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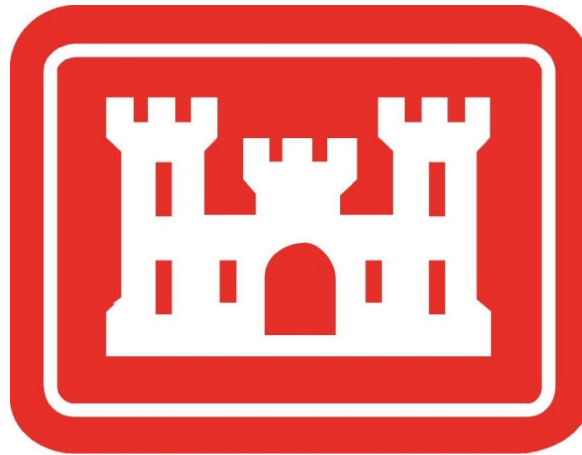
## Appendix D—2019 MTG Adaptive Criteria Assessment Report

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# **USACE**

## **New Orleans District (CEMVN)**



### **Morganza to the Gulf (MTG)**

### **Adaptive Criteria Assessment (ACA)**

**April 2019**

*Prepared For*

Mississippi Valley Division (CEMVD)  
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*Prepared By*


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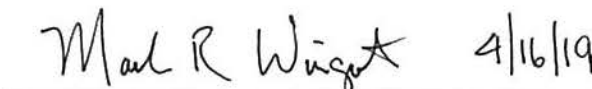
*In Coordination with*

Terrebonne Levee and Conservation District (TLCD)  
Louisiana Coastal Restoration and Protection Authority Board (CPRAB)  
North Lafourche Levee District (NLLD)  
South Lafourche Levee District (SLLD)

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The map displays the Lake Umbagog watershed area in Maine. A red line delineates the watershed boundary, which includes several towns and lakes. A blue arrow points to the project location, situated near the town of Gray. The map shows various towns such as Naplesville, South Vassie, Des Allandais, Raceland, Mathews, Bayou Cane, Houma, Montegut, Chasvin, Madison Bay, Dulac, and Golden Meadow. It also features numerous lakes, including Lake Umbagog, Lake Des Allandais, Lake Raceland, Lake Mathews, Lake Bayou Cane, Lake Houma, Lake Montegut, Lake Chasvin, Lake Madison Bay, Lake Dulac, and Lake Golden Meadow. Major roads like Highway 1, Highway 2, Highway 10, Highway 101, Highway 102, Highway 103, Highway 104, Highway 105, Highway 106, Highway 107, Highway 108, Highway 109, Highway 110, Highway 111, Highway 112, Highway 113, Highway 114, Highway 115, Highway 116, Highway 117, Highway 118, Highway 119, and Highway 120 are marked. The map also shows the location of the project relative to the town of Gray and the Lake Umbagog watershed boundary.

The Morganza to the Gulf (MTG) hurricane and storm damage risk reduction project is a southern Louisiana levee alignment predominately situated in Terrebonne Parrish and partially in Lafourche Parish. The project consists of approximately 98 miles of levee including associated navigation, roadway, pump station fronting protection, and environmental structures. The approximate location of the project relative to New Orleans and other towns in the vicinity can be seen in the figure above. MTG was originally authorized in 2007 at a cost of \$886,700,000 prior to updated hydraulic modeling in accordance with Hurricane and Storm Damage Risk Reduction System (HSDRRS) criteria. The project was redesigned in a Post Authorization Change Report (PACR) report and subsequently re-authorized in 2014 at a cost of approximately \$10.3B. Major changes to project features are reflected in the PACR reauthorized cost. In summary, changes include an increase of approximately 35% in total levee length, an increase of approximately 100% in structures, increased levee/structure elevations/widths, and increased costs for hydraulic mitigation to address potential indirect environmental impacts. However, MTG has not been Federally funded to date for construction and is unlikely to be funded for construction at the PACR cost level moving forward.



This Adaptive Criteria Assessment (ACA) resulted from a tasker from the 14 Nov 2018 meeting with Rep. Graves, Stakeholders, HQUSACE, CEMVD, and CEMVN to perform an assessment in collaboration with local stakeholders to potentially reduce the MTG Total Project Cost (TPC). Adaptive criteria would be utilized in conjunction with elimination of costs for NFS constructed project components. The objective was a 4-6 month effort (from the 14 Nov 2018 meeting) to produce a technical report with potential cost savings. A primary goal was to retain the 1 Percent Annual Exceedance Probability (1% AEP) or 100-year level of risk reduction (LORR), consistent with the PACR. Note this ACA is limited to potential cost savings and due to the limited time, scope, and funding, does not include economic analysis or any discussion on project credits, specific cost-sharing, or operation, maintenance, repair, rehabilitation and replacement (OMRR&R) costs.

Therefore, the US Army Corps of Engineers, New Orleans District (CEMVN) in coordination with State and local stakeholders (CPRAB, TCLD, NLLD and SLLD – collectively referred to as NFS in this report) developed an “Adaptive Criteria” to apply to construction of MTG project features. The objective of this limited scope effort is to lower TPC by applying the adaptive criteria and other cost savings. The three major cost saving components of this report include eliminating the non-Federal Sponsor (NFS) completed features from the TPC, increasing the overtopping rate to 1.0cfs/ft and incorporating other adaptive criteria, and potentially limiting the Federal investment for a 1% AEP to the year 2035 project horizon as an option where the NFS would be responsible to maintain a 1% AEP beyond 2035. **Please note that this effort was limited to a 4-6 month timeframe. The intent of the analysis was to investigate the potential to reduce TPC. As stated in the report, there are many caveats and limitations to the analysis (Reference Section 10.0).**

Notably in the 2013 Issue Evaluation Study on Design Criteria Site-Adaptation Report for the Proposed MTG Levee System, the USACE Risk Management Center (RMC) and CEMVN jointly evaluated the proposed MTG levee system to assess whether HSDRRS criteria could be “site-adapted” to reduce project costs without significantly increasing risk. The following recommendations resulted: reducing the Factor of Safety, increasing the overtopping rate, and eliminating structural superiority. Therefore the concept of the adaptive criteria is rooted in the 2013 RMC MTG report, which endorses the changing of these parameters. Furthermore, the MTG PACR and corresponding Chief’s Report also specifies that potential “site adaptations” would be investigated in Preconstruction Engineering and Design (PED).

Due to the limitation in schedule and budget, traditional USACE processes to study projects was not performed. CEMVN is attempting to capitalize on millions of dollars’ worth of past studies and analysis completed by CEMVN and the RMC as well as capitalize on the current USACE direction of making risk informed decisions. The goal of the effort was to perform a limited scope assessment and subsequently report on TPC savings, including potential of criteria adaptations and associated level of risk as described herein.

Therefore, this ACA documents a limited technical rationale for application of the adaptive criteria defined herein to the 2035 project horizon, as well as, the 2085 horizon in a much more summary fashion. In summary, the cost factor results (including contingency) of this ACA are illustrated in the table below.

Cost Factor	PACR (2085)	ACA (2035)	ACA (2085)
Relocations	\$291 M	\$232 M	
HNC Lock	\$622 M	\$460 M	
Fish & Wildlife facilities	\$514 M	\$129 M	
Mitigation	\$427 M	\$150 M	
Levees	\$5 B	\$1,075 M	
Floodwalls	\$409 M	\$221 M	
Floodway Control & Diversions	\$1 B	\$225 M	
Land & Damages	\$355 M	\$190 M	
PED (12.826%)	\$1 B	\$320 M	
S&A (8.044%)	\$631 M	\$201 M	
<b>Estimated Total Project Cost (TPC)</b>	<b>\$10.27 B</b>	<b>\$3.20 B</b>	<b>\$5.5B-\$6.0B</b>

Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of \$5.5B-\$6B. This estimate can be compared similarly to the PACR TPC of \$10.27B. The estimate of \$3.2B is for a potential option of a reduced Federal investment to the project horizon of 2035, with the NFS also responsible for the costs to achieve the 2085 1% AEP for the project (estimated at an additional \$2.8B - difference between \$3.2B and \$6.0B). The NFS has expressed support for this potential option (See Section 1.1) and also provided a Letter of Intent (See Appendix E).

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately \$3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The \$3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035.

A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria defined herein while constructing to 2085 elevation requirements. The 2085 assessment was much more limited in application as compared to 2035. The 2085 assessment limitations, as compared to 2035, are discussed further in the body of this document (See Section 8.0). The estimated 2085 TPC range is \$5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon, can be compared more directly to the 2085 cost range developed herein. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

In summary, an estimated Federal participation project cost savings of \$7.07B for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035. The overall TPC savings of \$4.27B appears attainable for the 2085 project horizon (using the higher range estimate of \$6B for the TPC). Please note, this assessment was limited in scope, time, and funding. More detailed data collection, analysis and design are required in PED to confirm these findings. Guidance is needed to determine the path forward on how to

proceed to design and construction utilizing these results as an option to deliver the MTG project more efficiently at a reduced TPC.

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### **List of Acronyms**

ACB - Articulated Concrete Block  
ACA – Adaptive Criteria Assessment  
AEP – Annual Exceedance Probability  
CEMVN – USACE New Orleans District  
CPRAB – State of Louisiana Coastal Protection Restoration Association Board  
CPT – Cone Penetrometer Test  
CSU - Colorado State University  
E&D – Engineering and Design  
FOS – Factor of Safety  
FPEIS - Final Programmatic MTG EIS  
GIWW – Gulf Intercoastal Waterway  
HNC – Houma Navigation Canal  
HPTRM - High Performance Turf Reinforcement Mat  
HSDRRS – Hurricane and Storm Damage Risk Reduction System  
HQUSACE- Headquarter USACE  
LAMP -Levee Analysis Mapping Process  
LORR – Level of Risk Reduction

LSP – Levee Safety Program  
LWL - Low Water Level  
MTG – Morganza to the Gulf  
NAVD – North American Vertical Datum  
NLLD – North Lafourche Levee District  
NFS – non-Federal Sponsor  
OMRR&R - Operation, Maintenance, Repair, Rehabilitation and Replacement  
PACR – Post Authorization Change Report  
PED – Preconstruction Engineering and Design  
PDT - Project Delivery Team  
RMC – Risk Management Center  
S&A – Supervision and Administration  
SLLD – South Lafourche Levee District  
SWL - Still Water Level  
TLCD – Terrebonne Levee and Conservation District  
TOW - Top of Wall  
TPC - Total Project Cost  
TRM – Turf Reinforcement Mat  
USFWS – US Fish & Wildlife Service  
WIFIA - Water Infrastructure Finance and Innovation Act  
WOS - Wave Overtopping Simulator  
WRDA – Water Resources Development Act  
WRRDA – Water Resources Reform and Development Act



## 1.0 INTRODUCTION

The MTG hurricane and storm damage risk reduction project is a southern Louisiana levee alignment predominately situated in Terrebonne Parrish and partially in Lafourche Parish, consisting of approximately 98 miles including associated navigation, roadway, pump station fronting protection, and environmental structures. MTG was authorized by the Water Resources Development Act (WRDA) of 2007 at a cost of \$886,700,000. However, due to the implementation of HSDRRS design criteria following the devastating impacts of Hurricane Katrina on the New Orleans metropolitan area, the MTG project was redesigned based on updated hydraulic modeling and to the new HSDRRS design criteria. Resulting costs exceeded the 20 percent cost increase limit specified in WRDA 1986, Section 902.

Subsequently, a PACR was completed in 2013 seeking Congressional re-authorization of the MTG construction and operation, maintenance, repair, rehabilitation and replacement (OMRR&R). The PACR was successfully completed and subsequently served as the basis for the Congressional re-authorization of the MTG project in the Water Resources Reform and Development Act (WRRDA) of 2014, at an estimated cost of \$10.3B. Major changes to the project features included increasing the total levee length from 72 miles to 98 miles, increasing levee/structure elevations and levee widths, increasing the number of floodgates and environmental control structures from 9 to 19 and 12 to 23 respectively, increasing the sill depth and floodgate width for the Houma Navigation Canal (HNC) lock complex, and including costs for hydraulic mitigation to address potential indirect impacts. Additionally, one of the two GIWW sector gates near Houma was eliminated. The PACR also included the RMC's Issue Evaluation Study on Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. However, due to the resulting significant increase in project cost, MTG has not been Federally funded to date for construction and is unlikely to be funded for construction at the PACR cost level moving forward.

This ACA resulted from a tasker from the 14 Nov 2018 meeting with Rep. Graves, Stakeholders, HQUSACE, CEMVD, and CEMVN to perform an assessment in collaboration with local stakeholders to potentially reduce the MTG TPC. Adaptive criteria would be utilized in conjunction with elimination of costs for NFS constructed project components. The objective was a 4-6 month effort (from the 14 Nov 2018 meeting) to produce a technical report with potential cost saving findings. A primary goal was to retain the 1% AEP or 100-year, consistent with the PACR. Note this ACA is limited to potential cost savings and due to the limited time, scope, and funding, does not include economic analysis or any discussion on project credits, benefits, specific cost-sharing, or OMRR&R costs.

To date, the Terrebonne Levee and Conservation District (TLCD) has designed and constructed approximately 47 miles of the authorized levee alignment to an elevation of 12 feet (NAVD88) (existing elevations range from 10.0 to 11.5 feet due to settlement) as well as a total of 23 structures in the alignment consisting of barge floodgates, environmental structures, and pump stations fronting protection. The HNC Lock Complex is also planned for construction beginning in 2019 at a cost of approximately \$400M. The Lock Complex is estimated to take 2 years to complete. In total, the NFS investment in the project consists of approximately \$814M (\$414M in levee/structures work and \$400M for the HNC Lock Complex).

Therefore, CEMVN in coordination with the CPRAB, TLCD, NLLD, and SLLD have developed “Adaptive Criteria” which can be applied to the remaining construction of the authorized MTG levee alignment. The primary objective of this effort is to capitalize on the NFS investment to date and lower the cost of remaining construction to a potentially fundable level. A new TPC shall be developed by:

- a. Eliminating costs of NFS features that have completed construction to date (or are nearing completion) from the total project cost. *(Please note that although the NFS is proceeding with design and construction of the HNC Lock complex utilizing local funding, this assessment shall include the cost of the HNC lock complex in the TPC as construction on this feature has yet to begin.)*
- b. Developing Adaptive Criteria which more closely reflects the level of risk associated with the infrastructure investment of landside adjacent communities.
- c. Applying this Adaptive Criteria to remaining construction features required to achieve a 1% AEP or 100-year level of risk reduction (LORR), same LORR as the PACR, at the 2035 project horizon.
- d. Perform the same (c. above) for the 2085 project horizon in a much more limited fashion.

### 1.1 NFS PERSPECTIVE OF THE ADAPTIVE CRITERIA ASSESSMENT (ACA)

The NFS provided their perspective of the ACA for inclusion in the report, which is quoted below in its entirety. Additionally the NFS provided a Letter of Intent, which is included in Appendix E and a Local Stakeholder Historical Perspective, which is included in Appendix F.

“The State of Louisiana through the Coastal Protection and Restoration Authority Board (CPRAB), the Terrebonne Levee and Conservation District (TLCD), and the residents of Terrebonne and Lafourche parishes fully support the authorized Morganza to the Gulf Project (MTG Project). The residents of Terrebonne and Lafourche parishes have demonstrated their support for the project by voting tax levies upon themselves to raise funds necessary to advance project construction ahead of Federal funding. To date, the State and TLCD have expended \$414 million designing and constructing approximately 47 miles of the approximately 98 miles of authorized levee alignment for the MTG Project to an elevation of 12 feet (NAVD88). Twenty-three structures (11 navigation structures, 10 environmental structures) and 2 pump stations fronting protection have been constructed to date. The construction of the Houma Navigation Canal Lock Complex (HNC Lock) is scheduled to begin in 2019 at a cost of approximately \$400M. In total, the State’s and TLCD’s funds committed to the project consists of approximately \$814M, including \$414M in levee and structure construction and \$400M for HNC Lock.

As the State and TLCD have expended non-federal funds to advance the MTG Project ahead of the Federal funding, it has become apparent to CPRAB, TLCD, and other project stakeholders that the MTG Project is facing challenges to obtain new start federal funding for the authorized estimated total project cost (TPC) of \$10.3B. At the same time, it is the opinion of project stakeholders that the project can be constructed for substantially less while still providing the storm surge protection so desperately needed in this vulnerable region. Stakeholders believe that the MTG Project Post Authorization Change Report (PACR) estimated cost of \$10.3B is a result of the levees and structures being designed to the standards of the Hurricane Storm Damage Risk

Reduction System (HSDRRS) located in the densely populated and infrastructure-heavy Greater New Orleans Area, standards which are not necessarily appropriate for the less densely populated areas to be behind the MTG Project alignment. In addition, the authorized costs do not take into account the cost savings that could be realized by levee reaches providing strength gains for future work and the geotechnical data obtained during the State's and TLCD's construction of over \$400 million in levees and structures.

By letter dated April 11, 2016, the Assistant Secretary of the Army/Civil Works (ASA/CW) indicated that site adaptation criteria would be utilized in future efforts to reduce TPC, while still providing approved project benefits. Therefore, in order to reduce the MTG Project TPC, CPRAB, TLCD and other project stakeholders encouraged USACE to perform an assessment, in collaboration with local stakeholders, using site adaptation criteria to potentially reduce the MTG Project TPC. Project stakeholders believe that by employing criteria more appropriate to the region, in conjunction with removing the costs for the components of the system that have already been constructed by the State and TLCD, the TPC could be greatly reduced.

In short, CPRAB believes that the Adaptive Criteria developed by USACE, in coordination with the CPRAB, TLCD, North Lafourche Levee District (NLLD), and South Lafourche Levee District (SLLD), as reflected in this ACA document, can be applied to the remaining construction of the authorized MTG levee alignment, allowing the project to capitalize on the Non-Federal Sponsor (NFS) and local stakeholder investment to date and lower the cost of remaining construction to a potentially fundable level.

CPRAB believes that cost savings can be achieved while still providing a 1% Annual Exceedance Probability (AEP) due to several factors. The levee alignments constructed by the State and TLCD provide some soil foundation shear strength gain that may reduce the cost of future lifts. The large hydraulic interior storage capacity within the system gives some flexibility in overtopping design that was not afforded in the HSDRRS. In addition, independent utility has been realized by constructing this system in phases; all components completed to date provide tangible benefits.

As the NFS for the MTG Project, CPRAB has participated in the development of and has reviewed the findings of the technical assessment, as reported in this ACA document. CPRAB supported the undertaking of this assessment and fully supports its findings. CPRAB concurs with the ACA technical assessment which confirms construction potential of a 1% AEP system for the MTG study area, inclusive of the HNC Lock structure, through the year 2035, and identifies the cost to perform future levee lifts and structure alterations through the year 2085. The 1% AEP 2035 construction costs, as defined in the ACA, is estimated at \$3.2B. The TPC, through 2085, is estimated in the range of \$5.5 to \$6B, a significant cost reduction compared to the authorized TPC of over \$10.3B. Although the level of analysis performed for the future levee lifts and structure alterations to year 2085 was not as detailed as the analysis performed for the construction of the 1% AEP system to year 2035, CPRAB generally concurs with the technical findings of the ACA to year 2085.

CPRAB acknowledges that in an effort to lower the MTG TPC, this assessment evaluated the application of Adaptive Criteria to three major cost saving components, namely eliminating the non-Federal Sponsor (NFS) completed features from the TPC, increasing the overtopping rate to

1.0 cfs/ft, and limiting the 1% AEP to the year 2035 project horizon as an option where the NFS would have 100% responsibility to maintain a 1% AEP beyond 2035 to 2085.”

## 2.0 REFERENCES

- a. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), August 2002.
- b. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries Supplemental Report (Chief of Engineers Report), July 2003.
- c. US Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines (Interim), October 2007 (Includes 12 June 2008 Revisions).
- d. US Army Corps of Engineers, Louisiana Coastal Protection and Restoration (LACPR) Final Technical Report, August 2009.
- e. US Army Corps of Engineers, New Orleans District Engineering Division, Hurricane and Storm Damage Risk Reduction System Design Guidelines, New Orleans District Engineering Division, February 2011.
- f. US Army Corps of Engineers, Post Authorization Change Report, Morganza to the Gulf of Mexico Project, LA, May 2013.
- g. US Army Corps of Engineers, Morganza, Louisiana, to the Gulf of Mexico, Mississippi River and Tributaries (Chief of Engineers Report), July 2013.
- h. US Army Corps of Engineers, Risk Management Center, Issue Evaluation Study, Design Criteria Site-Adaptation Report for the Proposed Morganza to the Gulf Levee System, July 2013, which includes as an Appendix the Morganza to the Gulf Sensitivity Analysis from October 2012.
- i. Morganza to the Gulf Cost Assessment, November 2018

These reports are incorporated by reference into this report. A summary of past authorizations and report results are included in Sections 3.0 and 5.0, respectively.

## 3.0 AUTHORITY HISTORY AND CURRENT STATUS

The MTG project was authorized by WRDA 2007 (PL 110-114, Sec 1001(24)) 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 MTG project is authorized as a feature of the Mississippi River and Tributaries (MR&T).

Following redesign, the cost estimate exceeded the 20% cost increase limit. Therefore a PACR was completed in 2013. The MTG project was re-authorized by Section 7002(3)5 of WRRDA 2014, PL 113-121, at a total cost of approximately \$10.3B as follows:

*“SEC. 7002. AUTHORIZATION OF FINAL FEASIBILITY STUDIES.*

*The following final feasibility studies for water resources development and conservation and other purposes are authorized to be carried out by the Secretary substantially in accordance with the plan, and subject to the conditions, described in the respective reports designated in this section:*

*(3) HURRICANE AND STORM DAMAGE RISK REDUCTION.—“*

<i>A. State</i>	<i>B. Name</i>	<i>C. Date of Report of Chief of Engineers</i>	<i>D. Estimated Initial Costs and Estimated Renourishment Costs</i>
5. LA	Morganza to the Gulf	July 8, 2013	Federal: \$6,695,400,000 Non-Federal: \$3,604,600,000 Total: \$10,300,000,000

A MTG project history timeline of authorizations, studies, and tropical storm events from 1985 through 2012 is provided in the table below:

Table 3-1 Timeline of MTG Authorizations & Studies

1985	Hurricane Juan caused extensive flooding in Terrebonne and Lafourche parishes.
1992	Reconnaissance study authorized by resolution adopted April 1992 by the Committee of Public Works and Transportation of the U.S. House of Representatives. In August, Hurricane Andrew caused extensive flooding in Terrebonne and Lafourche parishes.
1994	USACE completed the Morganza to the Gulf reconnaissance report (USACE, 1994).
1995	In the Energy and Water Development Appropriation Act of 1995 (PL 103-316), Congress directed the USACE to consider the interrelationship of studies and projects that impact the coastal area of Louisiana, including the Morganza feasibility study, the Lower Atchafalaya Basin reevaluation study, and several projects being pursued under the Coastal Wetlands Planning, Protection, and Restoration Act (CWPPRA) program, and directed the USACE to consider improvements at and/or within the HNC. The Feasibility Cost Share Agreement was executed in June 1995.
1996	Section 425 of WRDA 96 (PL 104-303) required the USACE to develop a study of the HNC lock as an independent feature of the Morganza to the Gulf project.
1997	USACE completed the HNC lock study, which recommended a 200-ft wide lock in the HNC south of Bayou Grand Caillou and concluded that a lock structure would provide direct and indirect benefits to the environmental (marsh) habitat in the study area (USACE, 1997). The report recommended that

	the HNC lock continue to be investigated as part of comprehensive Morganza to the Gulf hurricane and storm damage reduction plans and that the detailed design phase of the lock be expedited and proceed concurrently with the feasibility study.
1998	Congress authorized the USACE to initiate detailed design of the multipurpose HNC lock.
2000	The Morganza to the Gulf of Mexico project was conditionally authorized in WRDA 2000 at a cost of \$550 million subject to having a favorable Chief of Engineer's report completed by December 2000; the terms of this conditional authorization were not met. The PED phase on the HNC lock complex was initiated in advance of the PED phase for the Morganza to the Gulf of Mexico hurricane and storm damage reduction project. The PED Agreement for the HNC lock was signed in January 2000.
2002	The Morganza to the Gulf feasibility study and PEIS were completed in March 2002 (USACE, 3/2002). The PED Agreement for the overall project was signed in May 2002. In August 2002, the USACE issued a Chief of Engineers report (USACE, 9/2002). In September and October, Tropical Storm Isidore and Hurricane Lili impacted the study area.
2003	In July 2003, the USACE issued a supplemental Chief of Engineers report (USACE, 2003), which made changes to the non-Federal sponsor's in-kind services.
2004	Section 158 of the Energy and Water Development Appropriations Act, 2004 (Public Law 108-137) authorized construction on Reach J-1, which had been previously identified as work-in-kind.
2005	The PED Amendment 1 executed in March 2005 combined the two PED efforts into one and allowed the non-Federal sponsor to advance funds on the combined PED effort. In August and September, Hurricanes Katrina and Rita impacted the study area.
2007	WRDA 2007 authorized the Morganza to the Gulf of Mexico, Louisiana project for hurricane and storm damage reduction at a total cost of \$886.7 million.
2008	A recon-level analysis and programmatic cost estimate (ARCADIS, 2008) was completed to determine whether or not there would still be a Federal interest in the project with post-Katrina interim criteria (USACE, 2007) incorporated and whether a feasibility-level PAC report should be initiated. Based on an analysis of four alternatives, the general alignment strategy for the PAC report was determined, but not the final level of risk reduction. Phase I Design for the HNC lock and floodgate was finalized in a 50 percent Design Documentation Report (URS, 2008). In September, Hurricanes Gustav and Ike impacted the study area.
2011	The PED Amendment 2 executed in January 2011 increased the funding ceiling and changed the name of the non-Federal sponsor from Louisiana Department of Transportation and Development (DOTD) to the Louisiana Coastal Protection and Restoration Authority.
2012	Legislation changed the former Office of Coastal Protection and Restoration (OCPR) to the Coastal Protection and Restoration Authority (CPRA) and changed the former Coastal Protection and Restoration Authority (CPRA) to the Coastal Protection and Restoration Authority Board (CPRAB).

## 4.0 SYSTEM DESCRIPTION

The authorized MR&T MTG project is designed to provide hurricane and storm damage risk reduction benefits to a 1% AEP (or 100-year) (otherwise known as 1% or 100-year LORR) while ensuring navigational passage and tidal exchange. MTG is located in the state of Louisiana about 60 miles southwest of New Orleans and includes Terrebonne Parish and the portion of Lafourche Parish between the eastern boundary of Terrebonne Parish and Bayou Lafourche. The study area extends south to the saline marshes bordering the Gulf of Mexico and encompasses approximately 1,900 square miles. The Gulf Intracoastal Waterway (GIWW) and the HNC are major waterways in the area. The GIWW passes through Houma in an east-west direction. The HNC extends due south from Houma to the Gulf of Mexico. Bayou Lafourche runs along the northeastern boundary of the project/study area. Figure 4-1 illustrates the currently authorized MTG levee alignment (in



The map displays the Lake Charles area, including the city of Lake Charles and surrounding regions. A red line outlines the project location, which is situated in the central part of the map. A blue arrow points to this red line with the text "Project Location". The map shows various roads, including US Highway 101, and several bodies of water, such as Lake Charles and Lake de Cade. Other labeled locations include Thibodaux, Schriever, Raceland, and Bayou Cane.

Figure 4-2 on the next page illustrates the status of construction as of November 2018. Green highlighted alignments have been constructed by the NFS to an elevation of 12.0 feet (with corresponding settlement throughout the alignment that has resulted in current elevations ranging for 10.0 to 11.5 feet). Yellow highlighted reaches are currently under construction by the NFS. Red highlighted reaches have not yet begun construction. Otherwise the location of structures throughout the alignment are labeled following the same color scheme to illustrate construction status.



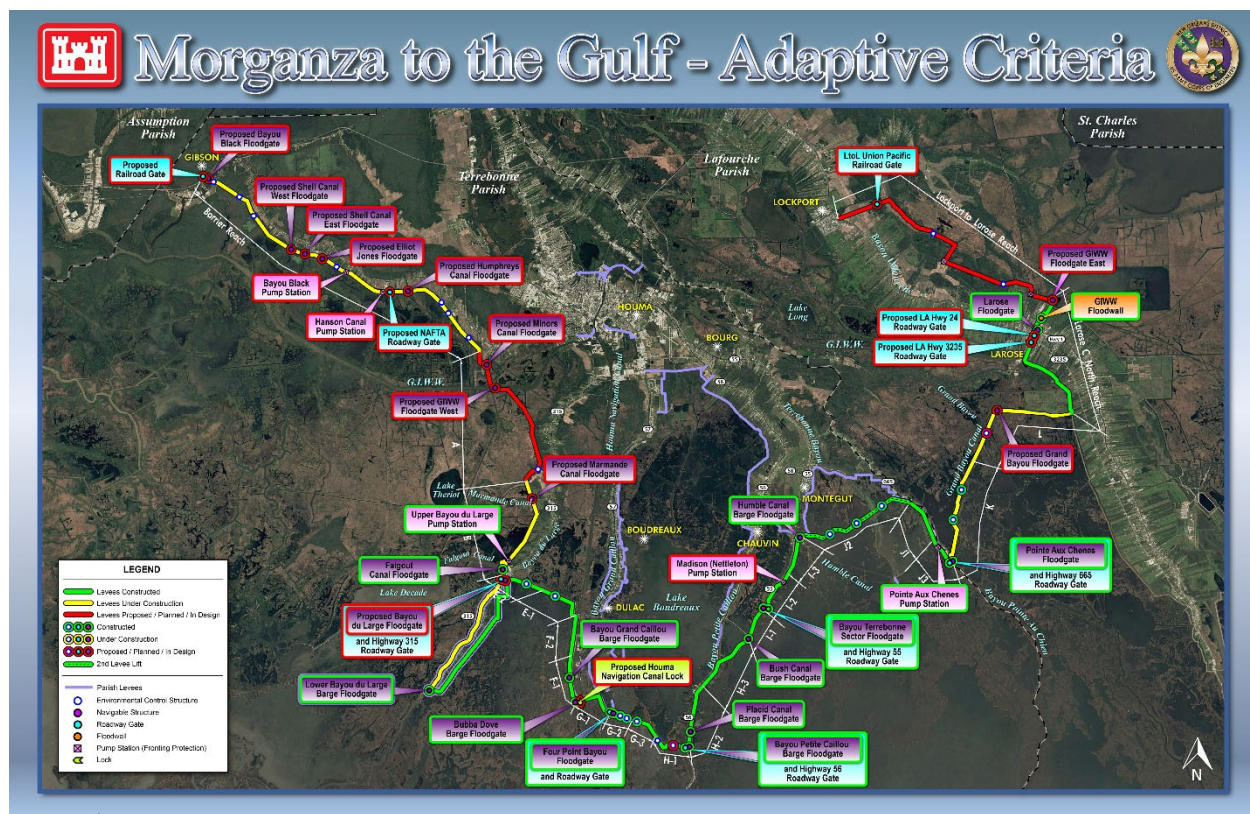


Figure 4-2 – MTG Levee Alignment (See Appendix A for larger version)

There are a total of approximately 98 miles of earthen levee, 22 navigation structures (includes 2 at GIWW and “Bubba Dove” at HNC), 12 roadway gates, 23 environmental structures, 5 pump stations (which require construction of fronting protection), and the HNC Lock Complex in the currently authorized alignment. To date, approximately 47 miles of earthen levee have been constructed by the NFS to an elevation of 12 feet (NAVD88 – **all elevations throughout this document are referenced to this datum**). Due to settlement, existing elevations range from 10.0 to 11.5 feet throughout the NFS constructed alignments based on data provided by the NFS. Additionally, 11 navigation structures, 10 environmental structures, and 2 pump stations fronting protection have been constructed. The NFS funded HNC Lock Complex is scheduled to begin construction in 2019. Therefore, the HNC Lock Complex cost estimate from the NFS is included in this assessment and is further discussed in Section 6.5.

A tabular listing of the levee quantities by reach and associated estimated costs (based on the adaptive criteria described herein) is provided in Appendix C for 2035. Appendix C also includes a tabular listing of the structures (by Reach) in the authorized alignment. The structures table indicates which structures have been built to date by the NFS and an estimated cost for the remaining structures (based on adaptive criteria). A larger version of Figure 4-2 project map is included in Appendix A. Please note that quantities for 2085 project horizon have not been included in Appendix A because the 2085 analysis is much more limited in scope. Rather a range for 2085 estimated cost is provided. See Section 8.0 for further discussion.

## 5.0 SUMMARY OF PAST REPORTS/ANALYSIS

### 5.1 PACR

The PACR report for MTG was completed in 2013. The 2013 PACR estimated cost of the project was approximately \$10.27B (w/contingencies) resulting in over \$9B cost increase as compared to the originally authorized project. The cost increase is predominately attributable to updated hydraulic modeling which capitalized on modern hydraulic modeling software as well as updated geometry (bathymetry and LIDAR) to compute new 1% hydraulic elevation requirements. MTG was subsequently re-authorized, however the project has not been funded for construction to date and is unlikely to be funded for construction at the PACR cost level moving forward.

### 5.2 RMC HISTORICAL EFFORTS

In 2013 the Risk Management Center (RMC) and CEMVN completed the Issue Evaluation Study for Design Criteria Site-Adaptation Report for the Proposed MTG Levee System. This report is mentioned in the MTG Chief's Report (paragraph 7), dated 8 July 2013 and states "While the estimated project costs in the district's report are the best available and compliant with current post-Katrina design criteria, the U.S. Army Corps of Engineers Risk Management Center and the New Orleans District jointly evaluated the proposed MTG project to assess whether the post-Katrina design criteria, specifically in the areas of global stability and overtopping and structural superiority, could be site adapted to reduce project cost without significantly increasing risk. Based on the results of this effort, site adaptations of the criteria were identified for consideration during the next phase of implementation, preconstruction, engineering and design." Part of that report (in an Appendix), included performing a Sensitivity Analysis (conducted in 2012) on one reach (J-2) of the proposed MTG alignment to investigate potential cost savings. As this RMC report is the original basis for the MTG adaptive criteria, a summary of those results from 2013 are detailed in the below paragraphs.

These RMC efforts were comprehensive, consisting of a multi-disciplined engineering, PM, economics, and environmental team including 10 RMC staff assisted by an additional 14 CEMVN staff. RMC efforts included performing a site visit and meeting with local stakeholders. The RMC analysis included performance of potential failure mode analysis in which screening of a wide variety of failure modes was conducted to determine the most significant for further analysis. Overtopping erosion leading to breach was found to be the only credible, significant failure mode. Subsequently overtopping failure modes were fleshed out leading to descriptions of the events resulting in breach and inundation. A multi-node event tree with associated estimates of probabilities for the each event node on the tree was then developed.

Various engineering analyses were then performed to support assessments of probabilities of events on the event tree, as well as assessments of times and depths for inundation when breaching occurs and associated consequences. These results were then compiled in a risk model used to evaluate and portray risk for the existing conditions, risks for HSDRRS criteria proposed system, and risks for site-adapted HSDRRS criteria system. Based on these results, the team developed recommendations for potential site-adaptation of HSDRRS criteria.

Under the “Major Findings and Understandings” section on page 73 of the RMC Issue Evaluation Study, the three primary design parameters recommended for adjustment include increasing the allowable overtopping rate to 0.5 cfs/ft (0.1 cfs/ft required for HSDRRS criteria), lowering the allowable factor of safety for global stability from 1.5 to 1.3, and eliminating structural superiority. Specifically the recommendations are quoted as follows:

“1. Reduce the Factor of Safety (FoS) for end of construction global stability from 1.5 to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk for a levee 800 ft wide (associated with global stability FoS = 1.5) versus a 600 ft wide (associated with a global stability FoS = 1.3). This reduction in end of construction factor of safety does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

2. Change the Design Overtopping Rate for well-maintained grass covered levee slopes from 0.1 to 0.5 cfs/ft. This change could result in reduction of levee and structure elevations by several feet. Based on tests conducted to assess USACE HSDRRS designs, the grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.

3. Elimination of the structural superiority requirement. Reducing top elevations of structures to match adjacent levee heights would lead to significantly shorter structures, i.e. reducing structure elevations by 2 ft in addition to the reductions in elevation resulting in the change in design overtopping rate.” (Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc. in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition, structure superiority lowers the potential for overtopping at critical infrastructure).

Subsequently, overall section width was reduced from 685 feet to 446 feet (for J-2). The levee crown elevation was reduced from 23.5’ to 22’. The resulting 2012 Sensitivity Analysis cost savings for levee construction is approximately \$1.521B. Corresponding reductions in real estate and mitigation costs amounted to \$131M. Construction of structures to the revised elevations of adjacent levees and eliminating structural superiority added a \$259M reduction. The total reduction in costs for the MTG project amounted to \$1.911B in the 2012 Sensitivity Analysis. This resulted in a revised TPC of approximately \$8B.

This ACA report carried forward two of the RMC recommendations verbatim; FOS 1.3 and elimination of structural superiority. CEMVN felt that the favorable language used in the overtopping recommendation (i.e. grass cover on clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft.) justified use of a 1.0 cfs/ft overtopping rate for the purposes of performing this ACA. Reference Section 6.0 for discussion of other criteria parameter changes employed by CEMVN for this assessment.

### 5.3 2018 COST ASSESSMENT

Subsequently, late in 2018, a Cost Assessment was performed by CEMVN to further assess if any additional cost saving measures could be employed in addition to those identified in the 2012 Sensitivity Analysis. In addition to the 2012 Sensitivity Analysis criteria changes, the 2018 Cost Assessment considered side cast material for each lift with a hauled in clay cap except for the final lift which is entirely hauled in. Haul distances assumed were 25 miles one way. Additionally, NFS constructed elements were considered at no cost to the Federal project. The revised TPC from the 2018 Cost Assessment is approximately \$6.9B.

### 5.4 PATH TO ACA

Beginning in November 2018, CEMVN was tasked to investigate further potential cost savings for the project, resulting in this ACA. CEMVN, in coordination with NFS stakeholders, has developed “Adaptive Criteria” and applied this criteria to the proposed MTG alignment in conjunction with eliminating costs for NFS constructed features from the TPC. Another cost savings component is potentially limiting the Federal investment for a 1% AEP to the year 2035 project horizon as an option where the NFS would be responsible to maintain a 1% AEP beyond 2035. This 4-6 month assessment was limited in scope to identify potential cost savings to reduce the MTG TPC. The adaptive approach and methodology to compute 2035 horizon costs is further discussed in Section 6.0. The more limited approach used to compute 2085 horizon costs is further discussed in Section 8.0.

## 6.0 ADAPTIVE CRITERIA APPROACH

The Adaptive Criteria developed for this effort is focused on reducing the levee cross section and footprint. Levee construction constitutes approximately 50% of the TPC. Reductions in levee quantities generate a corresponding “ripple” effect to other projects costs. Parameters such as mitigation and real estate will also see cost savings as the levee sections and footprints are reduced. As costs of construction features are reduced, cost for Supervision and Administration (S&A), Engineering and Design (E&D), and contingency are likewise reduced as these parameters are typically a percentage of construction costs.

In summary, the Adaptive Criteria consists of:

- Maintaining 1% LORR with 2 feet of overbuild to account for settlement. Federal involvement would potentially continue to 2035 with NFS maintaining 1% beyond 2035. CEMVN also investigated constructing to a 1% LORR 2085 horizon. See Section 8.0 for further discussion.
- Adjust overtopping rate to 1.0 cfs/ft and evaluation of in-system storage and overtopping scour failure mode to determine if allowable
- Levee global stability utilized a Factor of Safety (FoS) of 1.3 instead of 1.5.
- Geotechnical analysis to investigate foundation strength gains through soil consolidation was based on NFS provided data of the existing levees as well as new Cone Penetrometer Test (CPT) data. Increased strength gains enable the levee to



be constructed higher with minimal increase in footprint size thereby saving cost in material placement

- Tailoring haul distances to align with NFS input on actual pits used to date as well as potential pit locations
- Subtracting NFS furnished quantities (for completed sections) from revised design sections.
- Re-assessing structures to subtract out completed structures from 2035 horizon costs and pro-rating remaining structures to align with revised hydraulic elevations
- Re-assessing structures construction methodology and sequencing to the 2085 project horizon to determine cost saving potential verses PACR costs
- Eliminating structural superiority requirements
- Re-assessing Mitigation, Real Estate, Relocation, contingency, E&D, and S&A costs based on new design sections

## 6.1 PROJECT HORIZON

The MTG project, as currently authorized, was designed to have a project life to year 2085. As such, the alignment would require a total of four lifts to maintain a 1% LORR 2085 horizon in consideration of factors such as levee settlement, subsidence, relative sea level rise over the project life, as well as the resulting construction methodology required to mitigate these factors. For the purpose of this assessment, CEMVN investigated an option to limit Federal involvement in the project to the year 2035. The NFS would potentially be responsible for maintaining the project to a 1% LORR beyond the year 2035. The normal 50-year project life would remain the same as in the PACR (from 2035-2085). As such, CEMVN has determined that the design sections can be constructed in one remaining lift (instead of four) throughout the entire alignment to achieve a 2035 1% LORR. Approximately 50% of the total MTG alignment has been constructed to date to an elevation of 12 feet (10.5 to 11.5 with settlement). Therefore the final elevations on the NFS constructed reaches as well as the unconstructed reaches shall be built in one remaining lift. Cost saving potential of this criteria adaptation is anticipated to be significant, perhaps larger than any other single parameter associated with this analysis. However, risks to this approach are twofold:

1. CEMVN is not evaluating whether construction of a 2035 alignment could be easily augmented to achieve an eventual 2085 design level. Installation of geotextile fabric, quality of fill material used, and/or size of available footprint may become factors to achieve height and stability at a 2085 level. Therefore, engineering design factors typically considered for short term (2035) building toward long term (2085) have not been incorporated into this assessment and are potentially NFS responsibility within the context of the 2035 horizon assessment.
2. Height of structures in the alignment will be lowered to match a 2035 time horizon, 1.0 cfs/ft overtopping rate, and no structural superiority. If structures are ultimately constructed to 2085 elevations, significant and costly augmentation of the structures may be required to achieve an eventual 2085 project horizon and this effort is likewise potentially a NFS responsibility.



Please note that the majority of the time spent on this ACA was focused on the 2035 horizon for adaptive criteria application. Once this effort was complete, CEMVN also performed an investigation to the 2085 project horizon, however the 2085 analysis is more limited than the 2035 assessment. See Section 8.0 for further discussion. **Throughout Section 7.0, discussion of adaptive criteria application is limited to the 2035 project horizon.**

## 6.2 1.0 CFS/FT INTERIOR STORAGE CAPACITY ANALYSIS

CEMVN evaluated the effects of higher allowable overtopping rates on interior water levels. One of the primary design constraints for local levees and floodwalls is the allowable wave overtopping rate. For HSDRRS, the allowable overtopping rate was set to 0.1 cfs/ft at 90% level of assurance. For MTG, CPRAB has explored the possibility of increasing the allowable overtopping rate to 1.0 cfs/ft at 50% confidence. This increase in the allowable overtopping rate results in lower required design elevations and lower project cost. Typically, wave overtopping volumes are insignificant when compared to free-flow overtopping or breaching. Free-flow overtopping occurs when the still water level is greater than the levee crest elevation. In the design of HSDRRS, the allowable wave overtopping rate (0.1 cfs/ft) was selected to prevent damage and possible failure of the levee. With an allowable overtopping rate of 1.0 cfs/ft, the volume of overtopping increases and may have impacts to interior water levels.

To evaluate the possibility of increased interior stages associated with an allowable overtopping rate of 1.0 cfs/ft at the peak of a storm for the MTG project, overtopping volumes were estimated and then applied to a stage-storage curve of the protected area. The overtopping event was assumed to last 5 hours. The overtopping rate at the peak hour was assumed to 1.0 cfs/ft. Two overtopping lengths were evaluated. A 350,000-foot overtopping length, which equals the entire length of the MTG project, was assumed as a worst case event. This scenario is highly unlikely as different parts of the system will experience different surge levels. A more realistic 60,000-foot overtopping length was also evaluated. Figure 6-1 displays the stage-storage curve extracted from the LIDAR and bathymetry.

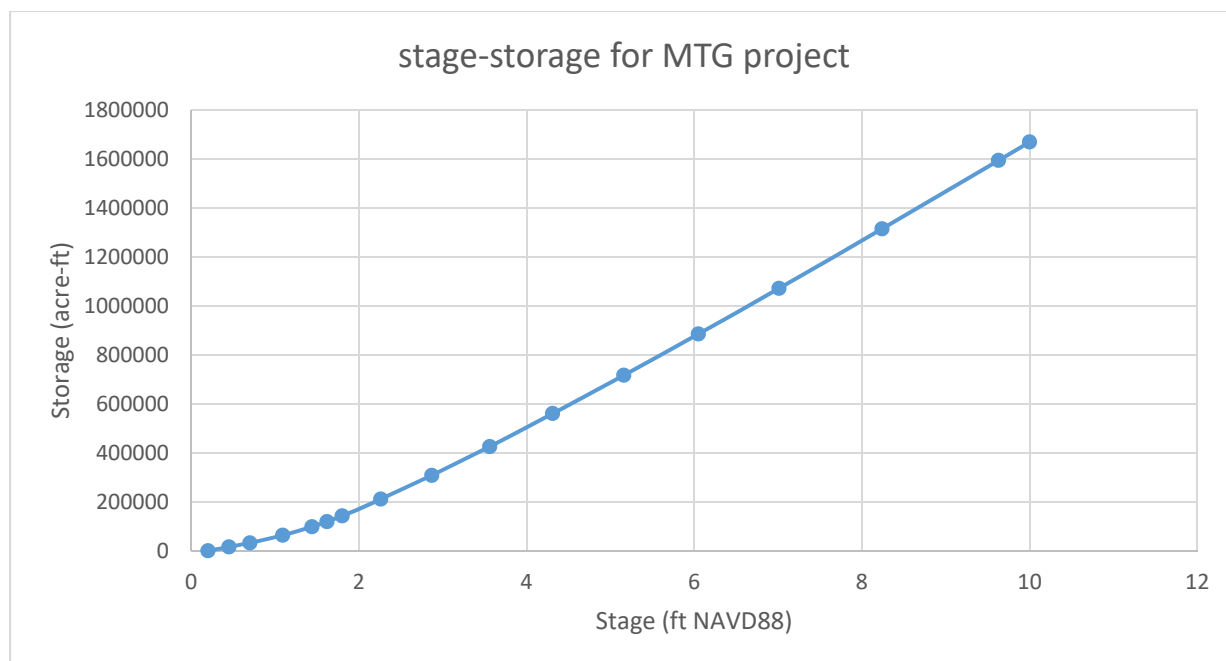


Figure 6-1 - Stage-storage curve associated with Morganza to Gulf Project

The results show a 0.25-foot increase in interior stage for the more realistic scenario, and a 1.1-foot increase for the extreme and unrealistic case. Therefore, allowing an overtopping rate of 1.0 cfs/ft appears to have an insignificant impact on interior drainage storage capacity in consideration of existing interior storage capacity as well as interior features (levees and drainage features).

### 6.3 1.0 CFS/FT OVERTOPPING SCOUR FAILURE MODE ANALYSIS

Levee overtopping is a key design parameter in consideration of scour failure mode. HSDRRS was designed for the 1% AEP event meeting overtopping criteria of 0.1 cfs/ft at 90% level of assurance and 0.01 cfs/ft at 50% level of assurance for grass-covered levees. This criteria was primarily based on Dutch research for grass covered slopes with limited applicability to the HSDRRS. Further review of existing design criteria and testing showed that steady state overtopping criteria was readily available. What was lacking is an understanding of wave overtopping and how grass covered earthen levees would perform under wave overtopping conditions in consideration of scour. In order to provide resilience to the HSDRRS, overtopping performance criteria needed to be established for grass covered earthen levees and for the various armoring materials being considered for the HSDRRS. These armoring materials included unreinforced grass (grass species included Bermuda Grass and Bahia Grass) covered earthen levees, grass reinforced with Turf Reinforcement Mat (TRM), grass reinforced with High Performance Turf Reinforcement Mat (HPTRM), and Articulated Concrete Block (ACB). In order to better understand the effects of wave overtopping and gain insight to performance of these different materials under wave overtopping conditions, USACE undertook several research initiatives in conjunction with the armoring program. The major component of this research is the full scale Wave Overtopping Simulator (WOS) at Colorado State University (CSU) in Ft. Collins, Colorado.

Full scale wave overtopping testing was conducted to determine the erosion resistance and performance of the various armoring materials and included; unreinforced Bermuda grass, unreinforced Bahia grass, TRM and HPTRM reinforced Bermuda grass, and ACB. These materials were subjected to wave overtopping associated with a 0.2% a.c.e. (500-year) storm surge, up to a maximum WOS flow capability of 4.0 cfs/ft, with 8 feet waves and 9 second periods to determine their performance ranges and ability to provide erosion resistance for earthen levees. A summary of results from the CSU WOS are presented in table below.

Results of CSU Testing in the Wave Overtopping Simulator are presented in Table 6-1

Table 6-1 – Results of CSU Wave Overtopping Simulator

Material No.	Material Description	Max. Tested Discharge, cfs/ft	Hours @Max Flow	Total Hrs	Notes
1	Bare Clay	0.2	0.3	1.3	Failed after 1 hr 20 m
2	Bermuda Grass	4.0	4	24	No visible erosion
3	Bahia Grass	3.0	4	17	No visible erosion
4	TRM/Bermuda	4.0	3	9.0	No visible erosion
5	HPTRM/Bermuda	4.0	3	9.0	No visible erosion
6	Bermuda Grass w/ruts	4.0	3	6.0	No propagation
7	Bermuda w/ruts & bare spot	4.0	3	9.0	No propagation
8	Lime-Stabilized Clay				Failure at 1.0 cfs/ft
9	ACB	4.0	3	3.0	Successful
10	Unreinforced Dormant Bermuda Grass	2.5	1	3.2	Failed at 2.0 cfs/ft
11	Dormant Bermuda Grass w/HPTRM	4.0	3	6.0	Slight visible erosion
12	Dormant Bermuda Grass w/TRM	1.5	2	5.0	Failed at 1.5 cfs/ft

Results of the wave overtopping tests at CSU demonstrated that increasing grass quality (from dormant grass to healthy green grass) and that the addition of HPTRM to distressed grass (similar in root quality to > 2-year old actual levee grass) increased their resiliency such that both could withstand at least double the wave overtopping flow rate (from 2.0 cfs/ft to 4.0 cfs/ft with no failures) from a 0.2% AEP storm surge.

Based on the above results, some additional analysis to determine the actual quality of Bermuda grass between the living and growing condition and the dormant condition was undertaken by Louisiana State University. Grass root analysis was completed on both the living and growing condition and the dormant condition, as well as Bermuda grass root samples from levees in and around the New Orleans metropolitan area. Comparing these root analyses indicated that the actual Bermuda grass root quality from the samples from levees in and around the New Orleans metropolitan area were similar to the root quality of the dormant Bermuda grass from the CSU overtopping testing. Using these results and the fact that the CSU overtopping testing showed that dormant Bermuda grass could withstand overtopping flows of 2.0 cfs/ft, it was concluded that living and growing Bermuda grass could withstand an overtopping flow rate of 1.0 cfs/ft on an earthen levee with an adequate factor of safety which aligns with an RMC conclusion further discussed in Section 5.2.

#### 6.4 LEVEE GLOBAL STABILITY FACTOR OF SAFETY (FoS) REDUCTION RATIONALE

According to RMC's Issue Evaluation Study dated 24 July 2013, end of construction global stability FoS may be reduced from 1.5 designated in HSDRRS criteria to 1.3. The risk assessment team concluded that there is inconsequential change in post-project residual risk. This reduction in end of construction FoS does increase the likelihood of slope stability failures during construction, which is often unacceptable in an urban environment. However, for the non-urban setting of this project, slope stability failures during construction can be mitigated during construction at relatively low costs and are unlikely to cause loss of life or significant property damage.

#### 6.5 HOUMA NAVIGATION CANAL (HNC) LOCK COMPLEX

The HNC lock complex is currently in the final stages of design and is due to begin construction by the NFS in 2019. Based on NFS cost estimates the complex will cost approximately \$400M to construct. The NFS has stated that the HNC Lock complex shall be constructed to the 2085 1% LORR horizon following all HSDRRS criteria. The PACR report estimated a cost of \$622M, however for the purpose of this ACA, the NFS cost estimate of \$400M is accepted for the Lock cost factor and shall be utilized to compute costs for both 2035 and 2085.

### 7.0 ADAPTIVE CRITERIA APPLICATION

**Please note that throughout Section 7.0, discussion of adaptive criteria application is focused on the 2035 1% LORR project horizon. Discussion of the more limited investigation into the 2085 1% LORR is included in Section 8.0.**

#### 7.1 HYDRAULICS

The ACA began with CEMVN developing new hydraulic levee sections based on a 1.0 cfs/ft overtopping rate for levee reaches and structures for the 2035 horizon only. Appendix D provides the methodology write-up and corresponding results for the hydraulic engineering performed for this effort. In summary, the hydraulic boundary conditions for each hydraulic reach for the 1% return period and year 2035 condition were obtained and tabulated. The hydraulic boundary

conditions were then input into the MATLAB script for overtopping of levees and structures using an overtopping threshold of 1 cfs/ft for the “with wave berm” and “without wave berm” scenarios. For the “with wave berm” scenario, a berm factor of 0.75 was used as was done in the MTG Feasibility Study. The resulting elevations ranged from 11.5 to 20 feet without wave berms and 11 to 19 feet with wave berms. Structural elevations ranged from 11.5 to 20 feet. Without the wave berms, the levee heights increased approximately 1 foot. See Appendix D for hydraulic engineering analysis.

## 7.2 GEOTECHNICAL

With CEMVN hydraulic sections complete, CEMVN geotechnical engineers developed new design sections for Reaches J2, B, Barrier Reach and Reach F for the 2035 1% LORR project horizon. Due to time constraints, new design sections were limited to four. Additionally a section developed by CPRAB for Reach E was evaluated. Section 7.2.4 includes further discussion on the design sections completed. The geotechnical engineers then performed an assessment of how to apply the design sections to the remaining reaches (i.e. which sections best fit the remaining undersigned reaches). Civil Engineers subsequently developed quantities throughout the alignment by using the newly designed sections and geotechnical engineering guidance to match analyzed cross sections to similar reaches.

As stated earlier, CEMVN reviewed design sections developed by CPRAB for Reach E. The NFS furnished levee section data including construction plans and specifications for various MTG levee reaches constructed to date. Additionally, the NFS provided geotechnical reports, boring/CPT logs, and soil parameters for each design Reach. Reaches E and G were constructed with geotextile fabric reinforcement. Otherwise the NFS only utilized fabric adjacent to structures in the remaining reaches. The CPRAB design section has been applied to Reaches E and G only.

### 7.2.1 NEW CPT DATA POINTS

MTG soil data obtained by CEMVN was collected before the NFS began levee construction. Since the first stage of levee construction for some of the levee reaches have already been constructed, consolidation and strength gain of foundation soils have taken place. CEMVN and the CPRAB performed theoretical foundation strength gain calculations, but these calculations were not verified by field data. Consequently, as part of this assessment, the NFS collected 10 new CPT data points to assess validity of the strength gains assumed in NFS and CEMVN geotechnical analyses. Two CPTs per reach were collected adjacent to existing soil borings or CPTs performed for previous CEMVN studies/investigations prior to levee construction in reaches J2, H, F, E, and Larose C North. The CPT data validated the methodology used to estimate the strength increase in foundation soils. The CPTs are considered representative of subsurface conditions at the CPT locations on the date completed. Though the CPT results are used to inform our engineering design for the rest of the MTG alignment, no guarantee is given that the CPTs will be representative of subsurface conditions or strength gains at other locations or times within the overall alignment. The nature and extent of variations in subsurface conditions between and away from the proposed CPT locations may not align. Therefore, further data collection points may be required to validate strength gain estimates throughout the alignment. Designs may require significant adjustment if

more detailed investigations are conducted. For final design of levee reaches with existing construction, additional field investigation will be performed to verify foundation strength gains.

## 7.2.2 GEOTECHNICAL DESIGN METHODOLOGY AND ASSUMPTIONS

The NFS has either completed construction or has begun construction on reaches B, E, F, G, H, J, K, and L to initial elevations of approximate 12 feet. Subsequent settlement of these reaches ranges from 0.5 feet to 1.5 feet over approximately two years. Because large amounts of settlement were observed and predicted during the first two years after levee construction, strength gain of foundation soils was incorporated into the design. Only gains in strength occurring during the initial two years after levee construction were considered. Geotechnical engineers developed the initial effective overburden for a reach with no levee present and then determined the levee section from the NFS's P&S that was likely constructed. Using Rocscience's Settle3D software, geotechnical engineers modeled this section to determine the induced stress with depth resulting from the constructed section at a time stage of two years.

The geotechnical engineers have found that cohesive soils in Southeastern Louisiana typically have an undrained shear strength to vertical effective stress ratio equal to approximately 0.22. Therefore, the engineers multiplied the induced change in stress at approximately two years by the correlation factor of 0.22 to estimate the increase in shear strength gain at the centerline and toe of the existing levee.

This method being utilized to calculate strength gain is approximate and will be verified prior to construction of the 2<sup>nd</sup> levee stage in the field by additional soil borings, laboratory testing, and CPTs.

Geotechnical engineers then applied these strength gain values to slope stability using the 2016 version of GeoStudio's Slope/W program to perform slope stability analyses using the Spencer Method for Still Water Level (SWL), Low Water Level (LWL) and Top of Wall (TOW) water loadings. Required global stability factor of safety is 1.3 for SWL and LWL. Geotechnical engineers assumed that additional shear strength gains in the soft clay soils encountered throughout the project would improve the global stability factor of safety during levee construction to the 2<sup>nd</sup> stage ranging from El 13 to El 21. A global stability FOS of 1.2 was utilized to capture foundation strength gains of soft soils during initial levee construction in our geotechnical analyses for all reaches analyzed. Additionally, for levee reaches where the 1<sup>st</sup> lift has already been constructed, foundation strength gains will continue to increase. Only strength gains from two years of consolidation are accounted for in our analyses. However, additional strength gain will be realized before construction to the 2<sup>nd</sup> levee lift. Typically, foundation strength gains are not considered for levee enlargement of existing levees. However, the timing between levee lifts, the large size of the typical enlargement, and additional foundation consolidation and strength gains justify this approach. Therefore, the factor of safety was designed to 1.2 for this assessment. After construction of these lifts, a field investigation program will be developed to document and verify foundation strength gains have occurred and a FOS of 1.3 was obtained.

The cross section for cost estimation for Reach E was provided to USACE by CPRAB. CEMVN openly shared design methodologies with CPRAB to ensure consistency in design and engineering analyses.



In addition to slope stability analyses, geotechnical engineers analyzed reaches J2, F, B, and the Barrier Reach for settlement using Settle3D. Each reach was designed with a two-foot overbuild to account for settlement after construction. With this two-foot overbuild, each of the levee crowns analyzed remained above the 1% design elevation for at least seven years.

Geotechnical engineers considered a levee cross section with and without a wave berm as designed by hydraulic engineers. After preliminary analyses, the “without wave berm” case was decided to be the smaller, more cost efficient levee section required for stability. The large wave berm developed by hydraulic engineers was not necessary for stability, particularly the low water case. Therefore, quantity calculations made in the current analyses were performed for the “without wave berm” case.

### 7.2.3 SEEPAGE

Seepage analyses were not performed for the ACA. Notably, a difference in cross section is noted between the ACA sections and previously developed sections (PACR report dated October 2011 and the “Morganza to the Gulf Sensitivity Analysis, Levee Reach J-2” report dated October 2012). Nevertheless, based on geotechnical engineering experience, the difference in cross section between the current proposed cross section and the cross sections previously developed does not significantly impact seepage performance under a flood load due to a reduced levee crown height for the current analysis and the similar foundation conditions. In the PACR, seepage analyses were analyzed for the foundation of reach F and reach I and indicated satisfactory seepage FOS for SWL and Top of Levee (TOL). Reach F is believed to be the most vulnerable to seepage due to the presence of near surface sands and will represent a worst case seepage condition for the western portion of the project. Reach I represents a typical eastern reach in regards to seepage. Additionally, borrow pits constructed to provide side cast material for future levee construction will be designed to be far enough away from the levee to ensure an adequate seepage FOS.

### 7.2.4 CONSTRUCTION METHODOLOGY ASSUMPTIONS

Since USACE was not involved during initial levee construction along the MTG alignment, geotechnical engineers assumed quality control testing such as soil classification, moisture content, organic content, and sand content were performed to ensure proper embankment material was used for construction. Embankment materials should be classified in accordance with ASTM D 2487 as CL or CH with less than 35% sand content. Geotechnical engineers assume typical embankment construction methods including clearing, grubbing, and proper drainage were performed. CEMVN understands that the first lift primarily served to preload the foundation of the levees and that minimal compaction effort took place (i.e., three passes of a dozer). As such, soil properties included in the analyses assumed semi-compacted levee fill with a unit weight of 110 pcf and cohesion of 400 psf. To account for settlement of foundation soils, geotechnical engineers designed each levee Reach with a two foot overbuild of the levee crown. Per information provided by the NFS, the first lifts of reaches E and G were constructed with geotextile reinforcement. All other levee reaches constructed to date do not have geotextile reinforcement fabric in the section.

Levee cross sections were designed and analyzed for slope stability and settlement for reaches J-2, B, F, E, and the Barrier Reach. The 1% design elevation for MTG levees varies across reaches from EL. 11 to EL. 19. The reaches that the geotechnical engineers analyzed represent good coverage with respect to varying levee crown elevations as they apply to engineering analyses. Therefore, appropriate levee cross sections that CEMVN analyzed were applied to MTG Reaches that we did not analyze. Projection of design sections were assumed as follows: Reach J2 was projected to reaches H2, H3, I1, I2, I3, J1, K, and L; reach B was projected to reach A; reach E was projected to reach G; the Barrier Reach was projected to the Lockporte to Larose Reach; and reach F was not projected onto any other reach.

In summary, the geotechnical engineers submitted to civil engineers; 1. four new design sections, 2. CPRAB's reach E design section, and 3. instructions on how to apply the new design sections to the remaining reaches throughout the alignment. Design sections developed utilizing the adaptive criteria for the without wave berm condition are illustrated in Figures 7-2 thru 7-6.

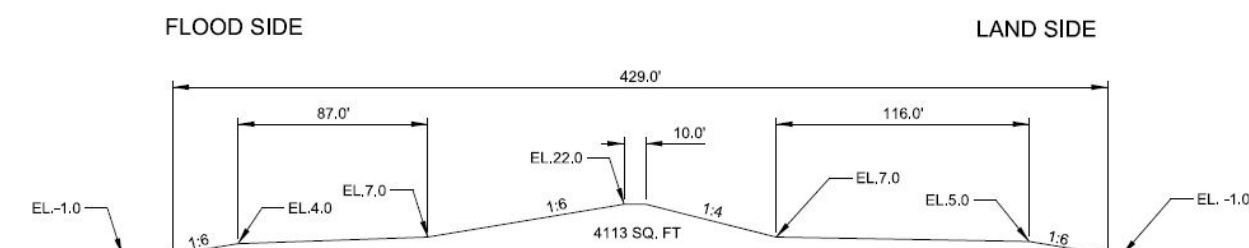


Figure 7-2 - Typical Section Reach J-2 – Not to Scale (NTS)

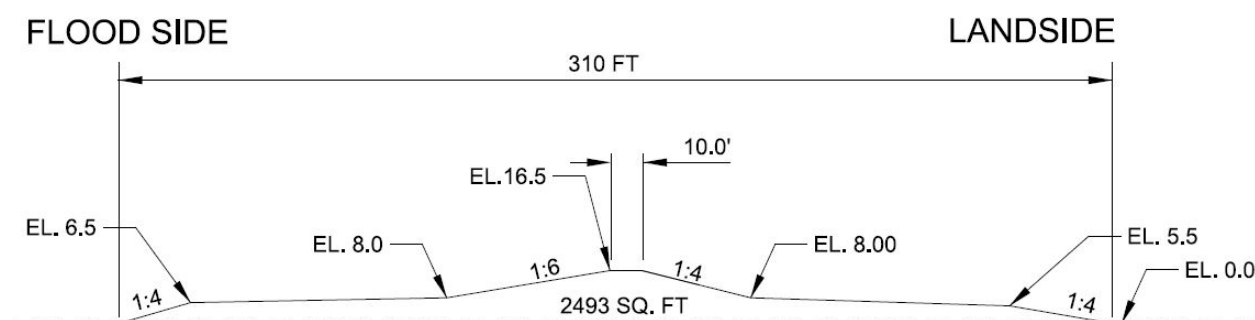


Figure 7-3 - Typical Section Reach B – NTS

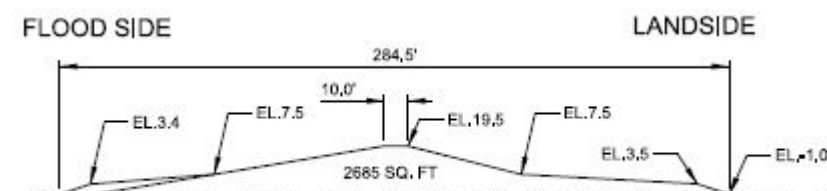


Figure 7-4 - Typical Section Reach E (CPRAB) – Not to Scale (NTS)

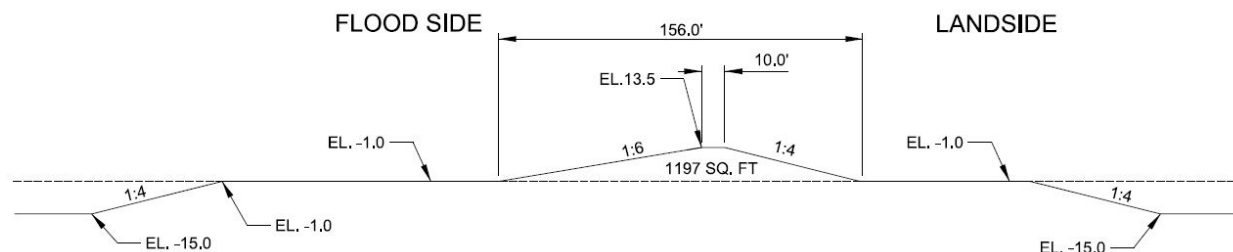


Figure 7-5 - Typical Section Barrier Reach – NTS

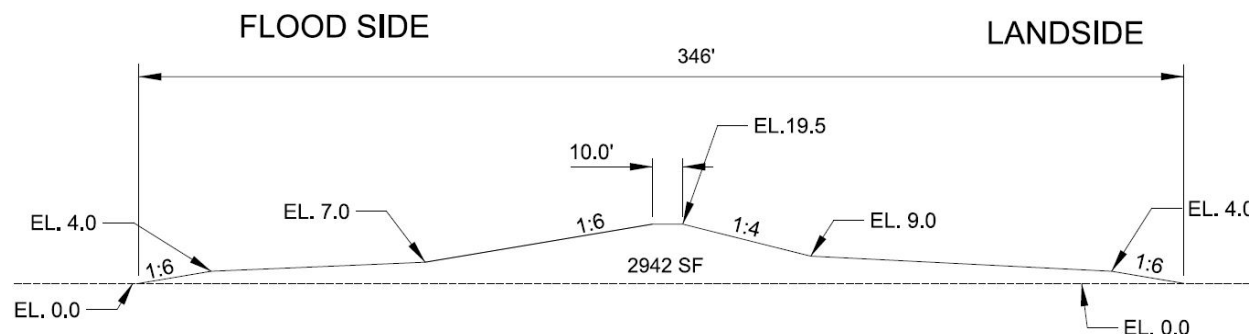


Figure 7-6 - Typical Section Reach F– NTS

### 7.3 CIVIL ENGINEERING

With geotechnical engineering design sections complete, civil engineers developed cross-sectional areas multiplied by reach lengths to develop neat line embankment quantities for the 2035 1% adaptive criteria LORR. Quantities of borrow placed to date were provided by the NFS. Since quantity of borrow was provided (verses quantity of embankment), NFS quantities were reduced by 20% to account for compaction during material placement. New design section quantities less the NFS quantities placed to date provided cost engineers with the additional quantities needed (by reach) to attain the 2035 1% LORR.

For levee reaches that construction of the 1<sup>st</sup> lift has not begun, the difference in design section quantities was increased by 20% to account for lateral spread. For levee reaches that initial construction to approximate EL 12 has been completed, the difference in design section quantities was increased by 35% to account for lateral spread and foundation settlement that has occurred since construction. CEMVN also furnished the levee area acreage for computing clearing/grubbing and fertilizing/seeding/mulching costs.

Figure 7-7 illustrates the magnitude of reduction for the adaptive criteria design cross sectional area by overlaying sections from prior design efforts. CEMVN developed the overlay for reach F to compare PACR, adaptive criteria, and NFS constructed existing sections.

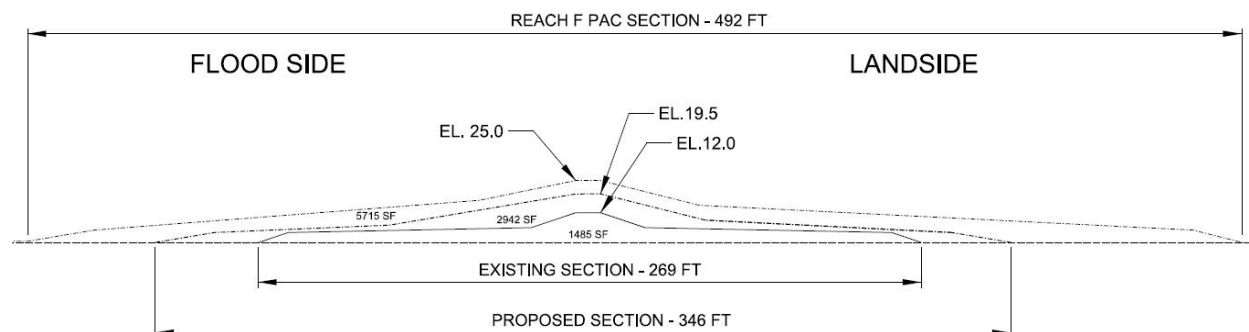


Figure 7-7 - Typical Section Reach F with overlays – NTS

As seen in Figure 7-7, the levee crown elevation requirement for reach F was reduced from an elevation of 25 feet to 19.5 feet, the section width was reduced from 492 feet to 346 feet, and the cross sectional area was reduced to 5,715 square feet to 2,942 square feet (neat line).

## 7.4 COST

Cost engineering developed new unit costs for the revised levee designs and worked with structural engineers to prorate new costs for the revised structures. Only the costs for currently unconstructed features are included in this effort. Any feature that has been constructed is assumed to be acceptable and has been removed from the TPC. All future levee construction is assumed to be built following typical New Orleans District levee construction techniques using truck hauled embankment with the exception of reach K which requires barge delivery for the majority of the length.

The embankment construction unit cost (\$/CY) for the revised levee design sections was based on an average 7-mile one-way truck haul distance. The haul distance was provided by TCLD based on the haul distances they have been experiencing for the alignments constructed to date. This appears to be a reasonable assumption based on a review of mileage arcs on the NFS furnished borrow map, which is provided in Appendix B. The unit cost for levee embankment includes basic assumptions for borrow pit development (i.e. pit management, excavation, on-site processing/moisture control), loading, truck hauling, spreading, compacting, testing, and truck wash racks. The cost for truck wash racks was removed from the Barrier Reach, reach A, reach B, and the Lockport to Larose reach, where it is assumed the levee is directly accessible without transiting on highways. The overall levee construction cost also includes parameters such as mobilization/demobilization, levee clearing, embankment construction, and fertilizing, seeding, and mulching.

The costs for the revised structures were based on the 35 year LORR structures developed for the PACR, which were similar to the ACA structure heights required. All NFS completed structures, including environmental control structures, were removed from the TPC. The 35 year LORR PACR structure costs were prorated down based on the revised hydraulic elevation requirements. This reduction was applied to the foundation, structural concrete, and structural steel for all structures including floodgates, roadway gates, and corresponding floodwalls. In addition, it is assumed that all unconstructed sector gates will be constructed as barge gates. The structural engineers did not have a design for the barge gates, therefore a cost savings percentage was

assumed from comparisons done in the past and applied to the remaining foundation, concrete, steel, and phase 1 cofferdam costs of the sector gates. The cost development assumes unrestricted solicitations as the contracting method.

Based on NFS input, relocations identified in the PACR have predominately not been completed in compliance with criteria for reaches constructed to date. Approximately 47 miles of the PACR alignment (98 miles in total) have been constructed by the NFS to elevation 12. Due to the limited time and scope of this assessment, the PDT was unable to go through the entire alignment with the NFS to determine which utility relocations have been performed in compliance with criteria. Ultimately the PDT concluded that it is reasonable to prorate the PACR utility relocation costs based on the NFS input. Therefore PACR relocation cost was reduced by 20% for this ACA.

## 7.5 STRUCTURES

Hydraulic engineers furnished structural engineers new hydraulic design elevations for the structures. Due to time constraints, structural engineers worked with cost engineers to prorate the cost of all of the structures based on the revised hydraulic elevation requirements. As stated earlier, this reduction was applied to the foundation, structural concrete, and structural steel for all structures including floodgates, roadway gates, and corresponding floodwalls. See Section 7.4 for further discussion. In addition to proration, structural engineers further reduced the cost of floodgates by assuming all sector gates included in the PACR would be constructed as barge gates. The structural engineers do not have a design for the barge gates therefore, sector gates were prorated based on elevations and then applied an assumed cost savings percentage for the barge gates received from previous comparisons done in the past.

## 7.6 ENVIRONMENTAL MITIGATION

The total PACR environmental cost was approximately \$1B; however, approximately half of this cost was for environmental control structures. Approximately \$427M makes up the PACR mitigation cost. Given the limited time to perform the ACA, the CEMVN Planning Team was not able to follow their typical processes to compute a new mitigation cost based on the newly developed ACA design sections and associated project footprint. However, based on a reduced project footprint, potential environmental mitigation savings can be assumed.

The Final Programmatic MTG EIS (FPEIS) assumed 3,743 acres of mostly marsh impacts. So, if the project footprint impacts are reduced by 50%, there would be 1,871.5 acres of direct impacts to marsh wetlands. The average cost for marsh is \$80,000/acre. This would result in a cost of approximately \$150 million to mitigate direct impacts to marsh wetlands. In the FPEIS, USFWS stated that further refinement of both direct and indirect impacts would not be possible until a more refined design was developed and other measures associated with the levee system were better understood. This information would be needed to conduct a hydrologic model analysis of the entire project to determine system-wide effects on the flow and distribution across the project area. Information taken from the hydrologic analysis would be used to conduct a wetland value assessment for indirect impacts to wetlands. USACE agreed to conduct the hydrologic analysis once the project was further defined to provide a better estimate of direct and indirect impacts to wetlands. Other resources studied in the FPEIS may also require mitigation; however, a more

refined project design would be required to identify any impacts. In summary the PACR environmental mitigation cost could potentially be reduced to a total of \$150M based on a 50% reduction in project footprint.

## 7.7 REAL ESTATE

PACR real estate costs exceeded \$350M. The CEMVN Real Estate (RE) Division was consulted to determine what if any real estate saving could be achieved based on the reduced project footprint as well as acreage of potential future borrow pits. Upon review, RE determined that the majority of the real estate costs (approximately \$300M) estimated in the PACR are attributable to homeowner buyouts on the flood side of the system resulting from anticipated project-induced flooding. Since completion of the PACR, the NFS has built a ring levee (Bayou du Large Ring Levee) around an area in which approximately 50% of the buyout homes are situated. Therefore the project should no longer induce flooding on this community.

Due to the time constraint associated with this effort, RE did not have time to perform a detailed analysis and develop revised real estate costs based on changes that have occurred in respect to the number of anticipated homeowner buyouts and changes in project footprint. However, based on input from the NFS with respect to the Bayou du Large Ring Levee, as well as the reduction in project footprint, real estate PACR costs are potentially reduced by 50% for buyouts and 25% for all other RE costs due to the reduced project footprint (including borrow areas) needed to construct the ACA sections. This is a very generalized approach to RE cost adjustments. RE costs could be significantly higher or lower based on detailed investigations that would be performed at a later date. Ultimately, the CEMVN PDT concluded that it is reasonable to assume real estate cost reductions at these levels based on NFS input and reduction in project footprint. Therefore, the total ACA real estate cost could potentially be reduced to \$190M from the PACR amount of \$355M.

## 7.8 CONTINGENCY, E&D, S&A

As new costs for all PACR parameters were completed, Cost Engineering then applied the PACR percentages for S&A and E&D to the TPC. No reduction in these percentages can be justified; however, the overall cost of these parameters is reduced based on a reduction of the TPC. Contingency was reduced to 15% based on NFS input. Based on construction completed to date, many PACR unknowns no longer exist. Therefore a contingency reduction to 15% is considered reasonable.

## 7.9 RESIDUAL RISK

The criteria adaptations made for this ACA are not expected to significantly impact the residual risk identified during RMC assessment efforts (See Section 5.2). Frequency of potential inundation will decrease, whereas loss of life in an event may increase due to less evacuation due to the existence of a new risk reduction system. This risk can be mitigated by local communities strictly enforcing hurricane evacuation requirements. Although there is an increase in water volume entering the system in an event, CEMVN evaluated the interior storage capacity and determined that allowing an overtopping rate of 1.0 cfs/ft appears to have an insignificant impact



on interior drainage storage capacity in consideration of existing interior storage capacity as well as interior features (levees and drainage features). See Section 6.2 for further discussion. Also, CEMVN determined that the increased overtopping rate should not have a significant impact on levee section reliability. Based on the CSU study of scour failure mode (see Section 6.3), CEMVN concludes there is acceptable risk associated with an increased overtopping rate relative to a potential breach due to scour.

## 8.0 POTENTIAL 2085 1% HORIZON

As part of this assessment, CEMVN evaluated the potential to achieve a 1% LORR 2085 project horizon utilizing the adaptive criteria approach defined herein but in a much more limited and broad brush application. Hydraulic engineers developed elevations for the 2085 levee alignment and associated structures utilizing modeling results as was done for the 2035 project horizon. However due to time constraints, CEMVN assessment was then limited to application of the 2085 elevations (plus 2 feet of overbuild) to the 2035 cross sections to compute new levee quantities. Increases in levee elevations ranged from 4.5 to 2 feet with a 2.0 foot increase predominant throughout the alignment. Again, due to time constraints, no geotechnical design or stability analysis was performed to develop 2085 cross sectional designs. Moreover, the iterative process between hydraulic, geotechnical, and civil engineering disciplines that occurs to dial in cross section side slope and berm design requirements did not occur. Levee footprints increased somewhat but not significantly.

2085 structure elevation requirements are equivalent to levee elevation requirement due to the fact that the levees were designed without wave berms. To develop 2085 costs for structures, 1% 2085 ACA hydraulic elevations were compared to the structure elevations for the 35 year LORR from the PACR. As discussed in Section 7.4, these elevations predominately aligned. Therefore, structures costs from the PACR 35 year LORR alternative were utilized. Floodgate PACR costs were reduced an additional 30% because sector gates were assumed in the PACR and barge gates are assumed in this ACA. A key assumption is that existing structures will have to be demolished and rebuilt to obtain the 2085 1% LORR standard. An increase of 15% in cost was included to account for required demolition and removal of existing barge gates and environmental control structures.

The final parameter considered in development of the 2085 1% LORR cost is the application of contingency. The number of unknowns with respect to 2085 as compared to 2035 is higher. Unknowns include factors such as detailed levee and structure designs, location of borrow, demolition, and future costs of structures, real estate/mitigation costs, etc. Therefore in development of the 2085 1% LORR cost the CEMVN PDT concluded that a 25% contingency should be applied to the 2085 1% LORR TPC. Notably, project footprint increases were predominately minor (2035 to 2085) within the context of this assessment. Therefore, real estate and environmental costs for the 2035 horizon were not changed for the 2085 horizon. The only cost difference for these two cost factors is the application of contingency from 15% to 25%.

In summary, the 2085 project horizon cost reported herein reflects construction of all features to the long term 2085 horizon. The 2035 cost reflects (as described in Sections 6.0 and 7.0) building to the short term (2035) without including adaptably in the designs of unbuilt structures to augment them to a 2085 elevation.

For structures, CEMVN considered the concept of using 2085 design criteria while constructing to 2035 elevations. Where feasible and cost-effective, structures initially built to the 2035 design height may be designed with the ability to be later augmented to attain a 2085 1% LORR design height. For example, floodgates would be built to the 2085 design height and the adjacent tie-in walls would have the 2035 design height. Existing structures built to 2035 design height would need to be demolished and rebuilt. This assumes existing structures were not designed/built with 2085 features.

In consideration of the concept of “2035 structure designs building toward 2085”, a reasonable cost basis to adapt a 2035 system to 2085 could not be developed due to time constraint. Ultimately, a design strategy for the unconstructed structural features that allows augmentation to a future design height requirement may prove beneficial to the project in the long term. CEMVN recommends further investigation of this scenario given appropriate time and funding to assess. In conclusion, this assessment shall report two costs:

1. 2035 project horizon w/o adaptability of structures to the 2085 project horizon
2. 2085 project horizon

The 2085 project horizon cost is reported as a range only. 2085 sections lack geotechnical analysis and the iterative process typically followed to maximize section efficiency and balance engineering requirements with cost. Therefore, CEMVN feels a cost range is more appropriate to report for the 2085 project horizon. As such, the 2085 project horizon cost range developed by CEMVN for this assessment is \$5.5B to \$6.0B.

## 9.0 OTHER COST FACTORS

The following cost factors were also considered as part of this effort.

- a. Project alignment
- b. Redundant back levees
- c. Relative sea level rise
- d. FEMA LAMP Program
- e. Borrow site depth

Each of these cost factors have been determined to have little or no impact to overall cost savings. NFS previously investigated changes to the project alignment, however no significant cost savings could be determined. Redundant back levees are a moot issue. Based on the available interior storage capacity determined by hydraulic engineers, a 1.0 cfs/ft overtopping rate is allowable and justified for both interior storage and scour. Relative sea level rise is a long term estimated parameter. Since the project life considered for this assessment is held to a 2035 horizon, relative sea level rise is an irrelevant parameter within the construct of the hydraulics models in terms of reducing required hydraulic design heights.

For this ACA effort, CEMVN coordinated with the local Levee Safety Team (LST) who in turn coordinated with the Risk Management Center (RMC). The LST and RMC coordinated a call with FEMA representatives to discuss the Levee Analysis and Mapping Procedures (LAMP) being

conducted in the MTG area. The FEMA LAMP program is simply intended to map risk for a levee system that are not accreditable in current condition. Therefore the LAMP program may be beneficial to the project in terms of insurance rates based on a lower risk, however the area will not receive insurance rates at the 1% LORR for an accredited system until the FEMA accreditation standard has been achieved. Ultimately the FEMA LAMP program will not impact the project cost either positively or negatively. However, tangible insurance benefits to local communities may be realized based on NFS constructed features completed to date.

The discussion with FEMA also included the 100-year LORR begin utilized by FEMA. Objective was to ensure that USACE and FEMA are both using the same 100 year LORR elevations in their respective analysis. The 100 year LORR was confirmed to be the same as used by FEMA in their mapping process.

Based on input from the NFS, borrow site depth is limited to between 20 to 24 feet in the project areas. Beyond this depth, the material mainly consists of sand. Therefore excavating deeper borrow pits is not a feasible parameter to consider for reducing costs.

## 10.0 RISKS – ASSUMPTIONS, CAVEATS, LIMITATIONS

This assessment documents major changes from the currently authorized project with significant assumptions and heavy reliance on NFS provided data/analysis. The objective is to furnish a defensible technical rationale for potential overall reduced project cost. Significant data collection, re-design, and detailed cost analysis shall be required to verify the findings in this ACA moving forward. The following provides a listing of assumptions, caveats, and limitations associated with development of this effort.

- 1% LORR was maintained. CEMVN investigated both 2035 and 2085 project horizons in a limited fashion, however the 2085 investigation was much more limited. See Sections 6.1 and 8.0 for further discussion.
- Reach E was designed by CPRAB. This reach is accepted without further analysis and applied to reach G (the only other reach constructed with geotextile fabric).
- A seven (7) mile one way haul distance was used for calculating levee construction cost. A seven mile haul distance (on average) has been utilized by NFS based on the levee construction to date.
- No borings of borrow site locations were provided or obtained for this effort.
- USACE is significantly relying on NFS furnished data and assumptions. Data, assumptions, and calculations have not been independently verified.
- No field visits were conducted for this assessment.
- The lengths of structures in the alignment were not subtracted out for levee quantity calculations.
- Full levee sections were assumed all the way to the end of the east and west alignments. (not tapered down).
- Borrow sources used for construction on initial levee lifts for MTG included adjacent side cast and hauled-in fill. Borrow boring data is either not available or insufficient to ensure that borrow material meets embankment specifications. Borrow boring data

should include soil classification, water content, organic content, and materials finer than No. 200 testing.

- Because levee cross sections that were analyzed were applied to MTG reaches that were not analyzed, it may be necessary to reevaluate designs in this assessment at a later date because of varying subsoil conditions.
- Existing structures were not evaluated by CEMVN. For this effort, existing structures are assumed to meet appropriate criteria and USACE construction practices without further actions, remedial or otherwise are required. PACR costs for structures completed have been eliminated from the TPC. Further evaluation of the structures will be required to determine compliance with USACE criteria if Federal construction funding is approved for the project.
- Assumption is made that structures designed with 2085 foundations can be cost effectively augmented to meet 2085 design heights beyond 2035.
- Geotechnical analyses were not performed to design levee cross sections for the 2085 1% horizon.
- CEMVN applied 2 feet of overbuild to the 2085 hydraulic crown elevations. However, settlement analyses were not performed. Therefore, no level of assurance can be given as to how long it will take for this overbuild to settle below the 2085 hydraulic elevations.

## 11.0 SUMMARY OF RESULTS

The following table provides a cost summary of the major cost line items associated with the MTG levee project **for the 2035 1% LORR horizon**. Discussion of 2085 results is included in Section 8.0. **Please note that the 2085 assessment is much more limited than 2035.**

Table 10-1 MTG ACA Cost Summary

Cost Factor	PACR (2085)	ACA (2035)	ACA (2085)
Relocations	\$291 M	\$232 M	
HNC Lock	\$622 M	\$460 M	
Fish & Wildlife facilities	\$514 M	\$129 M	
Mitigation	\$427 M	\$150 M	
Levees	\$5 B	\$1,075 M	
Floodwalls	\$409 M	\$221 M	
Floodway Control & Diversions	\$1 B	\$225 M	
Land & Damages	\$355 M	\$190 M	
PED (12.826%)	\$1 B	\$320 M	
S&A (8.044%)	\$631 M	\$201 M	
<b>Estimated Total Project Cost (TPC)</b>	<b>\$10.27 B</b>	<b>\$3.20 B</b>	<b>\$5.5B-\$6.0B</b>

Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of \$5.5B-\$6B. This estimate can be compared similarly to the PACR TPC of \$10.27B. The estimate of \$3.2B is for a potential option of a reduced Federal investment to the project horizon of 2035, with

the NFS also responsible for the costs to achieve the 2085 1% AEP for the project (estimated at an additional \$2.8B - difference between \$3.2B and \$6.0B). The NFS has expressed support for this potential option (See Section 1.1) and also provided a Letter of Intent (See Appendix E).

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately \$3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The \$3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035.

A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria defined herein while constructing to 2085 elevation requirements. The 2085 assessment was much more limited in application as compared to 2035. The 2085 assessment limitations, as compared to 2035, are discussed further in the body of this document (See Section 8.0). The estimated 2085 TPC range is \$5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon, can be compared more directly to the 2085 cost range developed herein. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

In summary, an estimated Federal participation project cost savings of \$7.07B (difference between \$10.27B and \$3.2B) for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035. The overall TPC savings of \$4.27B (difference between \$10.27B and \$6B) appears attainable for the 2085 project horizon (using the higher range estimate of \$6B for the TPC). Please note, this assessment was limited in scope, time, and funding, therefore, significant assumptions and heavy reliance on NFS furnished data are factors that may impact reliability of these findings. Please reference Section 9.0 for further discussion regarding risks and limitations associated with this assessment. More detailed data collection, analysis and design are required in PED to confirm these estimated cost savings. Specifically:

1. Collection of new survey and boring data to assess what has been built to date
2. Application of the Adaptive Criteria throughout the alignment tailored to the geometry of each reach
3. Investigation of borrow locations and haul roads
4. Detailed investigation of relocations completed to date to determine compliance with criteria and potential application of cost saving via lessons learned to remaining relocations throughout the alignment
5. Detailed evaluation of the NFS constructed structures to determine compliance with criteria and potential application of cost saving via lessons learned to remaining structures throughout the alignment
6. Detailed evaluation of Real Estate requirements based on 1 and 2 above
7. Detailed evaluation of Environmental requirements (mitigation) based on 1 and 2 above

## 12.0 PATH FORWARD

Guidance is needed to determine the path forward on how to proceed with PED and construction of the MTG project utilizing these results as an option to deliver the MTG project more efficiently

with a reduced TPC. Although a potential estimated Federal participation project cost savings of \$7.07B for an option of a reduced Federal investment appears attainable for the 2035 project horizon via application of the adaptive criteria developed for this assessment in conjunction with a greater financial role for the NFS beyond 2035, and an overall TPC savings of \$4.27B appears attainable for the 2085 project horizon (using the higher range estimate of \$6B for the TPC), significantly more analysis is required to confirm these findings in PED.

If the determination is made to proceed to PED, CEMVN could further refine these site adaptations as stated in the 2013 Chief's Report. Key points are listed below:

- A 1% LORR is maintained
- NFS design and construction efforts to date have eliminated multiple unknowns from the PACR thereby substantiating the cost saving potential of the ACA
- Changes in the ACA do not change the overall MTG project's purpose
- NFS funded design and construction to date have reduced costs and also demonstrates strong commitment to the project thus providing USACE with a strong local partner
- NFS is willing to accept responsibility to maintain the project at a 1% LORR beyond the year 2035

Other potential options for the path forward could possibly be:

1. Specific Authority – Legislation could be pursued to provide specific authority to proceed in accordance with this ACA report if HQUSACE determines we cannot utilize the Chief's discretionary authority.
2. Sec. 7001, WRRDA 2014 – Section 7001 of WRRDA 2014 requires that the Secretary of the Army annually submit to the Congress a report (Annual Report on Future Water Resources Development) that identifies for potential congressional authorization completed feasibility reports, proposed feasibility studies, and proposed modifications to authorized projects or studies. The report is to be based, in part, upon responses to an annual notice for proposals from non-Federal interests published in the Federal Register. A proposed modification to the authorized MTG project could be a potential option under Sec. 7001 if additional authority is needed.
3. Split Delivery – The project could be adapted to a format where the Federal shared involvement is only for the remaining structures and levees to the 2035 horizon and the NFS involvement is for the structures and levees they have built along with the future levee lifts and structure adaptations to the 2085 horizon or some form of a split delivery.
4. PACR - The ACA performed herein does not satisfy any USACE standard for project investigation or study. However, this project has been studied extensively to date (Feasibility level, PACR, as well as smaller studies) at a cost of over \$50M. Therefore, initiation of a further study action or another PACR is not recommended by the stakeholders.
5. Water Infrastructure Finance and Innovation Act (WIFIA) - The Water Infrastructure Finance and Innovation Reauthorization Act of 2017 extends and doubles the funding authorization for a critical credit assistance program designed to accelerate investment



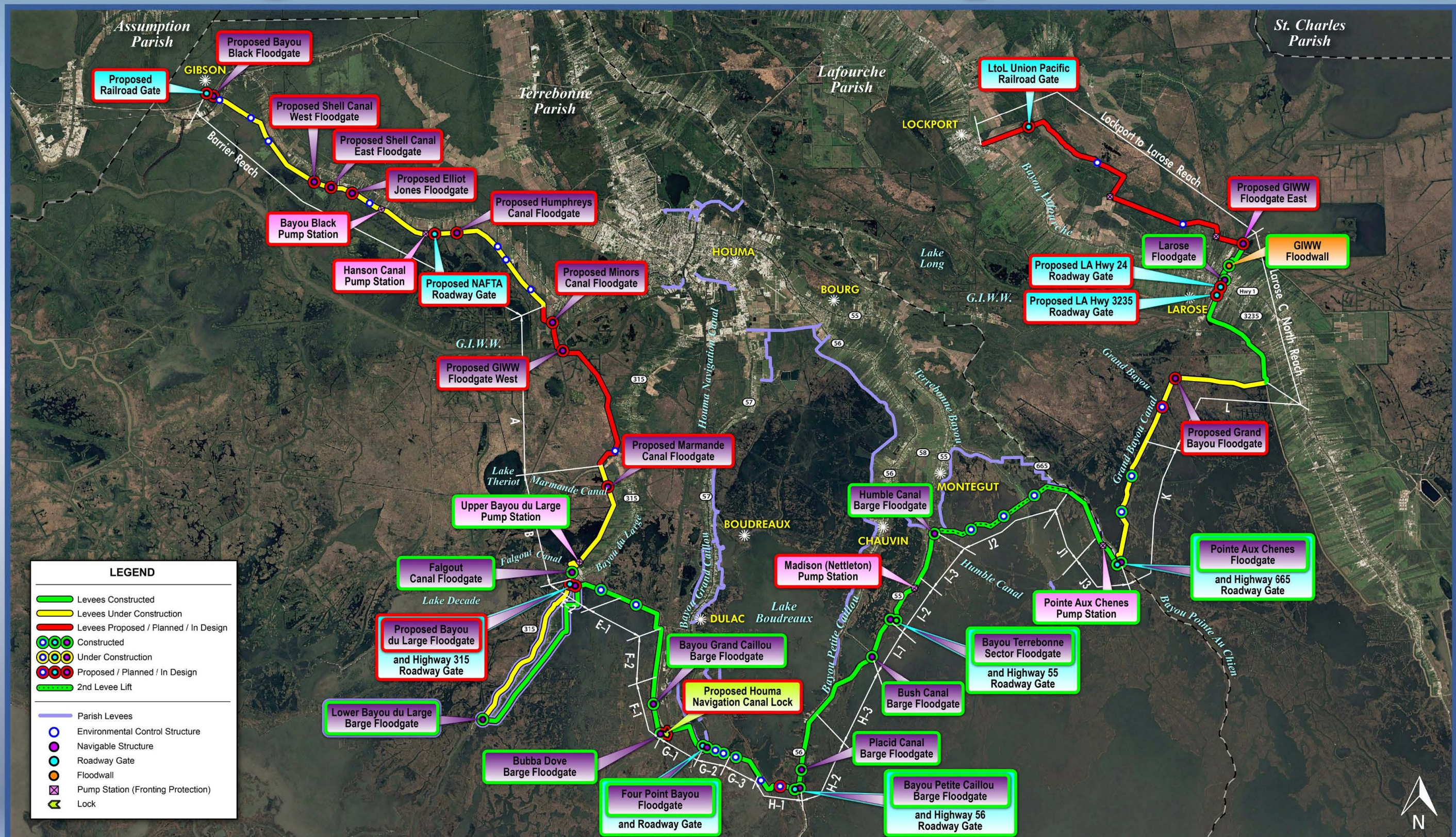
in our nation's water infrastructure. Established as part of the 2014 Water Resources Reform and Development Act, the WIFIA program is a federal loan and guarantee pilot program that aims to accelerate investment in our nation's water infrastructure by providing long-term, low-cost supplemental credit assistance for regionally and nationally significant projects. WIFIA offers greater financial flexibility to utilities, municipalities, nonprofits and other eligible entities who may lack the capacity to fund water infrastructure upgrades by helping cover up to 49% of the project costs.

The results of this ACA indicate the remainder of the MTG project can be constructed at a cost of approximately \$3.2B to the 1% AEP for the 2035 horizon for a potential reduced Federal investment option. Federal involvement in the project would potentially end in 2035 with the NFS also maintaining the 1% AEP beyond 2035. The \$3.2B estimate is limited to the 2035 horizon and does not include costs for future structural adaptations to a project life beyond 2035. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of \$5.5B-\$6B.

# **Appendix A**

## **Project Map**





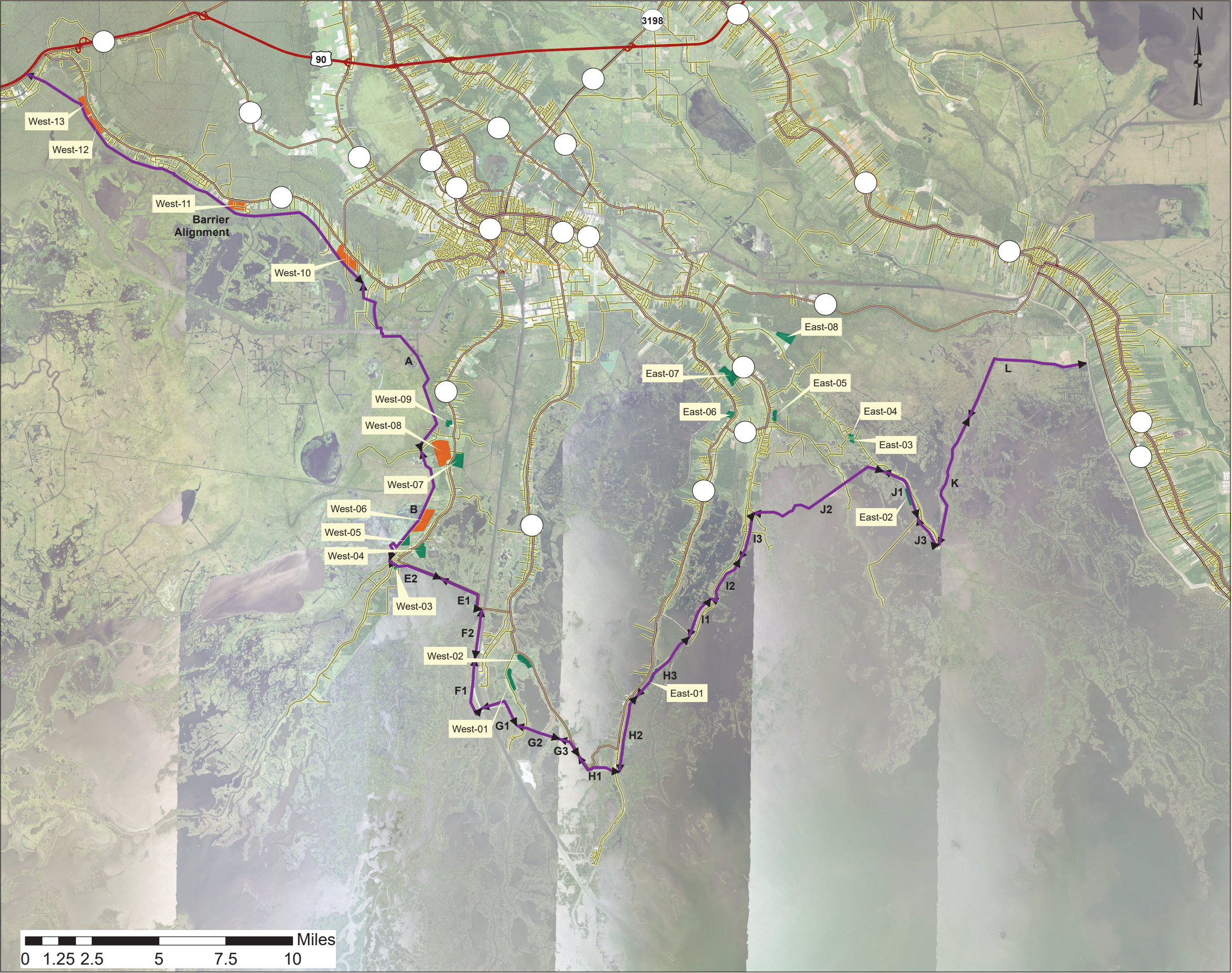


# **Appendix B**

## **Borrow Map**



# Morganza to Gulf Borrow Pits Map

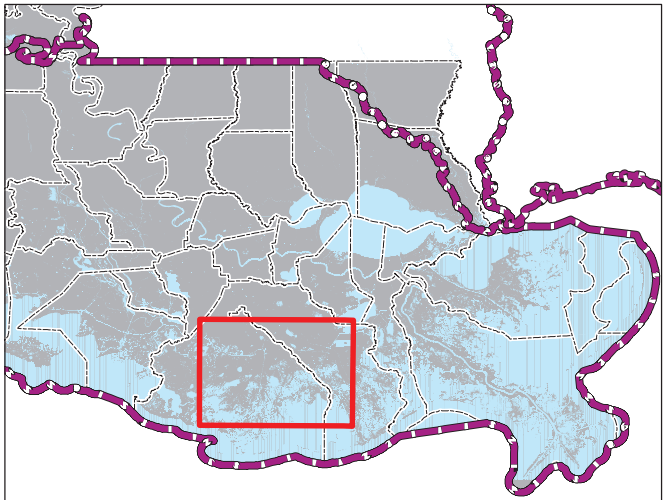


U.S. Army Corps of Engineers  
New Orleans District  
Engineering Office

## Legend

- ←→ Morganza to the Gulf Construction Reaches
- Interstate Highways
- Highway Interchanges
- US Highways
- Louisiana Highways
- Local Highways
- Rail Roads
- Streets
- Existing Dirt Pit
- Potential Dirt Pit

## LOCATION MAP





## **Appendix C**

### **Levee & Structures Quantities & Costs**



**Morganza to the Gulf Borrow and Fabric Quantities Without Wave Berms**

Project/Reach	Fabric (SY)	Borrow (CY)	Conversion to embankment (CY)	Total Reach Length (FT)	Cross sectional area (SF)	1% Design Section (CY)	Difference (CY)	Adjusted Difference (CY)	Unit Cost (\$/CY)	Embankment Subtotal (\$)	Section width (FT)	Levee Area (AC)	Clear/Grub Unit Cost (\$/AC)	Fert/Seed/Much Unit Cost (\$/AC)	Mob & Demob 5%	Total (\$)
Barrier Reach	0	0	0	83,081	1,197	3,683,258	3,683,258	4,419,909	\$ 15.11	\$ 66,784,828.01	156.00	298	\$ 3,500.00	\$ 4,000.00	\$ 3,450,817.12	\$ 72,467,159.60
Reach A	0	0	0	43,184	2,493	3,987,323	3,987,323	4,784,787	\$ 15.11	\$ 72,298,134.59	310.00	307	\$ 3,500.00	\$ 4,000.00	\$ 3,730,153.29	\$ 78,333,219.01
Reach B	0	0	0	26,786	2,493	2,473,241	2,473,241	2,967,889	\$ 15.11	\$ 44,844,799.77	310.00	191	\$ 3,500.00	\$ 4,000.00	\$ 2,313,724.66	\$ 48,588,217.96
Reach E	221,824	932,944	746,355	22,966	2,893	2,460,764	1,714,409	2,314,452	\$ 16.11	\$ 37,285,827.84	284.50	150	\$ 2,000.00	\$ 4,000.00	\$ 1,909,290.20	\$ 40,095,094.21
Reach F (Lower)	11,364	367,700	294,160	22,583	2,942	2,460,711	1,234,668	1,666,802	\$ 16.11	\$ 26,852,181.19	346.00	179	\$ 2,000.00	\$ 4,000.00	\$ 1,396,422.54	\$ 29,324,873.43
Reach F (Upper)	2,960	1,164,853	931,882													
Reach G-2A	0	188,831	151,065	24,388	2,893	2,613,129	1,725,917	2,329,988	\$ 16.11	\$ 37,536,106.68	284.50	159	\$ 2,000.00	\$ 4,000.00	\$ 1,924,590.36	\$ 40,416,397.59
Reach G-2B	93,030	503,468	402,774													
Reach G-2C	722	175,240	140,192													
Reach G-1	11,098	241,476	193,181													
Reach H-3	0	757,116	605,693	41,366	4,113	6,301,421	4,941,181	6,670,595	\$ 16.11	\$ 107,463,285.13	429.00	407	\$ 2,000.00	\$ 4,000.00	\$ 5,495,381.98	\$ 115,403,021.66
Reach H-2	23,260	675,965	540,772													
Reach H-1	27,166	267,218	213,774													
Reach I	0	362,732	290,186													
Reach J-3	0	1,631,900	1,305,520	49,357	4,113	7,518,716	4,526,521	6,110,804	\$ 16.11	\$ 98,445,044.87	429.00	486	\$ 2,000.00	\$ 4,000.00	\$ 5,068,079.74	\$ 106,429,674.61
Reach J-1	0	1,374,000	1,099,200													
Reach J-2	17,400	734,344	587,475													
Reach K	0	0	0	26,961	4,113	4,107,059	4,107,059	4,928,471	\$ 25.02	\$ 123,310,339.42	429.00	266	\$ 5,500.00	\$ 4,000.00	\$ 6,291,641.35	\$ 132,124,468.26
Reach L	0	364,834	291,867	31,143	4,113	4,744,117	4,452,250	6,010,537	\$ 16.11	\$ 96,829,754.78	429.00	307	\$ 2,000.00	\$ 4,000.00	\$ 4,933,501.15	\$ 103,603,524.10
Larose C North Reach	0	0	0	36,960		0	0	0		\$ -		0	\$ 2,000.00	\$ 4,000.00	\$ -	\$ -
Lockport to Larose Reach	0	0	0	77,531	1,197	3,437,208	3,437,208	4,124,649	\$ 15.11	\$ 62,323,449.41	156.00	278	\$ 3,500.00	\$ 4,000.00	\$ 3,220,294.68	\$ 67,626,188.31
			7,794,097			48,382,538	40,588,441			\$ 867,609,882.77		3,325				\$ 934,601,563.66

Notes:

Per LS - M. Marmande 2/21/19 - For reaches Barrier, A, B, LtoL will be adjacent pits and haul offroad so no need for truck wash down racks - JP removed \$1/cy

Per LS - M. Marmande 2/21/19 - For reach K will need to barge in.

Embankment unit costs DO NOT include wasting of unsuitable borrow material.

Adjusted difference includes 20% increase in quantity to account for lateral spread in reaches in which NFS has yet to complete any alignment.

Adjusted difference includes 35% increase in quantity to account for lateral spread and settlement during construction in which NFS has completed alignment.

**Morganza to the Gulf Structures Quantities**

Structure	Constructed (Y/N)	Cost
<b>Barrier Reach</b>		
Bayou Black Floodgate	N	18,066,918
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Shell Canal West Floodgate-Stoplog	N	12,123,873
Shell Canal East Floodgate	N	18,384,780
Elliot Jones Floodgate-Stoplog	N	11,700,818
Environmental Control Structure	N	9,363,485
Bayou Black Pump Station FP	N	8,280,035
Hanson Canal Pump Station FP	N	8,319,436
NAFTA Roadway Gate	N	8,531,435
Humphreys Canal Floodgate-Stoplog	N	11,754,740
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
Environmental Control Structure	N	9,363,485
<b>Reach A</b>		
Minors Canal Floodgate	N	16,995,182
GIWW Floodgate West	N	68,932,597
Environmental Control Structure	N	10,683,137
<b>Reach B</b>		
Marmande Canal Floodgate-Stoplog	N	13,935,095
Upper Bayou du Large Pump Station	Y	-----
Falgout Canal Floodgate	Y	-----
<b>Reach E</b>		
Bayou du Large Floodgate	N	19,361,905
Highway 315 Roadway Gate	N	incl
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
<b>Reach F</b>		
Grand Caillou Barge Floodgate	Y	-----
Houma Navigation Canal Lock*	N	-----
Bubba Dove Barge Floodgate	Y	-----
<b>Reach G</b>		
Four Point Bayou Floodgate	Y	-----
Four Point Bayou Roadwaygate	Y	-----
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
<b>Reach H</b>		
Environmental Control Structure	N	8,499,334
Environmental Control Structure	N	10,890,953
Bayou Petite Caillou Barge Floodgate	Y	-----
Hwy 56 Roadway Gate	Y	-----
Placid Canal Barge Gate	Y	-----
<b>Reach I</b>		
Bush Canal Barge Gate	Y	-----
Bayou Terrebonne Sector Floodgate	Y	-----
Hwy 55 Roadway Gate	Y	-----
Madison (Nettleton) Pump Station FP	N	14,817,712
Humble Canal Barge Gate	Y	-----

Reach J		
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
Pointe Aux Chenes Pump Station FP	Y	-----
Pointe Aux Chenes Floodgate	Y	-----
Hwy 665 Roadway Gate	Y	-----
Reach K		
Environmental Control Structure	Y	-----
Environmental Control Structure	Y	-----
Reach L		
Environmental Control Structure	N	11,206,781
Grand Bayou Floodgate	N	37,887,553
Larose C North Reach		
LA Hwy 3235 Roadway Gate	Y	-----
LA Hwy 24 Roadway Gate	Y	-----
GIWW Floodwall	N	164,991,532
Gulf South PPL Fldwl	Y	-----
Enbridge/Am Midstream PPL Fldwl	Y	-----
Williams PPL Fldwl	Y	-----
Larose Floodgate	Y	-----
GiWW Floodgate East	N	63,542,679
Lockport to Larose Reach		
LtoL - Union Pacific RR gate	N	5,150,929
Environmental Control Structure	N	8,873,031
Environmental Control Structure	N	7,732,006
	Total	\$626,206,851

structures	292,686,139
floodwalls	\$210,091,078
environmental control structures	\$123,429,633
Total	\$626,206,851

**Notes:**  
Costs based on PAC 2013 35yr structures costs adjusted for elevation then discounted to barge gate structure  
\*Although the HNC Lock complex is not yet constructed, the cost has been included idependently of the other structures  
Therefore a cost is not shown in this table because it would add the cost of the Lock twice.

### 2035 1% AEP LORR Morganza to the Gulf - Cost Summary Table

Cost Factor	PAC	PAC contingency (varies 25% to 35%)	PAC TOTAL In millions	ACA	ACA contingency 15%	ACA TOTAL 1% 2035	Reduction 2035
Relocations	\$ 231 M	\$ 60 M	\$291 M	\$202 M	\$30 M	\$232 M	\$59 M
HNC Lock	\$ 460 M	\$ 161 M	\$622 M	\$400 M	\$60 M	\$460 M	\$162 M
Fish & Wildlife facilities - ECS	\$ 381 M	\$ 133 M	\$514 M	\$112 M	\$17 M	\$129 M	\$385 M
Fish & Wildlife facilities - Mitigation	\$339 M	\$ 88 M	\$427 M	\$130 M	\$20 M	\$150 M	\$277 M
Levees	\$3,920 M	\$1,020 M	\$4,940 M	\$935 M	\$140 M	\$1,075 M	\$3,865 M
Floodwalls	\$303 M	\$106 M	\$409 M	\$192 M	\$29 M	\$221 M	\$188 M
Floodway Control & Diversions	\$791 M	\$277 M	\$1,000 M	\$196 M	\$29 M	\$225 M	\$775 M
Land & Damages	\$282 M	\$72 M	\$355 M	\$152 M	\$38 M	\$190 M	\$165 M
PED (12.826%)	\$ 781 M	\$ 225 M	\$1,000 M	\$278 M	\$42 M	\$320 M	\$680 M
S&A (8.044%)	\$490 M	\$141 M	\$631 M	\$175 M	\$26 M	\$201 M	\$430 M
<b>Total Cost</b>	<b>~\$7.981 B</b>	<b>~\$2.284 B</b>	<b>\$10.265 B</b>	<b>\$2.772 B</b>	<b>\$0.431 B</b>	<b>\$3.203 B</b>	<b>\$7.062 B</b>

PED and S&A calculated on all cost except Lands and Damages

ACA ONLY includes un-constructed features

# **Appendix D**

## **Hydraulics Input**





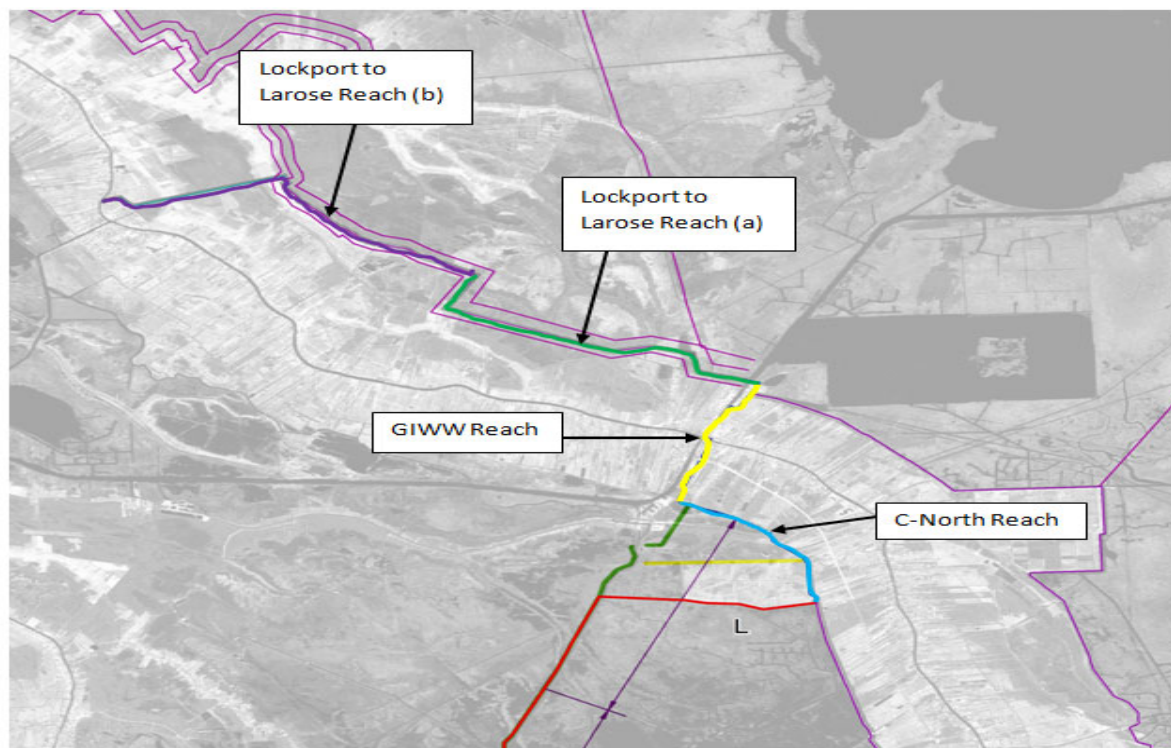


Figure 2– Northern Hydraulic Reaches East Side

#### Methodology:

The hydraulic boundary conditions for each hydraulic reach for the 1% return period and year 2035 condition were obtained and tabulated in Table 1 below.

Morganza to the Gulf 2035 1% Hydraulic Boundary Conditions					
Segment	Condition	Surge Level (ft)		Significant Height (ft)	Peak Period (s)
		Mean	Std. Dev.		
A-North	2035	10.4	1.19	3.0	5.2
A-South	2035	12.4	1.00	3.6	7.0
B	2035	12.4	1.00	3.6	7.0
E2	2035	15.2	1.23	3.6	7.0
E1	2035	15.2	1.23	3.6	7.0
F2	2035	15.2	1.23	3.6	7.0
F1	2035	15.2	1.23	3.6	7.0
G1	2035	14.8	1.10	6.5	7.3
G2	2035	14.8	1.10	6.5	7.3
G3	2035	14.8	1.10	6.5	7.3
H1	2035	14.8	1.10	6.5	7.3

<b>Morganza to the Gulf 2035 1% Hydraulic Boundary Conditions</b>					
Segment	Condition	Surge Level (ft)		Significant Height (ft)	Peak Period (s)
		Mean	Std. Dev.		
H2	2035	15.2	1.18	6.6	8.0
H3	2035	16.3	1.35	6.9	7.2
I1	2035	16.3	1.35	6.9	7.2
I2	2035	16.3	1.35	6.9	7.2
I3	2035	16.3	1.35	6.9	7.2
J2	2035	16.3	1.35	6.9	7.2
J1	2035	16.3	1.35	6.9	7.2
J3	2035	16.3	1.35	6.9	7.2
K	2035	16.1	1.52	4.9	6.9
L	2035	16.1	1.52	4.9	6.9
C-North	2035	14.0	1.50	2.7	5.9
GIWW	2035	9.2	0.50	1.9	3.4
Lockport-A	2035	8.7	0.50	4.4	5.0
Lockport-B	2035	7.5	0.50	2.9	5.4
Barrier	2035	10.4	1.19	3.0	5.2

Table 1– 1% Hydraulic Boundary Conditions

**Results:**

The hydraulic boundary conditions were then input into the MATLAB script for overtopping of levees and structures using an overtopping threshold of 1 cfs/ft. The resulting design elevations for the 1cfs/ft overtopping threshold for levees and structures are contained in Table 2 and Table 3 respectively below.

<b>Morganza to the Gulf 2035 1% Design Elevation 1 cfs/ft Overtopping Threshold</b>					
Hydraulic Reach	Feature Type	Condition (year)	Levee Slope	Wave Berm (Y/N)	Design Elevation in feet NAVD88(2004.65)
					@ 1.0 (cfs per ft) Overtopping Rate
A-North	Levee	2035	1:6	N	11.5
A-South	Levee	2035	1:6	N	14.5
B	Levee	2035	1:6	N	14.5
E2	Levee	2035	1:6	N	17.5
E1	Levee	2035	1:6	N	17.5
F2	Levee	2035	1:6	N	17.5
F1	Levee	2035	1:6	N	17.5
G1	Levee	2035	1:6	N	18.0
G2	Levee	2035	1:6	N	18.0
G3	Levee	2035	1:6	N	18.0
H1	Levee	2035	1:6	N	18.0
H2	Levee	2035	1:6	N	19.0
H3	Levee	2035	1:6	N	20.0
I1	Levee	2035	1:6	N	20.0
I2	Levee	2035	1:6	N	20.0
I3	Levee	2035	1:6	N	20.0
J2	Levee	2035	1:6	N	20.0
J1	Levee	2035	1:6	N	20.0
J3	Levee	2035	1:6	N	20.0
K	Levee	2035	1:6	N	19.0
L	Levee	2035	1:6	N	19.0
C-North	Levee	2035	1:6	N	15.0
GIWW	Levee	2035	1:6	N	9.5
Lockport-A	Levee	2035	1:6	N	10.0
Lockport-B	Levee	2035	1:6	N	8.5
Barrier	Levee	2035	1:6	N	11.5

Table 2– 1% Levee Design Elevations

<b>Morganza to the Gulf  2035 1% Design Elevation  1 cfs/ft Overtopping Threshold</b>			
Hydraulic Reach	Feature Type	Condition (year)	Design Elevation in feet NAVD88(2004.65)
			@ 1.0 (cfs per ft) Overtopping Rate
A-North	Structure	2035	11.5
A-South	Structure	2035	14.5
B	Structure	2035	14.5
E2	Structure	2035	17.5
E1	Structure	2035	17.5
F2	Structure	2035	17.5
F1	Structure	2035	17.5
G1	Structure	2035	18
G2	Structure	2035	18
G3	Structure	2035	18
H1	Structure	2035	18
H2	Structure	2035	19
H3	Structure	2035	20
I1	Structure	2035	20
I2	Structure	2035	20
I3	Structure	2035	20
J2	Structure	2035	20
J1	Structure	2035	20
J3	Structure	2035	20
K	Structure	2035	19
L	Structure	2035	19
C-North	Structure	2035	15
GIWW	Structure	2035	9.5
Lockport-A	Structure	2035	10
Lockport-B	Structure	2035	8.5
Barrier	Structure	2035	11.5

Table 3– 1% Structure Design Elevations

## **Appendix E**

### **NFS Letter of Intent**



# State of Louisiana

JOHN BEL EDWARDS

GOVERNOR

March 27, 2019

Mr. Mark Wingate  
Deputy District Engineer, Programs and Project Management  
U.S. Army Corps of Engineers  
New Orleans District  
7400 Leake Avenue  
New Orleans, LA 70118

**RE: Letter of Intent  
Morganza to the Gulf  
Hurricane and Storm Damage Reduction Project**

Dear Mr. Wingate:

The Coastal Protection and Restoration Authority Board of Louisiana (CPRAB) has reviewed the draft Adaptive Criteria Assessment (ACA) Report for the Morganza to the Gulf (MTG), Louisiana, Project. The ACA technical assessment confirms construction potential of a 1 percent Annual Exceedance Probability (AEP) system for the MTG study area, inclusive of the Houma Navigation Canal Lock structure, through the year 2035, and identifies the cost to perform future levee lifts and structure alterations through the year 2085. The 1% AEP 2035 construction costs, as defined in the ACA, is estimated at \$3.2 billion. The total project cost, through 2085, is estimated in the range of \$5.5 – 6 billion, a significant cost reduction compared to the authorized total project cost of over \$10.2 billion. Although the level of analysis performed for the future levee lifts and structure alterations was not as detailed as the analysis performed for the construction of the 1 percent AEP system, CPRAB generally concurs with the technical findings of the ACA.

This letter, while not legally binding on the State of Louisiana, acting by and through the CPRAB, as an obligation of future funds, declares the State of Louisiana's full support for this effort. By this letter, CPRAB also expresses its willingness to serve as a non-Federal sponsor to advance design and construction of the MTG Project. CPRAB's assessment of the approach described in the ACA is that it falls within the existing MTG authority as described in the Post Authorization Change Report (PACR), and therefore, advancement of MTG project will, as it currently stands, only require construction funds and no further re-authorization or PACR. However, since the project is within the jurisdictional boundaries of the Terrebonne Levee and Conservation District, the North Lafourche Levee District, and the South Lafourche Levee District, which are the delegated local statutory entities with responsibility for flood control and hurricane protection in the project area, the State notes its intent to request that these levee districts be included as a co-sponsors for the project. Additionally, the CPRAB plans to enter into cooperative agreements or other sub-agreements, in accordance with the Constitution and



March 27, 2019

Page 2 of 2

LOI: MTG Hurricane and Storm Damage Reduction Project

laws of the State of Louisiana, with these non-Federal governmental entities, for performance of all or part of the Non-Federal Sponsor's obligations under this Agreement, including but not limited to performance of future levee lifts and structure alterations through the year 2085.

Furthermore, CPRAB is willing to accept a larger role of responsibility in delivering the project. CPRAB understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required including lifts for the project through 2085.

CPRAB reiterates that it fully supports the MTG Project and looks forward to continuing to work with the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

A handwritten signature in blue ink, appearing to read "Chip Kline", is written over a horizontal line.

Kyle R. "Chip" Kline, Jr.

Executive Assistant to the Governor for Coastal Activities

and

Chairman, Coastal Protection & Restoration Authority Board of Louisiana

cc: Col. Michael N. Clancy, Commander and District Engineer, USACE  
Durund Elzey, Assistant Deputy District Engineer, Programs and Project Management, USACE  
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District  
Dwayne Bourgeois, Executive Director, North Lafourche Levee District  
Windell Curole, General Manager, South Lafourche Levee District  
Bren Haase, CPRA, Executive Director  
Ignacio Harrouch, CPRA, Operations Chief  
David Peterson, CPRA, General Counsel

## **Appendix F**

### **Local Stakeholder Historical Perspective**

“Following is a local stakeholder historical perspective of how we began the new push of finding a path forward on the Morganza to the Gulf Project.

The prospects of receiving federal construction funds for the Morganza to the Gulf Project were clearly stalled. The Terrebonne Levee and Conservation District, Terrebonne Parish, the State’s Coastal Protection and Restoration Authority, the Morganza Action Coalition and the Louisiana State and Congressional delegations along with many others have all tried diligently for many years to find a way to get this project funded. The project was wrapped up and ready to go already having a sizeable federal investment in determining its feasibility. It was authorized by Congress. All that was needed was the funding, which never came. We had to find another way to get there.

With the publication of the Post Authorization Change Report, the project now extended deeply into Lafourche Parish which brought the North Lafourche Levee District into the quest for new start funding for the project. But, we needed the Corps of Engineers to help us find another way to get there. Conversations about finding a new way to get money for this project without it having to be called a “New Start” began while on board the MV Mississippi on August 23<sup>rd</sup> Low Water Inspection trip. This MRC event brought together ASA-CW R.D. James, Major General Kaiser, Col Clancy, Mark Wingate and Jim Bodron and others. It provided a good opportunity to have detailed discussions as to why the project was in the predicament it was. At the end of the day, Major General Kaiser suggested, and we agreed, we needed to look at this closer to see if we could find another way. At the MRC public hearings on August 24<sup>th</sup>, numerous Morganza to the Gulf advocates gave impassioned speeches on the urgent need for the project. We met first with Major General Kaiser on September 14<sup>th</sup> 2018 in New Orleans, along with Col Clancy, Mark Wingate from MVN and others from the Corps.

Our ask was simple. We did not need all of the funds at once; but, we simply could not accept getting nothing. So, we asked: Is there a way that the Corps can complete some parts of the project now without having to complete the entire project? That started all of the great discussions that lead to this report.

Imbedded in that discussion were several key points.

- The admission that we would never get new start funding with the current project cost estimate being so high.
- The estimated cost of the project was clearly too high given the empirical data we now have based on the near \$400M spent by the State and Terrebonne Levee and Conservation District on the project to date. Further, the work already completed reduces the future scope and its cost can be removed from the project estimate. Finally, the completed work likely provided some soil strengthening that would reduce the cost of future lifts.
- The MR&T program might or might not be the best place for this project.

- The huge Basin within the system gives some flexibility in design not afforded in the HSDRRS.
- There was independent utility to be realized by constructing this system in phases. Every bit of work along the way provided tangible benefits. This was demonstrated in the 3% AEP evaluation alternative in the PAC itself. Subsequent to the decision by the then Director of Civil Works to use the 1% AEP level of protection, we now have the release and pilot of the new Levee Analysis Mapping Procedure (LAMP) by FEMA giving the ability to get some credit to the flood protection provided by levees not to the final elevation in a Flood Insurance Study and mapping.
- There was an opportunity, as outlined in the PAC report, to sight adapt the HSDRRS standards that were used in the cost estimate that would have huge implications on the cost of the project.
- There was clearly a Navigation interest in completing the project that was never captured.

That meeting was filled with helpful and very frank discussion about the limitations that the Corps finds itself operating within. We clearly recognized the post Hurricane Katrina world from which the PAC report came. But, it was time to move past all of that and everyone in the room was willing and committed to find a way.

The Corps was on it. At a MVFCA Breakfast in DC on October 3<sup>rd</sup>, we spoke to ASA-CW Mr. R.D. James, Mr. James Dalton, Mr. Jim Bodron and others with the Corps who were clearly engaged in the effort to find a way forward on this project. We heard Major General Kaiser clearly explain our effort to Lt General Semonite. It was not the first time they had spoken about this project. This “let’s find a way” approach to projects is exactly the type of thinking that we heard Lt General Semonite and Major General Kaiser call for. It also matches the “focus on the results and not the process” mantra of ASA R.D. James. During this same meeting, Mr. James Dalton asked to meet with us and Major General Kaiser as soon as possible as he and General Kaiser had already scheduled a meeting on the subject. Excited about the unprecedented level of collaboration, whatever it might yield, we had meetings with members of our Congressional Delegation to keep them apprised of the ongoing effort and discussions.

That next meeting with the Corps occurred in New Orleans on October 31<sup>st</sup> and it included Mr. James Dalton, Major General Kaiser, Col Clancy, Mark Wingate and along with others from the Corps. Actually, by the time we joined the meeting, the Corps had spent considerable time bringing Mr. Dalton up to speed on the details of the project and our ask. We were confident that Mr. Dalton left New Orleans with a clear understanding of our predicament and that he too, was committed to find a way forward.

All of this leads to the meeting arranged by Congressman Graves in DC on November 14<sup>th</sup>. All of the same players were in the room, this time augmented by several more from Corps HQ. We even had a quick visit from Congressmen Steve Scalise and Cedric Richmond during the meeting. It was clear that we are all on the same page. We all knew what we were trying to accomplish. Without any preconceived notions about the outcome or if and how the project

might eventually be funded, the Corps agreed to begin work on this report. It was agreed that we would need the CPRA as the local sponsor to the project involved and that the entire effort would be completed within 6 months.

On December 4<sup>th</sup> we had a re-cap meeting in New Orleans with Major General Kaiser, Col Clancy and others with the Corps along with Johnny Bradberry and Ignacio Harrouch with CPRA. This meeting also included members of the Morganza Action Coalition and Terrebonne Parish President Gordy Dove. Everyone was appreciative of the Corps effort to find a way to move forward with this project.

Rev 3/13/2019”

## MTG Review Comments/MVN Responses

### April 17, 2019 (Rev. April 19, 2019)

#### John Lucyshyn

C-1. It would have been nice to have seen incrementally how each of the factors reduces the cost of the project. If I understand correctly some of the cost reduction is associated with assuming the NFS constructed work into the without project conditions. How does this effect cost? On top of that what would the cost impact be of implementing the RMC recommended site adaptation criteria (Reduced factor of safety; Increased overtopping rate; eliminate structural Superiority), etc.

R-1. Assuming “factors” in the first sentence above is meant to be the cost factors as defined in the ACA, a table is provided in the executive summary and again in Section 11 in which the PACR costs and ACA 2035 costs are itemized by cost factor. Furthermore, Appendix C provides costs by levee reach, costs for structures, as well as a cost summary table illustrating how contingency was applied. ACA 2085 costs were not itemized by cost factor due to a much more limited approach (see Section 8.0 of the report for further discussion) and MVN felt it best to report 2085 cost as a holistic range.

If “factors” in the comment above is defined as criteria factors, the analysis is not that granular. Criteria adaptations were applied as a whole to individual “cost factors” to compute ACA costs.

The NFS constructed features reduces the project cost. The ACA accepted the NFS constructed features as existing conditions and essentially is building on top of or adding to what has already been built by the NFS. As discussed in Section 8.0, some of the existing structures will have to be demolished and rebuilt for 2085. Cost to accomplish demolition and reconstruction has been included in the 2085 cost.

Essentially the ACA is implementing the RMC recommended site adaptations. This is the fundamental objective of this analysis. FOS was reduced from 1.5 to 1.3, OT rate was increased from 0.1 to 1.0 CFS/FT, and structural superiority was eliminated. A full description of the ACA approach and application are provided in Sections 6.0 and 7.0, respectively.

C-2. The RMC report noted that clay levee slopes are generally not expected to fail at average overtopping rates of less than 1 cfs/ft but only recommended increasing the overtopping rate to 0.5 cf/ft. I see that the District increased the overtopping rate to 1.0 cfs/ft which is greater than the RMC recommendation. Has the district coordinated this with the RMC to determine if this would be an issue?

R-2. During initial scoping discussion of the ACA effort, the RMC was engaged in meetings. MVN was informed that to accomplish the coordination identified in this comment, RMC alone would require \$500K and a minimum six months of effort. MVN was funded a total of \$500K and provided a schedule of 4 months (once funding was received) to finalize to MVD the ACA. Therefore, based on the favorable language in the prior RMC report (as cited in the comment) as well as interior storage capacity analysis which demonstrated an abundance of interior storage capacity, MVN felt that a 1.0 CFS/FT OT rate is acceptable. Detailed discussion of the 1.0 CFS/FT criteria adaptation and the logic MVN used to support its use can be found in Sections 5.2 (added since the comment was made), 6.2 and 6.3 of the ACA.



C-3. Not sure what limiting Federal participation has to do with Adaptive Criteria or how this is view as a project cost saving. This would just be a cost transfer to the NFS.

R-3. Concur. Limiting the Federal participation is a Federal cost savings and this clarification has been added to the report. The team looked at savings from the adaptive criteria along with other savings such as reducing the costs from the NFS already constructed work and also the option of a reduced Federal investment (transfer of costs from Federal to NFS). The NFS cost transfer cited in the comment is supported by the NFS per Appendix E, which results in Federal cost savings. An objective of this effort is to investigate potential savings in which MTG can be constructed with Federal involvement at a funding level OMB will support. Limiting Federal involvement to 2035 is a potential option. Another potential option, similar to the PACR, is including Federal involvement to 2085 at a cost of \$5.5-\$6B (in total, not added to the 2035 cost).

C-4. It wasn't clear to me form the explanation provided how we went from four levee lifts to one.

R-4. For the 47 NFS constructed miles that is one lift. Another lift will be placed to achieve 2035 elevation. Beyond 2035 lifts will be placed to maintain a 1% system based on settlement curves, relative sea level rise, subsidence forecasts, etc. Therefore for the 47 NFS-constructed miles there are essentially 3 lifts. For the remaining alignment reaches, a lift will be placed to achieve 2035. Similarly, beyond 2035 lifts will be placed to maintain 1% up to 2085. Therefore the unconstructed reaches of the alignment are projected to have two lifts. These are northern reaches and will be constructed to a lower elevation. Please note that CPT data results obtained (since the initial writing of the report have been reviewed and validated the strength gain assumptions made during the ACA analysis. Therefore the current plan for constructing the project in the lifts described in this comment appears to have been substantiated.

C-5. Regardless of the cost responsibilities, not sure why we would recommend that the height of structures be constructed to the 2035 time horizon when we know the project will be O&M'd to the 2085 elevations as part of the project. What is most cost effective?

R-5. A good comment/point. MVN investigated building the unconstructed structures to either 2085 conditions and/or constructing substructure and superstructure components in a manner in which the structures could be augmented in the future to achieve 2085 elevations. However, due to time constraints MVN could not complete this analysis. Further discussion/explanation of this topic can be found in Section 8.0 of the report. The report currently does not provide a recommendation.

C-6. How much confidence do we have in the NFS \$400M cost estimate for the HNC lock Complex versus the \$622M PACR report estimate.

R-6. MVN accepted the cost estimate as provided by the NFS (they provided their estimate from a developed set of plans/specs). MVN did not review the HNC lock designs or cost estimates. Please note, a 15% contingency was applied to the \$400M NFS furnished estimate, along with the appropriate E&D and S&A percents.

C-7. A contingency reduction to 15% was considered reasonable. This is significant compared to the 25-35% contingency rates used in the 27 Feb 2013 certified cost estimate. Were there any discussions with Cost MCX to see if this is reasonable?

R-7. No. A formal cost risk analysis utilizing Crystal Ball software was not performed due to time constraint. The Cost MCX would require this to perform an analysis. 15% contingency was provided by the NFS based on their experience to date building the levees and structures in the alignment. There is much better understanding of borrow sources, haul routes, and other feasibility level cost factors that impact contingency. Therefore MVN accepted the NFS furnished 15% contingency for calculating the 2035 TPC. However, contingency applied to the 2085 cost range is 25%.

C-8. In this case why is the NFS willing to accept responsibility to maintain the project at a 1% LORR beyond 2035 when in other instances was not?

R-8. MVN assumes that there is an evolving understanding with the NFS regarding what OMB perceives to be a fundable level for a Risk Reduction project in the MTG geographical setting. Please note the NFS has invested over \$400M to date in a needed risk reduction project in which no Federal construction funding has been provided to date. They also provided a letter of intent/support for this option that is included in Appendix E.

## **Charlie Hanneken**

C-9. What are the ramifications of not counting the costs of the segments of the project that the Nonfederal sponsor already built? The non-fed sponsor is not seeking credit for those segment, but will we have segments of the system that are treated as a nonfederal system and other segments that are part of the Federal project?

R-9. The project will not have system segments that are non-Federal. The NFS constructed features are considered existing conditions (within the context of the ACA). If Federal involvement is funded, USACE would build on top of or add to the existing NFS construction existing conditions. Per Appendix E of the report, NFS does not plan to seek credit for the MTG features constructed by them to date.

C-10. I am concerned that we are overstating the cost savings. If we are shifting responsibility for lifts after 2035 to the non-fed sponsor, the costs do not necessarily go away. The total project cost remains the same, it is the federal share that has been reduced. It is appropriate to talk about total project costs savings in regards to changes resulting from applying adapted criteria. When talking about savings resulting from limited Corps participation to 2035, it is more appropriate to cite the reduction in the federal share.

C-10. Concur. Report was revised to clarify that the cost savings for the 2035 horizon is just a reduced Federal investment and that the 2085 horizon is TPC savings. Refer to C-3 & R-3 above. There is TPC savings (from \$10.3B in PACR to estimated \$5.5-6B in ACA) from applying the adaptive criteria and also removing the NFS constructed work from the TPC. The 2035 option is not a TPC reduction, but a reduction in Federal costs for the 2035 elevations. This potential concept is supported by the NFS per Appendix E letter.

C-11. If shifting the burden to the sponsor reduces the federal share and not the total project cost, it is important to understand what those costs are out to 2085. I would like to see these looked at in more detail.

R-11. Refer to Section 8.0 for a good discussion relative to this comment. Costs out to 2085 were investigated in a much more limited fashion and reported as a range. The 2085 TPC is estimated to be

between \$5.5-6B in total (not in addition to the 2035 cost). Therefore the TPC after applying the criteria adaptations discussed in Section 6.0 of the report result in a TPC reduction from \$10.3B (PACR) to \$5.5-6B (ACA) (approximately 40 -45% TPC reduction).

C-12. If the total project costs are really being limited to the period up to 2035, the benefits should be limited to this time period only too. What would this potentially do to the BCR?

R-12. Total project costs are not being limited to 2035, just a transfer of costs to the NFS for 2035-2085, therefore the BCR would remain for the entire project period (2085). The TPC to 2085 is the TPC whether or not there is Federal involvement beyond 2035 or not. Regardless the BCR will go up because the TPC is reduced from \$10.3B to a maximum of \$6B with equivalent benefits.

## **Jennifer Chambers**

C-13. Section 1.0 - the second paragraph of this section mentions increasing the number of floodgates from 9 to 19. Other sections of the report mention 22 floodgates. Please resolve.

R-13. Section 4.0 (page 8) calls out 22 “navigation structures”. Section 1.0 calls out 9 to 19 “floodgates”. The discrepancy is that the PACR included two gates at GIWW and another “Bubba Dove Floodgate” at HNC as one structure (see note in parentheses after 22 navigation structures on page 8). There are 3 additional navigation structures (3 + 19 = 22). Therefore the total number of 22 navigation structures is correct. Additionally, the increase of 9-19 specified in the PACR is also correct because these features (2 GIWW gates and Bubba Dove at HNC) were combined with other structures. After a search, these structures were not quantified in any other place in the report that MVN could find.

C-14. The report addresses endorsement of the Coastal Protection and Restoration Authority throughout but, never mentions the endorsement of the Terrebonne Levee and Conservation District. Please add verbiage addressing their endorsement.

R-14. Verbiage was added to the report to clarify. Reference the cover page (In Coordination With) and the executive summary on page iii paragraph 2, (CPRAB, TLCD, NLLD, SLLD) was added after the word stakeholders in the first sentence. Also page 2 “Therefore, CEMVN in coordination with the CPRAB, TLCD, NLLD, and SLLD have developed “Adaptive Criteria”....” Otherwise it was the author’s intent that in any place in which NFS and local/state stakeholders was used, this is a reference to each entity (CPRAB, TLCD, NLLD, and SLLD) as a whole – this was also clarified in the report. Furthermore, in the Letter of Intent provided in Appendix F (added since this comment was made), the following language appears, “However, since the project is within the jurisdictional boundaries of the Terrebonne Levee and Conservation District, the North Lafourche Levee District and the South Lafourche Levee District, which are the delegated local statutory entities with a responsibility for flood control and hurricane protection in the project area, the State notes its intent to request that these levee districts be included as a co-sponsors for the project.”

C-15. Since some of the project area is in Lafourche Parish, is endorsement of that levee district required (I assume the Lafourche Parish Levee District will be responsible for O&M like Terrebonne Levee District)?

R-15. Refer to R-14.

C-16. Section 1.0 b - this mentions adapting the criteria to reflect the level of risk associated with the adjacent communities. It would be helpful to know exactly what this means. Please explain how is the level of risk is changing... FROM what TO what?

R-16. Based on MVN's current understanding, the direction that USACE is going is toward risk informed decision making. Therefore in consideration of the level of population and infrastructure investment on the landside of the MTG system, a higher level of risk is deemed appropriate when compared to an area such as New Orleans, LA. MVN's position is that risk based analysis and decision making provides support and reinforcement of criteria adaptations such as 1.3 FOS vs. 1.5 and 1.0 CFS/FT vs. 0.1, etc. The intent of this statement is to convey to the reader that the HSDRRS criteria is too conservative to apply to this geographic area in consideration of relative risk of other areas more densely populated with much higher infrastructure investment that may impact regional, national, and/or international commerce in which HSDRRS criteria was developed for in the aftermath of Hurricane Katrina.

C-17. Table 6-1 - the results for material no. 10, 11, and 12 do not make sense. The same material failed at a discharge of 1.5cfs and 2.0cfs but was fine at 4.0cfs? Please verify that this is correct.

R-17. The table was edited to make it fit better on the page. Item No. 10 is unreinforced dormant Bermuda grass. Item No. 11 is dormant Bermuda grass reinforced with High Performance Turf Reinforcement Mat. Item No. 12 is dormant Bermuda grass reinforced with Turf Reinforcement Mat. This information will be added back in.

C-18. Section 7.5 - Please add discussion on how the costs were reduced to structures other than the sector gates. i.e. It is unclear if the roadway/railway gates were reduced. I assume the height of the floodwalls were also reduced?

R-18. Yes, all were reduced and we clarified in Sec 7.4 & 7.5. Section 7.4 also states, "The 35 year LORR PACR structure costs were prorated down based on the revised hydraulic elevation requirements. This reduction was applied to the foundation, structural concrete, and structural steel." So the ACA states "structure cost" (not just sector gates). All structures including floodgates, roadway gates, and corresponding floodwalls were reduced to reflect a lower required design height. Further reduction at the flood gates were applied to switch to barge gates instead of sector gates.

C-19. What if subsidence occurs earlier than expected (before 2035) who will be liable for maintaining the 100-year LORR?

R-19. This would be a parameter covered by contingency. However, based on experience, regional subsidence is not a parameter that changes quickly enough to have a meaningful impact to short term project goals and their expected cost. Settlement (during construction, uniform, and differential) is a larger concern particularly for alignments that have not yet been built. However, settlement is forecast based on boring data and knowledge of the regional geology. Therefore estimated costs take into account these parameters.

C-20. Appendix C - It was mentioned throughout the report that the cost of the HNC was included because it was not constructed yet. However, the table of structural quantities contained in Appendix C shows this item to be constructed with no cost associated with it. Does this need to be added back in?

R-20. The HNC Lock cost is a stand alone cost factor in the summary table. It was shown in the Appendix C table to be constructed so that no cost would be included in the table of structures in Appendix C. The Intent was to ensure that all the structures throughout the alignment were accounted for in the Appendix C table; however, since the HNC Lock is a stand alone cost factor, to add it to the Appendix C Table would be adding that cost in twice. A footnote will be added to the Appendix C table to clarify.

C-21. Appendix C - the note below the table has been cut off. Please resolve.

R-21. Concur. Has been corrected.

## **Sean Smith**

C-22. Page 5 as well as other locations throughout the report indicate additional guidance is necessary to enact the changes suggested within the subject report and more specifically on how to address these suggested design changes in PED. This begs the question of what sort of design guidance is necessary if these items of consideration were developed in accordance with existing USACE guidance. The District would need to clarify the necessary variances from existing USACE design guidance that are warranted.

R-22. The additional guidance requested has more to do with what the path forward should be to fund this project as authorized at the ACA estimated lower TPC without further study outside of PED. Some potential options have been developed and put forth by MVN for consideration in Section 12.0 of the report. MVN enumerates the variances in Section 6.0 to HSDRRS design criteria that WAS applied to develop the ACA costs included in this assessment. MVN also caveats the analysis performed in Section 10 among other places in the ACA. Ultimately guidance is needed to develop the path forward to advance this authorized project to PED and construction in conformance with the direction provided to MVN by MVD and HQ staff.

C-23. The major premise associated with the potential reduction in cost is directly attributed to the project life evaluations being limited to the year 2035 versus 2085. This is a significant departure from USACE policy (ER 1105-2-100, ER 1105-2-101 and ER 1110-2-8159). The project planning horizon within the associated planning/engineering guidance is defined as the 50-year project life whereas the engineering design aspects specify a 100-yr design life for certain infrastructure). It would appear that the report is being configured in a manner consistent with an Engineering Documentation Report (EDR). Though the design change considerations may be perceived to fall in-line with an EDR, the planning horizon changes would suggest this assessment should be submitted for consideration consistent with a General Reevaluation Report (GRR). Reason being, if the planning horizon was permitted to be on the order of something less than policy dictates, there is the potential that other alternatives may be considered to be deemed more viable and/or cost effective than the current plan.

R-23. Non-concur. The assessment is not departing from the normal 50-year project life. Refer to C-3 and R-3 and C-10 and R-10. Also reference added language in Section 11.0 that clarifies the \$3.2B estimate for the 1% AEP for the 2035 horizon is for a potential reduced Federal investment option, whereas the NFS would continue maintaining the 1% AEP beyond 2035. So this option still goes to the 50-year project life, just with a reduction in the Federal cost share. A cost range was also investigated for the 2085 horizon utilizing the adaptive criteria while constructing to 2085 elevation requirements. The estimated 2085 TPC range is \$5.5B-6.0B. The PACR estimate, which was also for the 2085 horizon,

can be compared more directly to the 2085 cost range developed. The normal 50-year project life remains the same as in the PACR (from 2035-2085).

Also, the project has been studied extensively to date (Feasibility level, PACR, as well as smaller studies) beyond which the NFS has taken upon themselves to construct over \$400M worth of project features to date. Therefore, initiation of a further study action or another PACR is not recommended by the stakeholders. More detailed data collection, analysis and design could be performed in PED in which P&S contracts are developed for the overall alignment. CEMVN is hoping to capitalize on the new USACE direction of risk informed decision making to make adaptive criteria adjustments.

C-24. The executive summary suggests the allowable overtopping rate may be increased to 1.0 cfs/lf. The original design overtopping rate was established at 0.1 cfs/lf whereas the RMC report cited 0.5 cfs/lf. There appears to be some additional leeway being exercised in the increased overtopping rate; yet there does not appear to be any documentation that this additional 0.5 cfs/lf (going from 0.5 to 1.0 cfs/lf) has been codified with the original RMC consultation team.

R-24. Refer to C-2 and R-2.

C-25. Section 5, (bulleted list on page 9 of 27) denotes eliminating structural superiority requirements. With the reduction of any superiority requirements, this would suggest the engineers have assessed and reduced all uncertainty associated with the establishment of the crest elevation of the levee system and any appurtenances. In addition, it would be assumed that any reduced crest elevation may/could result in increased capacity needs associated with interior drainage and/or associated pump stations due to the increased overtopping that may be experienced. To what degree has any of this increased overtopping rate impacted the plan selection or up-sizing of other features to accommodate the increased overtopping? Later in the report, it indicates that these changes result in insignificant cost increases, yet the report heavily caveats the level of effort/analysis placed on these findings. Similar to comment 3 (above), would this reduction in superiority (coupled with the reduced design life) have any effect on the plan selection thus warranting a re-evaluation of the project as a whole?

R-25. Structural superiority requirements were eliminated based on the RMC recommendation in their Sensitivity Analysis, a very large effort and expensive effort. MVN defers to their analysis in defense of structural superiority elimination and therefore feels more analysis as described in this comment would be redundant. Regarding interior drainage analysis refer to Section 6.2 of the ACA. As stated in R-23 a key objective for both CEMVN and NFS is to avoid further study of MTG and pursue PED as authorized capitalizing on USACE's new direction of risk informed decision making.

C-26. Page 10 of 27 denotes the increase in allowable overtopping rate results in lowered required design elevation and lower project costs. To what degree were these lowered design elevations considered in the context of increased risk as a result of a more frequent overtopping failure scenario (as would be considered within a probable failure modes analysis)? Presumably, reducing (as eliminating the superiority) associated with the levee system, would/may result in the potential for catastrophic failure of the system.

R-26. Refer to Section 6.3 for detailed discussion. CEMVN is referencing the CSU study that was performed during development of the HSDRRS criteria.



C-27. It could not be determined as to whether there was any sort of trade-off analysis conducted for a controlled or managed overtopping scenario as defined within ECB 2017-15? Utilizing this guidance may yield alternatives and potential cost reductions by simply assessing the system in a manner to identify lower impact zones that could be appropriately identified as an area or areas that would be ideal for consideration as a managed or controlled locations to offset any increased surge levels while still affording more robust sections of levee in the high impact areas.

R-27. Such an analysis would be appropriate given more time. Given the time constraint CEMVN simply evaluated the increase OT rate impact on interior storage capacity. See Section 6.2 for more detailed discussion and analysis results.

C-28. A great deal is placed on the emphasis to relax the overtopping rate of 0.1 cfs/lf. Though it can certainly be understood as a viable area for consideration, the question of viability with respect to performance is key to understand. The laboratory testing conducted through CSU outlines the various soil types and vegetative cover. This testing seems very similar to CSU testing conducted for work conducted for the Jacksonville District for work in South Florida. Are the site conditions and materials considered through this laboratory testing consistent with those that would be experienced within this region? In addition, do the overtopping rates outlined in the table adequately represent the loading conditions that might be experienced for this region? The durations denoted within the report would seem to indicate the region would only be susceptible to periods on the order of 3 hours (for a maximum flow rate); it would seem that this region could easily be exposed to durations well in excess of 3 hours. This assumes the line of protection is able to sustain the loading up to that crest elevation for this exposed period of time without breach. A rigorous analysis of the characteristics of this region to account for the land-fall direction and wind durations would be warranted to determine if the CSU testing is indicative of the region.

R-28. It is important to note that all of the armoring effort has been fully vetted, reviewed, and scrutinized, before any implementation.

1) As shown in the report(s), CSU testing for HSDRRS overtopping was completed in 2009 / 2010 time frame. Experts from the Netherlands collaborated with Dr. Chris Thornton and Dr. Steve Hughes (formerly of ERDC) to construct the overtopping testing facility for the HSDRRS overtopping testing.

2) Yes, site conditions and materials considered through this laboratory testing consistent with those that would be experienced within this region. Southern grass species including Bermuda and Bahia were used in the testing along with actual clay soil from south Louisiana.

3) The overtopping rates outlined in the table are in excess of loading conditions that might be experienced for this region. There is uncertainty built into the hydraulic modeling so that estimates of water elevations and overtopping are conservative. Additionally, the overtopping test apparatus at CSU was designed to model the highest overtopping rate based on the hydraulic modeling for the HSDRRS. Materials tested outperformed expectations and no failure was noted for live Bermuda grass, in any case. As presented in the CSU report, testing time durations were well in excess of estimates of storm durations impacting the HSDRRS. Also, at the time that the 0.1 cfs/ft overtopping rate was established for the HSDRRS, there was no published information regarding acceptable wave overtopping rates and acceptable materials to provide resiliency to earthen levees. As such, the established overtopping rates were conservative.

4) Analysis of region characteristics accounting for the land-fall direction and wind durations were included in the hydraulic analysis for the HSDRRS and are reflected in the design for the different levee reaches, that being different crown elevations and geometry, including wave berms. Resiliency was also built into these design analysis, including design to the 500-yr Stillwater level.

5) The assumption that the line of protection is able to sustain the loading up to that crest elevation for this exposed period of time without breach is valid. Note that there were no failures/breaches of levees constructed of clay soil or capped with clay soil during Katrina, so this is a valid assumption. Failures during Katrina included I-Walls and levees constructed of dredged fill material that were not properly capped with clay soil. Additionally, since live Bermuda grass showed no damage from the overtopping testing for periods exceeding those that may be expected from a tropical event impacting the area, there is further confidence that levees will maintain their integrity.

C-29. Page 22 of 27 discusses the potential to retrofit designed features (considering the 2035 planning) to the requirement of those same features if 2085 is later considered. This section in particular talks to augmenting the 2035 design. There is significant caveat language in this paragraph denoted by “where feasible” which can lead to significant cost growth later if not well understood now. How does the phrase “where feasible” play out in the overall cost growth for the 2085 condition and would this cost growth fully attributed to the Non-Federal Sponsor? This question is raised to determine what sort of cost deferral is being proposed and what sort of cost share implications may surface. The phrases “where feasible” and “a reasonable cost basis to adapt a 2035 to 2085 could not be developed due to time constraints” provides for a great deal of uncertainty in the overall cost growth. If this sort of assessment was not conducted, then how can USACE attest for the overall cost savings being proposed. Again, additional caveat language appears later in Section 12 the text “[a]lthough a potential MTG total cost savings of \$7.06B appears attainable via application of the adaptive criteria developed for this assessment, significantly more investigation and analysis is required to confirm these findings in PED”. With this disclaimer, it would appear the findings may not be fully substantiated, therefore the overall question of cost reduction is suspect.

R-29. CEMVN concurs. The ACA simply states that CEMVN considered the potential of constructing 2035 structures that could be augmented to meet 2085 elevation requirements. The concept is that structural features (substructure and superstructure) components would be built to meet 2085 requirements (loads) and other structural components (i.e. the gates, floodwalls) would initially be built to meet 2035 elevations and later augmented to meet 2085 elevation requirements where feasible and cost effective. However a reasonable cost basis could not be developed in large part due to the issues enumerated in the comment and limited time. USACE can attest to the overall 2085 cost savings (\$5.5-\$6B) proposed because the 2085 cost estimate is based on constructing all new structures from existing conditions to 2085 elevations and demolishing all existing structures and rebuilding to 2085 elevations without a 2035 interim condition (for structural features).

C-30. The intent of the assessment is well understood but a basic understanding of where the original criteria is overly restrictive (aside from cost) is not well founded. The general assessment is cost can be reduced by relaxing criteria but it was not evident in this report that the criteria is overly conservative in an manner that is subject to relaxation and one could consider if such risks are being considered, would there not be other alternatives (non-structural for example) that may be viewed as more viable than reduced levels of assurance on structural alternatives. The planning horizon, again, is a major deviation from USACE policy which may have long-term implications and be deemed as precedent setting as well.

R-30. CEMVN's position is that it is not appropriate to apply the HSDRRS criteria to MTG based on level of risk to population and infrastructure investment as compared to the Metropolitan New Orleans area for which the HSDRRS criteria was developed. The amount of risk the MTG project is willing to accept drives cost. The two cannot be separated. It is this risk informed decision process that drives the ACA proposed HSDRRS criteria changes which appears to lower TPC to a level that OMB may hopefully fund for construction in a PED setting.

## **Tammy Conforti**

C-31. I would like to see a paragraph or brief section added about incremental/residual risk, including something added about population at risk/life safety. I was looking for that somewhere. I didn't dig into the risk assessment, but the summary you sent had the information in there. I think for the leadership it would be good to briefly describe the risk associated with the levee between the \$10B versus this project, even if there is assumed to be little to no change.

R-31. Section 7.9 "Residual Risk" was added to the report. Please note that a scientific approach to risk analysis was beyond the scope of this effort. Risk is discussed largely based on study analysis conducted by others (RMC, CSU). Risks associated with Interior storage capacity as well as scour failure mode (due to increase overtopping) are discussed in more depth in Section 6.2 and 6.3 of the report.

C-32. Somewhat related, I would like to see a little more description about superiority. Would Mr. Graves know what that is? I'm sure this report will get around externally. This report focuses only on cost and technical aspects mainly. Granted, most may only look at the bottomline cost. All we can do is try to make the information available. When I see "no superiority", that means we won't be designing for a controlled overtopping point for the system. Maybe that's fine because it doesn't change the risk. I recommend we at least describe it and say what the result of not incorporating it does.

R-32. The following language was added to Section 5.2 the item 3 paragraph on page 10,

"(Note, As defined in the HSDRRS Design Guidelines on page 5-2 under Section 5.1.3, structural superiority is 2 feet added to structure elevations above the required design grade of adjacent levee alignments. Intent of structural superiority is to provide additional elevation for difficult to construct features such as sector gates, utility crossing, etc. in an effort to minimize the need for future adjustment should design grades increase due to greater than expected subsidence or sea level rise. In addition structure superiority lowers the potential for overtopping at critical infrastructure)."

C-33. I recommend removing the discussion about FEMA's LAMP program and the discussion about insurance benefits (which is saying not having to buy flood insurance is a benefit). I understand this is what the locals want. USACE promotes that people should buy flood insurance. FEMA's program doesn't impact project costs at all. The discussion about insurance rates and LAMP confuses things; sends mixed messages, and I'm not sure why that discussion is in this report. By the way, you should know USACE accredits levees via risk assessments now using the 1% AEP. It's not in accordance to 65.10.

R-33. Just for points of clarification relative to semantics, CEMVN understands that FEMA accredits (not USACE). If the concept of "positive finding" under the LSER EC has been abandoned by USACE, then we assume USACE now "certifies" levees via risk assessments using the 1% AEP. 65.10 still used by FEMA

should a local entity decide to pursue FEMA “accreditation” without USACE involvement. If anything in this paragraph is stated incorrectly, please provide feedback as understanding of USACE levee evaluation requirements for certification (positive finding, etc.) have evolved and are evolving and we would like to stay abreast of the current policy and corresponding language used to accurately describe it (for consistency).

This comment is a challenge to address because this topic is coming from NFS. CEMVN originally developed the language and then it was tweaked by NFS to the current version. Removal would require coordination with NFS. NFS angle is that the work they have done to date offers tangible benefit and they are looking for that to be stated.

Reference the following statement in the comment, “.....which is saying not having to buy flood insurance is a benefit.” It is unclear what specific language in the LAMP discussion states this. The discussion simply states that “..... LAMP program is simply intended to map risk for a levee system that are not accreditable in current condition.” and that there “may be” insurance benefits”. Which is accurate as explained to CEMVN via coordination call with FEAM Region VI. FEMA is not able to quantify the benefits as the LAMP in this region is only a pilot at this stage. However, the object of the program is to provide some type of insurance benefits for areas situated adjacent to flood risk reduction systems that are not accreditable. NFS considers this a significant point. Upon review, the discussion does not advocate in any fashion not buying flood insurance, only that a benefit to insurance rates “may be” possible via the LAMP program/process.

## **Jim Lewis**

C-34. How about “considerations” instead of “recommendations”? It doesn’t sound good that USACE recommends reducing a Factor of Safety.

R-34. The RMC report states “Based on the preliminary results from the evaluation, the RMC and MVN are recommending the following site-adaptations of the HSDRRS criteria be considered for the Morganza to the Gulf alternatives:”. We expanded on the RMC information in its own section in the report (Sec 5.2) on pages 9-10.

C-35. Is there any way to cite or reference this report? Was it published? If not, consider including it as an appendix? I haven't seen it; did it actually "endorse" the changes or just show the results of the changes?

R-35. The report cite is listed in the references on page 4. Sec 2.h. See also R-34 above.

C-36. Please clarify somehow whether this range includes the \$3.2B or is in addition to it.

R-36. The TPC range of \$5.5-6B is not in addition to the \$3.2B estimate. Clarification has been added under the table “Please note that the 2085 TPC in the table above is not in addition to the 2035 estimate. The estimated TPC to construct to 2085 from existing conditions is estimated to be a range of \$5.5B-\$6B.”

C-37. There seems to be a difference between this plan and the perspective given in the 3rd paragraph of Appendix E. There, it makes it seem as if they expect the federal government to do the work in phases. Here, we are shooting for 2035 and the NFS is responsible for the other \$6.0B. There is a question of expectations.

R-37. This option was discussed with the NFS/stakeholders in our collaboration meetings and they have also recently submitted a letter of support/intent, which is now included in the report in Appendix E.

C-38. Here would be a spot to clarify with either:  
"..., in addition to the \$3.2B" or "..., where this TPC includes the cost of meeting the 2035 criteria."

R-38. Clarification has been added. See R-36 above.

C-39. I'm not familiar with this term predominate for levee increases, so I wonder if it should be predominant?

R-39. A Google of the word predominate returns, "verb -be the strongest or main element; be greater in number or amount." A Google of the word predominant returns "adjective - present as the strongest or main element." Definitions are nearly identical with one a verb and one an adjective. As we did not change this in the final report submitted to MVD, will request MVD to change the word before it is submitted to HQ to go along with the adjective spelling of "predominant".

C-40. It needs to be clearer whether this amount includes the \$3.2B or is in addition to it.

R-40. Clarification added (see R-36 above).

C-41. 7.07 for consistency with previous page

R-41. The typo has been corrected to \$7.07

C-42. This legend is odd. I don't see any orange or dark blue lines/arrows/circle labels. The green arrow says "HNC Lock Complex". Is that right? It looks like there are two types of yellow/light green boxes. I don't see an explanation for the gray boxes. If a callout does not have an outline color, what does that mean?

R-42. This is not a legend, just a summary of information we have used in the past on a large-scale map. The box below it is the legend as so labeled. Will include something to explain the grey color and will also remove the summary as it is confusing on a small map. Will revise the map and request MVD to change it out before it is submitted to HQ.

C-43. I think you need to add a gray circle icon to this list.

R-43. Concur, legend will be corrected. See R-42 above.

C-44. I think this should just be cfs per ft, not cfs/s.

R-44. Concur, will be corrected. As we did not change this in the final report submitted to MVD, will request MVD to change out the pages before it is submitted to HQ.

C-45. Is this written by MVN? Unsure who the "We" is.  
At a minimum, maybe at the top you can add a parenthesis "(A summary written by xx)"? Or can there

be a signature block at the end so that it looks more like a letter?

R-45. This was written by the local stakeholders. We have moved it into Appendix F, put it in quotes, and started it with "Following is a local stakeholder historical perspective of how we began the new push of finding a path forward on the Morganza to the Gulf Project."

C-46. This paragraph implies that the 2035 design is Phase 1, and that they expect the federal government to perform future phases.

R-46. See R-37 above.

C-47. Not sure whether to suggest editorial comments here, but the "and" is not needed.

R-47. This perspective was provided by the local stakeholders and quoted as submitted.

-----Original Message-----

From: Chewning, Daniel B (Brian) CIV USARMY CEMVD (US)  
Sent: Monday, April 15, 2019 10:36 AM  
To: Bodron, James A SES USARMY HQDA OCE (USA) <James.A.Bodron@usace.army.mil>; Robinson, Charles L (Lee) JR CIV CEMVD CEMVD (USA) <Lee.Robinson@usace.army.mil>  
Cc: Turner, Renee N CIV USARMY CEMVD (US) <Renee.N.Turner@usace.army.mil>; LeBlanc, Julie Zitzmann CIV USARMY CEMVD (USA) <Julie.Z.LebLANC@usace.army.mil>; Harris, Nicole M CIV USARMY CEMVD (US) <Nicole.M.Harris@usace.army.mil>; Young, Gary L CIV USARMY CEMVD (USA) <Gary.L.Young@usace.army.mil>  
Subject: FW: M2G Net Benefit Revisions

Jim,

As discussed see attached, numbers are encouraging but need Lee to provide his assessment. Again, this information will not be included in the ACA Report that we expect to be delivered tomorrow but can be provided as supplemental information that MR. Dalton specifically requested.

Bottom Line:

2.875% (FY19) @ \$6.0B = 4.97 BCR  
7% @ \$6.0B = 2.95 BCR

3.5% (FY13) @ \$10.5B = 1.54 BCR  
7% @ \$10.5B = 0.70 BCR

-----Original Message-----

From: Wingate, Mark R CIV USARMY CEMVN (USA)  
Sent: Sunday, April 14, 2019 6:36 PM  
To: Chewning, Daniel B (Brian) CIV USARMY CEMVD (US) <Brian.Chewning@usace.army.mil>  
Cc: Burdine, Carol S CIV USARMY CEMVN (US) <Carol.S.Burdine@usace.army.mil>; Elzey, Durund F CIV USARMY CEMVN (US) <Durund.Elzey@usace.army.mil>  
Subject: FW: M2G Net Benefit Revisions

Brian,

As you and I discussed late last week, please see the B/C ratio update on subject matter. This should answer Mr. Dalton's question WRT changes to the B/C as a result of a reduced project cost from 10.3B to 5.5 to 6.0B. Note this analysis was completed for a NEW TPC of 6.0B.

Also, I do not intend to incorporate this language into the ACAR but rather it is provided separately under this email.

Also, we anticipate sending you the latest ACAR on Tuesday of this week. Carol has lead on this and is completing final touches and will submit over COL Clancy's signature.

Thanks  
mark

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Mark Wingate, P.E.  
Deputy District Engineer for Programs and Project Management Executive Office New Orleans District United States  
Army Corps of Engineers

504-862-2204 (w)  
504-858-8122 (c)



Updated to Oct. 2018 (FY19) price and interest rates

**1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ALTERNATIVE**  
**(2019 PRICE LEVEL, 2.875 % INTEREST RATE)**  
**(\$ Millions)**

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)	Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	Results FY19
<b>Damage Category</b>						
Residential & Commercial - Structure/Content/Vehicles	875.2	130.4	744.8	191.9	936.7	
Industrial - Structure/Contents	17.6	1.3	16.2	4.4	20.6	
Highways	7.0	2.4	4.5	1.3	5.8	
Streets	16.7	2.4	14.3	3.5	17.8	
Debris Removal & Cleanup	26.8	4.1	22.7	6.1	28.8	
Water Supply	0.1	0.1	0.1	0.1	0.2	
Boats	0.0	0.0	0.0	0.0	0.0	
<b>Sub-Total</b>	<b>943</b>	<b>141</b>	<b>803</b>	<b>207</b>	<b>1,010</b>	
<b>Avoided Structure Raising Costs</b>	<b>5.1</b>	<b>-</b>	<b>5.1</b>	<b>4.3</b>	<b>9.4</b>	
	<b>949</b>	<b>141</b>	<b>808</b>	<b>212</b>	<b>1,019</b>	
<b>Total Equivalent Annual Benefits (converted from 2013 to 2019 price level using RS Means)</b>						<b>1,118</b>
<b>First Costs</b>						<b>6,000</b>
<b>Annual Operation &amp; Maintenance Costs</b>						<b>7.6</b>
<b>Total Annual Costs</b>						<b>225</b>
<b>B/C Ratio</b>						<b>4.97</b>
<b>Equivalent Annual Net Benefits - Base Year 2035</b>						<b>893</b>

Updated to Oct. 2018 (FY19) price and interest rates

**1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ALTERNATIVE**  
**(2019 PRICE LEVEL, 7% INTEREST RATE)**  
**(\$ Millions)**

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)
<b>Damage Category</b>			
Residential & Commercial - Structure/Content/Vehicles	807.8	125.8	682.0
Industrial - Structure/Contents	16.3	1.3	15.0
Highways	6.5	2.3	4.2
Streets	15.0	2.3	12.7
Debris Removal & Cleanup	24.9	4.0	21.0
Water Supply	0.1	0.1	0.1
Boats	0.0	0.0	0.0
<b>Sub-Total</b>	<b>871</b>	<b>136</b>	<b>735</b>
<b>Avoided Structure Raising Costs</b>	<b>5.3</b>	<b>-</b>	<b>5.3</b>
	<b>876</b>	<b>136</b>	<b>740</b>
<b>Total Equivalent Annual Benefits (converted from 2013 to 2019 price level using RS Means)</b>			
<b>First Costs</b>			
<b>Annual Operation &amp; Maintenance Costs</b>			
<b>Total Annual Costs</b>			
<b>B/C Ratio</b>			
<b>Equivalent Annual Net Benefits - Base Year 2035</b>			

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<b>Equiv Annual Benefits During Construction (2024-2034)</b>		<b>Total Equiv Annual Benefits</b>	
454.4	1,136.4		
10.4	25.3		
3.0	7.2		
8.4	21.1		
14.4	35.4		
0.3	0.4		
0.0	0.0		
<b>491</b>	<b>1,226</b>		
<b>10.1</b>	<b>15.4</b>		
<b>501</b>	<b>1,241</b>		
		<b>1,361</b>	
		<b>6,000</b>	
		<b>7.6</b>	
		<b>462</b>	
		<b>2.95</b>	
		<b>899</b>	

**1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ALTERNATIVE**  
**(2013 PRICE LEVEL, 3.5% INTEREST RATE)**  
**(\$ Millions)**

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)	Equiv Annual Benefits During Construction (2024-2034)	Total Equiv Annual Benefits	Results FY19
<b>Damage Category</b>						
Residential & Commercial - Structure/Content/Vehicles	863.1	129.5	733.6	222.6	956.2	
Industrial - Structure/Contents	17.3	1.3	16.0	5.1	21.1	
Highways	6.9	2.4	4.5	1.5	5.9	
Streets	16.4	2.4	14.0	4.1	18.1	
Debris Removal & Cleanup	26.5	4.1	22.4	7.1	29.4	
Water Supply	0.1	0.1	0.1	0.1	0.2	
Boats	0.0	0.0	0.0	0.0	0.0	
<b>Sub-Total</b>	<b>930</b>	<b>140</b>	<b>791</b>	<b>240</b>	<b>1,031</b>	
<b>Avoided Structure Raising Costs</b>	<b>5.2</b>	<b>-</b>	<b>5.2</b>	<b>5.6</b>	<b>10.7</b>	
	<b>936</b>	<b>140</b>	<b>796</b>	<b>246</b>	<b>1,042</b>	
<b>Total Equivalent Annual Benefits</b>						<b>1,042</b>
<b>First Costs</b>						<b>10,458</b>
<b>Annual Operation &amp; Maintenance Costs</b>						<b>7.6</b>
<b>Total Annual Costs</b>						<b>678</b>
<b>B/C Ratio</b>						<b>1.54</b>
<b>Equivalent Annual Net Benefits - Base Year 2035</b>						<b>364</b>

**1 PERCENT ANNUAL EXCEEDANCE PROBABILITY ALTERNATIVE**  
**(2013 PRICE LEVEL, 7% INTEREST RATE)**  
**(\$ Millions)**

Item	Equiv Annual W/O Project Damages (2035-2084)	Equiv Annual With Project Damages (2035-2084)	Equiv Annual Benefits (2035-2084)
<b>Damage Category</b>			
<b>Residential &amp; Commercial - Structure/Content/Vehicles</b>	807.8	125.8	682.0
<b>Industrial - Structure/Contents</b>	16.3	1.3	15.0
<b>Highways</b>	6.5	2.3	4.2
<b>Streets</b>	15.0	2.3	12.7
<b>Debris Removal &amp; Cleanup</b>	24.9	4.0	21.0
<b>Water Supply</b>	0.1	0.1	0.1
<b>Boats</b>	0.0	0.0	0.0
<b>Sub-Total</b>	<b>871</b>	<b>136</b>	<b>735</b>
<b>Avoided Structure Raising Costs</b>	<b>5.3</b>	<b>-</b>	<b>5.3</b>
	<b>876</b>	<b>136</b>	<b>740</b>
<b>Total Equivalent Annual Benefits</b>			
<b>First Costs</b>			
<b>Annual Operation &amp; Maintenance Costs</b>			
<b>Total Annual Costs</b>			
<b>B/C Ratio</b>			
<b>Equivalent Annual Net Benefits - Base Year 2035</b>			

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<b>Equiv Annual Benefits During Construction (2024-2034)</b>		<b>Total Equiv Annual Benefits</b>	
454.4	1,136.4		
10.4	25.3		
3.0	7.2		
8.4	21.1		
14.4	35.4		
0.3	0.4		
0.0	0.0		
<b>491</b>	<b>1,226</b>		
<b>10.1</b>	<b>15.4</b>		
<b>501</b>	<b>1,241</b>		
		<b>1,241</b>	
		<b>10,458</b>	
		<b>7.6</b>	
		<b>1,780</b>	
		<b>0.70</b>	
		<b>(538)</b>	

Engineering Documentation Report (EDR), Morganza to the Gulf of Mexico, LA (MTG)

Hurricane and Storm Damage Risk Reduction

100% Review

DQC Certification of EDR for the MTG Project

The District Quality Control (DQC) has been completed for the subject report. Open comment period began on 29 October 2021 and concluded on 26 November 2021.

The DQC was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-217, 1 May 2021. The following DQC team members met the discipline requirements in the Review Plan.

<b>DQC Team Member</b>	<b>Discipline</b>	<b>Organization</b>
Lesley Prochaska	Plan Formulation & Policy	CEMVN
Ben Logan	Economics	CEMVN
Ralph Scheid	Civil Design	CEMVN

During the DQC, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the needs consistent with law and existing US Army Corps of Engineers policy.

A total of 12 DQC comments were recorded, resolved, and closed in DrChecks. There was one critical comment flagged, but it was resolved by the PDT and closed by the reviewer.

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Brandon Davis, DQC Lead  
Section Chief, Quality Control Branch  
CEMVN-PDQ

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Lacy Shaw Pfaff  
Project Manager  
CEMVN-PM-O



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Leslie Nuccio  
Engineering Deputy Chief  
CEMVK-ED-Q

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Shawn Vicknair  
Deputy Chief, Regional Planning &  
Environment Division South  
CEMVN-PDQ

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## Controlled Unclassified Information (CUI) Only

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Comment Report: All Comments

Project: Mo to the Gulf EDR Oct 2021

Review: Mo to the Gulf EDR 2021

Displaying 12 comments for the criteria specified in this report.

<b>Id</b>	<b>Discipline</b>	<b>Section/Figure</b>	<b>Page Number</b>	<b>Line Number</b>
9479530	Economics	n/a	n/a	n/a

Comment Classification: **Controlled Unclassified Information (CUI)**

The economics results shown in the EDR do accurately reflect the most recent iteration of the results presented in the economics appendix.

Submitted By: [John Logan](#) (504-862-1910). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

The EDR will be updated to FY 2022 Price Levels, once analysis is complete.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [John Logan](#) (504-862-1910) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

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9479543	Economics	n/a	n/a	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Although the economics results shown are accurate, at this point in the study, they are dated. The costs, damages, and benefits should be escalated to the FY22 price level, and the results should be recalculated using the FY22 discount rate.

Submitted By: [John Logan](#) (504-862-1910). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

The Economic Models are currently being updated and the final version will reflect FY 2022 Price levels.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [John Logan](#) (504-862-1910) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

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9479702	Planning - Plan Formulation	2	4	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E, E-4, Section 2 on Pertinent Data does currently meet the following: "tabular summary of essential data on the project cost, benefit-to-cost ratio, physical features, project purpose, and controlling elevations (e.g., for design flood, real estate acquisition, relocations, etc.) shall be provided." Suggest deleting sections 2.1 and 2. and replacing with guidance requested table.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

Will remove the current section 2.1 and replace with table of "Pertinent Data". The information that is requested to be in tabular summary is contained within the EDR. The information (project cost, benefit-to-cost ratio, physical features, project purpose) that is fairly straight-forward will be listed in the table and the controlling elevation, which is different per reach, so isn't appropriate for table format will be referenced per section.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

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9479704	Planning - Plan Formulation	3	5	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E, E-5, the status of the project authorization: Explain the need for an EDR...  
Suggest pull info from Introduction and or Section 7.1 into Section 3 to meet the ER intent.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

Added the following to Section 3: The need for this EDR is to document the refinements, that include inclusion of the adaptive design criteria, to the MTG Project that make up the current design (see Section 7 for more information). In addition, the EDR is needed to incorporate the increased NFSs construction cost share, as proposed by the NFSs, to limit Federal participation to initial construction, as defined in this report (see Section 10).

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

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9479706	Planning - Plan Formulation	5	6	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150, Appendix E-7, State whether or not the reconnaissance and feasibility phases of project development were managed under the project management policy. If not, state character and extent of previous surveys and studies made in connection with the feasibility document, cite the document number (if applicable), and treat any other pertinent prior investigations similarly. State briefly the character and extent of surveys, studies (including re-evaluation studies) and other planning completed subsequent to initiation of PED, including the results of public meetings held.

Suggest adding statement as referenced in the above ER and moving report history from Section 2 to Section 5. Include a robust project history table, including the 2002 and 2003 Feasibility Study Reports and pertinent documents and actions that are applicable to this decision document.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

Added to Section 5: 'Per ER 1110-2-1150, Appendix E-7, that directs "State whether or not the reconnaissance and feasibility phases of project development were managed under the project management policy." The MTG Project studies listed following in chronological order, along with pertinent actions, were managed under the project management policy.' Also added the Recon and Feas. studies to Table 5-1

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

**1-1 Backcheck Recommendation Open Comment**

I suggest not quoting the regs verbatim and instead confirm whether or not they were "managed under the project management policy"

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

**2-0 Evaluation Concurred**

Removed first sentence of the addition so Section 5 reads: he MTG Project studies listed following in chronological order, along with pertinent actions, were managed under the project management policy.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 26 2021

## 2-1 Backcheck Recommendation Close Comment

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

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9479715	Planning - Plan Formulation	7.2	10	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150 of : E-10. Current Engineering Studies, Investigations, and Design: ensure that the information in Section 7 presents In lieu of duplication, reference shall be freely made to the engineering appendix for items, which have not changed subsequent to its preparation.

Please review Section 7.2 and suggest changing to a new Section named: Project Changes to match guidance in ER. Suggest review of text to confirm it presents only changes and refers to appendices as needed in lieu of duplication.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

### 1-0 Evaluation Concurred

Changed 7.2 to be "Current Design and Changes" Reviewed Section 7.2 per E-10. There is mention of items in the design that have not changed but are important to include to mention to explain why it didn't change or needed to characterize a system.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 22 2021

### 1-1 Backcheck Recommendation Close Comment

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

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9479716	Planning - Plan Formulation	9.3	22	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Project Risk is not typically covered in a EDR main text per ER 1110-2-1150. Please provide an introduction to why risk is being presented and differences from previous decision documents.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

### 1-0 Evaluation Concurred

The goal of the EDR was to capture all of the changes in all aspects of the project since the PACR. Added the sentence ". This section discusses the changes in risk from the PACR."

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

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9479719	Planning - Plan Formulation	11	28	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Per ER 1110-2-1150 Appendix E Section E-14: The views and comments of other interested Federal, State and local agencies will be obtained as they relate to their specific areas of responsibilities. The document will also include the views and comments of the non-Federal sponsor.

Suggested Resolution: Add the the views of coordinating agencies and NFS on the approach USACE is taking on the Environmental Documentation being deferred.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454). Submitted On: Nov 03 2021

**1-0 Evaluation Concurred**

Added/ updated the following in Section 11 "Therefore, the project team has initiated a SEIS that can progress with more available funding. Once more funding is available and the SEIS initiated, the SEIS is estimated to take 2 years to complete. Initial coordination and feedback from agencies have occurred." The NFS is providing an LOI that will support the EDR.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [Lesley Prochaska](#) ((504) 862-1454) Submitted On: Nov 26 2021

Current Comment Status: **Comment Closed**

---

9480600	Civil	n/a	4	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

[**Critical/Flagged.**]

Showing epoch of 2004.65. but 209.55 is the most current epoch. NGS is working on a new epoch that would be 2017.xx. Publication date is uncertain.

Comment put in for R. Scheid

Submitted By: [Brandon Davis](#) (601-631-5961). Submitted On: Nov 04 2021

**1-0 Evaluation Concurred**

Showing the epoch that was used for the hydraulic design. A more up-to-date topo survey will be used for the designs of the individual features in the future.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

This response is sufficient in the context of the EDR. However, for MTOG Project design a project datum and epoch must be established. This project datum and epoch will fix all MTOG design and modeling efforts into a current datum that integrates into the National Spatial Reference System (NSRS).

Submitted By: [Ralph Scheid](#) (504-862-2995) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

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9480604	Civil	n/a	4	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

Prior to design, there will need to be a Datum Policy Memo, establishing the datum/epoch for MTOG. Does this document and policy requirements need to be addressed in this EDR?

Comments put in for R. Scheid.

Submitted By: [Brandon Davis](#) (601-631-5961). Submitted On: Nov 04 2021

**1-0 Evaluation Concurred**

No. The review of the datum for MTG will be reviewed before detailed design of the features of the project (pending funding).

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

Closed without comment.

Submitted By: [Ralph Scheid](#) (504-862-2995) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

---

9480617	Real Estate	n/a	15	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

LERRDs needs a better definition at first use.

CFR Title 33 CFR § 203.82, defines LERRDs and could be referenced.

Comment by R. Scheid

Submitted By: [Brandon Davis](#) (601-631-5961). Submitted On: Nov 04 2021



**1-0 Evaluation Concurred**

LERRD is defined in 7.2.4 for its first use.

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

Submitted By: [Ralph Scheid](#) (504-862-2995) Submitted On: Nov 23 2021

Current Comment Status: **Comment Closed**

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9480625	Project Management	7.2.4.3 Future Borrow	16	n/a
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Comment Classification: **Controlled Unclassified Information (CUI)**

"A temporary work area easement (for borrow) will be acquired over these areas, from an estimated 325 landowners."

Not clear this this statement "for borrow" means. Please clarify.

Comment by R. Scheid

Submitted By: [Brandon Davis](#) (601-631-5961). Submitted On: Nov 04 2021

**1-0 Evaluation Concurred**

Changed areas to "potential borrow pits".

Submitted By: [Lacy Pfaff](#) ((504) 862-1200) Submitted On: Nov 23 2021

**1-1 Backcheck Recommendation Close Comment**

Submitted By: [Brandon Davis](#) (601-631-5961) Submitted On: Nov 29 2021

Current Comment Status: **Comment Closed**

---

Controlled Unclassified Information (CUI) Only  
Patent 11/892,984 [ProjNet](#) property of ERDC since 2004.

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**From:** [Vicknair, Shawn Michael CIV USARMY CEMVN \(USA\)](#)  
**To:** [Kinsey, Mary V CIV USARMY CEMVN \(USA\)](#); [Burdine, Carol S CIV USARMY CEMVN \(USA\)](#); [Axtman, Timothy J CIV USARMY CEMVN \(USA\)](#)  
**Cc:** [Pfaff, Lacy Shaw CIV USARMY CEMVN \(USA\)](#); [Davis, Brandon L CIV USARMY USACE \(USA\)](#)  
**Subject:** RE: MTG EDR, DQC, MVN OC Comments  
**Date:** Friday, December 3, 2021 4:18:20 PM

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Mary,

Let me clarify, the comments you provided help clarify the language in the EDR. I misstated that the comments are not a concern to the DQC team. They are, in fact, a concern to the team. What I am suggesting is that the changes based on your comments do not negate or counter the DQC review or policy compliance. I am comfortable with your comments and applicable rewrites in regards to the DQC. The DQC is still valid and the rewrites do not alter policy compliance for the document. The DQC Cert is still valid.

I hope that helps.

Please let me know if we need to discuss further.

Shawn Vicknair  
Deputy Chief, Regional Planning and Environment Division, South  
504-862-2024 (w)  
504-615-6406 (c)  
[Shawn.M.Vicknair@usace.army.mil](mailto:Shawn.M.Vicknair@usace.army.mil)

---

**From:** Kinsey, Mary V CIV USARMY CEMVN (USA) <[Mary.V.Kinsey@usace.army.mil](mailto:Mary.V.Kinsey@usace.army.mil)>  
**Sent:** Friday, December 3, 2021 3:27 PM  
**To:** Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <[Shawn.M.Vicknair@usace.army.mil](mailto:Shawn.M.Vicknair@usace.army.mil)>;  
Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>; Axtman, Timothy J CIV USARMY CEMVN (USA) <[Timothy.J.Axtman@usace.army.mil](mailto:Timothy.J.Axtman@usace.army.mil)>  
**Cc:** Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <[Lacy.S.Pfaff@usace.army.mil](mailto:Lacy.S.Pfaff@usace.army.mil)>; Davis, Brandon L CIV USARMY USACE (USA) <[Brandon.L.Davis@usace.army.mil](mailto:Brandon.L.Davis@usace.army.mil)>  
**Subject:** RE: MTG EDR, DQC, MVN OC Comments

Shawn, Thank you for your response. Counsel doesn't concur in all of your responses.

A description of cost share obligations of the NFS is required to be in any decision document. That is a requirement in all decision documents and is not merely a concern of the PPA. The PPA draws its description of the cost share obligations of the NFS from the Congressional authorization but also from the decision document. In this case one of those decision documents is this EDR. For this EDR the cost share obligations of the NFS are described in Sec 10 of EDR. In kind work and the availability of credits is also a matter of law and policy (Sec 221 of the 1970 FCA, as amended most recently by

Sec 1018 of WRRDA 2014 and by ER 1165-2-208. Those issues are addressed in the NFS obligations as well. Since the DQC is looking at the EDR for matters of compliance with regulations and policy; how is it not their concern to assure that these issues are policy compliant as laid out in the EDR?

Sill depth of the HNC Lock was addressed in the 2013 PACR and is required to be addressed in the EDR as to the appropriateness of that increased sill depth to be chargeable as a credit against the MTG project. Again, a matter of law and policy compliance that Counsel would think is subject to the DQC review.

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**From:** Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <[Shawn.M.Vicknair@usace.army.mil](mailto:Shawn.M.Vicknair@usace.army.mil)>  
**Sent:** Friday, December 03, 2021 3:03 PM  
**To:** Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>; Axtman, Timothy J CIV USARMY CEMVN (USA) <[Timothy.J.Axtman@usace.army.mil](mailto:Timothy.J.Axtman@usace.army.mil)>  
**Cc:** Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <[Lacy.S.Pfaff@usace.army.mil](mailto:Lacy.S.Pfaff@usace.army.mil)>; Kinsey, Mary V CIV USARMY CEMVN (USA) <[Mary.V.Kinsey@usace.army.mil](mailto:Mary.V.Kinsey@usace.army.mil)>; Davis, Brandon L CIV USARMY USACE (USA) <[Brandon.L.Davis@usace.army.mil](mailto:Brandon.L.Davis@usace.army.mil)>  
**Subject:** RE: MTG EDR, DQC, MVN OC Comments

Carol/Mary,

I have reviewed Mary's comments below. I do not have any concerns with Mary's comments with respect to DQC. Brandon was the DQC Lead and I am his direct supervisor. Additionally, the ED Deputy Chief and I are the senior signatures on all DQC efforts led by RPEDS. All DQC comments were closed and attached to the DQC Certificate Brandon and I signed.

Comment 1 is not a concern as the EDR addresses the MTG Project. That is what we are conducting quality control review. The revision states that MTG is not responsible for depth beyond 18 feet. That is a costs share/allocation concern and should be addressed in the PPA. That clarification is no issue for DQC of the MTG EDR.

Comment 2 is not a concern for DQC because as Lacy stated, the Economic evaluation was for MTG not to include costs for the Houma Nav Sill depth beyond 18 feet. The latest changes were to update to FY22 price levels. No issue from DQC of the MTG EDR.

Comment 3 is fine. Your added language is of no concern from a DQC perspective. Brandon briefed the DQC team prior to review and all understood this was the premise of this document. No issue from DQC.

Brandon and the DQC team have reviewed the EDR from policy perspective and to ensure technical quality. Based on below concerns, I am comfortable that the DQC cert still stands as is and no further action from the team is needed.

Please let me know if there are further questions.

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504-615-6406 (c)  
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---

**From:** Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>  
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**To:** Vicknair, Shawn Michael CIV USARMY CEMVN (USA) <[Shawn.M.Vicknair@usace.army.mil](mailto:Shawn.M.Vicknair@usace.army.mil)>; Axtman, Timothy J CIV USARMY CEMVN (USA) <[Timothy.J.Axtman@usace.army.mil](mailto:Timothy.J.Axtman@usace.army.mil)>  
**Cc:** Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <[Lacy.S.Pfaff@usace.army.mil](mailto:Lacy.S.Pfaff@usace.army.mil)>  
**Subject:** FW: MTG EDR, DQC, MVN OC Comments

Shawn and Tim, thanks for the phone call. Below are OC's recent comments on the EDR and the PM responses – please see the email chain below. Also attached are OC's comments in track changes for the EDR. We need to have the DQC review and confirm that the DQC review remains the same based on these changes and to document that in an email.

Thanks, Carol

---

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---

**From:** Kinsey, Mary V CIV USARMY CEMVN (USA) <[Mary.V.Kinsey@usace.army.mil](mailto:Mary.V.Kinsey@usace.army.mil)>  
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**To:** Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <[Lacy.S.Pfaff@usace.army.mil](mailto:Lacy.S.Pfaff@usace.army.mil)>; Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>

**Cc:** Roth, Stephan C CIV USARMY CEMVN (USA) <[Stephan.C.Roth@usace.army.mil](mailto:Stephan.C.Roth@usace.army.mil)>

**Subject:** RE: MTG EDR, DQC, MVN OC Comments

Lacy and Carol,

In response to Lacy's responses regarding Counsel concerns about the DQC responses relative to the most recent iteration of the EDR following intensive engagement with HQ, I would offer the following:

I don't concur with Lacy's statement that a DQC reviewer would not know whether to question an issue or not. The question for the DQC is the quality of the report itself and its compliance with policy. If the DQC was not updated by PM with regard to the HQ guidance issued in response to the NFS deviation requests, then that lack of knowledge of the DQC members necessarily impacts the quality of the report itself and its compliance with policy. The example of the HNC Sill depth does bear on the reports quality and policy compliance and in addition it's eligibility for credit and the appropriateness of that credit allocation to Morganza is a matter of compliance with the project statutory authority as well as a matter of policy and regulation.

It doesn't matter whether a reviewer would know to question an issue or not; as Lacy, herself mentioned, the question is the quality of the report itself and compliance to policy.

There is an comment that is still marked as "open comment" in the DQC. Was it closed and if so, how was it closed?

Based on Lacy's interlineated responses to Counsel comments, I offer the following:

1. Based on the date of the DQC closeouts, was the DQC updated as project issues raised by the NFS deviation requests were discussed and responded to by HQ?

Lacy's Response: An example of compelling issue that has been added to the EDR is the HNC sill depth and it would not have had a bearing on the quality of the report. Likewise with the other changes.

Counsel reply: As I indicated above, Counsel doesn't agree that these deviation request issues are not relevant to statutory and policy compliance and the quality of the report, nor that these issues were beyond the ambit of the DQC review.

2. Was the DQC, with regard to the economic analysis, updated on the revisions that were made to the Economic Update and provided to MVD this week? I ask because the EDR Economic Analysis was substantially based on the content of the draft Economic Update that was in place at that time. It was understood, that since the Economic Update was being concurrently reviewed with preparation and review of the EDR, that the EDR might require changes in accordance with any changes to the Economic Update during its review. Likewise, discussions with HQ regarding deviation and resolution of those issues, may have impacted statements and information in the Economic Update. Did PM ensure that the Economic Update and EDR are consistent?

Lacy's Response: The changes to the Econnomic (sic) update was to mainly update to FY22 price

levels. The details that have caused changes to the EDR, such as the Houma Nav Sill would be non-consequential to the Economic Update as it was not included in those costs. Cost share is not discussed in the Economic Update.

Counsel Reply: I do not have a copy of the revised Economic Update and cannot assess if this is accurate. Please check with Economics and confirm that Lacy's response is correct.

3. With regard to your change to Section 3, regarding the purpose of the EDR, the verbiage that you inserted in the EDR and in your response to the DQC was not complete. Another primary reason for the EDR is that the revisions proposed to the 2013 PACR recommendation, per the ACAR, etc. had to be addressed in a decision document (the EDR) as the supporting decision document for the PPA (See Article I.A. of the draft PPA). I have inserted language into Section 3 to address this additional purpose for the EDR. You have already closed this comment in the DQC. I'm not sure of the DQC requirement to notify the DQC of that addition to Section 3.

Lacy's Response: The comment from the DQC reviewer was to add a reason for the EDR. The DQC reviewer was satisfied with the answer before so we are providing further clarification that would not be in the purview for a quality check.

Counsel Reply: Not sure this is accurate. The need for a supporting decision document in the PPA was a primary reason for the EDR. Policy and the model PPAs require that Article I.A. of the model PPA (the project description and scope of the PPA) must include a reference to the decision documents that serve as the basis for the provisions and obligations of the PPA. HQ in drafting the PPA made the formation of an EDR a requirement for the PPA in accordance with that policy and regulation. Please re-assess your response and confirm that your response does not need amendment.

I am going to dash out for lunch in just a few minutes. I'll let both of you know as soon as I return. I'm happy to discuss further when I return.

Mary

Mary V. Kinsey  
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**Sent:** Friday, December 03, 2021 11:33 AM  
**To:** Kinsey, Mary V CIV USARMY CEMVN (USA) <[Mary.V.Kinsey@usace.army.mil](mailto:Mary.V.Kinsey@usace.army.mil)>; Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>  
**Cc:** Roth, Stephan C CIV USARMY CEMVN (USA) <[Stephan.C.Roth@usace.army.mil](mailto:Stephan.C.Roth@usace.army.mil)>  
**Subject:** RE: MTG EDR, DQC, MVN OC Comments



Mary,

A reminder that a District Quality Control review speaks more to the quality of the report itself and compliance to policy, not the details of the project related content which, by design, the reviewer would not know to question. Therefore, I don't think any of the points brought up below require a re-opening of the DQC. I have responses below.

Lacy Shaw Pfaff, P.E.  
Project Manager  
New Orleans District, USACE  
Office: 504-862-1200  
Cell: 904-327-3197

---

**From:** Kinsey, Mary V CIV USARMY CEMVN (USA) <[Mary.V.Kinsey@usace.army.mil](mailto:Mary.V.Kinsey@usace.army.mil)>  
**Sent:** Friday, December 3, 2021 11:07 AM  
**To:** Pfaff, Lacy Shaw CIV USARMY CEMVN (USA) <[Lacy.S.Pfaff@usace.army.mil](mailto:Lacy.S.Pfaff@usace.army.mil)>; Burdine, Carol S CIV USARMY CEMVN (USA) <[Carol.S.Burdine@usace.army.mil](mailto:Carol.S.Burdine@usace.army.mil)>  
**Cc:** Roth, Stephan C CIV USARMY CEMVN (USA) <[Stephan.C.Roth@usace.army.mil](mailto:Stephan.C.Roth@usace.army.mil)>  
**Subject:** MTG EDR, DQC, MVN OC Comments

I note that some of your responses to the DQC are impacted by my review of the EDR, particularly where your response to the DQC included a quote of the language that you proposed to insert into the EDR in response to the DQC comments. Since the DQC comments have all been closed out, I don't know your process for advising them that I have recommended changes to the verbiage placed before them. I've tried to point those out to you in my below comment.

Otherwise, my comments are as follows:

Based on the date of the DQC closeouts, was the DQC updated as project issues raised by the NFS deviation requests were discussed and responded to by HQ?

Response: An example of compelling issue that has been added to the EDR is the HNC sill depth and it would not have had a bearing on the quality of the report. Likewise with the other changes.

Was the DQC, with regard to the economic analysis, updated on the revisions that were made to the Economic Update and provided to MVD this week? I ask because the EDR Economic Analysis was substantially based on the content of the draft Economic Update that was in place at that time. It was understood, that since the Economic Update was being concurrently reviewed with preparation and review of the EDR, that the EDR might require changes in accordance with any changes to the Economic Update during its review. Likewise, discussions with HQ regarding deviation and resolution of those issues, may have impacted statements and information in the Economic Update. Did PM ensure that the Economic Update and EDR are consistent?

Response: The changes to the Economic update was to mainly update to FY22 price levels. The details that have caused changes to the EDR, such as the Houma Nav Sill would be non-

consequential to the Economic Update as it was not included in those costs. Cost share is not discussed in the Economic Update.

With regard to your change to Section 3, regarding the purpose of the EDR, the verbiage that you inserted in the EDR and in your response to the DQC was not complete. Another primary reason for the EDR is that the revisions proposed to the 2013 PACR recommendation, per the ACAR, etc. had to be addressed in a decision document (the EDR) as the supporting decision document for the PPA (See Article I.A. of the draft PPA). I have inserted language into Section 3 to address this additional purpose for the EDR. You have already closed this comment in the DQC. I'm not sure of the DQC requirement to notify the DQC of that addition to Section 3.

Response: The comment from the DQC reviewer was to add a reason for the EDR. The DQC reviewer was satisfied with the answer before so we are providing further clarification that would not be in the purview for a quality check.

The DQC comment requiring the inclusion in the EDR of a "robust project table" stipulated that the table needed to include reference to both the 2002 and 2003 Chief's Reports. The EDR table, in the Dec 2 EDR draft did not do that. My comments noted this and stated that both the 2002 and 2003 Chief's reports needed to be cited. I note that the DQC comment referenced Feasibility Reports. Based on the context, I think they intended reference to the Chief's Reports, which incorporate the decision document by reference and serve as the basis of the Congressional authorization of the project in 2007.

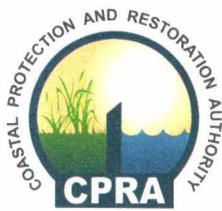
Response: Ok, can add.

With regard to the change in Section 11 regarding the SEIS, your response to the DQC that is the basis of closing the DQC comment is not quite accurate. As I pointed out in my comments on the EDR, you state that the SEIS has been funded and has been initiated, and then in a following sentence state "when the SEIS is initiated" My comment suggested that this sentence needs to be consistent with the earlier statement that the SEIS has already been initiated.

Response: Concur

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# State of Louisiana

JOHN BEL EDWARDS  
GOVERNOR

November 17, 2021

Mr. Mark Wingate  
U.S. Army Corps of Engineers  
New Orleans District  
7400 Leake Avenue  
New Orleans, LA 70118

RE: Letter of Intent - Engineering and Design Report  
Morganza to the Gulf Hurricane and Storm Damage  
Reduction Project

Dear Mr. Wingate:

The State of Louisiana acting by and through the Coastal Protection and Restoration Authority Board of Louisiana (CPRA Board) has reviewed the draft Engineering Documentation Report (EDR) for the Morganza to the Gulf (MTG), Louisiana, Project. The EDR recommends approval of the current design based on the April 2019 Adaptive Criteria Assessment Report (ACAR), inclusive of the recommended reduction in the Federal Total Project Cost (TPC) for construction and current design standards. The CPRA Board requests that the United States Army Corps of Engineers, New Orleans District, initiate efforts to further implement the MTG Project in accordance with the EDR recommendations. Therefore, the State of Louisiana is pleased to offer its continuing support for the MTG Project.

This letter, while not legally binding on the State of Louisiana, acting by and through the CPRA Board, as an obligation of future funds, declares the State of Louisiana's full support for this effort. By this letter, CPRAB also expresses its willingness to serve as a co-non-Federal sponsor with the Terrebonne Levee and Conservation District (TLCD) for the project and to move towards execution of a Project Partnership Agreement for the Project in accord with the EDR. As understood, the EDR "documents the incorporation of the adaptive design criteria and other design refinements" into the project.

Furthermore, the CPRA Board and the TLCD are willing to accept a larger role of responsibility in delivering the project. The CPRA Board understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required for the project through 2085. As additional refinements are necessary to implement the project based on actual engineering and design data and on-the-ground conditions, we look forward to continue working with USACE to identify methods to reduce overall project costs and deliver an effective project that reduces hurricane and storm damage within the project area.

**Executive Division**

CPRA Board reiterates that it fully supports the MTG Project and looks forward to continuing to work with the TLCD and the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Chip Kline', is positioned above a horizontal line.

Kyle R. "Chip" Kline, Jr.  
Executive Assistant to the Governor for Coastal Activities  
and Chairman Coastal Protection & Restoration Authority  
Board of Louisiana

cc: Mark Wingate, Deputy District Engineer, USACE  
Bren Haase, CPRA, Deputy Executive Director  
Ignacio Harrouch, CPRA, Operations Chief  
James McMenis, CPRA, Project Manager  
David Peterson, CPRA, Acting General Counsel  
Lacy Shaw Pfaff, USACE, Project Manager  
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District  
Dwayne Bourgeois, Executive Director, North Lafourche Levee District  
Windell Curole, General Manager, South Lafourche Levee District





## **TERREBONNE LEVEE & CONSERVATION DISTRICT**



December 1, 2021

Mr. Mark Wingate  
U.S. Army Corps of Engineers  
New Orleans District  
7400 Leake Avenue  
New Orleans, LA 70118

RE: Letter of Intent - Engineering and Documentation Report  
Morganza to the Gulf Hurricane and Storm Damage Risk Reduction Project

Dear Mr. Wingate:

The Terrebonne Levee & Conservation District (TLCD) has reviewed the draft Engineering Documentation Report (EDR) for the Morganza to the Gulf (MTG), Louisiana Hurricane and Storm Damage Risk Reduction Project. The EDR recommends approval of the current design based on the April 2019 Adaptive Criteria Assessment Report (ACAR), inclusive of the recommended reduction in the Federal Total Project Cost (TPC) for construction and current design standards. The TLCD joins the State of Louisiana acting by and through the Coastal Protection & Restoration Authority Board of Louisiana (CPRAB) in requesting that the United States Army Corps of Engineers, New Orleans District, initiate efforts to further implement the MTG Project in accordance with the EDR recommendations.

This letter, while not legally binding on the TLCD, as an obligation of future funds, declares the TLCD's full support for this effort. By this letter, TLCD also expresses its willingness to serve as a co-non-Federal sponsor, along with the CPRAB, for the project and to move towards execution of a Project Partnership Agreement for the Project in accord with the EDR. As understood, the EDR "documents the incorporation of the adaptive design criteria and other design refinements" into the project.

Furthermore, TLCD and CPRAB are willing to accept a larger role of responsibility in delivering the project. The TLCD understands and supports a course of action with the federally cost-shared project consisting solely of constructing the system to the 1 percent AEP elevation through 2035, with non-Federal interests being responsible for the costs of performing all future work required for the project through 2085. As additional refinements are necessary to implement the project based on actual engineering and design data and on-the-ground conditions, we look forward to continue working with USACE to identify methods to reduce overall project costs and deliver an effective project that reduces hurricane and storm damage within the project area.

Mr. Mark Wingate  
Morganza to the Gulf – Letter of Intent  
Page 2 of 2

The TLCD looks forward to continuing to work with the CPRAB and the USACE to provide integrated coastal protection to Louisiana's coastal communities through the implementation of this important project.

Sincerely,

**TERREBONNE LEVEE & CONSERVATION DISTRICT**

A handwritten signature in black ink, appearing to read 'Anthony J. Alford', is written over the printed name and title.

Anthony J. Alford  
President

cc: Chip Kline, CPRAB Chairman  
Bren Haase, CPRA, Deputy Executive Director  
Ignacio Harrouch, CPRA, Operations Chief  
James McMenis, CPRA, Project Manager  
David Peterson, CPRA, Acting General Counsel  
Lacy Shaw Pfaff, USACE, Project Manager  
Reggie Dupre, Executive Director, Terrebonne Levee and Conservation District  
Dwayne Bourgeois, Executive Director, North Lafourche Levee District  
Windell Curole, General Manager, South Lafourche Levee District  
Mitch Marmande, PE, MTG Program Manager



## CERTIFICATE OF LEGAL SUFFICIENCY

Mississippi River and Tributaries (MR&T)  
Morganza to the Gulf of Mexico, Louisiana (MTG)  
Engineering Documentation Report dated December 2021

The Mississippi River and Tributaries (MR&T) Morganza to the Gulf of Mexico, Louisiana (MTG) Engineering Documentation Report (EDR) dated December 2021, including all associated documents required by the National Environmental Policy Act, has been fully reviewed by the Office of Counsel, New Orleans District, and is approved as legally sufficient.

DATE: \_\_\_\_\_

12/6/21



Stephan C. Roth  
District Counsel  
U.S. Army Engineer District  
New Orleans