MISSISSIPPI RIVER COMMISSION

VICKSBURG, MISSISSIPPI

April 12, 2013

MISSISSIPPI RIVER COMMISSION
P.O. BOX 80
VICKSBURG, MISSISSIPPI 39181-0080

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Commander, Mississippi Valley Division
Vicksburg, Mississippi

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National Oceanic and Atmospheric Administration
Silver Spring, Maryland

*Brig. Gen. Anthony C. Funkhouser
Commander, Northwestern Division
Portland, Oregon

SECRETARY
Col. John C. Dvoracek
Vicksburg, Mississippi

DIRECTOR
Mr. T. Stephen Gambrell
Vicksburg, Mississippi
(601) 634-5766

Email: cemvd-ex@usace.army.mil
Web site: www.mvd.usace.army.mil/mrc

** nominee
* designee

Mississippi River Commission Recommendation

Morganza to the Gulf of Mexico, Louisiana Post Authorization Change (PAC) Report

The Mississippi River Commission concurs in the general engineering plan of improvements for the Morganza to the Gulf of Mexico, Louisiana, PAC report, as recommended by the District Engineer. The Commission agrees that the proposed improvements for hurricane risk reduction and the provisions for environmental features in the proposed project are technically sound, justified based on economic benefits and environmental analyses, and environmentally and socially acceptable. The Commission recognizes the federal interest in the proposed plan. Defenses against devastating storm surges are needed to protect lives, property, state and federal infrastructure, and the environment in the proposed critical project area, which suffers extremely high exposure to damage while serving the energy and other high value production needs of the nation.

Enclosures:
1-MRC Report
2-District presentation
3-MRC Staff presentation
4-District Summary Recommendation
5-MRC Hearing Question and Answer clarifications, 12 April 2013
6-District Report

Since 1879, the seven-member Presidentially appointed Mississippi River Commission has developed and matured plans for the general improvement of the Mississippi River from the Head of Passes to the Headwaters. The Mississippi River Commission brings critical engineering representation to the drainage basin, which impacts 41% of the United States and includes 1.25 million square miles, over 250 tributaries, 31 states, and 2 Canadian provinces.

Listening, Inspecting, Partnering and Engineering since 1879

Recommendation of the Mississippi River Commission
Morganza to the Gulf Project, Louisiana

John W. Peabody
Major General, U.S. Army
President, Mississippi River Commission
Vicksburg, MS

Hon. Sam E. Angel
Senior Civilian Member
Lake Village, AR

Hon. R.D. James
Civilian Member, Engineer
New Madrid, MO

Hon. Norma Jean Mattei, Ph.D.
Civilian Member, Engineer
Metairie, LA

RDML Gerd F. Glang
Member Designee
National Oceanic & Atmospheric Administration
Silver Springs, MD

Margaret W. Burcham
Brigadier General, U.S. Army
Member Designee
Great Lakes and Ohio River Division
Cincinnati, OH

Anthony C. Funkhouser
Brigadier General, U.S. Army
Member Designee
Northwestern Division
Portland, OR

MISSISSIPPI RIVER COMMISSION REPORT

Morganza to the Gulf of Mexico, Louisiana project

April 12, 2013

The Morganza to the Gulf of Mexico, Louisiana (Morganza to the Gulf) project authorized by Section 1001(24) the Water Resources and Development Act (WRDA) of 2007 at a total cost of $886.7 million is designed to provide hurricane and storm damage risk reduction benefits while ensuring navigational passage and tidal exchange. The project area is located about 60 miles southwest of New Orleans, LA, and includes Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. After the project's authorization in WRDA 2007 and as a result of Hurricane Katrina's devastating impact on the New Orleans hurricane levees in August 2005, more robust Hurricane and Storm Damage Risk Reduction System (HSDRRS) design standards caused the Morganza to the Gulf project to exceed the 20 percent cost increase limit specified in WRDA 1986, Section 902. The purpose of this Post Authorization Change (PAC) report is to seek re-authorization of the Morganza to the Gulf project.

The post-authorization plan does not include any changes in project purpose from the authorized plan (i.e., hurricane storm damage risk reduction). The purpose of the earthen levee system is to stop or slow surge inundation. The floodgates within the levee system provide storm damage risk reduction during tropical storms and allow currently navigable waterways to remain open to navigation during non-storm conditions. The purpose of the lock is to control saltwater intrusion at the Houma water treatment plant while allowing for navigation. The environmental control structures within the alignment mitigate for indirect impacts of the levee system by matching and/or enhancing existing drainage patterns during non-storm conditions.

The PAC study considered two primary hurricane and storm damage reduction alternatives in detail: a 3% annual exceedance probability (AEP) system (pre-Katrina 100-yr alternative) and a 1% AEP system (post-Katrina 100-yr alternative). The 3% AEP and 1% AEP alternatives follow the same levee alignment which is based on the authorized alignment, but with some modifications due to recommendations in the Interagency Performance Evaluation Taskforce study after Hurricane Katrina and better engineering data/analysis gained through planning, engineering and design that allowed for more cost efficient features to be developed. Of the two alternatives, the 1% AEP alternative has the greater net benefits, lower residual risk, and greater adaptability to future sea level rise.

As a comprehensive approach to reduce hurricane and storm risk in portions of Terrebonne and Lafourche parishes, the post-authorization project is a hurricane and storm damage reduction levee system designed to provide 1% AEP surge risk reduction based on post-Katrina HSDRRS criteria. The levee system consists of 98 miles of grass-covered earthen levees tying into Hwy 90 near the town of Gibson in Terrebonne Parish and Hwy 1 near Lockport, LA in Lafourche Parish (see figure S-2). Levee elevations for base conditions (2035) range from 10.5 to 24 ft North American Vertical Datum of 1988 (NAVD88) and final levee elevations (2085) range from 15 to 26.5 ft NAVD88 with final levee widths from 282 to 725 ft. Structures include 1 lock,

22 floodgates on navigable waterways (3 on Federally-maintained navigation channels and 19 on other canals and bayous), 23 environmental water control structures, 9 road gates, and fronting protection for 4 existing pumping stations. Structures on Federally-maintained navigation channels include the Houma Navigation Canal (HNC) lock and floodgate (250-ft sector gate) and two 125-ft sector gates on the GIWW east and west of Houma. Fourteen 56-ft sector gates and five 20 to 30-ft stop log gates are located on various waterways that cross the levee system. Structure elevations range from 17 to 33 ft NAVD88. Levees would be covered in grass to increase resilience in the case of wave overtopping. All of the transitions between levees and floodwalls would be armored with reinforced concrete scour protection.

Consistent with reducing hurricane and storm damages in an environmentally sustainable manner, the project is designed and could be operated to achieve coastal wetland conservation through the improved distribution of freshwater inflows to wetlands in conjunction with Louisiana Coastal Authority projects. The specific designs and operating plans would be formulated in consultation with the interagency Habitat Evaluation Team. At this time, mitigation features for the post-authorization project have only been identified for the constructible features. Mitigation for direct and indirect impacts of the constructible features includes approximately 394 acres intermediate marsh, 358 acres brackish marsh, and 883 acres saline marsh. For the remaining programmatic features, mitigation costs and land requirements were estimated, but the exact number of acres will be determined in the future as more specific designs are completed and impacts are assessed in future supplemental National Environmental Policy Act of 1969 document.

Construction of the project would be funded 65 percent by the federal government and 35 percent by the non-federal sponsor. Federal implementation of the post-authorization Morganza to the Gulf project would be subject to the non-federal sponsor agreeing to comply with applicable federal laws and policies as described in this report. The total cost for the project is $10,265,100,000 (October 2012 dollars) inclusive of associated investigation, environmental, engineering and design, construction, real estate, mitigation, supervision and administration, and contingency costs. The fully funded total project cost is approximately $12,872,846,000.

As a sponsor funded additional work item, the HNC lock complex sill depth may be deepened from -18 to -23 ft NAVD88 in anticipation of future deepening of the HNC.

The Louisiana Coastal Protection and Restoration Authority Board and the Terrebonne Levee and Conservation District have expressed their intent to be non-federal co-sponsors for the Morganza to the Gulf project (hereafter referred to as the non-federal sponsor). In a letter dated 21 December 2012, the non-federal sponsor expressed commitment and understanding of non-federal cost share responsibilities for construction and operation and maintenance, repair, replacement and rehabilitation

(OMRR&R). Section 1001(24) of WRDA 2007 specifies federal responsibility for OMRR&R of the HNC lock complex and the Gulf Intracoastal Waterway (GIWW) floodgate features that provide for inland waterway transportation in accordance with Section 102 of WRDA 1986, as amended. The non-federal sponsor is responsible for OMRR&R of all other project features.

The OMRR&R costs of this project are estimated to be approximately $7,400,000 annually. Annual OMRR&R costs for the GIWW floodgates and the HNC lock are estimated to be $1,700,000, which is a Federal responsibility. Annual OMRR&R costs for the remaining project features, including the sponsor funded additional work item, are estimated to be $5,700,000 and would be the responsibility of the non-Federal sponsor.

The benefit-to-cost ratio for the post-authorization project is 1.31 based on 2012 price levels and a 3.75 percent interest rate.

The Commission's review encompassed the overall technical, economic, social, environmental, and policy aspects involved in the formulation of alternative plans of improvement and in the findings, conclusions, and recommendations of the District Engineer. The Commission considered the results of the Washington level review and conformance of the recommended plan with the essential elements of the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies and compliance with the other applicable administrative and legislative policies and guidelines.

The Mississippi River Commission concurs in the plan of improvements recommended by the District Engineer and finds that the improvements for hurricane risk reduction and the provisions for environmental features in the Morganza, Louisiana, to the Gulf project are technically sound, are justified based on economic benefits and environmental analyses, and are environmentally and socially acceptable.

The Commission believes there is a federal interest in the proposed plan and that it is needed to protect lives, property, and environment in the area. This Commission endorses the concepts for cost effective hurricane protection in southern Louisiana as vital to support and protect the environment, economy, and culture of southern Louisiana and thus contribute to the economy and well-being of the Nation.

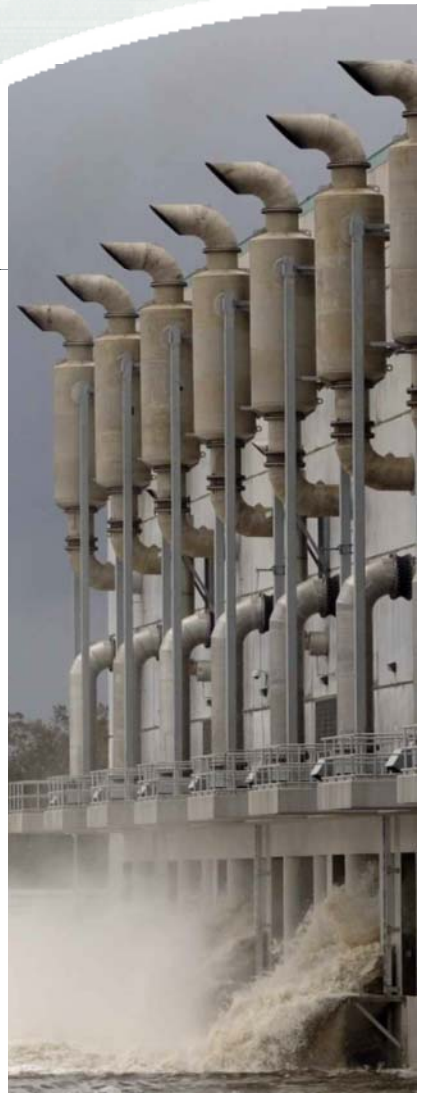
In summary, the Mississippi River Commission has met and reviewed the Morganza, Louisiana, to the Gulf of Mexico Hurricane Protection Project. The Commission concurs in the findings and recommendations of the District Engineer and, therefore, recommends implementation of this project to the Chief of Engineers.

Enclosure 2

Morganza to the Gulf of Mexico Post Authorization Change (PAC) Report

(for the Mississippi River Commission)

April 12, 2013



Col. Edward R. Fleming

New Orleans District Commander

US Army Corps of Engineers

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The Bottom Line

Morganza to the Gulf

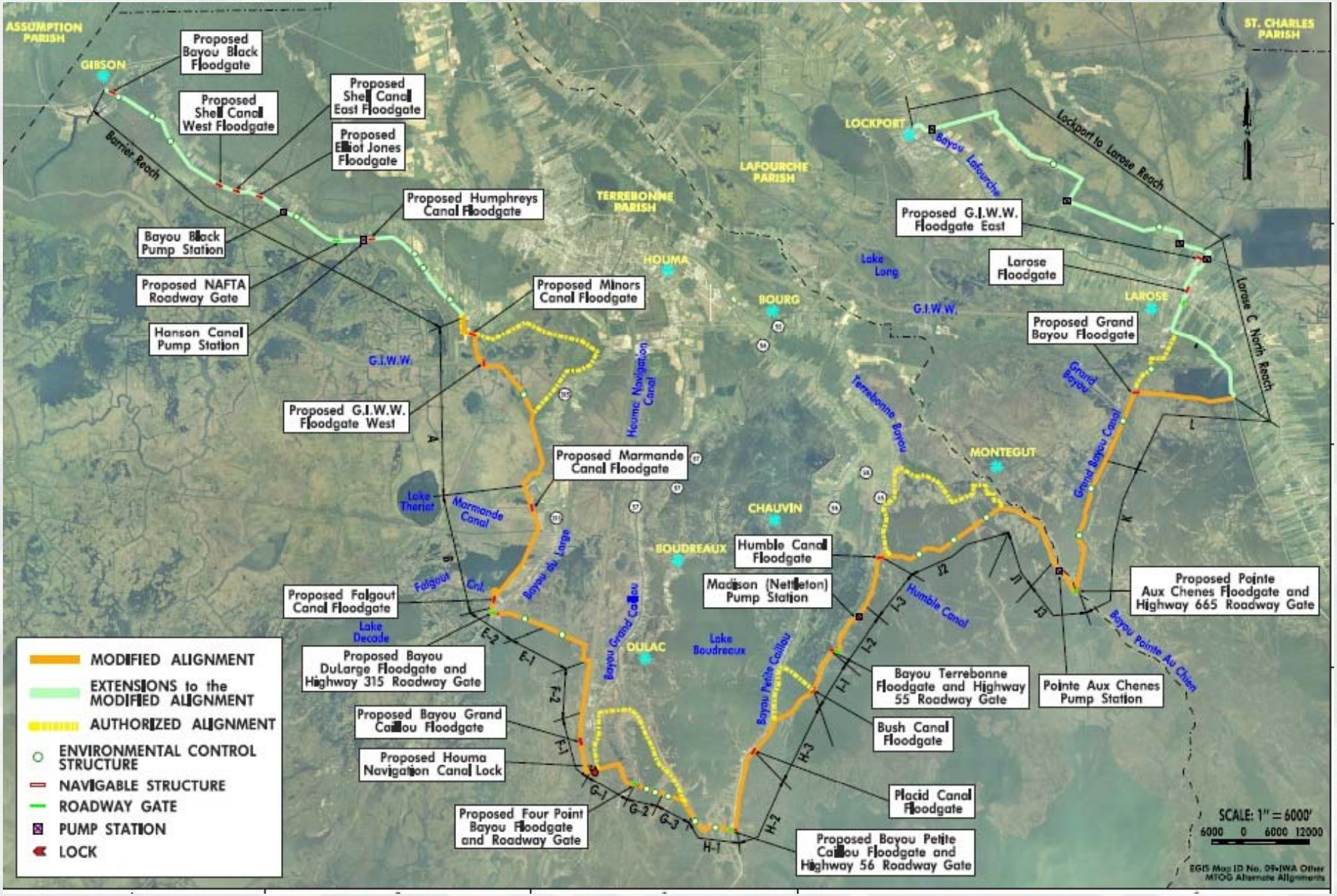
- Recommended Plan is 1% Plan
- Benefit Cost Ratio (BCR) = 1.3
- Cost Estimate is $10.3B (October 2012 dollars)

- The project represents a significant investment
  - ► Local, State & Federal Interest

Study Timeline

- Reconnaissance Study
  - Began April 1992, completed April 1994
- Feasibility Study Authorized 1995, Final Report in 2002
- Water Resources Development Act (WRDA) 2000 included authorization *contingent* upon having signed Chief's Report by December 2000
- Hurricanes Katrina and Rita, 2005
- IPET / HSDRRS Design Guidelines October 2005 - 2007
- Authorized for construction WRDA, November 2007
  - Pre-Katrina criteria, $886M cost (2007 dollars), No construction funds appropriated
- PAC Report initiated December 2008

PAC Report Alignment



PAC Report to Incorporate HSDRRS Design Criteria

- New Method for Modeling Storm Surge
  - Increases area and depth of flooding
- Relative Sea Level Rise (RSLR)
  - Increases area and depth of flooding
- Structural Superiority
  - Increases design elevations
- Higher Factors of Safety for Global Stability
  - Increases levee width / footprint

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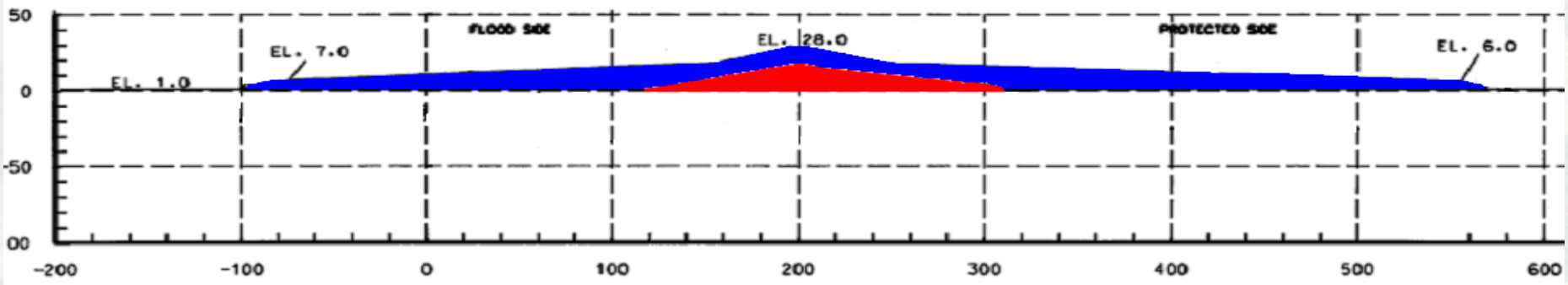
Comparison of Similar Levee Cross-Sections



Post- Katrina 100-year Cross-Section superimposed on Authorized Cross Section

Levee Cross-Section – changes due to Katrina/Rita

- > 50% increase in height
- > 350% increase in base width

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Authorized/PAC Comparison

Project Feature	Authorized (2002 Report)	PAC (2013 Report)
Alignment length	72 miles	98 miles
Levee elevations	9 to 15 ft NGVD	15.5 to 26.5 ft NAVD88
Navigable floodgates	12	22
Sets of box culverts with sluice gates	12	23

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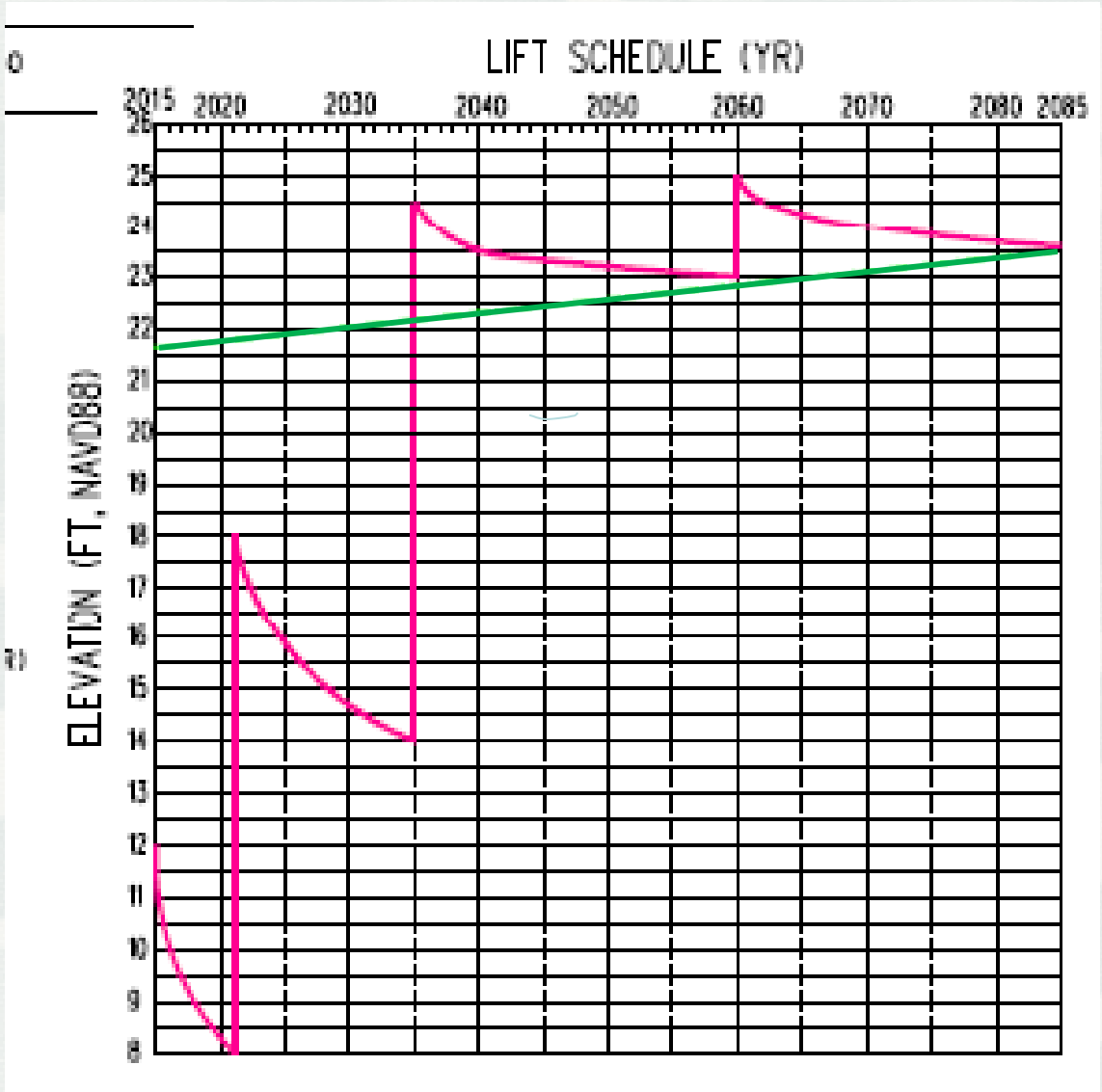
Typical Lift Schedule



- 1% AEP levee elevation
- Levee Lift Schedule

PAC Report Content

Project Background / History

Changes since 2002 Feasibility Report

Feasibility-level (approximately 25%-30%) designs

Feasibility-level cost estimate

Levee alignment (plan & profile views)

Identification of Tentatively Selected Plan (TSP)

Economic Analysis

- Benefit to Cost Ratio = 1.3 for both the 1% and 3% plans
- Tentatively Selected Plan is 1% plan
  - Greatest net annual benefits; least residual risk
  - Consistent with State Master Plan

Tentatively Selected Plan

- 98-miles: Earthen levees; approximately 1-mile floodwall along Larose to Golden Meadow (LGM)
- Final levee elevations 15 feet to 26.5 feet
- Final structure elevations 17 feet to 33 feet
- Floodgates: 22 across navigable canals
  9 across roads
- Sluice Gates: 23 sets for water circulation / drainage
- Cost: $10.3 Billion (October 2012 dollars)

Cost Estimates

Total Project Cost Estimate

- $10.3 (OCT 2012 dollars)
- BCR Calculation
- Congressional budget request

Fully Funded Estimate

- $12.8B (OCT 2012 dollars)
- Escalated to mid-point of construction
- Additional data point for decision-makers

Risk Assessment of Design Criteria

National-level: Ensure that Corps is applying risk consistently across the country - Ongoing

Morganza Project: Site-adapt HSDRRS criteria - Draft Report

- ► Increase Overtopping Rate
- ► Decrease End of Construction Factor of Safety
- ► Eliminate Structural Superiority

- Reduce costs 10% to 30%
- Minimal change in potential consequences
- Provides 1% LORR **but** less resilient system
- Implement during detailed design phase

IEPR Panel Comments

- IEPR Report complete on 5 March 2013
- Scope: Assess adequacy and acceptability of the economic, engineering and environmental methods
- 18 Final Panel Comments
  - High significance - 0
  - Medium significance - 13
  - Low significance – 5

Public Comments

- 45-day comment period
- 4 January to 19 February 2013
- Received:
  - 14 sets of agency comments
  - 15 letters from the public or NGOs
  - 3 comment cards from the public meeting
  - 12 speaker comments at 31 January public meeting
- Over 400 individual comments

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Schedule

MRC Formal Hearing	12 April 2013
MRC Final Report	15 April 2013
Senior Leaders Panel	3 May 2013
Public / State & Agency Review	24 May 2013
	24 June 2013
Signed Chief's Report	Summer 2013

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Back-Up Slides

Eastern Tie-In

- Seven miles of proposed Morganza levee overlays existing Larose to Golden Meadow (LGM) Federal Levee
  - LGM project authorized 1965; HSDRRS design criteria not incorporated
  - PAC Report being developed for LGM
- Larose to Lockport (14 miles)
  - Reduces risk of surge flanking from the eastern side (over Bayou Lafourche ridge)
  - Gheens not within Morganza authorized project area

PAC Report Scope

Limited Re-evaluation Report

- No reformulation of Recommended plan
- 75% Federal / 25% Non-Federal cost share
- Stay on authorized alignment
- Consider Two alternatives:
  1. Pre-Katrina 1% Plan
     - Based on Pre-Katrina stillwater elevations
     - PAC Report 3% Plan
  2. Post-Katrina 1% Plan
     - Equivalent to New Orleans system

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Mitigation for Induced Flooding

- Potential for higher water stages outside of proposed levee system
- Mitigation measures, such as structure raising, other floodproofing, flowage easements or buyouts / relocations may be required
- Additional hydraulic modeling required to determine the most appropriate mitigation method
- The worst case assumption, buyout of 100 percent of the affected structures, is reflected in the cost estimate for the PAC Report.

IEPR Comment Themes

- Economic Themes:
  - CSVR samples
  - Sources and impacts of residual risk
  - Communication plan for at-risk populations
- Environmental Themes:
  - Cumulative effects/modeling uncertainties (future)
  - Multi-purpose operation of HNC Lock
- Engineering Themes:
  - Limited subsurface investigations
  - Borrow Availability Assessment

Public Comment Themes

- Environmental issues
  - More disclosure of future indirect/cumulative impacts because of RSLR and more frequent gate closures
  - Concern about direct impacts at unidentified borrow sites
  - Mitigation requirements and mitigation funding commitment
  - Coordination with LCA
- Socioeconomic issues
  - Uncertainty about measures to address induced flooding
  - Environmental Justice concerns
  - More public outreach needed (specifically with tribes)
  - Communication of residual risk

Public Comment Themes

- Levee realignment
  - Lafourche Parish resolution to incorporate Gheens
  - Non-Federal sponsor and tribes want to incorporate Lower Dularge
  - NGOs generally support MLODS alignment
  - A few private property owners impacted by alignment (want to be all in or all out)
- Relative sea level rise (over/under-estimated)
- High cost and length of time to get authorization and funding
- Non-Federal sponsor wants work in kind credit and site-adapted HSDRRS

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Morganza to the Gulf of Mexico, Louisiana

Post Authorization Change Report

April 12, 2013

Overview of MRC Staff and HQUSACE Policy Review

Identified Policy Concerns

- Risk Assessment of Existing Local Protection Levees
- Future With- and Without-Project Assumptions with Regard to Potential Flanking at Eastern Terminus
- Depth-Damage Curves Used in Flood Damage Computations
- Repetitive Damages & Post Flood Response

These policy concerns have been resolved

MRC Staff Endorsement

- Concur with MVN Commander's findings and recommendations for Morganza to the Gulf PACR
- Report complies with all applicable policies and laws in place at this time
- Plan supported by sponsor and congressional delegation
- Recommend the Commission endorse the project

Project Status

- District Engineer's Final Report received on 29 Mar 2013
- Senior Leader Panel Briefing is scheduled for 3 May 2013
- Report of the Chief of Engineers is scheduled for July 2013
- Further refinement and additional analysis of the projects will be performed during PED and modifications made, as appropriate, prior to project implementation. Such analysis or modifications will continue to be coordinated with Federal, State, and local agencies and other parties.

Summary of the
MORGANZA TO THE GULF OF MEXICO, LOUISIANA
Draft Final Post Authorization Change Report
May 2013

Purpose of the Post-Authorization Change Report

The Morganza to the Gulf of Mexico, Louisiana (Morganza to the Gulf) project authorized by the Water Resources and Development Act (WRDA) of 2007 was developed well before Hurricane Katrina's devastating impact on the New Orleans hurricane levees in August 2005. Implementation of more robust Hurricane and Storm Damage Risk Reduction System (HSDRRS) design standards and other changes since project authorization caused the Morganza to the Gulf project to exceed the 20 percent cost increase limit specified in WRDA 1986, Section 902. The purpose of this Post Authorization Change (PAC) report is to seek re-authorization of the Morganza to the Gulf project. Once all required technical, legal, and policy reviews are complete, the report will ultimately be reviewed by the Assistant Secretary of the Army (Civil Works) and coordinated with the Office of Management and Budget as appropriate for submission to Congress.

Authority

The Morganza to the Gulf project was authorized by WRDA 2007 (PL 110-114, Sec 1001) at a total cost of $886.7 million as follows:

> *"(24) MORGANZA TO THE GULF OF MEXICO, LOUISIANA.—*
> *(A) IN GENERAL.—The project for hurricane and storm damage reduction, Morganza to the Gulf of Mexico, Louisiana: Reports of the Chief of Engineers dated August 23, 2002, and July 22, 2003, at a total cost of $886,700,000, with an estimated Federal cost of $576,355,000 and an estimated non-Federal cost of $310,345,000.*
> *(B) OPERATION AND MAINTENANCE.—The operation, maintenance, repair, rehabilitation, and replacement of the Houma Navigation Canal lock complex and the Gulf Intracoastal Waterway floodgate features of the project described in subparagraph (A) that provide for inland waterway transportation shall be a Federal responsibility in accordance with section 102 of the Water Resources Development Act of 1986 (33 U.S.C. 2212)."*

In accordance with the 2002 and 2003 reports of the Chief of Engineers, the Morganza project is authorized as a feature of the Mississippi River and Tributaries (MR&T).

Description of Authorized Project

The authorized MR&T project, Morganza to the Gulf, is designed to provide hurricane and storm damage reduction benefits while ensuring navigational passage and tidal exchange. The project is located about 60 miles southwest of New Orleans, LA, and includes Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. The 2002 and 2003 Chief of Engineers reports recommended a plan to reduce

hurricane and storm damages by providing a 100-year, or 1 percent annual exceedance probability (1% AEP), level of risk reduction including the features shown in figure S-1.

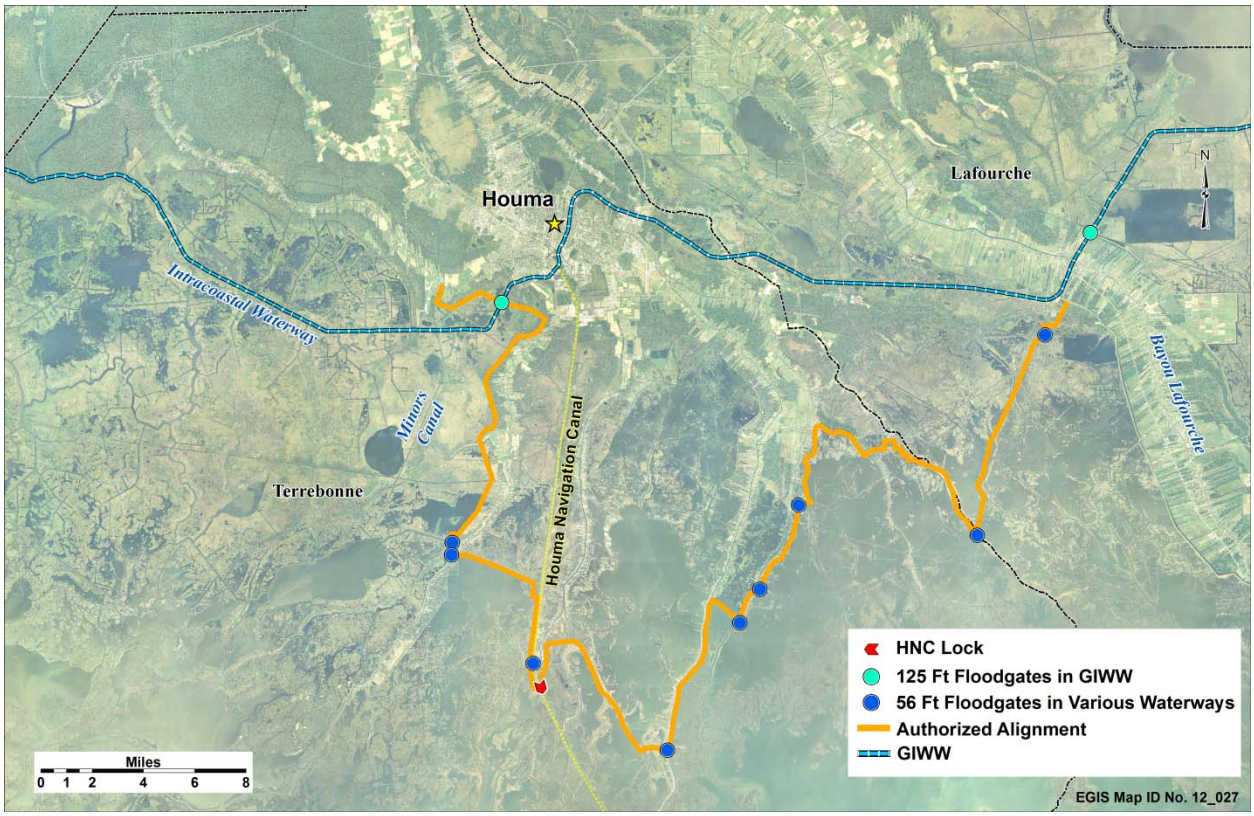

Figure S-1. Authorized Project Features

Project Purpose

The primary project purpose as described in the authorization is hurricane and storm damage reduction. The post-authorization plan does not include any changes in project purpose from the authorized plan. The purpose of the earthen levee system is to stop or slow down surge inundation. Floodgates provide storm damage reduction during tropical storms and allow currently navigable waterways to remain open to navigation during non-storm conditions. The purpose of the lock is to control saltwater intrusion at the Houma water treatment plant while allowing for navigation. Environmental control structures (box culverts) through the levee allow tidal ebb and flow.

Non-Federal Sponsor

The Louisiana Coastal Protection and Restoration Authority Board (LACPRAB) and the Terrebonne Levee and Conservation District (TLCD) have expressed their intent to be non-Federal co-sponsors for the Morganza to the Gulf project (hereafter referred to as the non-Federal sponsor). In a letter dated December 21, 2012, the non-Federal sponsor expressed commitment and understanding of non-Federal cost share responsibilities for construction and operation and maintenance, repair, replacement and rehabilitation (OMRR&R). Section 1001(24) of WRDA 2007 specifies Federal responsibility for OMRR&R of the Houma

Navigation Canal (HNC) lock complex and the Gulf Intracoastal Waterway (GIWW) floodgate features that provide for inland waterway transportation in accordance with Section 102 of WRDA 1986, as amended. The non-Federal sponsor is responsible for OMRR&R of all other project features. Additional responsibilities of the non-Federal sponsor are listed in section 8.3 of this report.

Funding Since Authorization

The Energy and Water Appropriations Act of 1998 (PL105-62) included funds to initiate design on the HNC lock feature of the Morganza to the Gulf project, which initiated the Preconstruction Engineering and Design (PED) phase for the HNC lock feature in advance of completing the Feasibility Report (2002) and signing of Chief's report (also 2002). The USACE and non-Federal sponsor signed a Design Agreement for the HNC lock in January 2000, and the non-Federal sponsor first contributed matching funds for PED in 2000. The first non-Federal contributions to the overall Morganza to the Gulf project were in September 2002. Approximately $61,650,000 has been allocated for the Morganza to the Gulf PED phase, which includes the PAC report. Most of the PED funds have been spent on engineering design and geotechnical investigations rather than on the PAC feasibility-level analysis.

Per U.S. Army Corps of Engineers (USACE) guidance, study costs for the PAC report are being cost shared 75 percent Federal and 25 percent non-Federal. The PAC study is cost shared under a Design Agreement originally executed on May 22, 2002 and amended on March 24, 2005 and January 11, 2011. While the Design Agreement provides for 75/25 cost share during design, WRDA 1986 (PL99-662), Section 105(c), stipulates that the non-Federal share of the cost of design is the same percentage as the non-Federal share for construction, which in this case is 35 percent. The design cost is shared per the percentage of construction cost with 25 percent being collected from the non-Federal sponsor during the Design Agreement and the remaining 10 percent collected in the first year after the Project Partnership Agreement is executed. Pending re-authorization, the construction cost share would be 65 percent Federal and 35 percent non-Federal. No Federal funds have been appropriated for construction of the Morganza to the Gulf project.

Project History Since Authorization

In 2008, a reconnaissance-level planning analysis and detailed programmatic cost estimate was completed for the purpose of determining whether or not there would still be a Federal interest in the project with post-Hurricane Katrina design criteria incorporated and whether a feasibility-level PAC report should be initiated. The 2008 analysis determined that the Morganza to the Gulf project updated with the HSDRRS criteria would still be economically justified, and the PAC re-evaluation study was initiated in early 2009.

Design Criteria Changes Since Authorization

Several policy, procedural, and design criteria changes have been made since the 2002 Morganza to the Gulf Feasibility Report was completed. Lessons learned from Hurricane Katrina and other recent storms have been incorporated into new HSDRRS design guidelines. These peer-reviewed guidelines were developed in response to recommendations made by the Interagency Performance Evaluation Task force (IPET), a team composed of members from USACE,

industry and academia that evaluated the Greater New Orleans levee system after Hurricane Katrina. In accordance with Assistant Secretary of the Army (Civil Works) direction, USACE is applying the HSDRRS guidelines to all hurricane levee system work in the New Orleans District, including the Morganza to the Gulf PAC project. The HSDRRS guidelines provide a comprehensive collection of best practices and were developed to provide redundancy, resiliency, and robustness of the interfaces between structures, materials, and members of the hurricane risk reduction system for the desired level of risk reduction.

The HSDRRS guidelines include some criteria that are more stringent than required for other USACE structures. Changes leading to larger designs and higher costs for the Morganza to the Gulf post-authorization project include the following:

- **Increase in Hydraulic Design Elevations –** Storm surge modeling in the 2002 report was based on only 17 tropical storms and did not consider relative sea level rise in the model. New storm surge modeling predicts water levels based on 115 theoretical storms and incorporates the effects of relative sea level rise within the model. In addition, the 2002 1% AEP water levels were based on the 50 percent confidence values, which have a 50 percent chance of being under-predicted. The new design guidelines require levees to be designed based on the 90 percent confidence values, which have only a 10 percent chance of being under-predicted. All of these factors result in prediction of higher surge and waves, and wave run up used to set levee elevations.
- **Change from I-Walls to T-Walls –** In the 2002 report, floodwalls could be based on I-wall designs. Under the new guidelines, I-walls are not permitted in most cases and have been replaced with more robust and more expensive T-walls.
- **Increase in Geotechnical Stability Factor of Safety –** The analysis method for global stability changed, leading to a higher factor of safety, resulting in taller and wider levees and cost increases.
- **Addition of Structural Superiority –** All new structures that are difficult to construct because of disruptions to navigation or traffic, large utility crossings, or requiring cofferdams must be designed with a minimum of 2 ft of additional wall height resulting in cost increases.

These increases in project size and costs resulted in the project exceeding the WRDA 1986 Section 902 limit.

Post-Authorization Change Alternatives

The PAC study considered two primary hurricane and storm damage reduction alternatives in detail: a 3% AEP system (pre-Katrina 100-yr alternative) and a 1% AEP system (post-Katrina 100-yr alternative). The 3% AEP and 1% AEP alternatives both follow the same levee alignment, which is based on the authorized alignment, but with some modifications that have occurred since authorization. Of the two alternatives, the 1% AEP alternative has the greater net benefits, lower residual risk, and greater adaptability to future sea level rise.

Description of the 1% AEP Post-Authorization Project

The post-authorization 1% AEP Morganza to the Gulf hurricane and storm damage risk reduction system based on post-Katrina HSDRRS criteria consists of 98 miles of grass-covered earthen levees tying into US 90 near the town of Gibson in Terrebonne Parish and Hwy 1 near Lockport, LA in Lafourche Parish (see figure S-2). Levee elevations for base conditions (2035) range from 10.5 to 24 ft NAVD88, and final levee elevations (2085) range from 15 to 26.5 ft NAVD88 with final levee widths from 282 to 725 ft.

Structures include a lock on the HNC, 22 floodgates on navigable waterways (3 on Federally-maintained navigation channels and 19 on other canals and bayous), 23 environmental water control structures, 9 road gates, and fronting protection for 4 existing pumping stations. Structures on Federally-maintained navigation channels include the HNC lock and floodgate (250-ft sector gate) and two floodgates on the GIWW (i.e. GIWW East, a 125-ft sector gate east of Bayou Lafourche, and GIWW West, a 125-ft sector gate west of Houma). Fourteen 56-ft sector gates and five 20- to 30-ft stop log gates are located on various waterways that cross the levee system. Structure elevations range from 17 to 33 ft NAVD88.

Levees would be covered in grass to increase resilience in the case of wave overtopping. All of the transitions between levees and floodwalls would be armored with reinforced concrete scour protection.

Changes in Location of Project

Figure S-2 shows the location of both the authorized and post-authorization (current) alignments. A few reaches in the authorized project were refined during PED (reaches A, G, H, J, and L), and the original alignment had to be extended to the west (Barrier Reach) and to the east (Larose reaches) because surge modeling now indicates that with projected sea level rise, the 1% AEP surge may be able to cross the Bayou Black and Lafourche ridges. Surge modeling for the 2002 feasibility report produced lower stages, which indicated that surge would not cross the ridges. Some levee reach footprints are also wider because of the higher post-Katrina design elevations and the HSDRRS increase in Geotechnical Stability Factor of Safety.

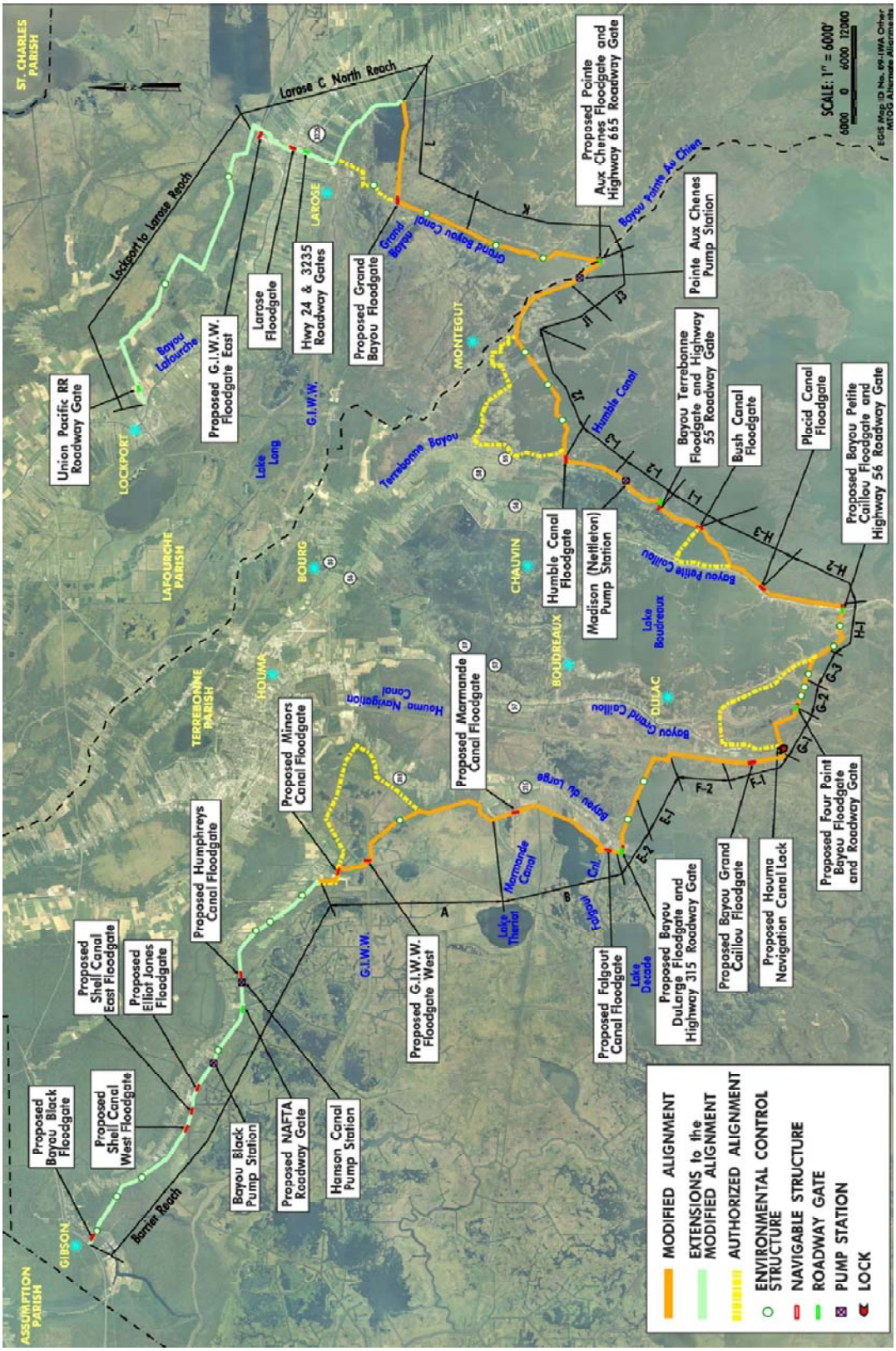

Figure S-2. Post-Authorization Morganza to the Gulf Project Map

Changes in Scope of Authorized Project

The post-authorization plan has the same target level of risk reduction as the authorized plan (1% AEP). More rigorous storm surge modeling and more robust post-Katrina HSDRRS standards expanded the scope of the authorized project as follows:

- **Total levee length** increased from 72 miles to 98 miles. Post-authorization refinements initially reduced the length of the 72-mile authorized alignment by approximately 11 miles, however, post-Katrina surge modeling, which considered higher rates of relative sea level rise and higher surge and waves in the future, demonstrated that the authorized project could potentially be flanked at either end. The proposed levees were also extended to address potential costs to complete the Morganza to the Gulf system in the event that other previously proposed hurricane and storm damage reduction projects in the area are never authorized and/or constructed. The alignment was extended 16 miles to the west and 21 miles to the east to complete the system.
- **Levee and structure elevations** increased by several feet in all reaches and more than doubled in some reaches. Authorized levee and structure elevations along the authorized alignment vary from a minimum elevation of 9 ft National Geodetic Vertical Datum (NGVD) to a maximum elevation of 15 ft NGVD. Post-authorization levee elevations (for future conditions at year 2085) range from 15 ft North American Vertical Datum (NAVD88 epoch 2004.65) at the lowest point to 26.5 ft NAVD88 at the highest point, and structure elevations range from 17 ft NAVD88 at the lowest structure to 33 ft NAVD88 at the highest structure. Note the different datum for the authorized (NGVD) and current (NAVD88) elevations. The change in elevation due to datum differences varies by location, and is around 0.5 to 1.5 ft. Most of the increase is attributable to higher predicted surge and waves and post-Katrina HSDRRS design criteria. For the structures, 2 ft of the increase is attributable to the HSDRRS structural superiority requirement.
- **Levee widths** increased by several hundred feet and are now four to eight times wider. Authorized levee widths range from 40- to 200-ft wide; post-authorization levee widths range from 282- to 725-ft wide. The increases in levee widths are attributable to the increases in levee heights and the HSDRRS increase in Geotechnical Stability Factor of Safety.
- **The HNC lock complex and GIWW floodgate features**, which are located on Federally-maintained navigation channels, are generally the same except for the following changes: The GIWW West floodgate near Houma was re-designed to eliminate one of the two sector gates. Both the GIWW West and GIWW East floodgate sizes were reduced from 175-ft to 125-ft sector gates consistent with the authorized channel width and as a cost-saving measure. The HNC floodgate width increased from 200 to 250 ft. The reason the HNC floodgate had to be widened is that the floodgate's pre-Katrina arrangement is no longer technically feasible given the increase in design height. HNC structure sill depths may increase by 5 ft as part of a requested sponsor funded additional work item.
- **The number of floodgates on other canals and bayous** increased from 9 to 19 for two reasons. One reason is that during PED, several bayous were identified as being used for

navigation, but were not noted as such in the original feasibility study. Another reason is that the western and eastern levee extensions contain several navigable bayous. The assumption for the PAC report was that all currently navigable bayous must remain navigable in the future; the number/sizes of gates may be reduced during PED with additional data on navigation.

- **The number of environmental flow control structures** increased from 12 to 23 sets of concrete box culverts with sluice gates. In the 2002 feasibility report, a single design criterion stated that the environmental control structures should be sized to "return the specified wetland storage area elevations to pre-storm elevations within 14 days." The PAC report includes a more refined set of criteria, including precipitation event conditions, water level, velocity, and box culvert design criteria.
- **The number of road gates and modifications to existing pump stations** also increased because of the western and eastern levee extensions.
- **Environmental mitigation features** for the project authorized in WRDA 2007 included creation of 1,352 acres of marsh habitat. At this time, mitigation features for the post-authorization project have only been identified for the constructible features (i.e. levee reaches F-1, F-2, and G-1; the HNC lock complex; and the Bayou Grand Caillou floodgate). Mitigation for direct and indirect impacts of the constructible features includes approximately 137 acres fresh marsh, 1,358 acres intermediate marsh, 868 acres brackish marsh, and 315 acres saline marsh. For the remaining programmatic features, mitigation costs and land requirements were estimated, but the exact number of acres will be determined in the future as more specific designs are completed and impacts are assessed in future supplemental NEPA documents.
- **A preliminary nonstructural buyout plan** has been developed for high risk areas outside the proposed levee system. Hydrologic modeling indicates that the levee could potentially increase storm surge flooding in these areas; however, additional modeling and analysis would need to be conducted during PED. For purposes of this report, the worst case scenario (most expensive option) has been assumed, which would be a 100 percent buyout of all structures in the impacted areas (approximately 1,000 structures). Should this scenario prove to be the appropriate mitigation method, approximately 2,500 people would need to be relocated to areas behind the Federal levee system.

Changes in Project Costs and Benefits

Both project costs and benefits have increased significantly since authorization. As shown in table S-1, project first costs have increased by an order of magnitude. As described in the previous section, the primary reasons for the cost increases are changes in predicted surge elevations and more robust post-Katrina HSDRRS guidelines. As a result, levee lengths, levee and structure heights, and levee widths have increased significantly.

As shown in table S-2, benefits have increased proportionately to costs, because the same, updated storm surge modeling indicates that more structures have a higher probability of getting flooded. The 1% AEP surge elevations have increased from 4 to 6 ft, to 12 to 14 ft, so the 1% AEP floodplain is now larger and incorporates more structures. The 2009/2010 PAC inventory

included approximately 53,000 structures, which is over twice the number of structures in the original 1997/1998 feasibility study inventory, which included approximately 26,000 structures.

Table S-1. Changes in Project First Costs ($ Millions) by Project Feature

Work Breakdown Structure No. & Civil Works Feature Description	Project as Authorized by Congress (WRDA 2007)	Authorized Project (Updated)	3% AEP PAC Alternative	1% AEP PAC Alternative
Effective Price Level	**Oct 2006**	**Oct 2012**	**Oct 2012**	**Oct 2012**
02 Relocations	43	49	274	291
05 Locks	169	192	530	622
06 Fish & Wildlife Facilities	55	61	619	941
11 Levees & Floodwalls	253	288	2,467	5,351
15 Floodway Control & Diversion Structures	219	245	763	1,068
Construction Totals:	$739	$834	$4,652	$8,273
01 Lands and Damages	10	11	339	355
30 Planning, Engineering & Design	87	98	574	1,006
31 Construction Management	50	56	385	631
Project Cost Totals:	**$887**	**$999**	**$5,950**	**$10,265**

Note: Authorized costs in 2006 price levels updated to 2012 price levels using the Composite Index Civil Works Construction Cost Index System (CWCCIS).

Table S-2. Changes in Annual Costs and Benefits ($ Millions)

(All costs and benefits in $millions)	Project as Authorized by Congress in WRDA 2007	Authorized Project (Updated)	3% AEP PAC Alternative	1% AEP PAC Alternative
Effective Price Level, Interest Rate:	**Oct 2006, 5.125%**	**Oct 2012, 3.75%**	**Oct 2012, 3.75%**	**Oct 2012, 3.75%**
Structures, Contents and Vehicles	91	98	549	877
Emergency Costs	9.6	10	37	54
Boats	1.6	2	<1	<1
Agricultural	2	2	N/A	N/A
Water Supply	0.3	0.3	<1	<1
Avoided Structure Raising Costs	N/A	N/A	10	10
Total Equivalent Annual Benefits	104	113	597	942
Annual Costs	49	55	442	716
Benefit-Cost Ratio	2.12	2.06	1.35	1.31
Net Benefits	55	58	155	225

Note: Benefits for boats in 2006 price levels updated to 2012 price levels using the Energy Information Administration (EIA) Diesel Fuel Price on Gulf Coast; Agricultural benefits updated using the National Agricultural Statistical Service (NASS) ratio of prices received and paid; all other benefit categories updated using the CWCCIS. Agricultural benefits were calculated for the 2002 authorized plan, but not for the PAC because a certified model was not available to incorporate risk analysis, and the agricultural benefits were a small percentage of the total PAC benefits.

Emergency cost reductions for the authorized project were based on pre-Hurricane Katrina/Rita information, and the emergency cost reductions for the post-authorization project were based on post-Hurricane Katrina/Rita information. Also, the emergency cost reductions for the post-authorization project include damages to transportation infrastructure, while these damages were not included in the emergency cost reductions for the authorized project.

The project benefit-to-cost ratio in the 2002 feasibility report was 1.43 based on 2000 price levels and an interest rate of 6.625 percent. The benefit-to-cost ratio of the 1% AEP post-authorization project is 1.31 based on 2012 price levels and a 3.75 percent interest rate. The benefit-to-cost ratio based on 2012 price levels and a 7.0 percent interest rate is 0.65 (required by ER 1105-2-100, Appendix H, Exhibit H-11).

Changes in Cost Allocation and Apportionment

No changes in cost allocation have occurred since authorization; all costs are for hurricane and storm damage reduction. The post-authorization project does not include any changes in the local cooperation requirements or changes in Federal/non-Federal cost share percentages. The cost apportionment would be 65 percent Federal and 35 percent non-Federal for construction.

The non-Federal sponsor requests that the entire non-Federal share be provided as work-in-kind rather than cash. The non-Federal sponsor would focus their effort on earthen levee construction (multiple lifts) concentrated between Reach E-2 and Reach L. The non-Federal sponsor would also construct floodgates on some bayous within the same geographical area, such as Bush Canal, Placid Canal, Bayou Pointe aux Chenes, Bayou Terrebonne, Humble Canal and Bayou Petit Caillou. Details regarding specific features and schedules for work-in-kind would continue to be coordinated between the USACE and the non-Federal sponsor throughout the design and construction phase of the project. Table S-3 compares the Federal and non-Federal cost-share of the authorized project and post-authorization project.

Table S-3. Changes in Cost Apportionment (Costs in $1000s)

(All costs in $1000s)	Authorized Project		Post Authorization 1% AEP Plan
	Authorized in WRDA 2007	Updated Price Levels	
Effective Price Level:	Oct 2006	Oct 2012	Oct 2012
Total Project Cost	$886,700	$1,007,543	$10,265,100
Federal Share (65%)	576,355	654,903	6,672,315
Non-Federal Share (35%)	310,345	352,640	3,592,785
Value of Proposed Work-in-Kind	140,959	160,169	2,947,262
LERRDs	69,110	78,529	645,523
Additional Cash Required	22,330	25,373	0

Note: WIK, LERRDs, and cash in 2006 price levels estimated based on percentages from 2002 report (45% WIK, 22% LERRDs, and 32% cash). Authorized costs in 2006 price levels updated to 2012 price levels using the CWCCIS.

Public Involvement and Environmental Considerations

A Revised Programmatic Environmental Impact Statement (RPEIS) was prepared to update environmental and socioeconomic impacts of the project. Given the size and complexity of the Morganza to the Gulf project and the uncertainties associated with unidentified borrow sources and future indirect impacts, most of the RPEIS is at a broad, programmatic level. The RPEIS

includes a more in-depth analysis of features for which borrow sources have been identified and that could be constructed in the near future, including the HNC lock complex, the Bayou Grand Caillou floodgate, and levee reaches F and G-1. For these features, the RPEIS provides sufficient detail so that no further environmental clearances would be needed upon signing of a Record of Decision. The remaining programmatic features would require supplemental National Environmental Policy Act (NEPA) documents (i.e. EISs or Environmental Assessments) before they could be constructed.

The Draft PAC/RPEIS documents were open to public comment from January 4, 2013 to February 19, 2013. A public meeting was held in Houma, LA on January 31, 2013. The most common concern in the top 10 comment themes (representing over 50 percent of the comments) are the potential environmental impacts of the project and associated mitigation requirements. Federal and State agencies noted that in the future there is a potential for adverse indirect and cumulative impacts to wetlands, fisheries, water quality, and navigation assuming there would be increased frequency and duration of water control structure closures as sea level rise accelerates. In response to these concerns, the Final PAC/RPEIS includes a quantitative analysis of the range of potential indirect impacts, including a mitigation plan, for the constructible features, and a qualitative analysis of the potential impacts for the entire project.

The remaining 9 of the top 10 comment themes (from most common to least common with each theme representing less than 10 percent of the total comments) were related to communication, coordination, and consideration of socioeconomic/cultural impacts; plan realignment or reformulation; design standards, RSLR, & constructability; project economics; nonstructural measures; the relationship of Morganza to other plans or projects, such as the State Master Plan and Louisiana Coastal Area (LCA) projects; GIWW floodgate size change, modeling, and impacts; non-Federal contributions; and general support for the project.

Project Benefits, Costs, and BCR Risk and Uncertainty

Although the costs, benefits, and project benefit-to-cost ratio are presented as “most likely” values in this report, there are large uncertainties surrounding single values. Uncertainty and variability are intrinsic in water resources planning, modeling, and design. Risk and uncertainty arise from measurement errors and from the underlying variability of complex natural, social, and economic situations. Major sources of uncertainty associated with the Morganza to the Gulf project that could impact the benefit-cost ratio include the following:

- **Uncertainty surrounding engineering models and inputs.** The uncertainty surrounding three key engineering parameters (ground elevations, stage-probability curves, and performance of existing and proposed levees) was quantified in the HEC-FDA model. Uncertainty in these engineering inputs arises from imperfect data and coastal storm damage models that represent complex meteorological and hydrologic conditions across a highly variable and changing coastal landscape. In general, the standard deviation associated with estimated still water elevations is greater than a foot. In reviewing the HEC-FDA risk analysis, the USACE Risk Management Center concluded that the lack of data on existing levees resulted in underestimating the without-project damages. The analysis performed on the with-project conditions understated the performance of the Federal levees as well as overstated the residual damages due to the interior/exterior relationships used in the economic model. The net effect of understating

the without-project damages and overstating the with-project residual damages is that the benefit-cost ratio is understated.

- **Uncertainty surrounding economic inputs.** The uncertainty surrounding four key economic variables (structure values, contents-to-structure value ratios, first floor elevations, and depth-damage relationships) was quantified in the HEC-FDA model. Uncertainties arise from measurement errors associated with collection of this economic input data and extrapolation of a small set of samples to a large, highly variable study area. The samples used to develop the contents-to-structure value ratios (CSVRs) for the various residential and non-residential damage categories could not be randomly selected due to the difficulty in obtaining volunteers to participate in the surveys. Consequently, there is the risk that the CSVRs used in the economic analysis may not accurately reflect the true mean CSVRs of the population of residential and non-residential properties in the evaluation area. The uncertainty surrounding the first floor elevations assigned to structures is less than a third of a foot; however, adjustments were made to the structure inventory assuming that structures that are repetitively damaged (i.e. in the 10-yr damage floodplain) will be rebuilt over time to higher elevations such that they are outside of the 100-yr floodplain. If more structures than expected are removed from the floodplain, the benefits would be lower than estimated. If fewer structures than expected are removed from the floodplain, the benefits would be higher than estimated.

- **Changes in the discount rate.** The 2013 discount rate of 3.75 percent is at a record low. All other variables being equal, the breakpoint for project justification is around a discount rate of 5 percent, meaning that if the discount rate rises above 5 percent and all other variables remain unchanged, the project would no longer have a benefit-cost ratio greater than unity.

- **RSLR uncertainty**. The National Research Council predicts that eustatic sea level (not accounting for subsidence) could increase 1 to 4 feet by 2085. Assuming that historic, local subsidence rates continue into the future, the amount of RSLR (sea level rise plus subsidence) for the Morganza to the Gulf area could range from 1.7 to 4.8 ft. The RSLR scenario selected for calculating the benefit-cost ratio assumes an intermediate level of approximately 2.4 ft RSLR by 2085. If the combined effect of RSLR is lower than expected, project benefits and costs would both be lower than estimated. If actual RSLR is higher than 2.4 ft, project benefits and costs would be higher than estimated. Based on a sensitivity analysis, the net effect on the benefit-cost ratio is minimal (a few tenths of a point) and the project would still be justified under any RSLR scenario (holding all other variables the same).

- **Total project cost uncertainties.** For the Morganza to the Gulf project, the high risk cost items are the structural and geotechnical uncertainty, steel cost, fuel cost, unidentified borrow pit for hauled in material, and construction modifications. A detailed cost risk analysis has been conducted and resulting project feature contingencies range from 26 to 35 percent, which results in a total project contingency of around $2.3 billion. Although there is a risk that costs could be underestimated, there is also the risk that costs could be overestimated.

- **Mitigation cost uncertainties for indirect impacts.** Compensatory mitigation costs for the 1% AEP plan are based on direct construction impacts assuming that tidal ebb and flow would be maintained by the environmental control structures designed throughout the levee alignment such that there would be minimal indirect impacts. However, if future sea level rise predictions come to fruition, these environmental control structures would have to be closed more frequently resulting in indirect impacts. Based on this assumption, the Habitat Evaluation Team estimates the constructible features could impact an additional 745 to 2,590 acres (216 to 750 AAHUs), which would require additional compensatory mitigation at a cost of $62 million to $214 million. Mitigation costs resulting from additional indirect impacts from the programmatic features would be covered in future supplemental NEPA documents.

- **Site-adapting the HSDRRS standards.** Estimated project costs in the PAC report are the best available and compliant with current HSDRRS standards. Based on a risk assessment of the Morganza to the Gulf project conducted after the PAC analysis was complete, risk-based modifications to current design criteria have the potential to reduce the total project cost estimates reflected in the PAC report. The USACE is also conducting a risk assessment to ensure risk is addressed consistently across the country. Once this assessment is complete, the results may be applied to the Morganza to Gulf project area. Such modifications would be made to designs and costs during the next phase of implementation, Pre-construction Engineering and Design (PED). Any decrease in costs would increase the benefit-cost ratio assuming the benefit remain unchanged.

Recommendation

As a comprehensive approach to hurricane and storm damage risk reduction in Terrebonne Parish and portions of Lafourche Parish, the District Commander recommends the construction of the 1% AEP hurricane and storm damage risk reduction system.

The District Commander has considered all the significant aspects of this study including the environmental, social, and economic effects, the engineering feasibility, and the comments received from other resource agencies, the non-Federal sponsors, and the public and has determined that the recommended plan presented in this report is in the overall public interest and a justified expenditure of Federal funds. The 1% AEP hurricane and storm damage risk reduction system is a stand-alone project with significant National Economic Development benefits. In coordination with other Federal, State of Louisiana, and parish agencies, USACE planned and would design a project that serves the needs of the nation.

The total cost for the project is $10,265,100,000 (October 2012 dollars) inclusive of associated investigation, environmental, engineering and design, construction, supervision and administration, and contingency costs (and exclusive of OMRR&R costs). The fully funded total project cost (includes inflation) is approximately $12,872,846,000. The project would be funded 65 percent by the Federal Government and 35 percent by the non-Federal sponsors, and subject to the implementation requirements specified in section 8 of this report.

The OMRR&R costs of this project are estimated to be approximately $7,400,000 annually. Approximately $1,700,000 annually would be a Federal responsibility, including OMRR&R for the GIWW floodgates and the HNC lock complex and a portion of cost-shared mitigation

OMRR&R. The remaining annual OMRR&R costs of approximately $5,700,000 would be the responsibility of the non-Federal sponsor, including OMRR&R for all project features (except the GIWW floodgates and HNC lock complex), the sponsor funded additional work item, a portion of cost-shared mitigation OMRR&R, and the remainder of mitigation OMRR&R once USACE determines that the mitigation has achieved initial success criteria.

The benefit-to-cost ratio for the post-authorization project is 1.31 based on October 2012 price levels and a 3.75 percent interest rate.

The recommendations contained herein reflect the information available at the time and current Department of the Army policies governing the formulation of individual projects. They do not reflect programming and budgeting priorities inherent in the formulation of National Civil Works construction program nor the perspective of higher review levels within the Executive Branch. Consequently, the recommendations may be modified before they are transmitted to Congress as proposals for implementation funding. However, prior to the transmission to Congress, the state, federal agencies, and other parties will be advised of any modifications and will be afforded the opportunity to comment.

Attachment: MRC Recommendation

Clarification on New Orleans District Responses
Morganza to Gulf PAC Report MRC Hearing
Baton Rouge, LA, 12 April 2013

1. Morganza PAC assumes borrow is all government furnished.
   - There is no Contractor Furnished borrow
   - Government furnished borrow is a more conservative (expensive) assumption

Borrow Cost: The Walla Walla Cost Engineering Dx guidance generally focuses on the eighty-percent level of confidence (80%) for cost contingency; the eighty-percent level of confidence (80%) was used for Morganza PAC.

Borrow Assumptions:
- PAC cost estimate assumes haul distance of 25 miles (average, one way) for 1% plan and 20 miles (average, one way) for 3% plan.
- PAC assumes all borrow is 100% hauled-in for Reaches Barrier, A, J, K, L, LGM overlay and Lockport to Larose.
- PAC assumes Preload to be excavated from adjacent borrow pit; remaining lifts hauled-in for Reaches B, E, F, G, H and I.

2. For Reaches H-2, H-3 and J-1 (approximately 9-miles), PAC Report assumes that proposed Federal levee will straddle existing Non-Federal Sponsor's (NFS) first-lift levee construction. PAC Cost estimate does not include quantities or costs for the NFS first-lift levees (assumes no credit for NFS work).

3. During the period 2009-2013, NFS will have constructed interim flood risk reduction structures across four waterways. These structures are considered "interim" in nature because they do not meet required 1% elevation for top-of-wall, do not meet other Corps/HSDRRS design criteria, and utilize steel barge gate designs. Corps community of practice prefers to construct pile-founded reinforced concrete sector gates instead of steel barge gates because sector gates can be opened and closed more quickly, require far less maintenance, and are easier to operate (closure is not dependent upon on-site crane; can be operated remotely). Note that none of these four structures meet 3% design elevation, either.

4. PAC designs and cost estimates assume levees are "armored" with grass cover; grass is established after construction of each individual levee lift. Colorado State University armoring tests indicate grass is more resilient than once thought; designs reflect resiliency provided by established grass able to withstand overtopping rates of 2 cf/sec/lf. PAC cost estimates include grass cover on each individual lift and concrete scour protection at all levee/structure transition points.

5. Average Annual Construction Cost for 1% Plan is $710M/year.
   - From 2015 to 2023, 8 years have annual construction costs in $450M-$950M range.
   - Highest annual construction cost is $958M in 2018
   - Lowest annual construction cost is $5M in 2061.
   - There are 20 years in which no construction occurs at all (annual construction cost = 0).

6. The EPA and other resource agencies will not have the opportunity to formally concur with the Corps responses to agency comments until the 30-day State and Agency review, currently scheduled to begin on 24 May 2013. In responding to agency comments, MVN collaborated with each of the agencies (especially EPA, NMFS and USFWS) to develop responses that would ultimately be accepted by the agencies.

Attachment: MRC Recommendation

Clarification on New Orleans District Responses
Morganza to Gulf PAC Report MRC Hearing
Baton Rouge, LA, 12 April 2013

7. Approximately 7 miles of the Morganza alignment overlays the existing Federal levee system, Larose to Golden Meadow (LGM) Reach C-North. The PAC designs include raising the LGM earthen levee segment by approximately 11 ft, removing 350 lf of existing I-wall currently at elevation +15 ft, and replacing the I-wall with 350 lf of new T-wall to elevation +23 ft.

- Existing elevations for LGM C-North levees = +9 ft to +10 ft
- Authorized levee elevations = +10 ft to + 12 ft
- Morganza 1% levee elevations = +18.5 ft (2035) and +20.5 ft (2085).
- Existing elevation for LGM C-North I-wall segment = +15 FT
- Morganza 1% t-wall elevation = +23 ft.

8. There are two IEPR comments regarding adequate site data included in the final IEPR report dated 5 March 2013. Both of these comments were listed as having "medium" significance; IEPR panel concurred with MVN response.

- "The effectiveness of the Morganza to the Gulf project design and construction is uncertain given the limited amount of site data"
- "A borrow availability assessment (BAA) has not been conducted; therefore, the likelihood of project success and the potential impacts (environmental, cost, schedule) of the project cannot be fully assessed."

9. There are both positives and negatives associated with the concept of *enclosing* marsh behind levee systems:

- Positive: Levees will help to protect marsh from damaging effects of salt water intrusion, storm surge and storm wave action
- Negative: Levees will prevent sediment from reaching and nourishing the marsh

10. Portions of Lower Dularge, Dulac, Cocodrie and Isle de Jean Charles lie south (and outside) of the proposed levee alignment. The Native American residents of Isle de Jean Charles are affiliated with the "Isle de Jean Charles Band of Biloxi-Chitimacha-Choctaw", which is not a federally recognized tribe.

11. Relative Sea Level Rise (RSLR) was calculated in accordance with EC1165-2-212. The historic sea level rise rate for Morganza PAC report was based on the Leeville, LA gauge, which was operated and maintained by the New Orleans District from 1957 to 2000. This was the only gauge in the project area for which 40 consecutive years of data were available, as stipulated in the EC.

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

REPLY TO
ATTENTION OF

CEMVN-PM-OP

29 MAR 2013

MEMORANDUM FOR Commander, Mississippi Valley Division (CEMVN-PD-N, Mr. Rayford E. Wilbanks)

SUBJECT: Morganza to the Gulf of Mexico, Louisiana – DRAFT Final Report Package for Civil Works Review Board

1. A Civil Works Review Board (CWRB) covering the Morganza to the Gulf of Mexico, Louisiana Post Authorization Change (PAC) Report and corresponding Revised Programmatic Environmental Impact Statement (RPEIS) is scheduled for 3 May 2013, at US Army Corps of Engineers Headquarters (HQUSACE) in Washington, DC. At the CWRB, Major Subordinate Commanders and District Commanders present the results of their water resources development studies and the recommendations contained in decision documents for projects that require authorization by the United States Congress. The CWRB briefing will serve as the corporate checkpoint in which the final decision reports and National Environmental Policy Act documents are ready for State and Agency Review as required by the Flood Control Act of 1944, as amended.

2. Materials that are required for the CWRB are identified in EC 1105-2-406, and also in the Standard Operating Procedures provided on the HQUSACE website. Information is required as part of a final report package and read ahead materials. The final report package is prepared by the District and Division staffs and the read ahead materials are assembled and distributed by the Regional Integration Team at HQUSACE.

3. The following items are submitted by the New Orleans District for the final report package for the Morganza to the Gulf of Mexico, Louisiana project. We have provided a status of each submitted item.

a. District Engineers Final PAC Report with EIS. Fifteen copies of the reports have been provided to HQUSACE and five copies have been provided to MVD under separate cover.

b. HQUSACE Final Report Submittals. One copy of a binder containing the final report submittals as required by ER 1105-2-100 Appendix H (and as listed on the cover of the enclosed binder) has been provided to HQUSACE and one copy has been provided to MVD.

c. CWRB Read Ahead Materials. Ten copies of a binder containing the Civil Works Review Board read ahead submittals as required by ER 1105-2-100 Appendix H (and as listed on the cover of the enclosed binder) have been provided to HQUSACE and one copy has been provided to MVD.

4. Conditioned on the finalization of all required items, CEMVN is requesting that the CWRB, following their review, provide approval to proceed to the final state and agency review of this report.

5. Additional copies of the final report package as described in para. 3 have been sent to the Commander, HQUSACE (CECW-MVD/Mr. John Lucyshyn), Washington, DC 20314-1000.

6. POC is Mr. Thomas A. Holden Jr., P.E., Deputy District Engineer for Project Management. He may be reached at (504) 862-2204.

2 Encls
as

EDWARD R. FLEMING
Colonel, EN
Commanding