.

APPENDIX D

PHYSIOLOGICAL

Fishery species and life stages react differently to a current of water (i.e., rheotaxis). Generally, fish are better able to orient to horizontal verses vertical flow (Meyers et al. 1986).

Locomotion

There are two means for migratory transport of estuarine and marine fish and crustaceans: passive and active transport. Passive transport is drift of organisms carried by the tides and currents. Larval and post-larval fish and crustacean life stages are predominately transported passively by tides and currents. Passive transport via tidal forcing can play a strong role in migration of sub-adult and adult brown shrimp, white shrimp, and blue crabs. Active transport is movement by swimming, which is the primary means of locomotion for sub-adults and adult fish.

SWIMMING SPEED

Refer to guiding principles number 7 for details on swimming speeds relative to impacts on fish passage.

BEHAVIORAL/PHYSIOLOGY INTERACTION

Many fishery organisms exhibit hierarchical behavior. This is a direct response to stimuli, such as astronomical (e.g., tidal rhythm) or meteorological driven flows. For example, brown shrimp mediate transport by circadian or diel vertical migration. Brown shrimp move down in the water column or cease activity as the become negatively buoyant when low salinity and temperature water develop in estuaries with north winds associated with spring fronts. Brown shrimp activity resumes with their movement up in the water column with increasing water temperature, salinity, and hydrostatic pressure associated with the southerly gulf return following after a cold front (Rogers et al. 1993). Similar selective tidal stream transport was reported by Hartman et al. (1987). Fishery organisms identify tide changes by detecting altered velocity, salinity, temperature, all of which can cue staging for immigration with an incoming tide. Future tidal pass or inlet studies are needed for better information on vertical distribution, depth preferences, and changes in buoyancy or behavior to evaluate active and passive transport of fishery organisms.

APPENDIX E

Reference Websites, Fish Passage Agency Representatives, and University Faculty

Baker, C. and J. Boubee. 2003. Using ramps for fish passage past small barriers. Water and Atmosphere 11(2). June.
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USACE Portland District, Fish Passage Team
http://www.nwp.usace.army.mil/pm/e/en_fish.asp

USACE, ERDC, Coastal Hydraulics Lab
http://chl.erdc.usace.army.mil/CHL.aspx?p=s&a=ResearchAreas;22

USFWS Fish Passage Decision Support System
http://fpdss.fws.gov/index.jsp

NC State's Center for Transportation and the Environment website:
http://www.itre.ncsu.edu/

http://itre.ncsu.edu/CTE/gateway/downloads/Culvert%20Impact%20Study(December2002).pdf

http://itre.ncsu.edu/CTE/gateway/downloads/FishPassage.pdf

FishXing software and learning systems for fish passage through culverts. This software is intended to assist engineers, hydrologists, and fish biologists in the evaluation and design of culverts for fish passage. It is free and available for download.
http://stream.fs.fed.us/fishxing/

- Allows for comparison of multiple culverts designs within a single project.
- Calculates hydraulic conditions within circular, box, pipe-arch, open-bottom arch, and embedded culverts.
- Contains default swimming abilities for numerous North American fish species.
- Contains three different options for defining tailwater elevations.
- Calculates water surface profiles through the culvert using gradually varied flow equations, including hydraulic jumps.

- Outputs tables and graphs summarizing the water velocities, water depths, outlet conditions, and lists the limiting fish passage conditions for each culvert.

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APPENDIX C
LATIN NAMES FOR SOME SPECIES DISCUSSED IN THE REPORT AND/OR FOUND IN THE PROJECT AREA

PLANTS

American sycamore	*Platanus occidentalis*
Black willow	*Salix nigra*
Box elder	*Acer negundo*
Chinese tallow-tree	*Triadica sebifera*
Cypress	*Taxodium distichum*
Eastern cottonwood	*Populus deltoides*
Green ash	*Fraxinus pennsylvanica*
Overcup oak	*Quercus lyrata*
Red maple	*Acer rubrum*
Red mulberry	*Morus rubra*
Roughleaf dogwood	*Cornus drummondii*
Sugarberry	*Celtis laevigata*
Sweet pecan	*Carya illinoinensis*
Water oak	*Quercus nigra*
Willow oak	*Quercus phellos*

FISH

Banded pygmy sunfish	*Elassoma zonatum*
Bigmouth buffalo	*Ictiobus cyprinellus*
Black crappie	*Pomoxis nigromaculatus*
Blue catfish	*Ictalurus furcatus*
Bluegill	*Lepomis macrochirus*
Blue sucker	*Cycleptus elongates*
Brook silverside	*Labidesthes sicculus*
Bullhead minnow	*Pimephales vigilax*
Channel catfish	*Ictalurus punctatus*
Chub shiner	*Notropis potteri*
Common carp	*Cyprinus carpio*
Dollar sunfish	*Lepomis marginatus*
Dusky darter	*Percina sciera*
Emerald shiner	*Notropis atherinoides*
Flathead catfish	*Pylodictis olivaris*
Freshwater drum	*Aplodinotus grunniens*
Ghost shiner	*Notropis buchanani*
Gizzard shad	*Dorosoma cepedianum*
Golden shiner	*Notemigonus crysoleucas*
Golden topminnow	*Fundulus chrysotus*

Goldeye	*Hiodon alosoides*
Grass carp	*Ctenopharyngodon idella*
Green sunfish	*Lepomis cyanellus*
Inland silverside	*Menidia beryllina*
Largemouth bass	*Micropterus salmoides*
Logperch	*Percina caprodes*
Longear	*Lepomis megalotis*
Longnose gar	*Lepisosteus osseus*
Mimic shiner	*Notropis volucellus*
Mississippi silvery minnow	*Hybognathus nuchalis*
Orangespotted sunfish	*Lepomis humilis*
Pallid sturgeon	*Scaphirhynchus albus*
Paddlefish	*Polyodon spathula*
Pugnose minnow	*Opsopoeodus emiliae*
Redear	*Lepomis microlophus*
Red shiner	*Cyprinella lutrensis*
Redspotted sunfish	*Lepomis miniatus*
River carpsucker	*Carpiodes carpio*
River darter	*Percina shumardi*
Shortnose gar	*Lepisosteus platostomus*
Shovelnose sturgeon	*Scaphirhynchus platorynchus*
Silverband shiner	*Notropis shumardi*
Silver chub	*Macrhybopsis storeriana*
Skipjack	*Alosa chrysochloris*
Slough darter	*Etheostoma gracile*
Smallmouth buffalo	*Ictiobus bubalus*
Spotted bass	*Micropterus punctulatus*
Spotted gar	*Lepisosteus oculatus*
Striped bass	*Morone saxatilis*
Threadfin shad	*Dorosoma petenense*
Warmouth	*Lepomis gulosus*
Western mosquitofish	*Gambusia affinis*
White bass	*Morone chrysops*
White crappie	*Pomoxis annularis*
White-striped bass hybrid	*Morone saxatilis x Morone chrysops*
Yellow bass	*Morone mississippiensis*
Yellow bullhead	*Ameiurus natalis*

AMPHIBIANS

American bullfrog	*Rana catesbeiana*
Cope's gray treefrog	*Hyla chrysoscelis*
Dwarf salamander	*Eurycea quadridigitata*
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*

Fowler's toad	*Bufo fowleri*
Green treefrog	*Hyla cinerea*
Northern cricket frog	*Acris crepitans*
Pig frog	*Rana grylio*
Small mouth salamander	*Ambystoma texanum*
Southern leopard frog	*Rana sphenocephala*
Spring peeper	*Pseudacris crucifer*
Western chorus frog	*Pseudacris triseriata*
Gulf coast toad	*Bufo vallicpes*

REPTILES

American Alligator	*Alligator mississipiensis*
Cooter	*Pseudemys floridana*
Copperhead	*Agkistrodon contortrix*
Cottonmouth	*Agkistrodon piscivorus*
Diamondback terapin	*Malaclemys terepin*
Eastern stinkpot turtle	*Sternotherus odoratus*
False map turtle	*Graptemys pseudogeographica*
Five-lined skink	*Eumeces fasciatus*
Racer	*Coluber constrictor*
Red eared turtle	*Pseudemys scripta*
Ring-necked snake	*Diadophis punctatus*
Smooth softshell turtle	*Trionyx muticus*
Snapping turtle	*Chelydra serpentina*
Watersnake	*Nerodia fasciata*

BIRDS

American wigeon	*Anas americana*
Anhinga	*Anhinga anhinga*
Bald eagle	*Haliaeetus leucocephalus*
Barred owl	*Strix varia*
Belted kingfisher	*Ceryle alcyon*
Black-necked stilt	*Himantopus mexicanus*
Blue-winged teal	*Anas discors*
Carolina chickadee	*Poecile carolinensis*
Double-crested cormorant	*Phalacrocorax auritus*
Eastern meadowlark	*Sturnella magna*
Gadwall	*Anas strepera*
Great blue heron	*Ardea herodias*
Great egret	*Ardea alba*
Greater white-fronted goose	*Anser albifrons*

Green heron	*Butorides virescens*
Green-winged teal	*Anas crecca*
Interior least tern	*Sterna antillarum athalassos*
Mallard	*Anas platyrhynchos*
Mourning dove	*Zenaida macroura*
Northern cardinal	*Cardinalis cardinalis*
Northern pintail	*Anas acuta*
Osprey	*Pandion haliaetus*
Pied-billed grebe	*Podilymbus podiceps*
Red-bellied woodpecker	*Melanerpes carolinus*
Red-headed woodpecker	*Melanerpes erythrocephalus*
Red-shouldered hawk	*Buteo lineatus*
Red-winged blackbird	*Agelaius phoeniceus*
Snow goose	*Chen caerulescens*
Solitary sandpiper	*Tringa solitaria*
Spotted sandpiper	*Actitis macularia*
White-eyed vireo	*Vireo griseus*
Wood duck	*Aix sponsa*

MAMMALS

Bobcat	*Lynx rufus*
Cotton mouse	*Peromyscus gossypinus*
Coyote	*Canis latrans*
Eastern cottontail rabbit	*Sylvilagus floridanus*
Fox	*Vulpes vulpes*
	Urocyon cinereoargenteus
Fox squirrel	*Sciurus niger*
Hispid cotton rat	*Sigmodon hispidus*
Mink	*Mustela vison*
Nutira	*Myocaster coypus*
Muskrat	*Ondatra zibethicus*
Northern raccoon	*Procyon lotor*
Swamp rabbit	*Sylvaligus aquaticus*
Virginia opossum	*Didelphis virginiana*
White-tailed deer	*Odocoileus virginianus*

United States Department of the Interior

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November 28, 2007

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...ANSMITTAL	# of pages ▶ 3
...Obiol	From David W
Agency	Phone # 337/291-3122
Fax #	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

Dear Ms. Wiggins:

The U.S. Fish and Wildlife Service (Service) has reviewed the information provided in your October 26, 2007, letter and attached figures for the proposed Levee and Floodwall Replacement Projects Individual Environmental Report (IER) 15, 16, 17, St. Charles and Jefferson Parishes, Louisiana. That letter and attachments provide a general description of the proposed West Bank and Vicinity levee and floodwall replacement (i.e. IER 15, 16, 17) and requests information regarding threatened and endangered species or their critical habitat and information on fish and wildlife resources in the project area. The following comments are provided in accordance with provisions of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.), Bald and Golden Eagle Protection Act (BGEPA) (54 Stat. 250, as amended, 16 U.S.C. 668a-d), the Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 703 et seq.) and the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

This Planning-aid Report supplements the Services November 26, 2007, draft Coordination Act Report that provided a description of fish and wildlife resources found throughout the project area (i.e., IER 1 through 17) and provided recommendations to ensure fish and wildlife resources received equal consideration during the planning phase. Descriptions of the fish and wildlife resources contained in that report are incorporated herein by reference. This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA.

At this time the Service is unaware of any known threatened or endangered species in the proposed project area of IER 15, 16, and 17. However, if the scope or design of the project changes, or the project is not implemented within one year from the date of this letter, the Corps should contact this office for further coordination.

The project area is located where colonial nesting waterbirds may be present. LDWF currently maintains a database of these colonies locations. That database is updated primarily by monitoring the colony sites that were previously surveyed during the 1980s. Until a new, comprehensive coast-wide survey is conducted to determine the location of newly-established nesting colonies, we recommend that a qualified biologist inspect the proposed work sites for the presence of undocumented nesting colonies during the nesting season (e.g. February through September depending on the species). If colonies exist, work should not be conducted within 1,000 feet of the colony during the nesting season.

Forested habitat in the project-area may provide nesting habitat for the bald eagle, which has officially been removed from the List of Endangered and Threatened Species as of August 8, 2007. Although the bald eagle has been removed from the threatened and endangered species list, it continues to be protected under the MBTA and the BGEPA. The Service developed the National Bald Eagle Management (NBEM) Guidelines to provide landowners, land managers, and others with information and recommendations regarding how to minimize potential project impacts to bald eagles, particularly where such impacts may constitute "disturbance," which is prohibited by the BGEPA. Those guidelines recommend maintaining: (1) a specified distance between the activity and the nest (buffer area); (2) natural areas (preferably forested) between the activity and nest trees (landscape buffers); and (3) avoiding certain activities during the breeding season. The buffer areas serve to minimize visual and auditory impacts associated with human activities near nest sites. Ideally, buffers would be large enough to protect existing nest trees and provide for alternative or replacement nest trees. On-site personnel should be informed of the possible presence of nesting bald eagles within the project boundary, and should identify, avoid, and immediately report any such nests to this office. A copy of the NBEM Guidelines is available at:
http://www.fws.gov/migratorybirds/issues/BaldEagle/NationalBaldEagleManagementGuidelines.pdf. If after consulting those guidelines you need further assistance in determining the appropriate size and configuration of buffers or the timing of activities in the vicinity of a bald eagle nest, then please contact this office.

Located within the project area of IER 17 is the Bayou Segnette State Park, which is operated by the Louisiana Department of Culture, Recreation and Tourism, Office of State Parks. Please contact Mr. John Lavin at 1-888-677-1400 regarding work on those areas. Impacts to public lands should be avoided, whenever feasible.

The following recommendations supplement those previously provided in our November 2007 Coordination Act Report and should be taken to assure that fish and wildlife receive equal consideration during further project planning, design and implementation:

1. Expansion of all levees should be towards the protected side, wherever feasible.

2. To the greatest extent possible, situate flood protection features so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized.

3. Avoid or minimize the enclosure of wetlands with new levee alignments. Alternatives presented in Figures 4 and 5 for IER 15 and the South Kenner Avenue alignment for IE 16 as presented in Figure 3 appear to best achieve this recommendation.

4. When enclosing wetlands is unavoidable, acquire non-development easements on those

wetlands, or maintain hydrologic connections with adjacent, un-enclosed wetlands to minimize secondary impacts from development and hydrologic alteration.

5. Forest clearing associated with project features should be conducted during the fall or winter to minimize impacts to nesting migratory birds, when practicable.

We appreciate the opportunity to provide planning assistance to the Corps and look forward to continued cooperation. If your or your staff have any questions, please contact David Walther (337/291-3122) of this office.

Sincerely,

James F. Boggs
Acting Supervisor
Louisiana Field Office

cc: National Marine Fisheries Service, Baton Rouge, LA
EPA, Dallas, TX
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources, CMD, Baton Rouge, LA
LA Office of State Parks

MITCHELL J. LANDRIEU
LIEUTENANT GOVERNOR

State of Louisiana

OFFICE OF THE LIEUTENANT GOVERNOR
DEPARTMENT OF CULTURE, RECREATION & TOURISM
OFFICE OF CULTURAL DEVELOPMENT
DIVISION OF ARCHAEOLOGY

DAWN ROMERO WATSON
SECRETARY

PAM BREAUX
ASSISTANT SECRETARY

March 24, 2008

Ms. Elizabeth Wiggins
Environmental Planning and Compliance Branch
New Orleans District, Corps of Engineers
P.O. Box 60267
New Orleans, LA 70160-0267

Re: CRM Management Summary
LA Division of Archaeology Report No. (22-3055)
Management Summary: Reconnaissance Survey of the Western Tie-In Segment (IER 16), West Bank and Vicinity Hurricane Protection Levee, Jefferson and St. Charles Parishes, Louisiana
Coastal Environments, Inc.

Dear Ms. Wiggins:

We are in receipt of your letter of March 10, 2008, transmitting a Management Summary from Coastal Environments, Inc. for the above-cited project. This Management Summary meets the basic guidelines for such documents set forth by the Louisiana Division of Archaeology.

We agree with the recommendations concerning cultural resources for the project area made by Coastal Environments, Inc. Namely, we have the same opinion that newly reported archaeological site [redacted] will be affected by the proposed undertaking in Alternative 1 of the IER#16 project area and should be avoided. If avoidance is not possible, we concur with the recommendation that additional archaeological investigations are necessary to determine the site's eligibility for the National Register of Historic Places. We also recognize that IER16's boundaries are different that originally proposed and hope that the SHPO should be consulted if project plans change and other alternatives are selected for construction.

We look forward to reviewing the full reports for this and other Individual Environmental Report Areas (IERs). Technical comments of a minor nature are enclosed and should be considered with the submission of a draft report for all the IERs. If you have any questions or comments concerning this project, please feel free to contact Dennis Jones at (225) 342-8170 or djones@crt.state.la.us.

Sincerely,

Pam Breaux

Pam Breaux
State Historic Preservation Officer

PB:DJ:s

C: Dr. Douglas Wells, Coastal Environments, Inc. (w/enclosures).

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

REPLY TO
ATTENTION OF

October 20, 2008

Planning, Programs, and
Project Management Division
Environmental Planning
and Compliance Branch
Attn: CEMVN-PM-RN

We concur that the proposed undertaking will have no adverse effect on historic properties. This effect determination could change should new information come to our attention.

Scott Hutcheson 12-11-08
Scott Hutcheson Date
State Historic Preservation Officer

Mr. Scott Hutcheson
State Historic Preservation Officer
Office of Cultural Development
Department of Culture, Recreation, and Tourism
P.O. Box 44247
Baton Rouge, Louisiana 70804

RE: Request to Continue Consultation Under Section 106 of the National Historic Preservation Act for the West Bank and Vicinity Hurricane Protection Project, Western Tie-in, Individual Environmental Report #16, Jefferson and St. Charles Parishes, Louisiana.

Dear Mr. Hutcheson:

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District, is amending the Area of Potential Effects (APE) for the project area currently being studied under Individual Environmental Report #16, West Bank and Vicinity Hurricane Protection Project, Western Tie-in, Individual Environmental Report #16, Jefferson and St. Charles Parishes, Louisiana. This amendment removes Alternative Alignment 2 as the proposed action and replaces it with Alternative Alignment 3, which is located south of the Outer Cataouatche Canal (Enclosures #1 and #2). In our letter to your office dated March 10, 2008, the District provided project documentation and a finding of "no historic properties affected" for the Alternative Alignment 2 APE. Your office concurred with our opinion in a letter dated March 17, 2008. Copies of these letters are attached herein.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), the District, in consultation with the State Historic Preservation Officer (SHPO) and Indian Tribes, will determine if the amended area of potential effects (APE) established for IER #16 contains historic properties. The amended APE follows Alternative Alignment 3 and measures approximately 22,300 feet long by approximately 500 feet wide for a total of approximately 256 acres. Proposed activities in the amended APE include levee, floodwall, closure structure, drainage ditch, and Highway 90 bridge construction.

OCT 21 2008

In a recent cultural resources investigation conducted by Coastal Environments, Inc., researchers utilized background research, previous cultural resource investigation review, soil and topographic analyses, and field reconnaissance and Phase 1 data to identify and assess historic structures and high potential areas for archaeological resources in the IER #16 study area (Wells, 2008). The management summary of this investigation was submitted to your office as an attachment to our March 10, 2008 letter. This study evaluated all three project alternative alignments, including the majority of Alternative Alignment 3. No previously recorded cultural resources, artifacts or intact archaeological deposits or features, or historically significant standing structures were identified in the Alternative Alignment 3 APE.

Subsequent to the completion of the Coastal Environments, Inc. cultural resources investigation, the Alternative Alignment 3 APE was modified to include an additional area not evaluated by Wells (2008). This area is located north, and adjacent to, the APE on the western end of the alignment (Enclosure #3). A District archaeologist conducted a field trip and found the area was relatively low and susceptible to frequently flooding with portions severely impacted by previous highway, canal, and levee construction. The potential for cultural resources in this area is considered extremely minimal. No further cultural resources investigations are recommended.

Based on a review of the information summarized above, it is our view that the proposed project activities in the Alternative Alignment 3 APE will not impact any significant cultural resources. However, in the event that cultural resources are encountered during construction activities, work will be halted and your office will be contacted for further consultation. Any resources encountered will be recorded and documented, and state archaeological site forms will be provided.

Please review the enclosed project documentation and provide this office with your opinion regarding our "no historic properties affected" finding within 30 days of receipt of this letter. If you have any questions and/or concerns, please contact Mr. Michael Swanda at (504) 862-2036.

Sincerely,

Elizabeth Wiggins
Chief, Environmental Planning
and Compliance Branch

Enclosures

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

REPLY TO
ATTENTION OF.

January 2, 2009

Planning, Programs, and
Project Management Division
Environmental Planning
and Compliance Branch
Attn: CEMVN-PM-RN

No known historic properties will be affected by this undertaking. This effect determination could change should new information come to our attention.

Scott Hutcheson 1/29/09
Scott Hutcheson Date
State Historic Preservation Officer

Mr. Scott Hutcheson
State Historic Preservation Officer
Office of Cultural Development
Department of Culture, Recreation, and Tourism
P.O. Box 44247
Baton Rouge, Louisiana 70804

RE: Request to Continue Consultation Under Section 106 of the National Historic Preservation Act for the West Bank and Vicinity Hurricane Protection Project, Western Tie-in, Individual Environmental Report #16, Jefferson and St. Charles Parishes, Louisiana.

Dear Mr. Hutcheson:

The U.S. Army Corps of Engineers, Mississippi Valley Division, New Orleans District, is amending the Area of Potential Effects (APE) for the project area currently being studied under Individual Environmental Report #16, West Bank and Vicinity Hurricane Protection Project, Western Tie-in, Jefferson and St. Charles Parishes, Louisiana. This amendment expands the width of the APE alignment (Alternative Alignment 3) an additional 100 to 200 feet to the south along the project alignment between the western end of the Lake Cataouatche Levee and the Davis Pond Guide Levee.

In our letter to your office dated March 10, 2008, the Corps provided project documentation, evaluated the results of the initial cultural resources investigation of the project area, including all three project alternative alignments (Wells 2008a), and prepared a finding of "no historic properties affected" for the Alternative Alignment 2 APE. Your office concurred with our effect determination in a letter dated March 24, 2008. In our second letter to your office dated October 20, 2008, the District amended the APE by eliminating Alternative Alignment 2 as the proposed action and replacing it with Alternative Alignment 3. Utilizing the results of Douglas Wells' 2008 study and additional field reconnaissance information obtained by Corps archaeologists, the Corps found that proposed construction in the Alternative Alignment 3 APE would have no impact on cultural resources. Your office concurred with our "no historic properties affected" finding in a stamped letter dated December 11, 2008. Copies of these letters are attached herein.

Pursuant to Section 106 of the National Historic Preservation Act (NHPA), the District, in consultation with the State Historic Preservation Officer (SHPO) and Indian Tribes, will determine if the amended area of potential effects (APE) established for IER #16 contains historic properties. The amended APE follows Alternative Alignment 3 and measures an additional 100 to 200 feet to the south along the project alignment between the western end of the Lake Cataouatche Levee and the Davis Pond Guide Levee. The amended APE is approximately 22,300 feet long by approximately 600 to 700 feet wide for a total of approximately 333 acres. A map of the amended Alternative Alignment 3 APE is provided in the enclosed management summary (Wells 2008b, page 2). Proposed activities in the amended APE include levee, floodwall, closure structure, drainage ditch, and Highway 90 bridge construction.

The District contracted Coastal Environments, Inc. to conduct a cultural resources evaluation of the amended Alternative Alignment 3 APE. Researchers reviewed the background research and the cultural resource evaluation previously conducted for Alternative Alignment 3 (Wells 2008a), and conducted supplemental soil and topographic analysis to identify and assess historic properties and high potential areas for archaeological resources in the expanded area (Wells, 2008b). The management summary of this supplemental evaluation is attached herein.

No previously recorded archaeological resources or historically significant standing structures were identified in the expanded portion of Alternative Alignment 3 APE. Researchers found that the two high probability areas for archaeological resources initially identified in the first study extend into the amended APE. These high probability areas were not investigated because they are currently underwater and access into the area is extremely difficult due to extensive backswamp flooding and large numbers of deadfalls. Previous investigations along the bankline of the Outer Cataouatche Canal immediately to the north and in similar backswamp and subsided waterways along Alternative Alignment 2 found no archaeological sites. Therefore, it is very likely that the potential for cultural resources in the amended APE is extremely minimal. Researchers recommended no further cultural resources investigations in the amended Alternative Alignment 3 APE.

Based on a review of the information summarized above, it is our view that the proposed project activities in the amended Alternative Alignment 3 APE will not impact any significant cultural resources. However, in the event that cultural resources are encountered during construction activities, work will be halted and your office will be contacted for further consultation. Any resources encountered will be recorded and documented, and state archaeological site forms will be provided.

Please review the enclosed project documentation and provide this office with your opinion regarding our "no historic properties affected" finding within 30 days of receipt of this letter. If you have any questions and/or concerns, please contact Mr. Michael Swanda at (504) 862-2036.

Sincerely,

Gib Owen

Elizabeth Wiggins
Chief, Environmental Planning
and Compliance Branch

Enclosures

CF: Klima, Advisory Council on Historic Preservation
Rivet, Louisiana State Historic Preservation Office
Varnado, Louisiana State Historic Preservation Office

References Cited

Wells, Douglas
2008a *Management Summary: Reconnaissance Survey of the Western Tie-in Segment (IER #16), West Bank and Vicinity Hurricane Protection Levee, Jefferson and St. Charles Parishes, Louisiana.* Prepared by Coastal Environments, Inc., Baton Rouge. On file, New Orleans District Corps of Engineers.

Wells, Douglas
2008b *Management Summary: Reconnaissance Survey of the Redesigned Western Tie-in Segment (IER #16), West Bank and Vicinity Hurricane Protection Levee, Jefferson and St. Charles Parishes, Louisiana.* Prepared by Coastal Environments, Inc., Baton Rouge. On file, New Orleans District Corps of Engineers.

Nord, Beth P MVN

From: Patrick Williams [Patrick.Williams@noaa.gov]
Sent: Thursday, February 26, 2009 10:17 AM
To: Nord, Beth P MVN
Subject: Re: IER 16 Essential Fish Habitat Coordination

Re: IER 16 - it is safe to assume that EFH has not been designated for any of the alignments under consideration even those south of HWY 90.
You need not submit anything. We soon will be reviewing the IER and plan to coordinate with EPA and FWS at the mtg Monday regarding the positions they are considering. But again, no EFH.

thanks for catching and coordinating,
Pat

Nord, Beth P MVN wrote:
>
> Patrick-
> I am going through Bonnie Obiol's records regarding IER 16 Western
> Tie-In and I find where she sent a request for a list of protected
> species and EFH to the St. Pete office instead of forwarding the EFH
> letter directly to the Baton Rouge Habitat Office. I have attached
> the correspondence to the other office, their response and the email
> you forwarded from Miles Croom discussing the Not likely to adversely
> affect verses no-effect determinations and work load issues.
>
> Based on the list of species from St. Pete I have no problem coming to
> a no-effect determination for the T and E piece, but since it looks
> like the EFH letter never made it directly to the Habitat Office, I
> wanted to get some feedback from you on if you wanted me to submit
> something now.
>
> Let me know how you want to handle this and thanks for your input in
> advance.
>
> Beth <<ESACoordination.pdf>>
>

BOBBY JINDAL
GOVERNOR

HAROLD LEGGETT, PH.D.
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

MAR 0 6 2009

U.S. Army Corps of Engineers- New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Attention: Beth Nord

RE: Water Quality Certification (WQC 090212-06/AI 163172/CER 20090001)
Individual Environmental Report (IER) #16
West Bank & Vicinity, Western Tie-In
Jefferson & St. Charles Parishes

Dear Ms. Nord:

The Department has reviewed your application for the construction of the West Bank & Vicinity, Western Tie-In project (IER #16), in the vicinity of Ama, Louisiana. .

The requirements for Water Quality Certification have been met in accordance with LAC 33:IX.1507.A-E. Based on the information provided in your application, we have determined that the placement of the fill material will not violate the water quality standards of Louisiana provided for under LAC 33:IX.Chapter 11. Therefore, the Department has issued a Water Quality Certification.

Sincerely,

Thomas F. Harris
Administrator
Waste Permits Division

TFH/jjp

DC
DD
DPM

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
March 13, 2009

→ Gib Owens.

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Lee

Please reference the Individual Environmental Report (IER) West Bank and Vicinity (WBV) Western Terminus Levee (Lake Catahoutche Tie-in) (IER16) St. Charles and Jefferson Parishes. That study was conducted in response to Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the Corps of Engineers (Corps) to upgrade some existing hurricane protection projects to provide protection against a 100-year hurricane event. This draft report contains an analysis of the impacts on fish and wildlife resources that would result from the implementation of 100-year hurricane protection for that area, and provides recommendations to minimize and/or mitigate project impacts on those resources.

The proposed project was authorized by Supplemental 4 which instructed the Corps to proceed with engineering, design, and modification (and construction where necessary) of the WBV Hurricane Protection Projects so those projects would provide 100-year hurricane protection. Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has precluded the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing post-authorization 2(b) reports for each IER.

This report incorporates and supplements our FWCA Reports that addressed impacts and mitigation features for the WBV of New Orleans (dated November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the November 26, 2007 Draft Programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4. This report does not constitute the report of the Secretary of the Interior as required by Section 2(b) of the FWCA. This draft FWCA Report has been provided to the Louisiana Department of Wildlife and Fisheries (LDWF) and the National Marine Fisheries Service (NMFS) and their comments will be incorporated into our final report.

Should your staff have any questions regarding this report, please have them contact David Castellanos (337/291-3112) of this office.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

Attachment

cc: Corps of Engineers, New Orleans, LA
EPA, Dallas, TX
NMFS, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD/CRD), Baton Rouge, LA

Draft Fish and Wildlife Coordination Act Report for Individual Environmental Report 16 (IER 16)

Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
DAVID CASTELLANOS
FISH AND WILDLIFE BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA
MARCH 2009

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

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INTRODUCTION

The proposed project was authorized by Supplemental 4 which instructed the Corps of Engineers (Corps) to proceed with engineering, design, and modification (and construction where necessary) of the Lake Pontchartrain and Vicinity (LPV) and the West Bank and Vicinity (WBV) Hurricane Protection Projects so those projects would provide 100-year hurricane protection. Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has prevented our agencies from following the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing a 2(b) report for each IER. This report addresses IER 16 which is the plan for the western terminus of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). Our report contains a description of the existing fish and wildlife resources of the project area, discusses future with and without project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations to avoid, reduce, or compensate for impacts to fish and wildlife resources This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV Hurricane Protection Project (November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the November 26, 2007 draft programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4.

This report constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA; it also reflects the comments of the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service on this study.

DESCRIPTION OF THE STUDY AREA

The approximate project-area boundaries are South Kenner Road on the east (Jefferson Parish); the Davis Pond Freshwater Diversion Project Canal on the west (St. Charles Parish); South Kenner at the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroad Lines and the Mississippi River on the north, and the Outer Cataouatche Canal and the Davis Pond Freshwater Diversion Project to the south. Communities near the project area include Avondale and Waggaman to the east and South Kenner to the north. With the exception of landfills on the eastern portion of the project area and some development between U.S. Highway (Hwy) 90 and the Outer Cataouatche Canal, much of the study area remains undeveloped. These undeveloped areas consist of mostly bottomland hardwood (BLH) forests, freshwater marsh, scrub shrub, and mowed pasture (Cowardin et. al., 1979).

FISH AND WILDLIFE RESOURCES

The Service provided a draft programmatic FWCA report on November 26, 2007, that contains a thorough discussion of the significant fish and wildlife resources (including habitats) that occur within the entire 100 year levee protection study area. For brevity, that discussion is incorporated by reference herein.

Mammals known to occur in the project-area bottomland hardwoods and marshes include mink, raccoon, swamp rabbit, nutria, river otter, and muskrat. Those habitats also support a variety of birds including herons, egrets, ibises, least bittern, rails, gallinules and various waterfowl,. Forested and scrub-shrub habitats within the study area also provide habitat for many resident passerine birds and essential resting areas for many migratory songbirds including warblers, orioles, thrushes, vireos, tanagers, grosbeaks, buntings, flycatchers, and cuckoos (Lowery 1974).

Freshwater sport fishes present in the project area include largemouth bass, crappie, bluegill, redear sunfish, warmouth, channel catfish, and blue catfish. Other fishes likely to be present include yellow bullhead, freshwater drum, bowfin, carp, buffalo, and gar.

FUTURE FISH AND WILDLIFE RESOURCES

Although the area is experiencing subsidence like most of Louisiana's deltaic plain, it is expected that for the 50 year project life most of the BLH will remain, with some shift toward more water tolerant BLH species (e.g. red maple) and also some conversion to swamp habitat. Fresh marsh is expected to remain and possibly increase in area. The Davis Pond Freshwater Diversion Project provides freshwater and sediment input to this area. These areas are expected to support fish and wildlife resources for the project life and beyond. With the construction of the proposed project or either of the alternatives, fish and wildlife habitat will be impacted permanently.

THREATENED AND ENDANGERED SPECIES

The service is unaware of any known threatened of endangered species in the proposed project area and provided recommendations to ensure fish and wildlife resources received equal consideration during the planning phase. The project area is located where colonial nesting water birds and bald eagles may be present. In a November 28, 2007 letter, the Service provided recommendations to avoid potential impacts to these wildlife resources.

DESCRIPTION OF SELECTED PLAN

The purpose of the proposed plan is to provide the 100-year level of protection for the HSDRRS for New Orleans East. The term "100-year level of risk reduction," as it is used throughout this document, refers to a level of protection which reduces the risk of hurricane surge and wave driven flooding that the New Orleans Metropolitan area has a 1 percent chance of experiencing each year.

The proposed plan results from a defined need to reduce flood risk and storm damage to residences, businesses, and other infrastructure from hurricanes (100-year storm events) and other high water events. The completed HSDRRS would lower the risk of harm to citizens, and damage to infrastructure during a storm event. The safety of people in the region is the highest priority of the Corps.

Various alternative alignments and structures (i.e., floodwalls and levees) were evaluated for the protection needed. Based upon a detailed analysis that included evaluating risk and reliability; construction schedule; cost; right-of-way requirements; environmental impacts; and operations and maintenance needs, the following alignments and structures were chosen as the proposed project for IER 16.

Earthen levees in southern Louisiana settle over time due to the type of soils and geology present in the area. Because of this settlement, levees are maintained over the project life (50 years) by a process of multiple lifts. The Corps has determined that a base elevation for the levees would allow the levee to be certified into the National Flood Insurance Program (NFIP). This base elevation plus some overbuild is what the Corps is proposing to construct as discussed below for each reach. As stated, because settlement is an issue in this location, the Corps proposed plan includes initially overbuilding the levees to an elevation that has been determined to allow the levee to settle for 10 years, but would still be above the height required to be eligible for certification into the NFIP. After 10 years, an additional lift would be required to maintain the levee above the required NFIP elevation.

The proposed plan (Figure 1) originates on the western end of the existing Lake Cataouatche Levee south of where the levee terminates at Hwy 90 and continues westerly along the south bank of the Outer Cataouatche Canal. Since the previous authorized project was not constructed and USACE rights-of-way (ROW) were never established for this segment of the WBV, the proposed plan could not be designed within existing ROW. The reach of the project alignment from the western end of the Outer Cataouatche Canal to the Mississippi River generally follows the Davis Pond Freshwater Diversion Project's Main East Guide Levee ROW, the ROW for River Road, or the Mississippi River Levee ROW. The western tie-in is comprised of 5 reaches, characterized as follows:

Connecting to the western end of the Lake Cataouatche Levee, reach 1 originates approximately 1,200 feet south of Hwy 90 with an approximately 500 foot long, un-navigable earthen closure across the Outer Cataouatche Canal. The new closure would have a base width of approximately 500 feet and a top elevation of +15.5 feet North American Vertical Datum 1998 (NAVD88). The protected-side toe of the earthen closure would begin approximately 400 feet south from the southern bank of the east-west reach of the Outer Cataouatche Canal. The earthen closure would require approximately 500 feet of ROW to accommodate construction resulting in approximately 5.7 acres being disturbed for construction of which 2.3 acres would be fill placed into open water. Discharge lines from the Highway 90 Pump Station would be extended approximately 800 feet in length south to cross over the new closure so that the pumping station discharge would be on the flood side of the new alignment.

On the west side of the Outer Cataouatche Canal, the alignment would continue west as earthen levee with a base width of 500 feet and a top elevation of +15.5 feet NAVD88. The alignment would continue west and transition to an approximately 300-foot long floodwall on the eastern side of Bayou Verret with a top of elevation of +15.5 feet NAVD88. The floodwall would then tie into the approximately 135 feet long Bayou Verret closure structure. In the area adjacent to the new Bayou Verret closure structure, the ROW width would be expanded to 700 feet, as the increased ROW would be necessary to accommodate construction staging and access areas. The Bayou Verret closure structure itself would cross Bayou Verret on a southwesterly alignment. Within this reach, guide walls would be constructed on both the north and south ends of the closure structure within the bayou.

No decision has been made on the final design of the Bayou Verret closure structure. Possible designs for the closure structure include a sector gate, a stoplog structure, and a barge gate. All alternatives would have a usable navigation opening of approximately 56 feet and a depth of -10 ft NAVD88. The total width of the structure depends on the final design selected. However, the maximum width of the possible alternatives would be approximately 135 feet. The closure structure would remain open most of the time. In the event of a storm, the structure would be closed and remain closed until the storm has passed and emergency operations were concluded.

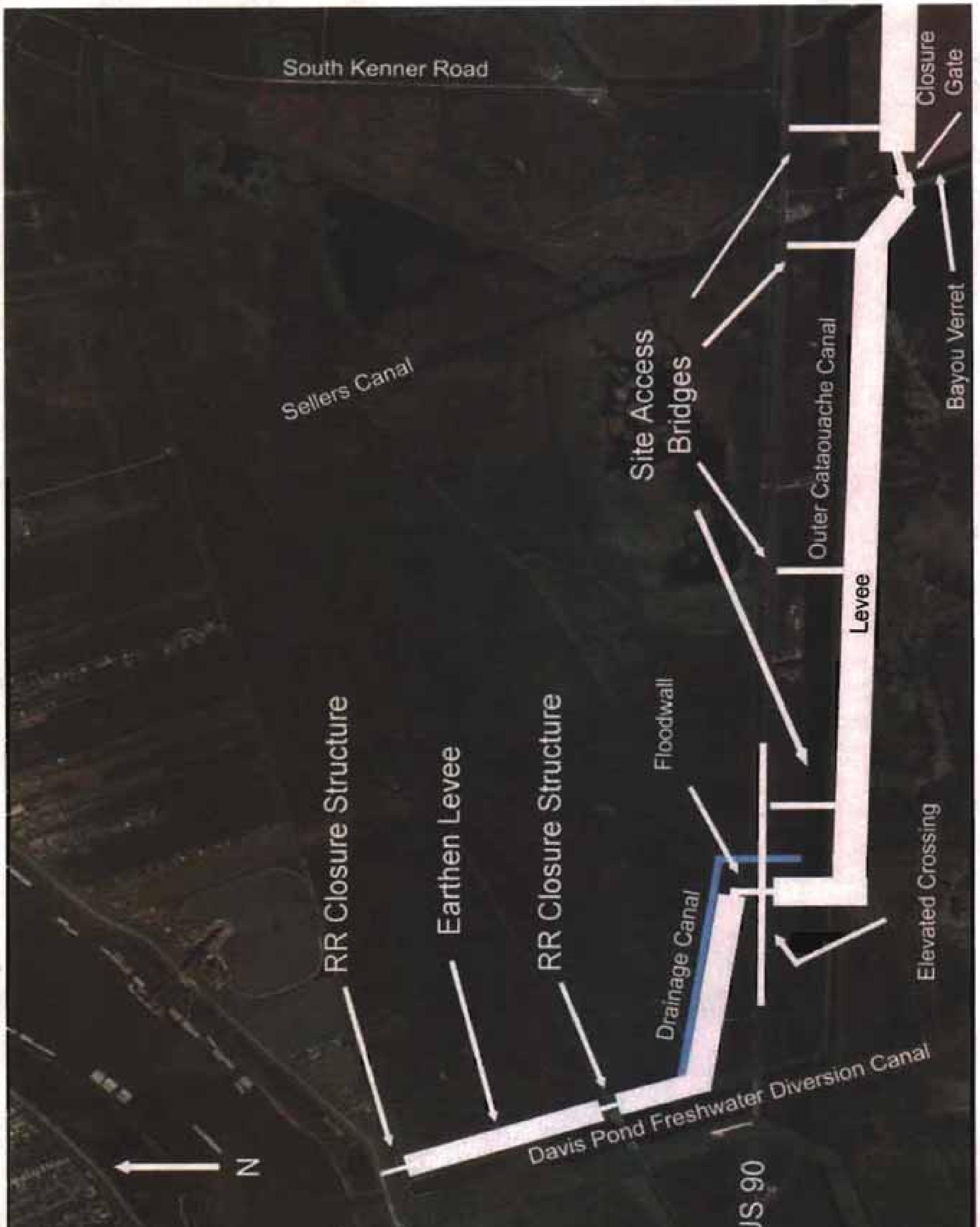


Figure 1. Proposed plan for IER 16.

Dredging would be necessary to provide adequate depth for structure construction. Approximately 50,000 cubic yards of material would be excavated from the Bayou Verret at the closure structure alignment and to provide approach channels on either end of the structure.

Adjacent to the Bayou Verret structure, a temporary bypass channel would be constructed to allow navigation and drainage while the closure structure was being built. The bypass channel could be on the east or west side of Bayou Verret and would be approximately -6 feet deep NAVD88, approximately 78 feet wide, and 1,000 feet long. Material excavated to construct the bypass channel would be side-cast, stockpiled on site, and then used to backfill the bypass channel when the structure was completed.

To provide access and egress for reach 1 construction, a permanent access corridor would be constructed beginning at a point approximately 1,400 feet west of the Hwy 90 access to the Lake Cataouatche Levee and continuing south to the construction area south of the Outer Cataouatche Canal. As part of this access, a permanent bridge would be constructed spanning the outer Cataouatche Canal. The bridge itself could be constructed of pre-fabricated concrete and would be set high enough off the water surface for small recreational boats to pass underneath.

The access corridor would be approximately 100 feet wide and extend approximately 500 feet in length from Hwy 90 to the north bank of the Outer Cataouatche Canal. Continuing on approximately the same line, the permanent bridge would be approximately 100 feet wide, and span the approximately 400 feet width of the canal. South of the Outer Cataouatche Canal, the permanent access would continue the 100-foot width for an additional 300-foot length to join the work site. All woody vegetation cleared from the access corridor would be windrowed and then burned on site.

Construction access for equipment and materials to the construction site could be provided by barge access from Bayou Verret or from the permanent access corridor and bridge. Because the proposed location of the closure structure would be within the existing waterway, the structures would be constructed in a cofferdam. Due to the depth and size of the excavation, dewatering wells or well points would be continually pumped during construction to keep the area dry. Because space inside the cofferdam would be very limited, the equipment used to build the structure would be outside of the excavation on a marine plant or temporary work platform.

Construction of reach 1 would require approximately 44 acres of new ROW, would permanently fill approximately 4.5 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 38 acres of vegetated wetlands, and would permanently alter approximately 0.15 acres of canal bottom from the footing under a permanent bridge spanning the Outer Cataouatche Canal.

On the west side of the Bayou Verret closure structure, the alignment would continue west as floodwall with a top elevation of +15.5 feet NAVD88 for approximately 300 feet in length. The alignment would then turn northwest for a short distance and then again transition to a westerly direction to parallel the south bank of the Outer Cataouatche Canal. Along the west side of the Bayou Verret closure structure, the ROW would be expanded to 1,100 feet in width. This increased ROW width would be necessary for construction and staging areas. Within this increased ROW, an approximately 1,200 feet length of an unnamed canal that is approximately

100 feet wide would be filled.

As the alignment continues west, the floodwall would transition to a levee with a base width of 500 feet and a top of elevation of +15.5 NAVD88 for a length of approximately 9,600 feet. The Davis Pond Freshwater Diversion Project guide levee comprises the most northern 100 feet of this 500 foot width along the entire length of the levee. The existing guide levee would be incorporated into the new levee. In additional to the 500-foot levee width, an additional 100 feet of ROW would be required on the flood side throughout the 9,600 feet length to construct de-watering cells. The de-watering cells would be built on the south side of the levee and would be necessary to keep the levee construction area de-watered while the Davis Pond Freshwater Diversion Project structure operates throughout the construction period.

At the western end of the 9,600-foot length, the levee would then turn north for approximately 800 feet crossing the Outer Cataouatche Canal and approaching Hwy 90. The canal crossing would form a second permanent closure of the Outer Cataouatche Canal (the reach 1 closure was the first). This closure would also be used as an access point during construction activities. With the construction of the closure the wetlands located immediately west of the closure would no longer have hydrologic connection to the Outer Cataouatche Canal. That area is bounded by Hwy 90 to the north, the Davis Pond Freshwater Diversion Project East Main guide levee to the west and the Davis Pond Freshwater Diversion Project east guide levee to the south. With the construction of the closure to the east, those wetlands would be completely enclosed. To ensure continued water exchange to this area an opening would be cut into the Davis Pond Freshwater Diversion Project east guide levee on the southern boundary of the area. The opening would be approximately 50 ft wide and would be to a depth of 0 NAVD88. The opening would be reinforced with scour protection.North of the Outer Cataouatche Canal, the levee would transition to a floodwall, approximately 300 feet in length, turn 90-degrees to the west, and continue westward parallel to Hwy 90.

An unnamed drainage canal, parallel to, and approximately 500 feet to the east of the floodwall would be enlarged between Hwy 90 and the Outer Cataouatche Canal. The enlarged canal would tie into an existing (or replacement) culvert that passes under Hwy 90. The drainage canal would be enlarged from the existing 20-foot width to approximately 100 feet wide and 10 feet deep. Within reach 2, two temporary access corridors with temporary bridges, a permanent access corridor and permanent bridge, and two temporary staging areas would be constructed. The temporary and permanent access corridors and temporary staging areas would be located between Hwy 90 and the north bank of the Outer Cataouatche Canal. The first temporary bridge, access corridor and staging area would originate approximately 300 feet west of Sellers Canal on the south side of Hwy 90. The staging areas would be south of Hwy 90 and north of the Outer Cataouatche Canal and would be approximately 200 feet wide by 400 feet long. The access corridor between Hwy 90 and the Outer Cataouatche Canal would be approximately 100 feet wide by 500 feet long and the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. All woody vegetation within the footprint of these areas would be cleared, grubbed, windrowed, and burned in place. The temporary bridge would be used to transport construction equipment and materials to and from the construction area south of the Outer Cataouatche Canal. Bridge design has not been completed, but would include an approximately

40-foot opening to allow navigation during the construction period. Advanced notice would be required to deploy the opening.

A second temporary access corridor and temporary bridge would originate on Hwy 90 approximately 4,300 feet west of the first temporary staging area; the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. The staging area would be approximately 100 feet wide by 500 feet long. The permanent access area and permanent bridge would similarly extend south from Hwy 90 originating approximately 1,000 feet east of the western termination of the Outer Cataouatche Canal. The access area would be approximately 120 feet wide by 500 feet long and an approximately 60 foot wide, permanent bridge would span the Outer Cataouatche Canal at this location. The bridge would be set high enough off the water surface for small recreational boats to pass underneath.

Construction of reach 2 would require approximately 145 acres of new ROW, would create approximately 1 acre of aquatic habitat (canal widening), would permanently fill approximately 7.4 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 143 acres of vegetated wetlands, and would permanently alter approximately 0.1 acres of canal bottom from the footing under a permanent bridge spanning the Outer Cataouatche Canal. Construction would also occur on approximately 22 acres of existing Davis Pond Freshwater Diversion guide levee ROW.

The floodwall that had paralleled Hwy 90 in the end of reach 2 would turn north on a 90-degree angle and continue another 800 feet in length crossing Hwy 90. The intersection of the highway and floodwall would be constructed by raising the highway approaches over the +15.5 foot NAVD88 profile to have an elevated crossing of the floodwall. The roadway's grade change for crossing the floodwall would be very gradual to allow the safe flow of traffic; the transition would be approximately 2,000 feet long in both directions and require a 2.04 percent grade. The roadway would include a median, four 12-foot lanes, two 10-foot shoulders and a cross slope of 0.025 ft/ft away from the median. This design would not impede the proposed I-49 elevated highway construction through this reach as the bottom girders of the raised highway would be designed to be above the floodwall for the full width of the highway. This reach would also include pipeline crossings.

Elevating Hwy 90 over the floodwall was recommended, rather than providing a closure gate, because of the importance of keeping Hwy 90 open to traffic during hurricane evacuation. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway. The temporary roadway, or lane detour would be a four-lane shift to the north, but entirely within the existing Hwy 90 ROW.

Construction of reach 3 would require approximately 10.2 acres of new ROW and would require the clearing, grubbing, and fill of approximately 1 acre of vegetated wetlands. The remaining 9 acre of impacts would occur on the existing Hwy 90 road surface.

North of Hwy 90, the floodwall would continue for approximately 200 feet in length, turn 90 degrees west for approximately 100 feet in length with a width of disturbance of approximately 500 feet. At the end of the floodwall, the alignment would transition to an earthen levee with a base width of 300 feet and a top elevation of +13.5 NAVD88. The levee would extend approximately 2,700 feet long in a west northwesterly direction. The drainage canal enlargement that began south of Hwy 90 would continue in this reach initially paralleling and offsetting the floodwall alignment by approximately 500 feet and then turning west northwesterly and paralleling the protected-side levee toe for the entire 2,700-foot length. The drainage canal would be approximately 100 feet wide and 10 ft deep.

Construction of reach 4 would require approximately 29 acres of new ROW and would require the clearing, grubbing, and fill of approximately 22 acres of vegetated wetlands. An additional 6.75 acres of vegetated wetlands would be excavated to create 6.75 acres of new open water (drainage canal) habitat.

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north and run parallel to the Davis Pond Freshwater Diversion Project's Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The new levee would be constructed to +13.5 ft NAVD88 for a distance of approximately 1,300 feet. The centerline of the proposed levee would be offset a minimum of 120 feet from the existing canal bank, but would be within the Davis Pond Freshwater Diversion Canal's previously disturbed ROW. The width of the ROW for the levee in this section would be approximately 500 feet for the entire 1,300-foot length to the railroad crossing. This construction would occur within an area of previous disturbance.

At the BNSF Railroad crossing, the alignment would transition to floodwall of approximately +13.5 feet NAVD88 for a distance of approximately 150 feet and require 400 feet of construction ROW for the construction of the railroad closure structure. The closure structure would be constructed of structural steel and covered with a steel skin plate. On the north side of the BNSF Railroad crossing, the alignment would again return to a levee of +13.5 feet NAVD88 for the remaining distance (approximately 3,000 feet). The width of the construction ROW would be approximately 500 feet over the entire distance. This construction would occur within the previously disturbed Davis Pond Freshwater Diversion Canal ROW.

At the northern end of the alignment, the levee would transition to floodwall and closure structures (e.g., roller gate) to cross the Union-Pacific Railroad track, River Road (with a closure structure), and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. This section would require a 400-foot construction ROW over the approximately 600-foot length of the section, but would be within the previously disturbed Davis Pond Freshwater Diversion Canal ROW, the ROW for River Road, or the Mississippi River Levee ROW. Construction of reach 5 would require less than 5 acres of new construction ROW as the majority of the footprint of disturbance is already designated as Corps ROW. There would be no clearing, grubbing, or fill of wetlands, as this reach would utilize previously disturbed areas.

In total, construction of the project would require approximately 233 acres of new ROW, approximately 204 acres of vegetated wetlands would be cleared, grubbed, and filled, approximately 7.8 acres of aquatic (open water) habitat would be created and approximately 12 acres of aquatic habitat would be filled. Submerged aquatic vegetation (SAV) would be impacted by during construction throughout the 12 acres. Construction of the footings for the permanent bridges spanning the Outer Cataouatche Canal would permanently alter approximately 0.25 acres of canal bottom, and the western tie-in would enclose approximately 2,750 acres of wetlands within the WBV portion of the Greater New Orleans Hurricane Storm Damage Risk Reduction System. Approximately 2,485 of those 2,750 acres of wetlands were previously segmented and partially enclosed by the construction of Hwy 90, and the BNSF and Union Pacific railroads.

ALTERNATIVES UNDER CONSIDERATION

No Action

Under the no action alternative, the proposed 100-year level of hurricane and storm damage reduction would not be constructed by THE CORPS in this portion of the WBV Project. The authorized completion of the Western Tie-in of the WBV has never been constructed. As a result, the level of existing protection for this reach of the WBV project is only that afforded by the elevation from Hwy. 90 between the Davis Pond Freshwater Diversion Canal and the end of the Lake Cataouatche Levee at Hwy. 90; that elevation is estimated at about +4 feet NAVD 88. The line of protection described in this IER is an integral part of the WBV Project (i.e., not a separable project element) as it provides the tie-in to the Mississippi River Levee and completes the line of protection for the West Bank. Taking no action along this reach of the WBV would result in a significant gap in the WBV project and the benefits for projects constructed to the east of the western tie-in would not be achieved if the tie-in were not completed. With the Lake Cataouatche levee (IER #15) being constructed to an elevation of +14.5 to +15 feet, the absence of the western tie-in would render the new Lake Cataouatche levee ineffective for floods with water surface elevations exceeding +4 feet.

Alternative 1

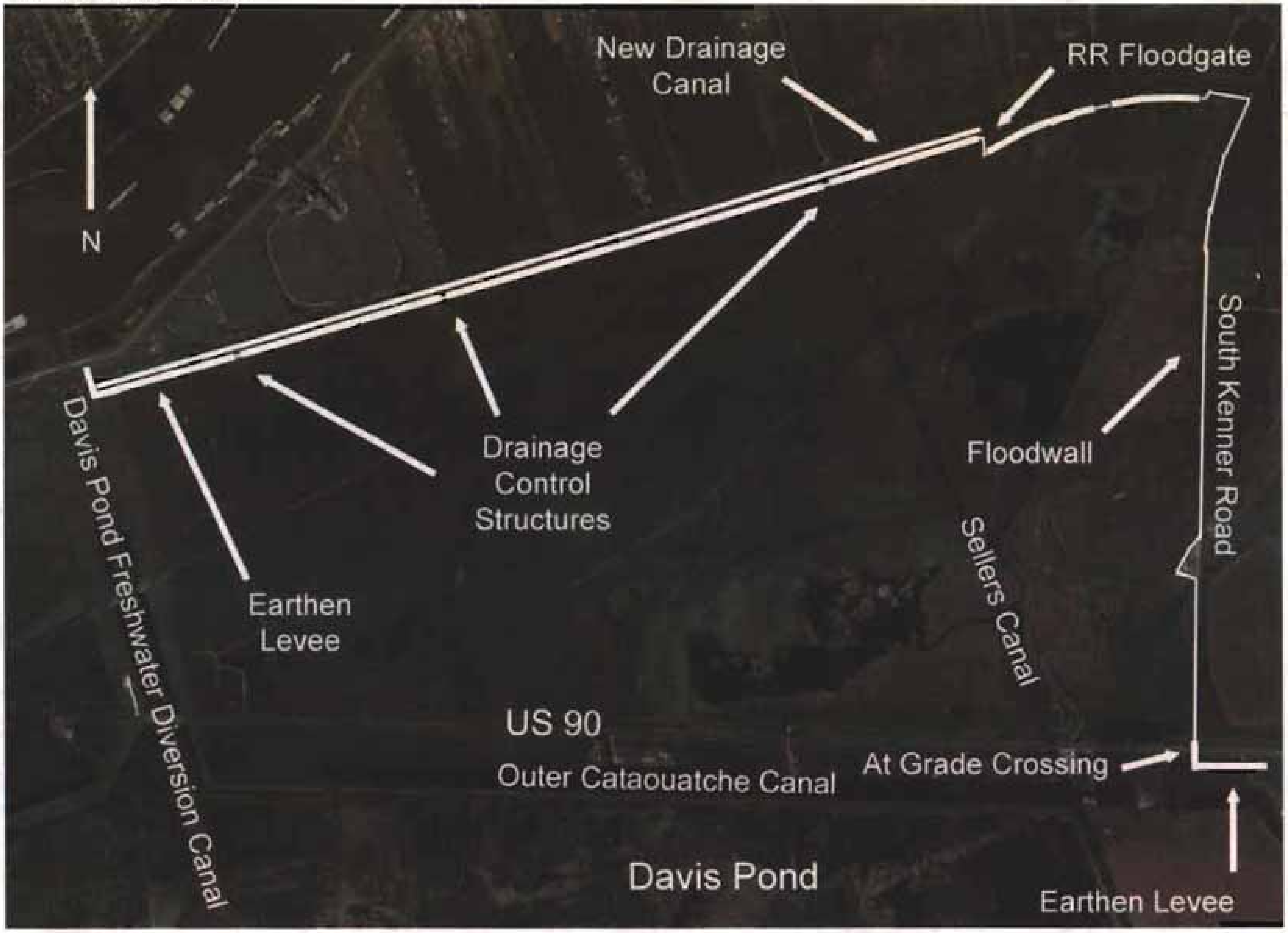
Alternative 1, as shown in Figure 3, is described as the South Kenner Road and West Railroad Tie-In Alignment. The alignment is comprised of approximately 19,500 linear feet of levee, and 10,200 linear feet of floodwall constructed to an elevation of +13.5 to +15.5 feet. The alignment begins as earthen levee joining the western end of the Lake Cataouatche Levee (IER #15) and proceeds approximately 800 feet parallel to Hwy. 90 in a westerly direction before turning 90-degrees to the north. At that point, the alignment crosses Hwy. 90 with a levee crossing (i.e., no closure structure) and transitions to floodwall on the north side of Hwy. 90. On the north side of Hwy. 90, the floodwall proceeds for approximately 10,000 feet along South Kenner Road. Just south of the BNSF Railroad right-of-way the alignment turns west continuing as floodwall for approximately 800 feet bounding the northern perimeter of the Greater Orleans Landfill. On the western edge of the Greater Orleans Landfill, the alignment transitions to earthen levee for approximately 1,400 feet. Thereafter, the alignment again transitions to floodwall for approximately 400 feet to allow the crossing of a 12-inch pipeline (Bridgeline Gas Co.)

After the pipeline crossing, the alignment returns to earthen levee for approximately 2,500 feet at which point the earthen levee transitions to floodwall and turns 90 degrees to the north for approximately 250 feet for a gated closure structure (e.g., railroad roller gate) across the BNSF railroad tracks. On the north side of the BNSF tracks the alignment turns 90-degrees to the west, makes a transition to earthen levee, and proceeds westward for approximately 13,000 feet to the Davis Pond Fresh Water Diversion Canal. Throughout this reach of levee, the alignment is parallel to, and on the south side of, the Union-Pacific RR right of way. Within the Davis Pond Freshwater Diversion Canal right-of-way, the earthen levee transitions to floodwall, turns 90-degrees to the north, crosses the Union-Pacific RR track with a closure structure (e.g., railroad roller gate), as well as River Road with a closure structure, and ties into the Mississippi River Levee in St. Charles Parish. The floodwall along South Kenner Road would include three vehicular floodgates because of limited rights-of-way and existing utilities and four drainage control structures would be required at major canal crossings for this alignment. The design assumptions for the elements of this alternative are presented below.

The alignment consists of a levee running parallel to Hwy. 90 where it begins with a tie-in to the Lake Cataouatche levee. This levee would have a cross-sectional width of approximately 150 feet, but requires a wave berm on the flood side and a stability berm on the protected side. The wave berm would be sloped at 1 vertical to 12 horizontal and add an additional (ENGINEERING INSERT) feet of width to the construction footprint. The stability berm would be sloped at XX vertical (ENGINEERING INSERT) to YY horizontal (ENGINEERING INSERT) and add an additional (ENGINEERING INSERT) feet of width to the construction footprint. The total width necessary to construct the typical levee section assumed for all earthen levee components within this IER would be XXYY feet (ENGINEERING INSERT).
The levee would be located outside of the highway right-of-way and would have no impact on utilities or drainage in the right-of-way. At the levee tie-in, the proposed location would also be shifted away from the Outer Cataouatche Canal bank for stability reasons. The levee closure would be in the east-west direction and could tie into the existing Lake Cataouatche Levee without crossing the Outer Cataouatche Canal.

At Hwy. 90 and South Kenner Road, the levee would turn to the north crossing Hwy. 90. Traffic would be maintained during levee construction and would require the construction and use of a bypass roadway. The intersection of the highway and levee would be built by raising the highway approaches over the profile of the proposed levee. To accomplish this, the bottom of the subbase of the raised highway would be designed to be above the levee crown for the full width of the crown and highway, thus preserving the levee profile and the flood protection heights. The roadway's grade change for crossing the levee would be

Figure 2. Alternative 1 plan.



very gradual to allow the safe flow of traffic; the transition would be approximately 2,000 feet long and require a 2.04 percent grade. The crossing would utilize a 6-foot median, four 12-foot lanes, two 10-foot shoulders and a cross slope of 0.025 ft/ft away from the median. The intersection would also include turn lanes on Hwy. 90 for access to South Kenner Road. Elevating Hwy. 90 over the levee was recommended at this location (rather than providing a closure gate) because of the importance of keeping Hwy. 90 open to traffic during hurricane evacuation.

Upon crossing Hwy. 90, the earthen levee would transition to a floodwall on the west side of South Kenner Road parallel to the roadway. Placement of the floodwall on the west side of South Kenner Road would minimize the impact to the existing River Birch Landfill facility and the associated truck traffic. Proceeding north, the wall would offset around the west side of the existing truck weigh station. North of the weigh station, the floodwall would be aligned so that the piles would remain clear of the existing landfill geotextile liner. To accommodate this, the floodwall centerline would shift east to the existing centerline of South Kenner Road; the existing roadway would be shifted to the east side of the floodwall and reconstructed. Three vehicular gates (e.g., 24-foot) would be required to access the existing roadways on the west side of the floodwall. All vehicular swing gates would be constructed of structural steel and covered with a steel skin plate.

At the north end of South Kenner Road, the floodwall would turn west between the Union-Pacific railroad to the north and the BNSF railroad to the south. Once past the landfill, the alignment would transition to an earthen levee remaining to the south of, and outside of, the railroad right-of-way. The north toe of the proposed east-west levee located south of the Union-Pacific Railroad would be sited approximately 140 feet from the railroad's south right-of-way line. This space would be provided to allow for the construction of a major east-west canal. This proposed canal would be approximately 150 feet wide for the entire distance of the levee (approximately 13,000 feet).

To accommodate the earthen levee and the proposed drainage canal south of the Union-Pacific Railroad, the width of the limits of construction would be approximately 420 feet. The levee footprint would be offset from the rail line to eliminate the effects of differential settlement and to minimize the impact to existing utilities. Railroad closure gates constructed of structural steel and covered with a steel skin plate would be located at the BNSF spur track crossing. At the western end, the levee would turn to the north, cross the railroad spur and River Road to eventually tie into the Mississippi River Levee. The design details of the tie-in are not available at this time.

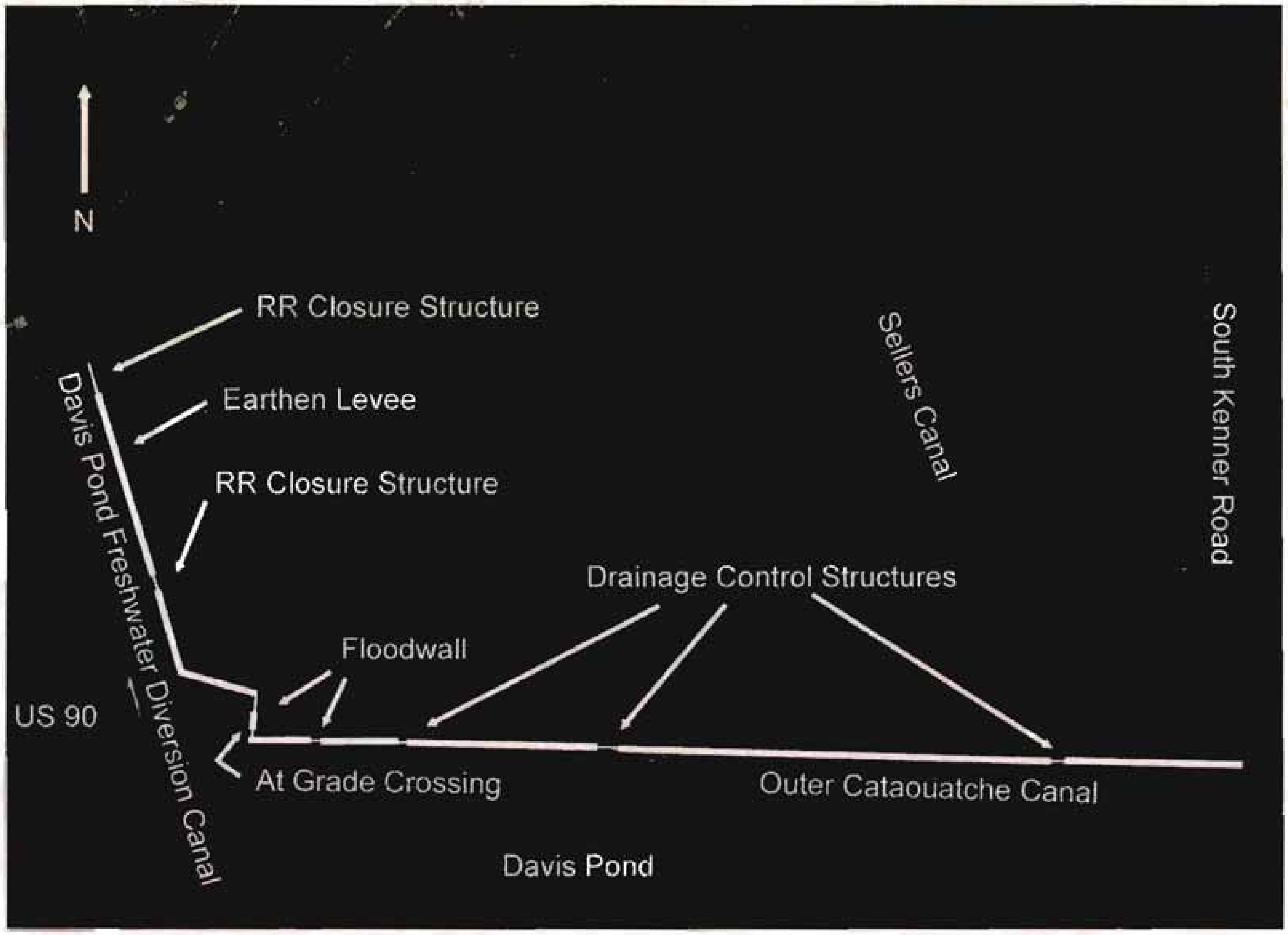
To ensure adequate flow capacity through the levee and floodwall, a system of drainage control structures would be required for Alternative 1. The drainage control structures would likely utilize box culvert designs to allow maintenance vehicles to cross the new drainage canals and perform routine maintenance (e.g., clean debris bar screens). A ramp system would be designed to provide access to the box culvert crossings from the levee crown. The structures would use steel sluice gates to allow flow through the structure during rain events and permit them to be closed during storm surge to prevent backflow. The new canal would collect all drainage that flows southerly through existing culverts under the railroad tracks where it would be directed to new drainage control structures through the proposed levee. These features allow drainage through the railroad to remain unchanged by this project and surface water flows would then drain south through existing outfall canals and bayous.

Alternative 2

Alternative 2, as shown in Figure 4, is described as the North of Outer Cataouatche Canal to Davis Pond Freshwater Diversion Project Tie-In. The alignment consists of approximately 21,500 linear feet of levee constructed to an elevation of +13.5 to +15.5 feet. As in Alternative 1, the alignment begins as earthen levee joining the western end of the Lake Cataouatche Levee (IER #15). However, instead of turning north and crossing Hwy. 90 near South Kenner Road (as with Alternative 1), this alignment continues as earthen levee in a western direction for approximately 12,000 feet. Throughout the entire distance, the levee would be parallel to, and on the south side of, Hwy. 90 and the width of the limits of levee construction would be approximately 300 feet. In the vicinity of the western termination of the Outer Cataouatche Canal, the levee would transition to floodwall for a short distance to accommodate the crossing for the Bridgeline Gas Pipeline. After the pipeline crossing, the alignment would return to earthen levee for approximately 1,000 feet. At that point, the alignment would then turn 90-degrees north, cross Hwy. 90 at a reconstructed and elevated position over the levee. After crossing Hwy. 90, the alignment turns western for approximately 1,250 feet toward the Davis Pond Freshwater Diversion Project. Within the Davis Pond Freshwater Diversion Project's construction right-of-way the levee would turn to the north and continue parallel to the diversion canal for approximately 1,500 feet to the BNSF railroad crossing. At the BNSF Railroad crossing a closure structure (e.g., floodgate) would be constructed. North of the BNSF Railroad crossing, the alignment would be constructed similar to Alternative 1.

The east-west segment of Alternative 2 consists of a levee running west, and parallel to the south side of Hwy. 90. The cross sectional width of this segment would be the same as the segment of the Alternative 1 levee that runs parallel to Hwy. 90. Three drainage control structures would be included for this levee segment as noted on figure 4. A short floodwall would be used at the Bridgeline Gas Company Pipeline Crossing to eliminate deflection of the pipeline, which could result from the weight of the levee fill. The line of protection then transitions back to an earthen levee, turning north to cross Hwy. 90.

Figure 3. Alternative 2 plan.



At the southwestern corner of Alternative 2, the levee turns north to cross Hwy. 90. The highway would be reconstructed over the levee crossing to cross over the new levee similar to the Hwy. 90 crossing in Alternative 1 (although at a different location). This would require that the levee at Hwy. 90 be offset to the east from the Hwy. 90 bridge by 1,050 feet. As a result there would be a dogleg in the levee at this location to allow development of the roadway profile required from the bridge abutment to the centerline of the levee crossing. Elevating the highway profile to cross over the top of the levee was recommended at this location rather than providing a floodgate because of the importance of keeping Hwy. 90 open to traffic during hurricane evacuation.

After the alignment crosses Hwy. 90, an earthen levee would run parallel to the Davis Pond Freshwater Diversion Project's Main East Guide Levee in St. Charles Parish, and would be incorporated into the existing guide levee as a wave berm on the flood side. The top of the existing guide levee would be degraded to drain into the Davis Pond Freshwater Diversion Canal's existing drainage canal and match the slope requirements for the wave berm. The centerline of the proposed levee would be offset 300 feet from the existing canal bank but would be within the Davis Pond Freshwater Diversion Canal's previously disturbed right-of-way. The width of the limits of construction for the levee in this section would be approximately 210 feet. Two railroad closure structures would be required under this alignment. The gates would be constructed of structural steel and covered with a steel skin plate. At the northern terminus, the alignment would require crossings, closures, and tie into the Mississippi River Levee as with Alternative 1. As part of the tie-in, work will include a rail and highway crossing. The design details of the crossings, closure structures, and tie-in are not available at this time.

To ensure adequate flow capacity through the components of Alternative 2, three drainage control structures would be required along the levee between Hwy. 90 and the Outer Cataouatche Canal (see figure 4). These drainage control structures would likely utilize box culvert designs to allow maintenance vehicles to cross the new drainage canals and have access to maintain them (e.g., clean bar screens). A ramp system would be designed to provide access to the box culvert crossings from the levee crown. The structures would use steel sluice gates to allow normal flow through the structure and permit them to be closed during storm surge. These drainage control structures would remain open until the threat of hurricane storm surge required closing to prevent back-flow through these structures.

EVALUATION METHODS FOR SELECTED PLAN AND ALTERNATIVES

The Service used the Habitat Assessment Methodology (HAM) to quantify the benefits of anticipated mitigation measures for forested habitats. The habitat assessment models for swamps and bottomland hardwoods (BLH) within the Louisiana Coastal Zone utilized in this evaluation are modified from those developed in the Service's Habitat Evaluation Procedures (HEP). For each habitat type, those models define an assemblage of variables considered important to the suitability of an area to support a diversity of fish and wildlife species (Louisiana Department of Natural Resources 1994; U.S. Fish and Wildlife Service 1980). The HAM, however, is a community-level evaluation instead of the species-based approach used with HEP. Further explanation of how impacts/benefits are assessed with HAM and an explanation of the assumptions affecting habitat suitability (i.e., quality) index (HIS) values for each target year are available for review at Service's Lafayette, Louisiana, field office. The Fresh-Intermediate Coastal Marsh Model of the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) Wetland Value Assessment (WVA) Methodology was used to quantify the impacts to the fresh marsh habitat in the project area.

IMPACTS OF SELECTED PLAN AND ALTERNATIVES

The no action alternative was not selected because it would not allow completion of 100 year flood protection; the purpose of the Supplemental 4 authorization. Fish and wildlife resources would not be impacted by selection of this alternative.

The proposed project and alternatives 1 and 2 would all result in some degree of impacts to fish and wildlife resources, mostly by direct habitat destruction. Levees and associated right of ways cleared will replace BLH and fresh marsh and the beneficial functions of refugia, food resources, nesting areas, etc.

Alternative1 would impact high quality BLH, fresh marsh and pasture, but does not enclose any wetland or non wet BLH behind levees. The major portion of impacted habitat is along the part of the alignment between the Davis Pond Freshwater Diversion Project levee tie in and South Kenner Road. A smaller amount of BLH is also impacted south of Highway 90. The part of the alignment along South Kenner Road is mostly flood wall and the areas impacted are developed or landfill or cleared areas for landfill. The construction of this alternative would directly impact 70.7 acres of BLH and 27 acres of freshwater marsh resulting in the loss of 35.5 AAHUs and 17.7 AAHUs respectively (Table 1).

Alternative 2 would impact slightly lower quality BLH than alternative 1, and some marsh toward the eastern end of the alignment. The BLH that would be impacted occurs on the north side of U.S. highway 90 and the south side between the highway and the Outer Cataouatche Canal. Wetlands would be enclosed with this alternative with levees to the south and west. However, this land is already bounded by roadways, a levee and a railroad, and if drainage structures are constructed to provide at least the same drainage capacity as currently exists then any hydrologic impacts due to enclosure could be avoided. There would be greater impacts to residential and commercial interests associated with alternative 2 than with the proposed project or alternative 1. Construction of this alternative would directly impact 72.27 acres of BLH and 4.68 acres of fresh marsh, resulting in the loss of 37.12 AAHUs and 2.2 AAHUs respectively (Table 1).

The proposed project (alignment 3) would impact BLH similar in quality to alternative 2, and also large areas of fresh marsh south of the Outer Cataouatche Canal. Wetlands would be enclosed with this alternative with levees to the south and west. However, this land is already bounded by roadways, a levee and a railroad, and if drainage structures are constructed to provide at least the same drainage capacity as currently exists, then any hydrologic impacts due to enclosure could be avoided. Construction of the proposed project would enclose a section of wetlands and block their existing hydrologic connection to the west end of the Outer Cataouatche Canal. These wetlands are south of U.S. highway 90 and bounded on the west by the Davis Pond

Freshwater Diversion Project East Main guide levee, and to the south by the Davis Pond east guide levee. The Corps has indicated that it will cut an opening into the Davis Pond Freshwater Diversion Project east guide levee approximately 50 ft wide to a depth of 0 NAVD88 to allow water exchange with the Davis Pond Freshwater Diversion Project outfall canal. Construction of the proposed project would directly impact 78.6 acres of BLH and 137.8 acres of fresh marsh, resulting in the loss of 36.18 AAHUs and 66.3 AAHUs respectively (Table 1).

Construction of alternative 2 and the proposed project would both result in approximately 2000 acres of BLH and other wetlands being on the protected side of a 100 year protection levee. Development has occurred on the protected side of previous protection levees in the New Orleans area. The potential for this so called induced development was explored in the St. Charles Parish Development Study by the Corps. Through their analysis, conducted with an assumed 12 year period after project construction, they concluded that the expense of making the land suitable for construction would be prohibitive to new development. The Service is concerned, that over time, development in these levee protected lands may become feasible and impacts to this habitat could be realized.

Table 1. Project impacts by alternative and habitat type.

	Proposed project (alignment 3)	Alternative 1	Alternative 2
BLH (acres/AAHUs)	78.6 / 36.18	70.7 / 35.5	72.27 / 37.12
Fresh marsh (acres/AAHUs)	137.8 / 66.3	27 / 17.7	4.68 / 2.2
Total	**216.4 / 102.5**	97.7 / **53.2**	**77.0 / 39.3**

FISH AND WILDLIFE CONSERVATION MEASURES

Where practicable, the use of floodwalls instead of levees would reduce the area impacted and help conserve important fish and wildlife habitat (i.e., bottomland hardwoods, cypress swamps, fresh and estuarine marsh and associated shallow open water habitats). Clearing and grubbing should be limited to only what is necessary at the time of construction. If either alternative 2 or 3 is ultimately selected as the final plan, the Corps should acquire non-development easements on those wetlands that would be on the protected side of the new levee. If bald eagle nesting locations and wading bird colonies are found in the project area before or during construction, adverse impacts may be avoided by timing of construction and further consultation with the Service.

COMPENSATORY MITIGATION MEASURES

The President's Council on Environmental Quality defined the term "mitigation" in the National Environmental Policy Act regulations to include:

(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process.

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved. Considering the high value of forested and marsh wetlands for fish and wildlife and the relative scarcity of that habitat type, those wetlands are usually designated as Resource Category 2 habitats, the mitigation goal for which is no net loss of in-kind habitat value. Because the "no action" alternative was not selected, avoiding the project impacts altogether is not feasible. Therefore, remaining project impacts should be mitigated via compensatory replacement of the habitat values lost.

Based on our analysis, assuming the proposed project using the levee alignment 3, the Corps shall provide mitigation in kind for 36.2 AAHUs of BLH and 66.3 AAHUs of fresh marsh.

SERVICE POSITION AND RECOMMENDATIONS

The Service recommends the selection of alternative 1 because its direct impacts are much less than the proposed project (alignment 3) in terms of AAHUs, and it does not have the potential long term indirect development impacts of alternatives 2 and 3. However, construction of the flood protection levee even as proposed would provide flood protection to meet the Supplemental 4 authorization; therefore, the Service does not object to the construction of the proposed project provided the following fish and wildlife conservation recommendations are implemented concurrently with project implementation:

1. The Corps shall provide mitigation for impacts to BLH and fresh marsh habitat to the extent specified for the project plan ultimately selected. With construction of the proposed project 78.6 acres of BLH and 137.8 acres of fresh marsh would be impacted requiring mitigation for 36.2 AAHUs of BLH and 66.3 AAHUs of fresh marsh.

2. Flood protection and ancillary features such as staging areas and access roads should be designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.

3. The enclosure of wetlands within new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-development easements on enclosed wetlands should be aquired, and hydrologic connections with adjacent, unenclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.

4. The Service recommends that the previous induced development study examine potential development over the period of analysis (i.e. 50 years) to be consistent with the planning process. Information about potential development of the area in question derived from this analysis would be used to determine mitigation requirements.

5. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to pre-storm levels.

6. Flood protection structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered, and coordination should continue with the natural resource agencies to ensure fish passage features are fully incorporated to the extent praticable.

7. Flood protection water control structures should remain fully open except during storm events, unless otherwise determined by the natural resource agencies.

8. Any proposed change in plan features or mititgation should be coordinated in advance with the Service, NMFS, LDWF, EPA and LDNR.

9. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

LITERATURE CITED

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish and Wildlife Service, Division of Biological Services, Washington, D.C. FWS/OBS-79/31. 108 pp.

Lowery, A.H. 1974. Louisiana birds. La. State Univ. Press. 651 pp.

Bobby Jindal
GOVERNOR

Scott A. Angelle
SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF COASTAL RESTORATION AND MANAGEMENT

April 14, 2009

Joan M. Exnicios
Acting Chief, Environmental Planning and Compliance Branch
U. S. Army Corps of Engineers, New Orleans District
P. O. Box 60267
New Orleans, Louisiana 70160-0267

RE: **C20080324,** Coastal Zone Consistency
U. S. Army Corps of Engineers, New Orleans District
Direct Federal Action
IER #16, West Bank and Vicinity, Western Tie-In, **St. Charles and Jefferson Parishes, Louisiana**

Dear Ms. Exnicios:

The above referenced project has been reviewed for consistency with the approved Louisiana Coastal Resource Program (LCRP) as required by Section 307 of the Coastal Zone Management Act of 1972, as amended. The project, as proposed in the Corps submittal of March 19, 2009, is consistent with the LCRP, provided direct and indirect impacts to wetlands are avoided to the maximum extent practicable; that the USACE takes actions to retain wetland function in the 2,485 acre area above Highway 90 and incorporates other features to benefit other wetland areas newly segmented by project construction. The USACE shall incorporate features into the project design at Highway 90 that will retain cross section/water exchange to the large wetland area above Highway 90 and provide equivalent cross section with the parameter of the project area.

If you have any questions concerning this determination please contact Brian Marcks of the Consistency Section at (225) 342-7939 or 1-800-267-4019.

Sincerely yours,

Gregory J. DuCote
Acting Administrator
Interagency Affairs/Field Services Division

GJD/JDH/bgm
Attachments

cc: Dave Butler, LDWF
Norwyn Johnson, OCPR
Beth Nord, COE-NOD
Richard Hartman, NMFS
David Walther, USFWS
Earl Matherne, St. Charles Parish
Marnie Winter, Jefferson Parish
Frank Cole, CMD, FI

BOBBY JINDAL
GOVERNOR

SCOTT A. ANGELLE
SECRETARY

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF COASTAL RESTORATION AND MANAGEMENT

April 14, 2009

Beth Nord
Environmental Planning and Compliance Branch
Corps of Engineers- New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

RE: **C20080324,** Coastal Zone Consistency
New Orleans District, Corps of Engineers
Direct Federal Action
IER #16 West Bank and Vicinity, Western Tie-In project, **St. Charles and Jefferson Parish, Louisiana**

Dear Ms. Nord:

This office has received and reviewed your email of April 8, 2009, in response to comments from LDWF, USFWS, and this agency that would include conditions to preclude induced development in the 2400 acre wetland that would be inside the new Federal levee.

We would like to know what rules or policies the Corps has that disallows the Corps from obtaining conservation easements where induced development is a probability in the implementation of their projects. This would seem, pursuant to the provisions of the National Environmental Policy Act, an appropriate topic to address regarding secondary and cumulative, foreseeable consequences. More importantly, what specific rules, mechanisms, and/or policies does the Corps have to restrict or otherwise address induced development that would otherwise come at the expense of wetlands?

The control of induced development of wetlands is a significant concern of this agency as well as, based on the comments received, other regulatory and commenting agencies. Any possible mechanisms or rules that the Corps has to deal with this problem would be much appreciated. If you have any questions regarding this issue, please call Brian Marcks of the Consistency Section at (225) 342-7939.

Sincerely yours,

Gregory DuCote
Acting Administrator

Interagency Affairs/Field Services Division

GJD/ JH/bgm

cc: Louis Buatt, DNR
Joan Exnicios, COE-NOD
Cynthia Duet, OCPR
Jimmy Anthony, LDWF
Michele Deshotels, LADOTD
Heather Finley, LDWF

Bobby Jindal
Governor

Scott A. Angelle
Secretary

State of Louisiana

DEPARTMENT OF NATURAL RESOURCES
OFFICE OF COASTAL RESTORATION AND MANAGEMENT

April 14, 2009

Jimmy L. Anthony
Assistant Secretary
Louisiana Dept. of Wildlife and Fisheries
P. O. Box 98000
Baton Rouge, LA 70898-9000

RE: **C20080324,** Coastal Zone Consistency
New Orleans District, Corps of Engineers
Direct Federal Action
IER #16 West Bank and Vicinity, Western Tie-In project, **St. Charles and Jefferson Parish, Louisiana**

Dear Mr. Anthony:

The Office of Coastal restoration and Management (OCRM) has received responses from the NOD-COE to your comment letter on the above referenced consistency project IER #16, dated February 17, 2009. Most of the issues addressed in your comment letter will be met by the Corps, but they have objected to language that refers to induced development on the inside of the new levee system. Such concerns about "induced development" could most appropriately be dealt with by a three step approach. An interim method for the short term would be the extant permitting processes that OCRM, the COE, and the Parish have in place that pertain to conservation and balancing competing uses. Secondly, the Parish should develop comprehensive land use planning and zoning that addresses the development of wetland areas inside and outside of levees. Thirdly, and going hand in hand with comprehensive land use planning is effective use of public/private partnerships to effect such practices as conservation easements that address our concerns. In addition the Corps will maintain regulatory authority over wetlands in the area under its Section 404 permitting authority.

We wish to work towards a suitable and equitable solution to this potential problem of induced development of wetlands behind levees. We believe it can be solved to the satisfaction of most stakeholders and governmental agencies and would like to partner to that end with the regulatory community, local government and other private partnerships.

If you have any questions please call Brian Marcks of the Consistency Section at (225) 342-7939.

Sincerely yours,

Gregory J DuCote

Gregory DuCote
Acting Administrator
Interagency Affairs/Field Services Division

GJD/ JH/bgm

cc: Heather Finley, LDWF
Louis Buatt, Assistant Secretary, DNR
Cynthia Duet, OCPR
Michele Deshotels, LADOTD
David Walther, USFWS
Jon Ettinger, USEPA
Earl Matherne, St. Charles Parish
Marnie Winter, Jefferson Parish

BOBBY JINDAL
GOVERNOR

HAROLD LEGGETT, PH.D.
SECRETARY

State of Louisiana
DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL SERVICES

APR 20 2009

U.S. Army Corps of Engineers- New Orleans District
P.O. Box 60267
New Orleans, LA 70160-0267

Attention: Beth Nord

RE: Water Quality Certification (WQC 090212-06/AI 163172/CER 20090002)
Individual Environmental Report (IER) #16
West Bank & Vicinity, Western Tie-In
Jefferson & St. Charles Parishes

Dear Ms. Nord:

The Department has reviewed your revised application for the construction of the West Bank & Vicinity, Western Tie-In project (IER #16), in the vicinity of Ama, Louisiana. This revision concerns the installation of additional water control structures along the north side of US Hwy. 90 to improve the hydrology to the wetland area north of the highway.

The requirements for Water Quality Certification have been met in accordance with LAC 33:IX.1507.A-E. Based on the information provided in your application, we have determined that the placement of the fill material will not violate the water quality standards of Louisiana provided for under LAC 33:IX.Chapter 11. Therefore, the Department has issued a Water Quality Certification.

Sincerely,

Thomas F. Harris
Administrator
Waste Permits Division

TFH/jjp

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TX 75202-2733

MAY 22 2009

Mr. Gib Owen
Environmental Planning and Compliance Branch
Planning, Programs, and Project Management Division
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Mr. Owen:

The Environmental Protection Agency (EPA) has reviewed Individual Environmental Report (IER) #16 regarding the "Western Tie-In" in Jefferson and St. Charles Parishes, Louisiana (May 2009). While EPA does not disagree with the proposed alignment for this project, we do have remaining concerns with the potential for the proposed project to induce development in wetlands that would be on the protected side of the levee. We continue to disagree with the conclusion that certain characteristics of the area at issue would counter the development-inducing potential of reductions in flood risk, flood insurance and construction costs. We also do not agree with the Corps of Engineers (Corps) guidance (Appendix G) which suggests that the issue of induced development in wetlands is primarily a state and local interest. Avoiding development in wetlands is clearly also a Federal interest, thus we have the Clean Water Act Section 404 regulatory program which calls for careful evaluation of direct, indirect and cumulative effects of proposed activities, as well as the long-standing Federal goal of no net loss of wetlands.

Moreover, the financial consequences of risky development are often shared by the Federal government in the form of emergency response, relief, and rebuilding funds. It is, therefore, in the Federal interest to minimize such risky development. Placing the wetlands at issue under a conservation easement could do just that. Such an action could be viewed as a component of the overall flood damage reduction project, as opposed to a wetland mitigation measure. To that end, we would recommend that the Corps reconsider the costs and benefits of using conservation easements to further minimize hurricane flooding risks in the areas that would be enclosed by this project.

Thank you in advance for your consideration of these comments. We look forward to continuing to coordinate and collaborate with the Corps on this important matter. If you have any questions or wish to discuss this matter further, please contact John Ettinger at (504) 862-1119.

Sincerely yours,

Barbara Keeler
for
Timothy Landers, Chief
Marine and Coastal Section

cc: USFWS, Lafayette, LA
NMFS, Baton Rouge, LA
LDNR, Baton Rouge, LA
LDWF, Baton Rouge, LA

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701

May 26, 2009 F/SER46/GC:jk
225/389-0508

Mr. Gib Owen
Environmental Planning and Compliance Branch
Planning, Programs, and Management Division
New Orleans District, U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Mr. Owen:

NOAA's National Marine Fisheries Service (NMFS) has reviewed the draft **Individual Environmental Report (IER) #16** transmitted by letter from Ms. Exnicios dated May 1, 2009. The draft IER evaluates and quantifies the impacts associated with providing 100-year level of hurricane protection through the construction of levees and floodwalls for the West Bank and Vicinity, Western Terminus Levee (Lake Cataouatche tie-in) Flood Damage Reduction project area in Jefferson and St. Charles Parishes, Louisiana.

NMFS is concerned that ponding of water on wetland surfaces caused by inadequate drainage could adversely impact wetland health and lead to accelerated wetland loss. As was stated on page 72, approximately 35% of the pre-construction cross-sectional area providing drainage would remain after installation of the structures on Bayou Verret and Outer Cataouatche Canal. That section of IER 16 also indicates that the reduction in cross-sectional area could result in delays in "water surface elevation equilibrium." However, the document does not indicate that this prolonged inundation of wetlands enclosed within the system could lead to elevated wetland loss rates. This section of the document should include a thorough discussion on the likely impacts of this reduction in drainage capacity from the enclosed area, both under existing conditions and with the potential development of the area to be enclosed by this hurricane protection system.

Page 107, paragraph 4 of the draft IER indicates that in total, construction of the project would impact approximately 204 acres of wetlands. In summing the reach by reach breakdown of wetland impacts provided earlier in the draft IER, NMFS believes the correct number is actually 210.75 acres. The difference between the two numbers is the 6.75 acres of wetlands that would be excavated to create open water habitat in reach 4 as indicated on page 17, paragraph 5. In addition, page 122, paragraph 9, indicates that 78.6 acres of bottomland hardwoods would be permanently destroyed requiring mitigation. NMFS recommends the draft IER be revised to quantify the accurate acreage of wetland impacts by habitat type.

We appreciate the opportunity to review and comment on the draft IER. If you have any questions regarding our comments, please contact Gayle-Anne Chavers at (225) 389-0508, ext 209.

Sincerely,

Richard Hartman

for Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

c:
FWS, Lafayette
EPA, Dallas
LA DNR, Consistency
F/SER46, Swafford
Files

BOBBY JINDAL
GOVERNOR

State of Louisiana

DEPARTMENT OF WILDLIFE AND FISHERIES
OFFICE OF WILDLIFE

ROBERT J. BARHAM
SECRETARY

JIMMY L. ANTHONY
ASSISTANT SECRETARY

May 29, 2009

Attn: Gib Owen
Planning, Programs, and Project Management Division
Environmental Planning and Compliance Branch
United States Army Corps of Engineers
P. O. Box 60267
New Orleans, LA 70160-0267

RE: *Application Number: Individual Environmental Report #16 (IER #16)*
Applicant: Corps of Engineers – New Orleans District
Public Notice Date: March 19, 2009

Dear Mr. Owen:

The professional staff of the Louisiana Department of Wildlife and Fisheries (LDWF) has reviewed the above referenced Public Notice. Based upon this review, the following has been determined:

> LDWF recommends that the natural resource agencies be provided an opportunity to review and comment on plans to construct additional water control structures, deemed necessary to provide adequate cross sectional area.
>
> The Corps of Engineers shall also develop a mitigation plan designed to off-set impacts to fish and wildlife resources. The mitigation plan shall be approved by the resource and regulatory agencies. The approved mitigation plan shall be incorporated as part of the conditions of the permit.

The Louisiana Department of Wildlife and Fisheries appreciates the opportunity to review and provide recommendations to you regarding this proposed activity. Please do not hesitate to contact Habitat Section biologist Chris Davis at 225-765-2642 should you need further assistance.

Sincerely,

Jimmy L. Anthony
Assistant Secretary

cd

c: Chris Davis, Biologist
Heather Finley, Biologist Program Manager
EPA Marine & Wetlands Section
USFWS Ecological Services

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506

May 29, 2009

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Lee:

The U.S. Fish and Wildlife Service (Service) has reviewed the May 1, 2009, draft Individual Environmental Report #16 (IER#16), "West Bank and Vicinity, Western Tie-in, Jefferson and St. Charles Parishes, Louisiana", transmitted to our office via a letter from Ms. Joan M. Exnicios, Acting Chief of your Environmental Planning and Compliance Branch. That study addresses impacts resulting from the construction of levee improvements and repairs to increase hurricane protection within the Greater New Orleans area located in southeast Louisiana. Work associated with that IER is being conducted in response to Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4). That law authorized the U.S. Army Corps of Engineers (Corps) to upgrade two existing hurricane protection projects (i.e., Westbank and Vicinity of New Orleans and Lake Pontchartrain and Vicinity) in the Greater New Orleans area to provide protection against a 100-year hurricane event. The Service submits the following comments in accordance with provisions of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), and the National Environmental Policy Act of 1969 (83 Stat. 852, as amended; 42 U.S.C. 4321- 4347).

General Comments

The IER #16 is well written and provides a good description of fish and wildlife resources in the project area and project impacts on those resources. Wetlands in the project area provide important habitat for several Federal trust species including wading birds, neotropical migrants, and resident and migratory waterfowl. The proposed project would impact approximately 216 acres of forested and fresh marsh wetlands; however, the Corps has indicated that mitigation for all impacts will be implemented.

As indicated in our March 13, 2009, FWCA report, the Service is concerned about the potential for induced development of approximately 2000 acres of wetlands that would be surrounded by hurricane protection levees as part of the proposed project. Development has occurred on the protected side of previous protection levees in the New Orleans area. The Service continues to recommend that the Corps consider some type of measure, such as a conservation easement, to minimize indirect impacts to these wetland areas from development.

As stated on page 72, regarding the proposed project, the drainage capacity of the area south of Hwy 90 would be affected by the closure of the Outer Cataouatche Canal and the Bayou Verret structures. Basically, this area could be subject to greater inundation if certain meteorological conditions occurred. The Service is concerned about the effect of greater and longer duration inundation of the vegetation in this area. Although wetland vegetation is adapted to periodic flooding, there is no quantitative estimate, in the report, of the change to the existing hydrologic conditions that would allow a better evaluation of the potential adverse effects.

Specific Comments

Page 18, Line 3, Sec. 2.3.1.6 Quantities Summary
The document states here and in other places that X acres of aquatic habitat would be created. Although the statement is correctly written, the destruction of wetland habitat is the cause of the open water creation, and it should be explicitly stated, perhaps as it is written on page 17, sec. 2.3.1.4 Reach 4, paragraph 2. The acres of wetlands cleared, grubbed, and filled should be combined with the acres of marsh destroyed by open water creation for one total number of wetland acres impacted.

Other than our recommendation of a conservation easement, the Service thus far does not object to the proposed features in IER #16 Hurricane Protection Project. Thank you for the opportunity to provide comments on the draft IER. If you or your staff has any questions regarding our comments, please contact David Castellanos at (337) 291-3112.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

cc: EPA, Dallas, TX
NMFS, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
LA Dept. of Natural Resources (CMD/CRD), Baton Rouge, LA

Nord, Beth P MVN

From: Owen, Gib A MVN
Sent: Friday, May 29, 2009 5:07 PM
To: Nord, Beth P MVN
Subject: FW: Individual Environmental Report (IER) #16

Beth,
OCPR comment for IER 16.
Gib

Gib Owen
US Army Corps of Engineers
Chief, Ecological Planning and Restoration Section/ HSDRRS Environmental Team Leader New Orleans District
504 862-1337

-----Original Message-----
From: James McMenis [mailto:James.McMenis@LA.GOV]
Sent: Friday, May 29, 2009 4:59 PM
To: Owen, Gib A MVN
Cc: Chris Williams; Stephanie Zumo
Subject: Individual Environmental Report (IER) #16

Please find the Office of Coastal Protection & Restoration's comments regarding Individual Environmental Report (IER) #16 For West Bank And Vicinity - Western Tie-In Jefferson And St. Charles Parishes, Louisiana.

The Corps current recommended plan, as identified in Section 2.3.1 Alternative 3 (Proposed Action), includes the construction of a segment of levee that will replace portions of the Davis Pond Diversion Project's Main East Guide Levee. At an identified point, this levee will then swing north and cross over Highway 90. Our question pertains to the remaining portion of the east guide levee. As identified in the IER, a 50-foot wide cut, at an elevation of zero NAVD88, would be made in the remaining Davis Pond east guide levee to allow some hydrologic exchange between this portion of partially isolated wetlands and open water of the Outer Cataouatche Canal with Mississippi River freshwater and nutrients received from the Davis Pond Freshwater Diversion. The remaining guide levee appears to no longer serve its original purpose . As such, it would be beneficial to determine the viability of serving dual purposes (protection and restoration) by degrading the guide levee and then incorporating the levee material either into the federal levee or beneficially usitlizing the material which would then allow the habitat area to have true connectivity to the freshwater diversion project and its associated benefits .

This assumes, of course, that by degrading the remaining portion of the guide levee it will not induce any impacts to the section of highway 90 that runs from the diversion channel eastward to where it intersects the WBV floodwall.

If you have any questions regarding this comment, please let me know and we can discuss.

James McMenis, P.E.
Program Manager, OCPR
225-342-4525

United States Department of the Interior

FISH AND WILDLIFE SERVICE
646 Cajundome Blvd.
Suite 400
Lafayette, Louisiana 70506
June 8, 2009

Colonel Alvin B. Lee
District Engineer
U.S. Army Corps of Engineers
Post Office Box 60267
New Orleans, Louisiana 70160-0267

Dear Colonel Lee:

Please reference the Individual Environmental Report #16 (IER #16) "Westbank and Vicinity, Western Tie-in, Jefferson and St. Charles Parishes, Louisiana". That study was conducted in response to Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4) which instructed the Corps of Engineers (Corps) to proceed with engineering, design, and modification (and construction where necessary) of the Lake Pontchartrain and Vicinity (LPV) and the West Bank and Vicinity (WBV) Hurricane Protection Projects so those projects would provide 100-year hurricane protection. This report contains a description of the existing fish and wildlife resources of the project area, discusses future with and without project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations to avoid, reduce, or compensate for impacts to fish and wildlife resources.

Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has prevented our agencies from following the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing a 2(b) report for each IER. This report addresses IER 16 which is the plan for the western terminus of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS).

This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV Hurricane Protection Project (November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the November 26, 2007 draft programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4.

This report constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA; it also reflects the comments of the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service on this study.

If you or your staff has any questions regarding our comments, please contact David Castellanos (337-291-3112) of this office.

Sincerely,

James F. Boggs
Supervisor
Louisiana Field Office

cc: EPA, Dallas, TX
NMFS, Baton Rouge, LA
LA Dept. of Wildlife and Fisheries, Baton Rouge, LA
Office of Coastal Protection and Restoration, Baton Rouge, LA

Final
Fish and Wildlife Coordination Act Report
for
Individual Environmental Report 16 (IER 16)

Public Law 109-234, Emergency Supplemental Appropriations Act for Defense, the Global War on Terror, and Hurricane Recovery, 2006 (Supplemental 4)

PROVIDED TO
NEW ORLEANS DISTRICT
U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

PREPARED BY
DAVID CASTELLANOS
FISH AND WILDLIFE BIOLOGIST

U.S. FISH AND WILDLIFE SERVICE
ECOLOGICAL SERVICES
LAFAYETTE, LOUISIANA
June 2009

U.S. FISH AND WILDLIFE SERVICE – SOUTHEAST REGION

Executive Summary

The proposed project was authorized by Supplemental 4 which instructed the Corps of Engineers (Corps) to proceed with engineering, design, and modification (and construction where necessary) of the Lake Pontchartrain and Vicinity (LPV) and the West Bank and Vicinity (WBV) Hurricane Protection Projects so those projects would provide 100-year hurricane protection. This report addresses IER 16 which is the plan for the western terminus of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). Our report contains a description of the existing fish and wildlife resources of the project area, discusses future with and without project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations to avoid, reduce, or compensate for impacts to fish and wildlife resources This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV Hurricane Protection Project (November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the November 26, 2007 draft programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4.

The approximate project-area boundaries are South Kenner Road on the east (Jefferson Parish); the Davis Pond Freshwater Diversion Project Canal on the west (St. Charles Parish); South Kenner at the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroad Lines and the Mississippi River on the north, and the Outer Cataouatche Canal and the Davis Pond Freshwater Diversion Project to the south.

The project area is composed of mostly bottom land hardwood and freshwater marsh habitats. These habitats support a variety of birds, mammals, and fishes, including various waterfowl, wading birds, furbearers, and sport and commercial fish.

Various alternative alignments and structures (i.e., floodwalls and levees) were evaluated for the protection needed. The Corps' selection of the proposed project was based upon a detailed analysis that included evaluating risk and reliability, construction schedule, cost, right-of-way requirements, environmental impacts and operations and maintenance needs.

The proposed project (Alternative 3) is the South of Outer Cataouatche Canal to Davis Pond Tie-In. This alternative would consist of approximately 23,600 linear feet of levee, floodwall, and closure structures constructed to an elevation of +13.5 to +15.5 feet North American Vertical Datum 88 (NAVD88).

The Service evaluated the three alternatives proposed for study and recommends the selection of Alternative 1 because its direct impacts are less than the proposed project (Alternative 3) in terms of AAHUs, and it does not have the potential long term indirect development impacts of Alternative 2 or Alternative 3 (proposed plan). However, construction of the flood protection levee even as proposed would provide flood protection to meet the Supplemental 4 authorization; therefore, the Service does not object to the construction of the proposed project provided the following fish and wildlife conservation recommendations are implemented concurrently with project implementation:

1. The Corps shall provide mitigation for impacts to BLH and fresh marsh habitat to the extent determined for the project plan ultimately selected. With construction of the proposed project 78.6 acres of BLH and 134.1 acres of fresh marsh would be impacted requiring mitigation for 36.2 AAHUs of BLH and 65.5 AAHUs of fresh marsh.

2. Flood protection and ancillary features such as staging areas and access roads should be designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.

3. The enclosure of wetlands within new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-development easements on enclosed wetlands should be acquired, and hydrologic connections with adjacent, unenclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.

4. The Service recommends that the previous induced development study examine potential development over the period of analysis (i.e. 50 years) to be consistent with the planning process. Information about potential development of the area in question derived from this analysis would be used to determine mitigation requirements.

5. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to pre-storm levels.

6. Flood protection structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered, and coordination should continue with the natural resource agencies to ensure fish passage features are fully incorporated to the extent practicable.

7. Flood protection water control structures should remain fully open except during storm events, unless otherwise determined by the natural resource agencies.

8. Due to some of the proposed project features, the drainage capacity of the area between Hwy 90 and the proposed levee will be reduced. The Service is concerned about the potential for ponding in the area and subsequent impacts to wetland vegetation and to Hwy 90. The Service recommends that the Corps undertake additional hydrologic studies to determine the effects of those drainage capacity reductions.

9. Any proposed change in plan features or mitigation should be coordinated in advance with the Service, the National Marine Fisheries Service (NMFS), the Louisiana

Department of Wildlife and Fisheries (LDWF), the Environmental Protection Agency) EPA and the Office of Coastal Protection and Restoration (OCPR).

10. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

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INTRODUCTION

The proposed project was authorized by Supplemental 4 which instructed the Corps of Engineers (Corps) to proceed with engineering, design, and modification (and construction where necessary) of the Lake Pontchartrain and Vicinity (LPV) and the West Bank and Vicinity (WBV) Hurricane Protection Projects so those projects would provide 100-year hurricane protection. Procedurally, project construction has been authorized in the absence of the report of the Secretary of the Interior that is required by Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.). In this case, the authorization process has prevented our agencies from following the normal procedures for fully complying with the FWCA. The FWCA requires that our Section 2(b) report be made an integral part of any report supporting further project authorization or administrative approval. Therefore, to fulfill the coordination and reporting requirements of the FWCA, the Service will be providing a 2(b) report for each IER. This report addresses IER 16 which is the plan for the western terminus of the Greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS). Our report contains a description of the existing fish and wildlife resources of the project area, discusses future with and without project habitat conditions, identifies fish and wildlife-related impacts of the proposed project, and provides recommendations to avoid, reduce, or compensate for impacts to fish and wildlife resources This report incorporates and supplements our Fish and Wildlife Coordination Act (FWCA) Reports that addressed impacts and mitigation features for the WBV Hurricane Protection Project (November 10, 1986, August 22, 1994, November 15, 1996, and June 20, 2005) and the November 26, 2007 draft programmatic FWCA Report that addresses the hurricane protection improvements authorized in Supplemental 4.

This report constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA; it also reflects the comments of the Louisiana Department of Wildlife and Fisheries and the National Marine Fisheries Service on this study.

DESCRIPTION OF THE STUDY AREA

The approximate project-area boundaries are South Kenner Road on the east (Jefferson Parish); the Davis Pond Freshwater Diversion Project Canal on the west (St. Charles Parish); South Kenner at the Union Pacific and Burlington Northern Santa Fe (BNSF) Railroad Lines and the Mississippi River on the north, and the Outer Cataouatche Canal and the Davis Pond Freshwater Diversion Project to the south. Communities near the project area include Avondale and Waggaman to the east and South Kenner to the north. With the exception of landfills on the eastern portion of the project area and some development between U.S. Highway (Hwy) 90 and the Outer Cataouatche Canal, much of the study area remains undeveloped. These undeveloped areas consist of mostly bottomland hardwood (BLH) forests, freshwater marsh, scrub shrub, and mowed pasture (Cowardin et. al., 1979).

FISH AND WILDLIFE RESOURCES

The Service provided a draft programmatic FWCA report on November 26, 2007, that contains a thorough discussion of the significant fish and wildlife resources (including habitats) that occur within the entire 100 year levee protection study area. For brevity, that discussion is incorporated by reference herein.

Mammals known to occur in the project-area bottomland hardwoods and marshes include mink, raccoon, swamp rabbit, nutria, river otter, and muskrat. Those habitats also support a variety of birds including herons, egrets, ibises, least bittern, rails, gallinules and various waterfowl,. Forested and scrub-shrub habitats within the study area also provide habitat for many resident passerine birds and essential resting areas for many migratory songbirds including warblers, orioles, thrushes, vireos, tanagers, grosbeaks, buntings, flycatchers, and cuckoos (Lowery 1974).

Freshwater sport fishes present in the project area include largemouth bass, crappie, bluegill, redear sunfish, warmouth, channel catfish, and blue catfish. Other fishes likely to be present include yellow bullhead, freshwater drum, bowfin, carp, buffalo, and gar.

FUTURE FISH AND WILDLIFE RESOURCES

Although the area is experiencing subsidence like most of Louisiana's deltaic plain, it is expected that for the 50 year period of analysis most of the BLH will remain, with some shift toward more water tolerant BLH species (e.g. red maple) and also some conversion to swamp habitat. Fresh marsh is expected to remain and possibly increase in area. The Davis Pond Freshwater Diversion Project provides freshwater and sediment input to this area. These areas are expected to support fish and wildlife resources for the project life and beyond. With the construction of the proposed project or either of the alternatives, fish and wildlife habitat will be impacted permanently.

THREATENED AND ENDANGERED SPECIES

The service is unaware of any known threatened of endangered species in the proposed project area and provided recommendations to ensure fish and wildlife resources received equal consideration during the planning phase. The project area is located where colonial nesting water birds and bald eagles may be present. In a November 28, 2007 letter, the Service provided recommendations to avoid potential impacts to these wildlife resources.

DESCRIPTION OF SELECTED PLAN

The purpose of the proposed plan is to provide the 100-year level of protection for the HSDRRS. The term "100-year level of risk reduction," as it is used throughout this document, refers to a level of protection which reduces the risk of hurricane surge and wave driven flooding that the New Orleans Metropolitan area has a 1 percent chance of experiencing each year.

The proposed plan results from a defined need to reduce flood risk and storm damage to residences, businesses, and other infrastructure from hurricanes (100-year storm events) and other high water events. The completed HSDRRS would lower the risk of harm to citizens, and damage to infrastructure during a storm event.

Various alternative alignments and structures (i.e., floodwalls and levees) were evaluated for the protection needed. Based upon a detailed analysis that included evaluating risk and reliability; construction schedule; cost; right-of-way requirements; environmental impacts; and operations and maintenance needs, the following alignments and structures were chosen as the proposed project for IER 16.

The proposed project (Alternative 3) is the South of Outer Cataouatche Canal to Davis Pond Tie-In (Figure 1). This alternative would consist of approximately 23,600 linear feet of levee, floodwall, and closure structures constructed to an elevation of +13.5 to +15.5 feet NAVD88. Originating approximately 500 feet further south than Alternatives 1 and 2 on the western end of the Lake Cataouatche Levee, the alignment would begin as an earthen closure of the Outer Cataouatche Canal. Discharge lines from the Highway 90 Pump Station would be extended and cross over the closure so that the pump station discharge would be on the flood side of the alignment. Proceeding westward, the alignment would continue as levee south of, and parallel to, the Outer Cataouatche Canal for approximately 2,400 feet. On the eastern side of Bayou Verret, the levee would transition to a floodwall approximately 300 feet in length before transitioning to a closure structure on Bayou Verret. The closure structure would preserve navigation and drainage through the Outer Cataouatche Canal and Bayou Verret.

On the western side of the closure structure, the alignment would transition back to a 300-foot long reach of floodwall and then transition to earthen levee continuing in a western direction for approximately 9,600 feet long to a point approximately 850 feet east of the western end of the Outer Cataouatche Canal. In that vicinity, the levee would then turn north, cross, and close the Outer Cataouatche Canal. Between the Outer Cataouatche Canal and Hwy 90 the levee would transition to a floodwall prior to crossing Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the floodwall similar to the crossings described for Alternatives 1 and 2.

Similar to Alternative 2, on the north side of Hwy 90, the floodwall would continue for approximately 400 feet in a northern direction before turning to the west and transitioning to a levee on a west northwestern direction for approximately 2,700 feet to the Davis Pond Freshwater Diversion Canal's eastern construction ROW.

An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy 90, and further north would be widened from approximately 20 feet to approximately 100 feet and deepened to 10 feet. The existing culvert under Hwy 90 may be replaced. Where the alignment transitions from floodwall to levee and extends to the Davis Pond Freshwater Diversion Canal's eastern construction ROW, new drainage canal would be constructed parallel the 2,700 feet length of levee.

When the alignment reached the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north, incorporating the existing Davis Pond Diversion Project's Main East Guide Levee into the new levee while continuing to the BNSF Railroad. The levee

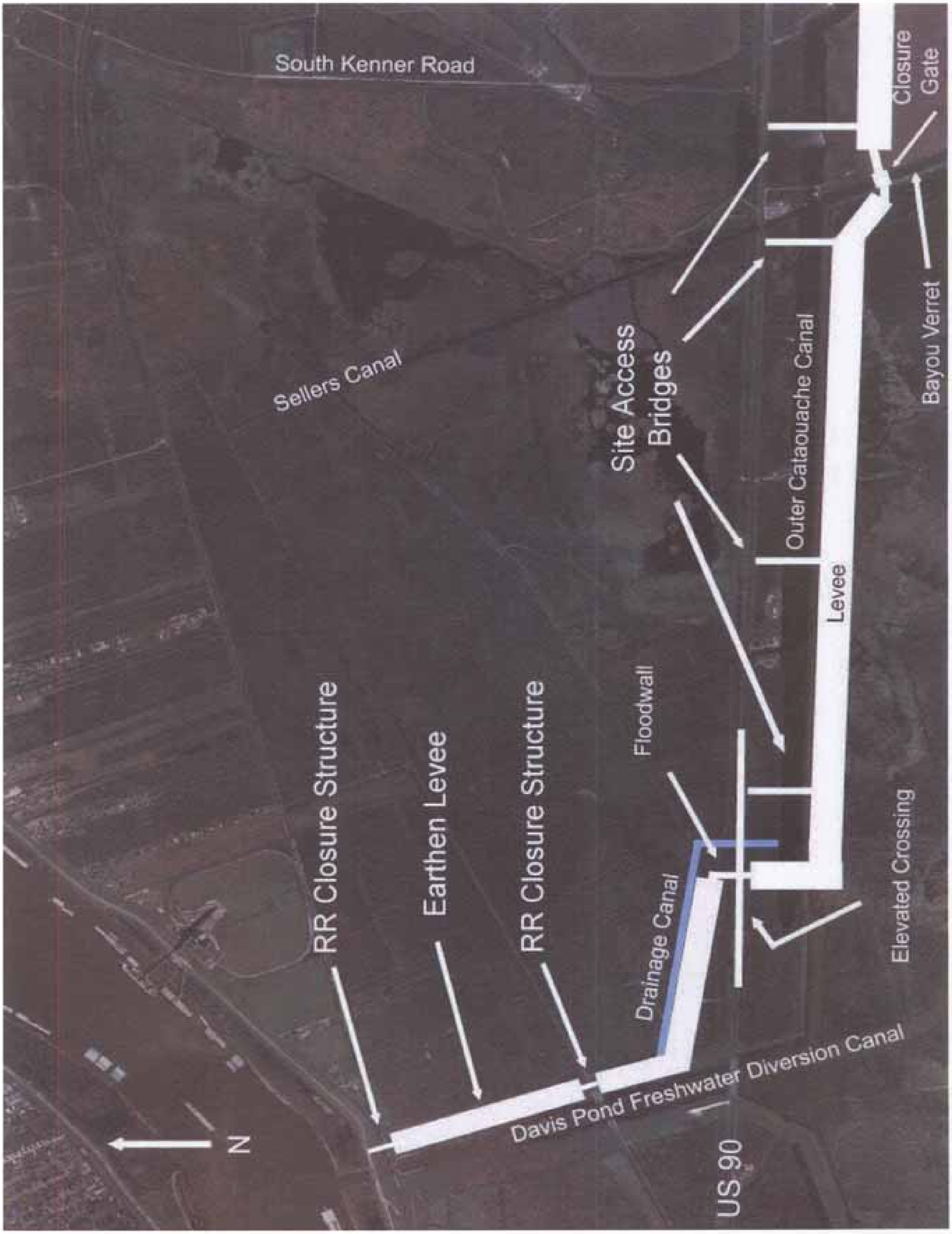

Figure 1. Proposed plan (Alternative 3) for IER 16.

alignment would continue to the north and terminate into high ground at the Mississippi River Levee. Between the BNSF Railroad and high ground of the Mississippi River Levee the alignment would alternate between floodwall (to accommodate closure structures for the two railroad crossings and the River Road crossing) and levee. The western tie-in is comprised of 5 reaches, characterized as follows:

Connecting to the western end of the Lake Cataouatche Levee, reach 1 originates approximately 1,200 feet south of Hwy 90 with an approximately 500 foot long, un-navigable earthen closure across the Outer Cataouatche Canal. That new closure would have a base width of approximately 500 feet and a top elevation of +15.5 feet NAVD88. The protected-side toe of the earthen closure would begin approximately 400 feet south from the southern bank of the east-west reach of the Outer Cataouatche Canal. The earthen closure would require approximately 500 feet of ROW to accommodate construction resulting in approximately 5.7 acres being disturbed for construction of which 2.3 acres would be fill placed into open water. Discharge lines from the Highway 90 Pump Station would be extended approximately 800 feet in length south to cross over the new closure so that the pumping station discharge would be on the flood side of the new alignment.

On the west side of the Outer Cataouatche Canal, the alignment would continue west as earthen levee with a base width of 500 feet and a top elevation of +15.5 feet NAVD88. The alignment would continue west and transition to an approximately 300-foot long floodwall on the eastern side of Bayou Verret with a top of elevation of +15.5 feet NAVD88. The floodwall would then tie into the approximately 135-feet long Bayou Verret closure structure. In the area adjacent to the new Bayou Verret closure structure, the ROW width would be expanded to 700 feet, as the increased ROW would be necessary to accommodate construction staging and access areas. The Bayou Verret closure structure itself would cross Bayou Verret on a southwesterly alignment. Within this reach, guide walls would be constructed on both the north and south ends of the closure structure within the bayou.

No decision has yet been made on the final design of the Bayou Verret closure structure. Possible designs for the closure structure include a sector gate, a stoplog structure, and a barge gate. All alternatives would have a usable navigation opening of approximately 60 feet and a depth of -10 feet NAVD88. The total width of the structure depends on the final design selected. However, the maximum width of any alternative would be approximately 135 feet. The closure structure would remain open most of the time. In the event of a storm, the structure would be closed and remain closed until the storm has passed and emergency operations were concluded. Dredging would be necessary to provide adequate depth for structure construction.

Adjacent to the Bayou Verret structure, a temporary bypass channel would be constructed to allow navigation and drainage while the closure structure was being built. To ensure equal capacity for water exchange as currently exists to the approximately 2,000 acre wetland area north of Hwy 90, an additional 110 square foot of drainage capacity would be added to the Bayou Verret Structure or with the bypass channel. The bypass channel could be on the east or west side of Bayou Verret and would be approximately -6 feet deep NAVD88, approximately 78-feet wide, and 1,000-feet long. Approximately 50,000 cubic yards of material would be excavated from the Bayou Verret at the closure structure alignment and to provide approach channels on either end of the structure. Material excavated to construct the bypass channel would be side-cast, stockpiled on site, and then used to backfill the bypass channel when the structure was completed.

To provide access and egress for reach 1 construction, a permanent access corridor would be constructed beginning at a point approximately 1,400 feet west of the Hwy 90 access to the Lake Cataouatche Levee and continuing south to the construction area south of the Outer Cataouatche Canal. As part of this access, a permanent bridge would be constructed spanning the outer Cataouatche Canal. The bridge itself could be constructed of pre-fabricated concrete and would be set high enough off the water surface for small recreational boats to pass underneath.

The access corridor would be approximately 100-feet wide and extend approximately 500 feet in length from Hwy 90 to the north bank of the Outer Cataouatche Canal. Continuing on approximately the same line, the permanent bridge would be approximately 100 feet wide, and span the approximately 400-feet width of the canal. South of the Outer Cataouatche Canal, the permanent access would continue the 100-foot width for an additional 300-foot length to join the work site. All woody vegetation cleared from the access corridor would be windrowed and then burned on site.

Construction access for equipment and materials to the construction site could be provided by barge access from Bayou Verret or from the permanent access corridor and bridge. Because the proposed location of the closure structure would be within the existing waterway, it would be constructed in a cofferdam. Due to the depth and size of the excavation, dewatering wells or well points would be continually pumped during construction to keep the area dry. Because space inside the cofferdam would be very limited, the equipment used to build the structure would be outside of the excavation on a marine plant or temporary work platform.

Construction of reach 1 would require approximately 44 acres of new ROW, would permanently fill approximately 4.5 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 38 acres of vegetated wetlands, and would permanently alter approximately 0.15 acres of canal bottom from the footing of the permanent bridge spanning the Outer Cataouatche Canal.

On the west side of the Bayou Verret closure structure, the alignment would continue west as a floodwall with a top elevation of +15.5 feet NAVD88 for approximately 300 feet in length. The alignment would then turn northwest for a short distance and then again transition to a westerly direction to parallel the south bank of the Outer Cataouatche Canal. Along the west side of the Bayou Verret closure structure, the ROW would be expanded to 1,100 feet in width. This increased ROW width would be necessary for construction and staging areas. Within this increased ROW, an approximately 1,200 feet length of an unnamed canal that is approximately 100 feet wide would be filled.

As the alignment continues west, the floodwall would transition to a levee with a base width of 500 feet and a top of elevation of +15.5 NAVD88 for a length of approximately 9,600 feet. The Davis Pond Freshwater Diversion Project guide levee comprises the most northern 100 feet of this 500 foot width along the entire length of the levee. The existing guide levee would be incorporated into the new levee. In addition to the 500-foot levee width, an additional 100 feet of ROW would be required on the flood side throughout the 9,600 feet length to construct de-watering cells. The de-watering cells would be built on the south side of the levee and would be necessary to keep the levee construction area de-watered while the Davis Pond Freshwater Diversion Project structure operates throughout the construction period.

At the western end of the 9,600-foot length, the levee would then turn north for approximately 800 feet crossing the Outer Cataouatche Canal and approaching Hwy 90. The canal crossing would form a second permanent closure of the Outer Cataouatche Canal (the reach 1 closure was the first). This closure would also be used as an access point during construction activities. With the construction of the closure the wetlands located immediately west of the closure would no longer have hydrologic connection to the Outer Cataouatche Canal. That area is bounded by Hwy 90 to the north, the Davis Pond Freshwater Diversion Project East Main guide levee to the west and the Davis Pond Freshwater Diversion Project east guide levee to the south. With the construction of the closure to the east, those wetlands would be completely enclosed. To ensure continued water exchange to this area an opening would be cut into the Davis Pond Freshwater Diversion Project east guide levee on the southern boundary of the area. The opening would be approximately 50 ft wide and would be to a depth of 0 NAVD88. The opening would be reinforced with scour protection. North of the Outer Cataouatche Canal, the levee would transition to a floodwall, approximately 300 feet in length, turn 90-degrees to the west, and continue westward parallel to Hwy 90.

An unnamed drainage canal, parallel to, and approximately 500 feet to the east of the floodwall would be enlarged between Hwy 90 and the Outer Cataouatche Canal. The enlarged canal would tie into an existing (or replacement) culvert that passes under Hwy 90. The drainage canal would be enlarged from the existing 20-foot width to approximately 100 feet wide and 10 feet deep.

Within reach 2, two temporary access corridors with temporary bridges, a permanent access corridor and permanent bridge, and two temporary staging areas would be constructed. The temporary and permanent access corridors and temporary staging areas would be located between Hwy 90 and the north bank of the Outer Cataouatche Canal. The first temporary bridge, access corridor and staging area would originate approximately 300 feet west of Sellers Canal on the south side of Hwy 90. The staging areas would be south of Hwy 90 and north of the Outer Cataouatche Canal and would be approximately 200-feet wide by 400-feet long. The access corridor between Hwy 90 and the Outer Cataouatche Canal would be approximately 100-feet wide by 500-feet long and the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. All woody vegetation within the footprint of these areas would be cleared, grubbed, windrowed, and burned in place. The temporary bridge would be used to transport construction equipment and materials to and from the construction area south of the Outer Cataouatche Canal. The bridge design has not been completed, but would include an approximately 40-foot opening to allow navigation during the construction period. Advanced notice would be required to deploy the opening.

A second temporary access corridor and temporary bridge would originate on Hwy 90 approximately 4,300 feet west of the first temporary staging area; the bridge would span the Outer Cataouatche Canal immediately south of the access corridor. The staging area would be approximately 100-feet wide by 500-feet long. The permanent access area and permanent bridge would similarly extend south from Hwy 90 originating approximately 1,000 feet east of the western termination of the Outer Cataouatche Canal. The access area would be approximately 120-feet wide by 500-feet long and an approximately 60-foot wide, permanent bridge would span the Outer Cataouatche Canal at this location. The bridge would be high enough off the water surface for small recreational boats to pass underneath.

Construction of reach 2 would require approximately 167 acres of new ROW, would create approximately 1 acre of open water (canal widening), would permanently fill approximately 7.4 acres of open water habitat, would require the clearing, grubbing, and fill of approximately 143 acres of vegetated wetlands, and would permanently alter approximately 0.1 acres of canal bottom from the footing of the permanent bridge spanning the Outer Cataouatche Canal. Construction would also occur on approximately 22 acres of existing Davis Pond Freshwater Diversion guide levee ROW.

The floodwall that had paralleled Hwy 90 in the end of reach 2 would turn north on a 90-degree angle and continue another 800 feet in length crossing Hwy 90. The intersection of the highway and floodwall would be constructed by raising the highway approaches over the +15.5 foot NAVD88 profile to have an elevated crossing of the floodwall. The roadway's grade change for crossing the floodwall would be very gradual to allow the safe flow of traffic; the transition would be approximately 2,000-feet long in both directions and require a 2.04 percent grade. The roadway would include a median, four 12-foot lanes, two 10-foot shoulders and a cross slope of 0.025 ft/ft away from the median. This design would not impede the proposed Interstate 49 (I-49) elevated highway construction through this reach as the bottom girders of the raised highway would be designed to be above the floodwall for the full width of the highway. This reach would also include pipeline crossings.

Elevating Hwy 90 over the floodwall was recommended, rather than providing a closure gate, because of the importance of keeping Hwy 90 open to traffic during hurricane evacuation. Traffic would be maintained during levee construction by the construction and use of a temporary bypass roadway. The temporary roadway, or lane detour, would be a four-lane shift to the north, but entirely within the existing Hwy 90 ROW.

Construction of reach 3 would require approximately 10.2 acres of new ROW and would require the clearing, grubbing, and fill of approximately 1 acre of vegetated wetlands. The remaining 9 acre of impacts would occur on the existing Hwy 90 road surface.

North of Hwy 90, the floodwall would continue for approximately 200 feet in length, turn 90 degrees west for approximately 100 feet in length with a width of disturbance of approximately 500 feet. At the end of the floodwall, the alignment would transition to an earthen levee with a base width of 300 feet and a top elevation of +13.5 NAVD88. The levee would extend approximately 2,700-feet long in a west northwesterly direction. The drainage canal enlargement that began south of Hwy 90 would continue in this reach initially paralleling and offsetting the floodwall alignment by approximately 500 feet and then turning west northwesterly and paralleling the protected-side levee toe for the entire 2,700-foot length. The drainage canal would be approximately 100-feet wide and 10-feet deep.

Construction of reach 4 would require approximately 29 acres of new ROW and would require the clearing, grubbing, and fill of approximately 22 acres of vegetated wetlands. An additional 6.75 acres of vegetated wetlands would be excavated creating 6.75 acres of new open water (drainage canal).

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north and run parallel to the Davis Pond Freshwater Diversion Project's Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The new levee would be constructed to +13.5 ft NAVD88 for a distance of approximately 1,300 feet. The centerline of the proposed levee would be offset a minimum of 120 feet from the existing canal bank, but would be within the Davis Pond Freshwater Diversion Canal's previously disturbed ROW. The width of the ROW for the levee in this section would be approximately 500 feet for the entire 1,300-foot length to the railroad crossing. This construction would occur within an area of previous disturbance.

At the BNSF Railroad crossing, the alignment would transition to floodwall of approximately +13.5 feet NAVD88 for a distance of approximately 150 feet and require 400 feet of construction ROW for the construction of the railroad closure structure. The closure structure would be constructed of structural steel and covered with a steel skin plate. On the north side of the BNSF Railroad crossing, the alignment would again return to a levee of +13.5 feet NAVD88 for the remaining distance (approximately 3,000 feet). The width of the construction ROW would be approximately 500 feet over the entire distance. This construction would occur within the previously disturbed Davis Pond Freshwater Diversion Canal ROW.

At the northern end of the alignment, the levee would transition to floodwall and closure structures (e.g., roller gate) to cross the Union-Pacific Railroad track, River Road (with a closure structure), and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. This section would require a 400-foot construction ROW over the approximately 600-foot length of the section, but would be within the previously disturbed Davis Pond Freshwater Diversion Canal ROW, the ROW for River Road, or the Mississippi River Levee ROW. Construction of reach 5 would require less than 5 acres of new construction ROW as the majority of the footprint of disturbance is already designated as Corps ROW. There would be no clearing, grubbing, or fill of wetlands, as this reach would utilize previously disturbed areas.

In total, construction of the project would require approximately 255 acres of new ROW, approximately 204 acres of vegetated wetlands would be cleared, grubbed, and filled, approximately 7.8 acres of open water would be created by the excavation of wetlands, and approximately 12 acres of aquatic habitat would be filled. Construction of the footings for the permanent bridges spanning the Outer Cataouatche Canal would permanently alter approximately 0.25 acres of canal bottom, and the western tie-in would enclose approximately 2,750 acres of wetlands within the WBV portion of the Greater New Orleans Hurricane Storm Damage Risk Reduction System.

ALTERNATIVES UNDER CONSIDERATION

NO ACTION

Under the no action alternative, the proposed 100-year level of hurricane and storm damage reduction would not be constructed by the Corps in this portion of the WBV Project. The authorized completion of the Western Tie-in of the WBV has never been constructed. As a result, the level of existing protection for this reach of the WBV project is only that afforded by the elevation from Hwy. 90 between the Davis Pond Freshwater Diversion Canal and the end of the Lake Cataouatche Levee at Hwy. 90; that elevation is estimated at about +4 feet NAVD 88. The line of protection described in this IER is an integral part of the WBV Project (i.e., not a separable project element) as it provides the tie-in to the Mississippi River Levee and completes the line of protection for the West Bank. Taking no action along this reach of the WBV would result in a significant gap in the WBV project and the benefits for projects constructed to the east of the western tie-in would not be achieved if the tie-in were not completed. With the Lake Cataouatche levee (IER #15) being constructed to an elevation of +14.5 to +15 feet, the absence of the western tie-in would render the new Lake Cataouatche levee ineffective for floods with water surface elevations exceeding +4 feet.

ALTERNATIVE 1

The South Kenner Road Floodwall and West Railroad Tie-In Levee Alignment would be comprised of approximately 17,700 linear feet of levee, 12,050 linear feet of floodwall, and closure structures constructed to an elevation of +13.5 to +15.5 feet NAVD88 (Figure 2). The alignment would begin as an earthen levee (500-foot base width) joining the western end of the Lake Cataouatche Levee and proceeding approximately 800 feet parallel to Hwy 90 in a westerly direction before turning 90-degrees to the north. At that point, the alignment transitions to a 300-foot long section of floodwall crossing Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the proposed floodwall.

On the north side of Hwy 90, the floodwall would continue for approximately 7,400 feet along South Kenner Road. Just south of the BNSF Railroad right-of-way (ROW) the alignment would turn west, continuing as a floodwall for approximately 800 feet bounding the northern perimeter of the Greater New Orleans Landfill. On the western edge of the Greater New Orleans Landfill, the alignment would transition to earthen levee for approximately 1,400 feet. Thereafter, the

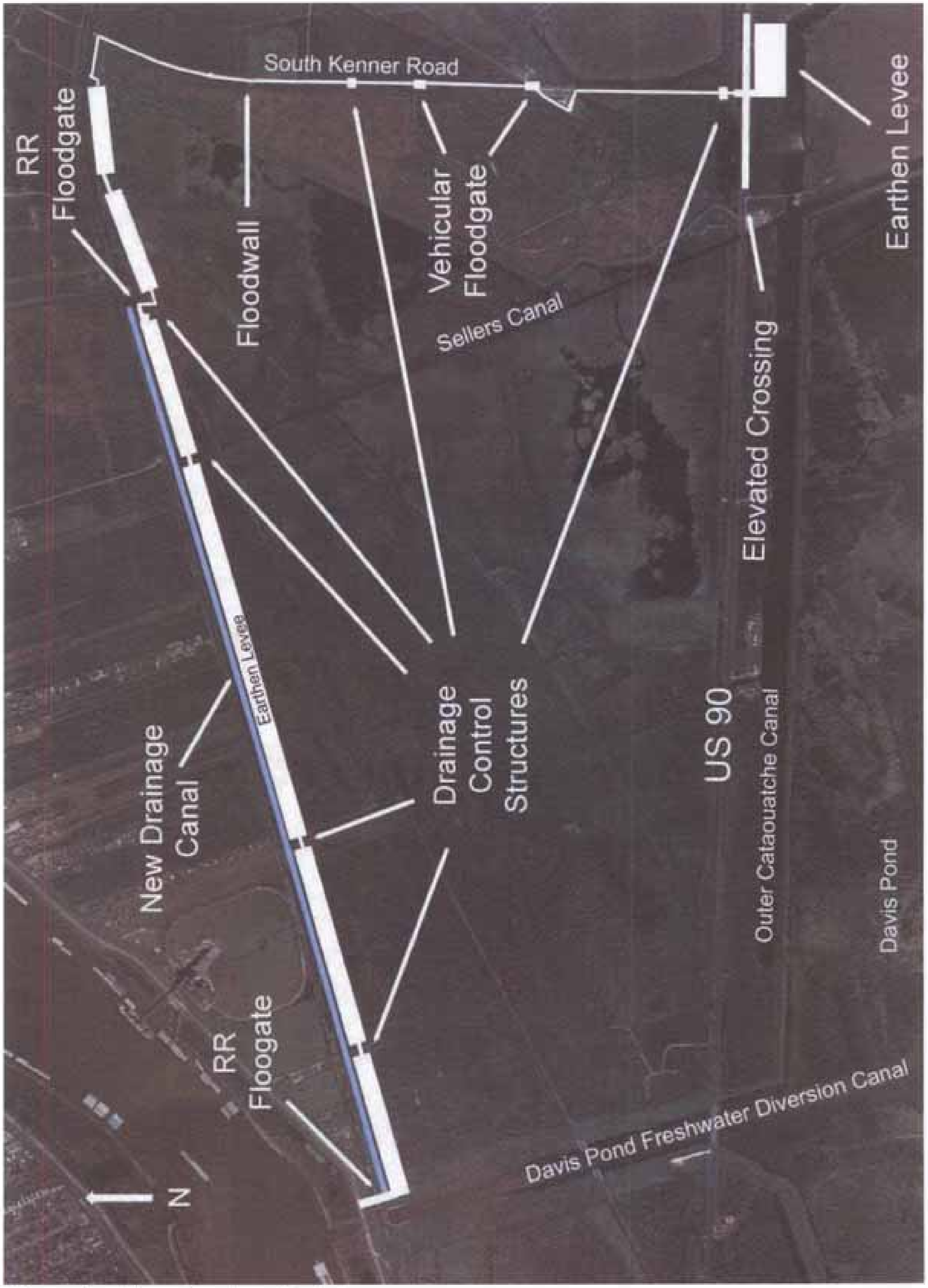

Figure 2. Alternative 1 project plan.

alignment would again transition to floodwall for approximately 400 feet to allow the crossing of a 12-inch pipeline (Bridgeline Gas Company).

After the pipeline crossing, the alignment would return to earthen levee for approximately 2,500 feet, at which point the earthen levee would transition to floodwall and turn 90 degrees to the north for approximately 150 feet to a gated closure structure (e.g., railroad roller gate) across the BNSF Railroad tracks. On the north side of the BNSF tracks the alignment would turn 90-degrees to the west, make a transition to earthen levee, and proceed westward approximately 13,000 feet to the east side of the Davis Pond Freshwater Diversion Canal. Throughout this reach of levee, the alignment would be parallel to, and on the south side of, the Union-Pacific Railroad right of way. Within the Davis Pond Freshwater Diversion Canal's eastern ROW, the earthen levee would again transition to floodwall, turn 90-degrees to the north and proceed approximately 600 feet to cross the Union-Pacific Railroad track with a closure structure (e.g., railroad roller gate), River Road with a closure structure, and terminate by tying into high ground at the Mississippi River Levee in St. Charles Parish. The floodwall along South Kenner Road would include three vehicular floodgates because of limited ROW and existing utilities. Six drainage control structures at major canal crossings and a parallel drainage canal (185-foot width) along the east-west reach would also be required for this alignment.

The total area of new ROW needed to complete construction of Alternative 1 would be approximately 217 acres. Approximately 1.4 acres of open water within the Outer Cataouatche Canal would be filled to complete construction. Approximately 124 acres of vegetated wetlands would be cleared, grubbed, filled, or excavated to construct the alternative. Constructing Alternative 1 would enclose approximately 17 acres of wetlands within the WBV portion of the HSDRRP.

ALTERNATIVE 2

The North of Outer Cataouatche Canal to Mississippi River Levee alignment consists of approximately 23,000 linear feet of levee, floodwall, drainage control, and closure structures built to +13.5 to +15.5 feet NAVD88 (Figure 3). As with Alternative 1, the alignment would begin as earthen levee joining the western end of the Lake Cataouatche Levee. However, instead of turning north and crossing Hwy 90 near South Kenner Road, this alternative would continue in a western direction for approximately 13,000 feet parallel to, and on the south side of, Hwy 90. Throughout the 13,000-foot length, the alignment would alternate between levee and floodwall sections to accommodate three drainage control structures needed to convey surface water flow through the alignment.

Approximately 800 feet west of the western termination of the Outer Cataouatche Canal, the alignment (within a floodwall section) would turn 90-degrees to the north, crossing over Hwy 90. The intersection of the highway and floodwall would be built by raising the highway approaches over the +15.5 foot NAVD88 profile of the proposed floodwall similar to the crossing described for alternative 1. On the north side of Hwy 90, the floodwall would continue for approximately 400 feet in a northern direction before turning to the west and transitioning to a levee on a west

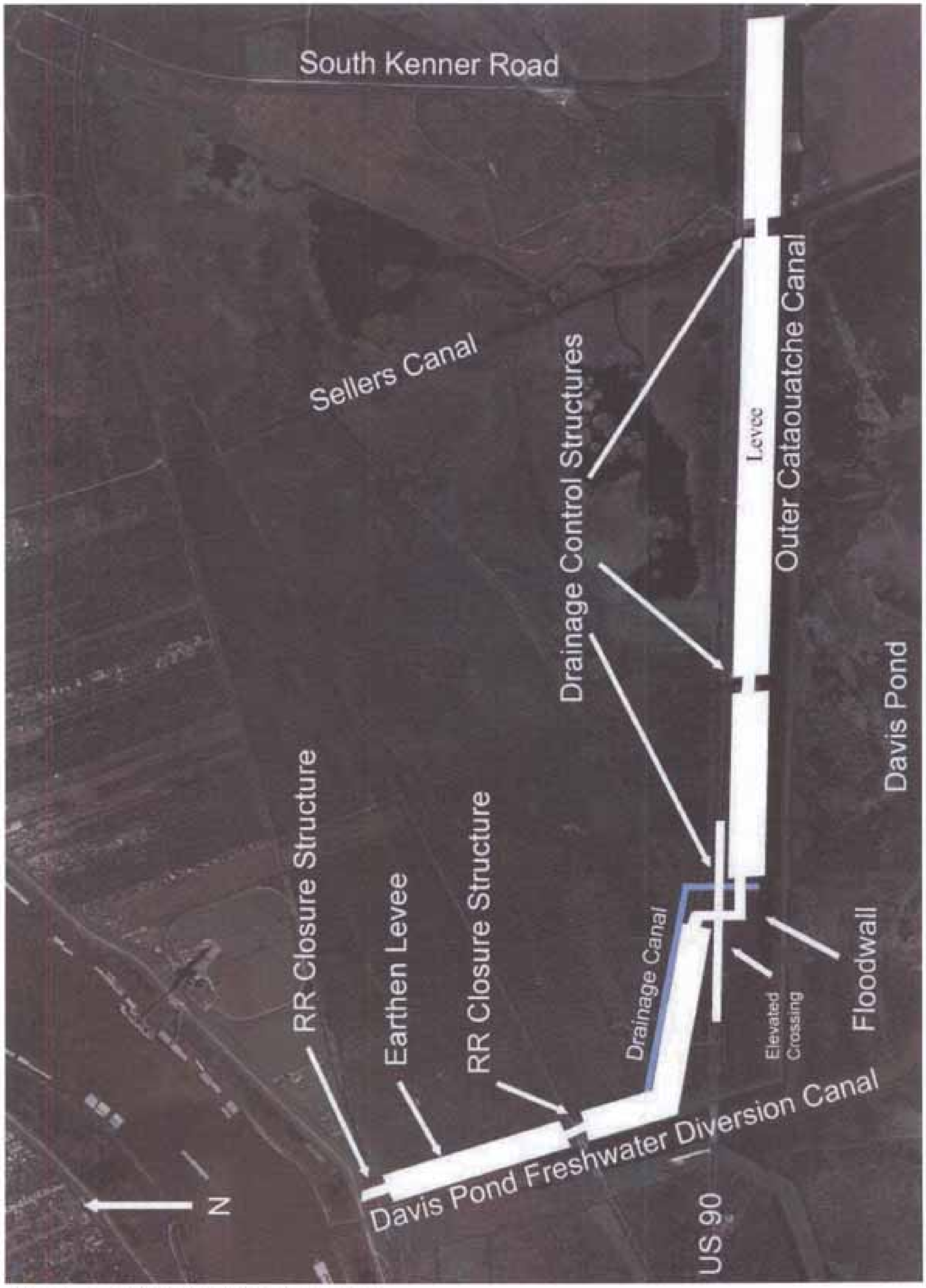

Figure 3. Alternative 2 project plan.

northwest direction for approximately 2,700 feet to the Davis Pond Freshwater Diversion Canal's eastern construction ROW.

An existing drainage canal that extends from the Outer Cataouatche Canal, north under Hwy 90, and further north would be widened from approximately 20 feet to approximately 100 feet and deepened to 10 feet. The existing culvert under Hwy 90 may be replaced. Where the alignment transitions from floodwall to levee and extends to the Davis Pond Freshwater Diversion Canal's eastern construction ROW, new drainage canal would be constructed parallel the 2,700 feet length of levee.

When the alignment reaches the Davis Pond Freshwater Diversion Canal's eastern construction ROW, the levee would turn north and continue parallel to the Davis Pond Diversion Project's Main East Guide Levee to the BNSF Railroad. The existing guide levee would be incorporated into the new levee. The alignment would continue to the north and terminate by tying into high ground at the Mississippi River levee. Between the BNSF Railroad and the high ground of the Mississippi River levee the alignment would alternate between floodwall, closure structures, and levee to accommodate closure structures for the two railroad and River Road crossings.

To ensure adequate flow capacity through the components of Alternative 2, three drainage control structures would be required along the levee between Hwy 90 and the Outer Cataouatche Canal (Figure 3). These drainage control structures would likely utilize box culvert designs to allow maintenance vehicles to cross the drainage canals and have access to maintain them (e.g., clean bar screens). A ramp system would be designed to provide access to the box culvert crossings from the levee crown. The structures would use steel sluice gates to allow normal flow through the structure and permit them to be closed during storm surge. These drainage control structures would remain open until the threat of hurricane storm surge required closing to prevent surge from entering through the structures.

The total area of new ROW needed to complete construction of Alternative 2 would be approximately 198 acres. Approximately 155 acres of vegetated wetlands would be cleared, grubbed, and filled, cleared, or excavated, and approximately 21 acres of aquatic habitat would be filled. Constructing Alternative 2 would enclose approximately 2,485 acres of wetlands within the WBV portion of the HSDRRP.

EVALUATION METHODS FOR SELECTED PLAN AND ALTERNATIVES

The Service used the Habitat Assessment Methodology (HAM) to quantify the benefits of anticipated mitigation measures for forested habitats. The habitat assessment models for swamps and bottomland hardwoods (BLH) within the Louisiana Coastal Zone utilized in this evaluation are modified from those developed in the Service's Habitat Evaluation Procedures (HEP). For each habitat type, those models define an assemblage of variables considered important to the suitability of an area to support a diversity of fish and wildlife species (Louisiana Department of Natural Resources 1994; U.S. Fish and Wildlife Service 1980). The HAM, however, is a community-level evaluation instead of the species-based approach used with HEP. Further explanation of how impacts/benefits are assessed with HAM and an explanation of the assumptions affecting habitat suitability (i.e., quality) index (HIS) values for each target year are available for review at Service's Lafayette, Louisiana, field office. The Fresh-Intermediate Coastal Marsh Model of the Coastal Wetlands Planning Protection and Restoration Act (CWPPRA) Wetland Value Assessment (WVA) Methodology was used to quantify the impacts to the fresh marsh habitat in the project area.

IMPACTS OF SELECTED PLAN AND ALTERNATIVES

The no action alternative was not selected because it would not allow completion of 100 year flood protection; the purpose of the Supplemental 4 authorization. Fish and wildlife resources would not be impacted by selection of this alternative.

The proposed project and Alternatives 1 and 2 would all result in some degree of impacts to fish and wildlife resources, mostly by direct habitat destruction. Cleared levees and associated right of ways will replace BLH and fresh marsh and their beneficial functions of refugia, food resources, nesting areas, etc.

Alternative1 would impact high quality BLH, fresh marsh and pasture, and enclose about 17 acres of BLH between a levee and a drainage canal. The major portion of impacted habitat is along the part of the alignment between the Davis Pond Freshwater Diversion Project levee tie in and South Kenner Road. A smaller amount of BLH is also impacted south of Highway 90. The part of the alignment along South Kenner Road is mostly flood wall and the areas impacted are developed or landfill or cleared areas for landfill. The construction of this alternative would directly impact approximately 92 acres of BLH and 32 acres of freshwater marsh resulting in the loss of 46.7 AAHUs and 21.0 AAHUs respectively (Table 1).

Alternative 2 would impact slightly lower quality BLH than Alternative 1, and some marsh toward the eastern end of the alignment. The BLH that would be impacted occurs on the north side of Hwy 90 and the south side between the highway and the Outer Cataouatche Canal. Wetlands would be enclosed with this alternative with levees to the south and west. However, this land is already bounded by roadways, a levee and a railroad, and if drainage structures are constructed to provide at least the same drainage capacity as currently exists then any hydrologic impacts due to enclosure could be avoided. There would be greater impacts to residential and commercial interests associated with Alternative 2 than with the proposed project or Alternative 1. Construction of this alternative would directly impact approximately 145.2 acres of BLH and 9.7 acres of fresh marsh, resulting in the loss of 59.7 AAHUs and 4.6 AAHUs respectively (Table 1).

The proposed project (alignment 3) would impact BLH similar in quality to Alternative 2, and also large areas of fresh marsh south of the Outer Cataouatche Canal. Wetlands would be enclosed with this alternative with levees to the south and west. However, this land is already bounded by roadways, a levee and a railroad, and if drainage structures are constructed to provide at least the same drainage capacity as currently exists, then any hydrologic impacts due to enclosure could be avoided. Construction of the proposed project would enclose a section of wetlands and block their existing hydrologic connection to the west end of the Outer Cataouatche Canal. These wetlands are south of U.S. highway 90 and bounded on the west by the Davis Pond Freshwater Diversion Project East Main guide levee and to the south by the Davis Pond east guide levee. The Corps has proposed to cut an opening into the Davis Pond Freshwater Diversion Project east guide levee approximately 50 ft wide to a depth of 0 NAVD88 to allow water exchange with the Davis Pond Freshwater Diversion Project outfall canal. Construction of the proposed project would directly impact approximately 78.6 acres of BLH and 134.1 acres of fresh marsh, resulting in the loss of 36.2 AAHUs and 65.5 AAHUs respectively (Table 1).

Construction of Alternative 2 and the proposed project would both result in approximately 2000 acres of BLH and other wetlands being on the protected side of a 100 year protection levee. Development has occurred on the protected side of previous protection levees in the New Orleans area. The potential for induced development was explored in the St. Charles Parish Development Study by the Corps. Through their analysis, conducted with an assumed 12 year period after project construction, they concluded that the expense of making the land suitable for construction would be prohibitive to new development. The Service is concerned, that over time, development in these levee protected lands may become feasible and impacts to this habitat could be realized.

Table 1. Project impacts by alternative and habitat type.

	Proposed project (alignment 3)	Alternative 1	Alternative 2
BLH (acres/AAHUs)	78.6 / 36.2	92 / 46.7	145.2 / 59.7
Fresh marsh (acres/AAHUs)	134.1 / 65.5	32 / 21.0	9.7 / 4.6
Total	**212.7 / 101.7**	**124 / 67.7**	**154.9 / 64.3**

FISH AND WILDLIFE CONSERVATION MEASURES

Where practicable, the use of floodwalls instead of levees would reduce the area impacted and help conserve important fish and wildlife habitat (i.e., bottomland hardwoods, cypress swamps, fresh and estuarine marsh and associated shallow open water habitats). Clearing and grubbing should be limited to only what is necessary at the time of construction. If either Alternative 2 or 3 is ultimately selected as the final plan, the Corps should acquire non-development easements on those wetlands that would be on the protected side of the new levee. If bald eagle nesting locations and wading bird colonies are found in the project area before or during construction, adverse impacts may be avoided by timing of construction and further consultation with the Service.

COMPENSATORY MITIGATION MEASURES

The President's Council on Environmental Quality defined the term "mitigation" in the National

Environmental Policy Act regulations to include:

(a) avoiding the impact altogether by not taking a certain action or parts of an action; (b) minimizing impacts by limiting the degree or magnitude of the action and its implementation; (c) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (d) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; and (e) compensating for the impact by replacing or providing substitute resources or environments.

The Service supports and adopts this definition of mitigation and considers its specific elements to represent the desirable sequence of steps in the mitigation planning process.

The Service's Mitigation Policy (Federal Register, Volume 46, No. 15, January 23, 1981) identifies four resource categories that are used to ensure that the level of mitigation recommended by Service biologists will be consistent with the fish and wildlife resource values involved. Considering the high value of forested and marsh wetlands for fish and wildlife and the relative scarcity of that habitat type, those wetlands are usually designated as Resource Category 2 habitats, the mitigation goal for which is no net loss of in-kind habitat value. Because the "no action" alternative was not selected, avoiding the project impacts altogether is not feasible. Therefore, remaining project impacts should be mitigated via compensatory replacement of the habitat values lost.

Based on our analysis, assuming that the proposed project using the levee alignment 3 is chosen, the Corps shall provide mitigation in-kind for 36.2 AAHUs of BLH and 65.5 AAHUs of fresh marsh. Impacts should be considered as "flood side" regarding designation in the separate IER that will provide for the implementation of mitigation measures for the entire 100 year protection levee system impacts.

SERVICE POSITION AND RECOMMENDATIONS

The Service recommends the selection of Alternative 1 because its direct impacts are less than the proposed project (alignment 3) in terms of AAHUs, and it does not have the potential long term indirect development impacts of Alternatives 2 and 3. However, construction of the flood protection levee even as proposed would provide flood protection to meet the Supplemental 4 authorization; therefore, the Service does not object to the construction of the proposed project provided the following fish and wildlife conservation recommendations are implemented concurrently with project implementation:

1. The Corps shall provide mitigation for impacts to BLH and fresh marsh habitat to the extent determined for the project plan ultimately selected. With construction of the proposed project 78.6 acres of BLH and 134.1 acres of fresh marsh would be impacted requiring mitigation for 36.2 AAHUs of BLH and 65.5 AAHUs of fresh marsh.

2. Flood protection and ancillary features such as staging areas and access roads should be

designed and positioned so that destruction of wetlands and non-wet bottomland hardwoods are avoided or minimized to the greatest extent possible.

3. The enclosure of wetlands within new levee alignments should be minimized to the fullest extent. When enclosure of wetlands is unavoidable, non-development easements on enclosed wetlands should be acquired, and hydrologic connections with adjacent, unenclosed wetlands should be maintained. Such actions will serve to minimize secondary impacts from development and hydrologic alteration.

4. The Service recommends that the previous induced development study examine potential development over the period of analysis (i.e. 50 years) to be consistent with the planning process. Information about potential development of the area in question derived from this analysis would be used to determine mitigation requirements.

5. Water control structures should be designed to allow rapid opening in the absence of an offsite power source after a storm passes and water levels return to pre-storm levels.

6. Flood protection structures should include shoreline baffles and/or ramps (e.g., rock rubble, articulated concrete mat) that slope up to the structure invert to enhance organism passage. Various ramp designs should be considered, and coordination should continue with the natural resource agencies to ensure fish passage features are fully incorporated to the extent practicable.

7. Flood protection water control structures should remain fully open except during storm events, unless otherwise determined by the natural resource agencies.

8. Due to some of the proposed project features, the drainage capacity of the area between Hwy 90 and the proposed levee will be reduced. The Service is concerned about the potential for ponding in the area and subsequent impacts to wetland vegetation and to Hwy 90. The Service recommends that the Corps undertake additional hydrologic studies to determine the effects of those drainage capacity reductions.

9. Any proposed change in plan features or mitigation should be coordinated in advance with the Service, NMFS, LDWF, EPA and OCPR.

10. If a proposed project feature is changed significantly or is not implemented within one year of the date of our Endangered Species Act consultation letter, we recommend that the Corps reinitiate coordination with this office to ensure that the proposed project would not adversely affect any federally listed threatened or endangered species or their habitat.

LITERATURE CITED

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