NOTE TO READERS of the Draft Morganza to the Gulf of Mexico, Louisiana Post Authorization Change Report, January 2013

The Morganza to the Gulf of Mexico Post Authorization Change (PAC) Report is a Draft Report for public review and is subject to change before the approval and release of the Final Report. The Draft Report has undergone technical, legal, and policy reviews; however, as with all reports, those reviews are ongoing and will continue during and after the 45-day public review period. Comments of the public, U.S. Army Corps of Engineers (USACE), Mississippi River Commission (MRC), other Federal agencies, Coastal Protection and Restoration Authority (CPRA), CPRA Board (CPRAB), other State agencies, parish governments, non-governmental organizations (NGOs), Louisiana Water Resources Council (LWRC), and others will be taken into consideration and may change the Final Report. The Final Report and a Chief of Engineers Report will ultimately be reviewed by the Assistant Secretary of the Army (Civil Works) and coordinated with the Office of Management and Budget (OMB) as appropriate for submission to Congress.

As the result of legal reviews preceding the release of the Draft Report, several changes/clarifications were made in the draft summary report, main PAC report, and main Revised Programmatic Environmental Impact Statement (RPEIS) documents. At the time of release of the draft report for public review, these changes will not have been made to the remainder of the report and its appendices. However, all of these changes and clarifications will be made to the entirety of the Final PAC Report and its appendices. The changes and clarifications that have been made to the Executive Summary, Main Report and main RPEIS of the draft PAC Report are as follows:

- The Morganza to the Gulf, LA project is authorized as a feature of the Mississippi River and Tributaries (MR&T) project.

- As a result of Act 604 of the 2012 Louisiana Legislative Session, the former Coastal Protection and Restoration Authority (CPRA) is now named the Coastal Protection and Restoration Authority Board (CPRAB). The former Office of Coastal Protection and Restoration (OCPR) is now named the Coastal Protection and Restoration Authority (CPRA).

- The CPRAB and Terrebonne Levee and Conservation District (TLCD) have agreed to be co-sponsors for the Morganza to the Gulf, Louisiana project and submitted an updated letter of intent on 21 December 2012, which replaces the June 1, 2012 letter of intent.

- All project benefits are related to hurricane and storm damage risk reduction. No flood damage reduction, navigation, or ecosystem restoration benefits are quantified for this project. The Houma Navigation Lock mitigates for impacts to the existing navigation channel resulting from placement of the risk reduction system. Any benefit to navigation is incidental in nature and does not constitute a navigation feature.

- Several LCA projects authorized by WRDA 2007 are located within the Morganza study area, including but not limited to: (1) Convey Atchafalaya River Water to Northern Terrebonne Marshes and Multipurpose Operation of Houma Navigation Lock (2) Modification of Davis

Pond Diversion and (3) Land Bridge between Caillou Lake and Gulf of Mexico. By letters dated August 20, 2012 and October 16, 2012, CPRAB has notified the Corps that it desires to suspend study and design on these projects. The decision of CPRAB to suspend these projects results in some degree of uncertainty regarding implementation of these projects as part of the authorized Federal LCA.

While risk-based modifications to current design criteria have the potential to reduce the total project cost estimates, the Draft and Final reports will be completed based on the current estimated costs, which are the best available and compliant with current standards. An ongoing risk-based analysis of the design criteria for the Morganza to the Gulf of Mexico project will continue on a parallel path in concert with an ongoing national-level USACE risk assessment to ensure that risk is being addressed consistently across the country. To ensure that the PAC report is expeditiously processed through the Administration and to Congress, the results of the risk-based analysis of the Hurricane and Storm Damage Risk Reduction System (HSDRRS) design criteria, along with any site-adapted designs, will be completed during the project's Preconstruction Engineering and Design (PED) phase.

Summary of the
MORGANZA TO THE GULF OF MEXICO, LOUISIANA
Draft Post Authorization Change Report
January 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.

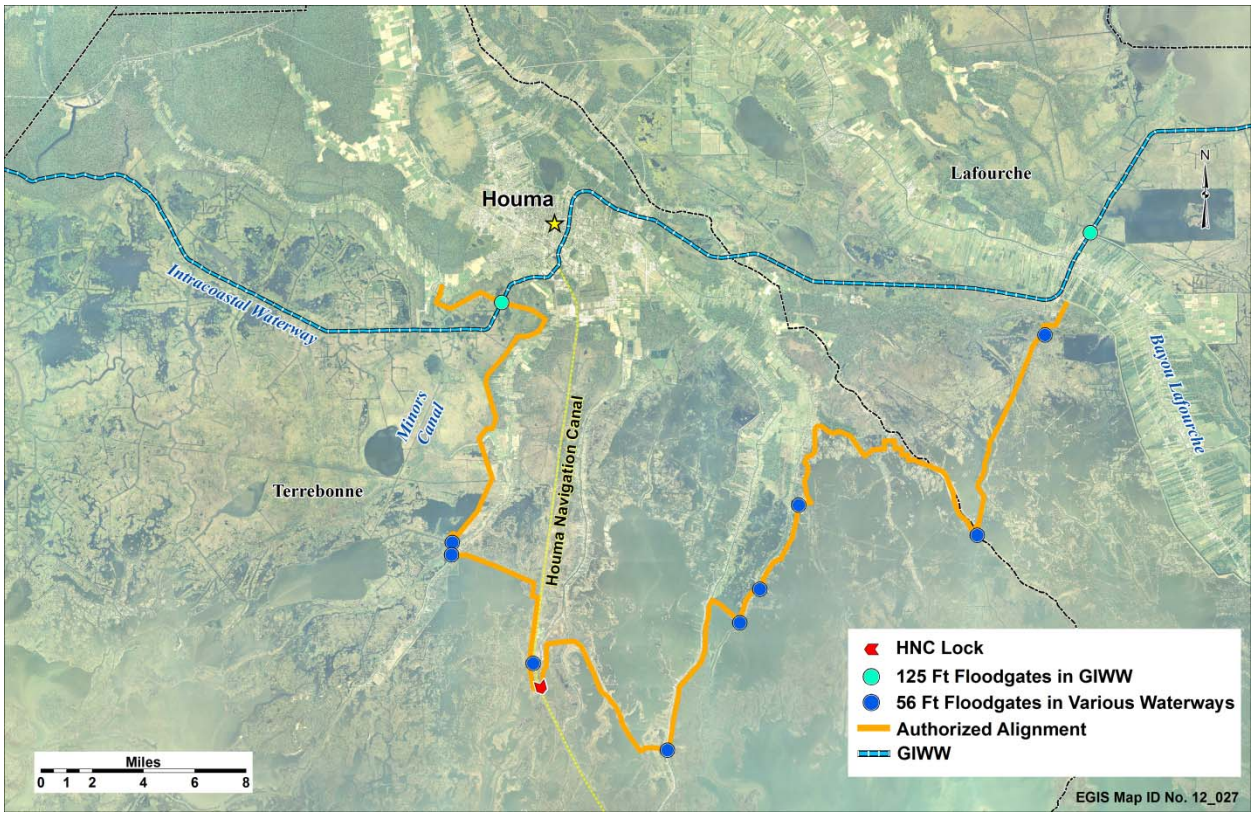

Figure S-1. Authorized Project Features

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. The floodgates within the levee system 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 plan 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.

Non-Federal Sponsor

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 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

Approximately $61,650,000 has been allocated for the Preconstruction Engineering and Design (PED) phase, which includes the PAC report, however, most of the PED funds have been spent on engineering design and geotechnical investigations since 2003, 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 22 May 2002 and amended on 24 March 2005 and 11 January 2011. While the Design Agreement provides for 75/25 cost share during design, WRDA 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

Lessons learned from Hurricane Katrina and other hurricanes have led to the development of new criteria for hydraulics, relocations, geotechnical work, levees, structures, and mechanical and electrical work. The Assistant Secretary of the Army (Civil Works) is requiring the USACE to apply the *Hurricane and Storm Damage Risk Reduction System Design Guidelines (New Orleans District Engineering Division, February 2011)* or "HSDRRS guidelines" to all hurricane levee system work in the New Orleans District. 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 and Tentatively Selected Plan

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, and has therefore been identified as the tentatively selected plan.

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 the 1% AEP surge may be able to cross the Bayou Black and Lafourche ridges at some point in the future. 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.

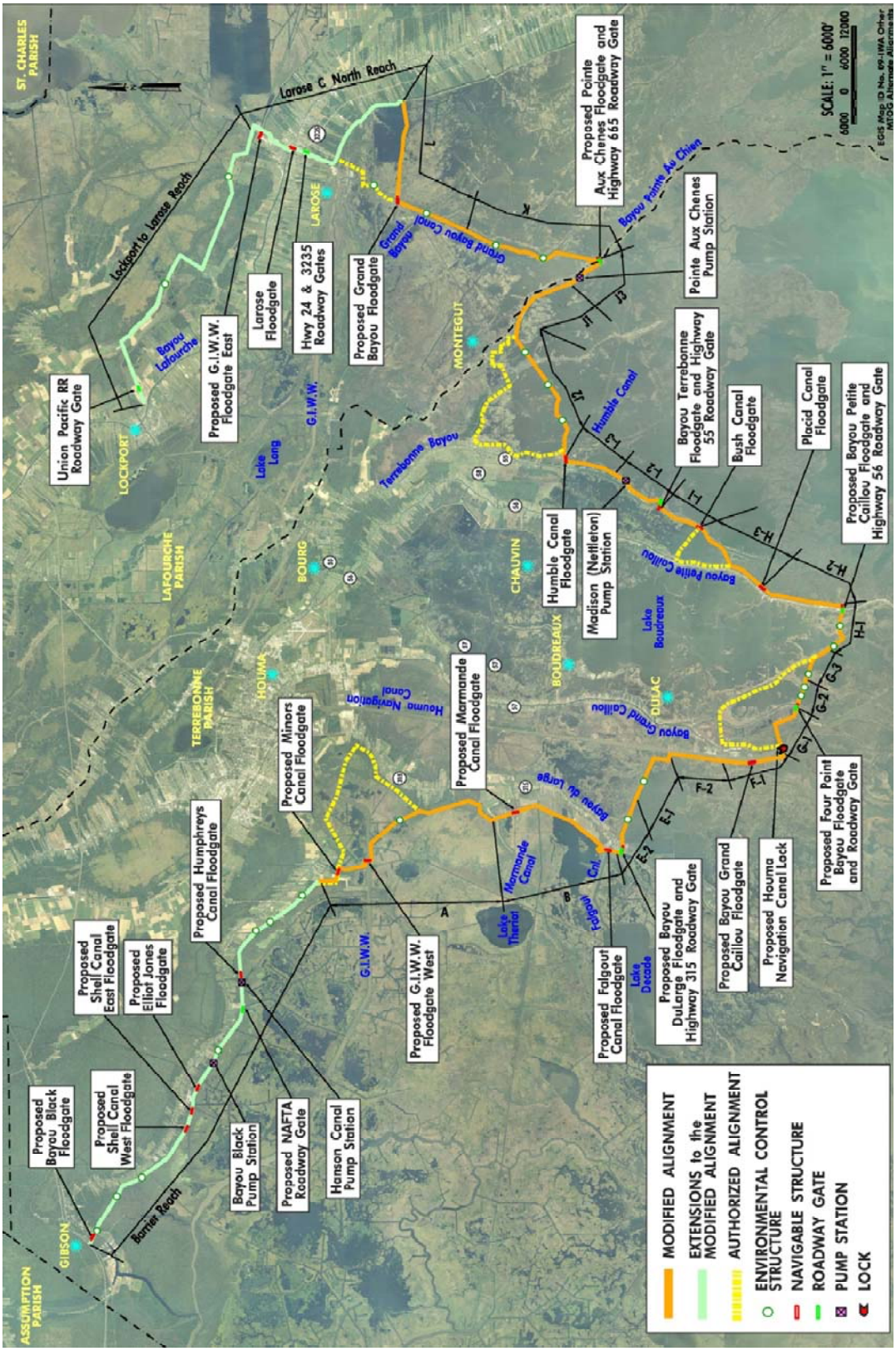

Figure S-2. Post-Authorization Morganza to the Gulf Project Map

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, which is a 36 percent increase. The purpose of extending the levee is to reduce risk of flanking, assuming higher rates of relative sea level rise, and higher surge and waves in the future. 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.
- **Levee and structure elevations** increased by 6 to 18 ft, which is a 67 to 120 percent increase. Authorized levee elevations varied from 9 to 15 ft National Geodetic Vertical Datum (NGVD). Post-authorization levee elevations for future conditions (year 2085) vary from 15 to 26.5 ft and structure elevations range from 17 to 33 ft North American Vertical Datum (NAVD88 epoch 2004.65). 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 floodgate near Houma was re-designed to eliminate one of the two 125-ft sector gates; HNC structure sill depths may increase by 5 ft as part of a requested sponsor funded additional work item; and 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.
- **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 authorized project included creation of 1,352 acres of marsh habitat. The post-authorization project would directly impact 4,113 acres of wetlands. Mitigation acres for the constructible features (levee reaches F-1, F-2, G-1; the HNC lock complex; and the Bayou Grand Caillou floodgate) include 136 acres of intermediate marsh and 780 acres of brackish marsh. No attempt was made to calculate mitigation requirements for the remaining programmatic project features; design details will be further refined and the impacts assessed in a future NEPA document.
- **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.

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 (Tentatively Selected Plan)	
Price Level*	**2006**	**2011**	**2011**	**2011**	**2012**
02 Relocations	43	51	267	283	286
05 Locks	169	197	518	615	621
06 Fish & Wildlife Facilities	55	63	626	955	965
11 Levees & Floodwalls	253	297	2,428	5,259	5,312
15 Floodway Control & Diversion Structures	219	251	774	1,087	1,098
Construction Totals:	**$739**	**$859**	**$4,613**	**$8,200**	**$8,282**
01 Lands and Damages	10	12	339	355	359
30 Planning, Engineering & Design	87	102	569	997	1,007
31 Construction Management	50	58	381	625	631
Project Cost Totals:	**$887**	**$1,031**	**$5,902**	**$10,177**	**$10,279**

*Price levels throughout the PAC report are in 2011 dollars but have been updated to 2012 dollars in some instances.

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. Levee lengths, levee and structure heights, and levee widths have increased by 36 percent, 67 to 120 percent, and 400 to 800 percent, respectively.

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-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 (Tentatively Selected Plan)	
Price Level, Interest Rate:	**2006, 5.125%**	**2011, 3.75%**	**2011, 3.75%**	**2011, 3.75%**	**2012, 3.75%**
Structures, Contents and Vehicles	91	114	540	862	877
Emergency Costs	9.6	12	36	52	54
Boats	1.6	2.1	<1	<1	<1
Agricultural	2.0	2.5	*	*	*
Water Supply	0.3	<1	<1	<1	<1
Avoided Structure Raising Costs	N/A	N/A	10	10	10
Total Equivalent Annual Benefits	104	131	586	924	942
Annual Costs	49	38	438	710	717
Benefit-Cost Ratio	2.12	3.48	1.34	1.30	1.31
Net Benefits	55	94	148	214	224

*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 post-authorization TSP is 1.31 based on 2012 price levels and a 3.75 percent interest rate.

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 Project	
	Authorized in WRDA 2007	Updated Price Levels		
Price Level:	**2006**	**2011**	**2011**	**2012**
Total Project Cost	$886,700	$1,032,000	$10,177,200	$10,279,000
Federal Share (65%)	576,355	670,800	6,615,200	6,681,350
Non-Federal Share (35%)	310,345	361,200	3,562,000	3,597,650
Value of Proposed Work-in-Kind	140,959	180,435	2,923,800	2,952,650
LERRDs	69,110	116,707	638,200	645,000
Additional Cash Required	22,330	164,058	0	0

*WIK, LERRDs, and cash in 2006 price levels estimated based on percentages from 2002 report (45% WIK, 22% LERRDs, and 32% cash).

Environmental Considerations

The main environmental impact of the project is the loss of wetlands within the project right of way. Wetland impacts would be mitigated through the restoration of eroded and subsided wetlands in the project area. The project would complement state and Federal coastal restoration projects by providing protection against coastal erosion and adverse effects of storm surges. A Revised Programmatic Environmental Impact Statement (RPEIS) updates environmental and socioeconomic impacts of the project. Given the size and complexity of the Morganza to the Gulf project and the fact that not all borrow sources have been identified, most of the RPEIS is at a broad, programmatic level; however, 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.

Several LCA projects authorized by WRDA 2007 are located within the Morganza study area, including but not limited to: (1) Convey Atchafalaya River Water to Northern Terrebonne

Marshes and Multipurpose Operation of Houma Navigation Lock (2) Modification of Davis Pond Diversion and (3) Land Bridge between Caillou Lake and Gulf of Mexico. By letters dated 20 August 2012 and 16 October 2012, CPRAB has notified the Corps that it desires to suspend study and design on these projects. The decision of CPRAB to suspend these projects results in some degree of uncertainty regarding implementation of these projects as part of the authorized Federal LCA.

Public Involvement

The Morganza to the Gulf project underwent extensive public review and comment during the feasibility phase. The greatest area of public concern was related to the importance of providing hurricane, storm, and flood risk reduction for businesses and residences. Other concerns included potential adverse impacts to existing marshes, improvement of marsh habitat both inside and outside the proposed levee system, maintaining or improving ingress and egress of marine organisms for the benefit of commercial fisheries, and avoiding adverse water quality impacts. Additional opportunities for public comment include public review of the Draft PAC Report and RPEIS.

Summary of the Post-Authorization Project

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 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 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 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 would be operated to achieve coastal wetland conservation through the improved distribution of freshwater inflows to wetlands using environmental water control structures for tidal exchange. The specific designs and operating plans would be formulated in consultation with the interagency Habitat Evaluation Team.

Mitigation acres for the constructible features (levee reaches F-1, F-2, G-1; the HNC lock complex; and the Bayou Grand Caillou floodgate) include 136 acres of intermediate marsh and

780 acres of brackish marsh. No attempt was made to calculate mitigation requirements for the remaining programmatic project features; design details will be further refined and the impacts assessed in a future NEPA 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 $10,279,000,000 (October 2012 dollars) inclusive of associated investigation, environmental, engineering and design, construction, real estate, mitigation, supervision and administration, and contingency costs. The 2014 Program Year project cost is $10,544,000,000 (October 2013 dollars). The fully funded total project cost is approximately $12,978,000,000.

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 OMRR&R costs of this project are estimated to be approximately $7,284,000 annually. Annual OMRR&R costs for the GIWW floodgates and the HNC lock are estimated to be $1,574,000, 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 $5,710,000 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.

Potential Risk Assessment Impacts on Project Costs

This PAC report reflects the current estimated costs, which are the best available and compliant with current standards. The USACE is 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. Risk-based modifications to current design criteria have the potential to reduce the total project cost estimates reflected in the PAC report. Such modifications would be made to designs and costs during the next phase of implementation, Pre-construction Engineering and Design (PED).