

CECW-PC

MEMORANDUM FOR CECW-MVD (ATTN: Beth Marlowe)

SUBJECT: Mississippi River-Gulf Outlet Ecosystem Restoration Project,
Documentation of Review Findings.

1. This memorandum transmits the HQUSACE policy review comments for the subject report and integrated environmental impact statement.
2. All review issues have been resolved.
3. Questions may be directed to the review manager, Mark Matusiak, at (202) 761-4700.

Encl
CECW-P
CECW-PC file

Wesley E. Coleman, Jr.
Chief, Office of Water Project Review
Planning and Policy Division
Directorate of Civil Works

MATUSIAK 30 OCT 12

Coleman 30 OCT 12

CECW-PC

5 October 2012

MEMORANDUM FOR CECW-MVD (ATTN: Beth Marlowe)

SUBJECT: Mississippi River-Gulf Outlet Ecosystem Restoration Project,
Documentation of Review Findings.

1. This memorandum transmits the HQUSACE policy review comments for the subject report and integrated environmental impact statement.
2. All review issues have been resolved.
3. Questions may be directed to the review manager, Mark Matusiak, at (202) 761-4700.

Encl
CECW-P
CECW-PC file



Wesley E. Coleman Jr.
Chief, Office of Water Project Review
Planning and Policy Division
Directorate of Civil Works

Table of Contents

1. Background	1
2. Review of the May 2010 Alternative Formulation Briefing Report.	
A. General comments	
1. Scope of the evaluation	2
2. Account for long term success/sustainability in the formulation process	3
3. Comparison of plans and alternative development	8
4. Develop a systematic risk analysis	11
5. Establish critical planning units	33
6. Further develop a systems perspective for plan development	34
7. Miscellaneous	35
B. Plan formulation	
1. Habitat switching objective	43
2. Habitat targets	45
3. Justification for accretion rate	45
4. Incomplete assessment of sediment budget	46
5. Distinguish between restoration and coastal protection	48
6. Combining measures into plans	50
7. O & M status of existing foreshore dikes	53
8. Future without-project conditions	54
9. Constraints	62
10. Identification of sponsor and sponsor letter	63
11. Cost sharing of Violet diversion	63
12. Feasibility level of design	64
13. Use of MRGO channel as borrow source	68
14. Adaptive management and monitoring plan	55
C. Real Estate	

1. Real estate plan	70
2. Additional relocations	72
3. Sponsor capability assessment.....	73
4. Nonstandard estates.....	74
D. Cost estimating	
1. Comparative cost estimates.....	75
2. Peer review.....	76
3. Summary report	77
4. Real estate costs.....	77

HQUSACE review of the December 2010 AFB report

A. General comments	
1. Sponsor support for project	78
2. OMRR&R	78
3. Rate of sea level rise unclear.....	79
4. Cost allocation tables	79
5. Separable elements.....	80
B. Plan formulation	
1. Description of Violet diversion inconsistent	80
2. Feasibility level information not available for Violet diversion	81
3. St. Bernard Parish opposition to Violet diversion	81
4. AAHU outputs inconsistent	82
5. Plan formulation strategy.....	82
6. Adaptive management and monitoring plan	83
7. Adaptive management and risk and uncertainty.....	83
8. Adaptive management and SLR.....	84
9. Review plan update	84
10. Incomplete ATR.....	85
11. Sea level rise.....	85
12. Directional indicators	85

13. Risk and uncertainty	85
14. Status of WVA certification	86
15. Habitat scarcity.....	86
16. Goal #3	86
17. Habitat objectives.....	86
18. Habitat switching.....	86
19. Sediment needs inventory	87
20. TSP dependent on other projects.....	87
C. Environmental	
1. Environmental justice	88
2. Endangered species act.....	88
3. Environmental compliance	89
D. Legal and real estate	
1. Local cooperation requirements	90
2. Non-Federal cost share for Violet diversion.....	90
3. Secretary vs. Assistant Secretary.....	91
4. Study authority.....	91
5. Nonstandard estates	91
6. No non-Federal sponsor identified.....	91
7. Real estate plan.....	91
4. HQUSACE review on April 2012 final report	
1. Importance of Violet diversion.....	93
2. RSLR and OMRR&R.....	94
3. Costs and benefits of recommended plan	95
4. Biological opinion	96
5. Adaptive management and plan formulation process	96
6. Potential non-Federal sponsors	97
7. LCA near term project authority	98
8. State of Mississippi participation in project.....	98
9. Sponsor letter of intent	98

10. Recommendations	99
11. Items of local cooperation.....	99
12. Draft chief's report	103
13. Non-Federal cost share allocation for Violet diversion.....	103
14. Nonstandard estate.....	103
5. State and Agency Review	96

Mississippi River-Gulf Outlet Ecosystem Restoration
Documentation of Review Findings

1. Background.

a. Study Area. The study area includes portion of the Mississippi River Deltaic Plain in Southeast Louisiana and Southwest Mississippi. The study area encompasses approximately 3.86 million square miles of land and water.

b. Problem. The construction of the Mississippi River-Gulf Outlet channel resulted in the loss of significant areas of wetlands and other important resources in the vicinity of Lake Borgne, and increased historic salinity levels in the vicinity of Lake Ponchartrain, Lake Borgne and the Biloxi Marsh.

c. Study Authority. The authority for the study is Section 7013 of the Water Resources Development Act of 2007.

d. Tentatively Selected Plan. The tentatively selected plan is Alternative C. The plan would protect or restore approximately 58,861 acres of habitat in the study area, comprised of 13,950 acres of fresh and intermediate marsh, 33,966 acres of brackish marsh, 10,431 acres of cypress swamp, 466 acres of saline marsh and 48 acres of ridge habitat. The project would also protect about 70 miles of shoreline in Lake Borgne, Biloxi Marsh and areas adjacent to the Mississippi River-Gulf Outlet channel. The restoration would be accomplished through marsh restoration and nourishment, swamp restoration and nourishment, shoreline protection, ridge restoration and diversion of water and sediments from the Mississippi. The \$2.9 billion selected plan described in the AFB report does not propose any O&M measures, such as periodic renourishment, for the approximately 49,000 acres of marsh or swamp areas that would be restored by the project. Other project features such as shoreline protection structures, water control structures and water diversion structures would be maintained under standard OMRR&R practices.

e. Project Costs. The cost of the tentatively selected plan is approximately \$2.9 billion.

f. Cost Apportionment. Project costs for all aspects of the plan except Violet Diversion would be apportioned 65% Federal and 35% non-Federal, and OMRR&R would be a 100% non-Federal responsibility, in accordance with WRDA 1986. The cost-share for the Violet Diversion would be 75% Federal and 25% non-Federal, with OMRR&R as a 100% non-Federal responsibility. There is no identified non-Federal sponsor for the project at this time.

2. Review of the May 2010 Alternative Formulation Briefing Report.

A. General Comments.

1. Scope of the Evaluation. The report's goals should be consistent with CEQ's Presidential Ecosystem Restoration Working Group: Roadmap for Restoring Ecosystem Resiliency and Sustainability dated March 2010 for coastal Louisiana. For example the planning constraints and assumptions in the MRGO report state the project should avoid actions that negatively affect the capability of the authorized navigation projects. This may not be consistent with integrated planning noted in the Commissions Roadmap. Recommend that the MRGO Planning Objectives and Constraints and Assumptions be reviewed for consistency with CEQ's roadmap.

MVN Response to Comment 2.A.1: Concur.

Discussion: The report should reference CEQ's roadmap and other ongoing efforts; however, the roadmap workgroup may not have a final product in time for release of the MRGO report.

Required Action: The MRGO Planning Objectives and Constraints and Assumptions should be reviewed for consistency with CEQ's roadmap, for example, long-term sustainability.

Action Taken: The MRGO Planning Objectives and Constraints and Assumptions are revised for consistency with CEQ's roadmap. In addition to the existing text in Section S.2.6, Federal Interest, the following text has been added to Section S.4 Systems/Watershed Context and a new Section 1.8 Roadmap for Restoring Ecosystem Resiliency and Sustainability, which follows the Environmental Planning Guiding Principles section:

The systems-based planning approach for this study supports the strategic approach described in the Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group Roadmap for Restoring Ecosystem Resiliency and Sustainability. Specifically the planning process was cognizant of the following key points of the strategic approach:

- *Enhancing essential coastal processes and the ecological services they provide.*
- *Incorporating a multiple lines of defense strategy.*
- *Safeguarding the region's rich cultural history and economic resources.*
- *Addressing the potential impacts of accelerated sea level rise and subsidence as a strategy to protect communities, infrastructure, and to restore ecosystems and the services they provide.*

HQUSACE Assessment: The above paragraphs partially respond to the comment. More detail on how the TSP accomplishes the key points of the strategic approach, especially the last bullet on accelerated sea level rise, should be provided. The TSP has minimal benefits under the high sea level rise scenario.

MVN Response: The following text has been added to Section 2.10 Plan Selection.

The selected plan accomplishes the following key points of the strategic approach described in the Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group Roadmap for Restoring Ecosystem Resiliency and Sustainability:

- Enhancing essential coastal processes and the ecological services they provide. The selected plan recommends reconnecting the Mississippi River to the estuary to restore an essential coastal process. The reestablishment of historic habitat types as proposed in the selected plan would restore ecosystem function and productivity. Over 58,000 acres of habitat and 70 miles of shoreline would be restored and protected in the selected plan, significantly improving the spatial integrity and structure of the landscape.
- Incorporating a multiple lines of defense strategy. The selected plan includes restoration located in critical landscape features and adjacent to the HSDRRS, in keeping with the multiple lines of defense strategy.
- Safeguarding the region's rich cultural history and economic resources. The restoration and protection of the area is essential to sustain the unique natural and cultural heritage of the region, as well as the nationally significant economic resources it provides. The selected plan outlines a broad plan for the restoration and protection of the study area to safeguard these resources for the benefit of the nation.
- Addressing the potential impacts of accelerated sea level rise and subsidence as a strategy to protect communities, infrastructure, and to restore ecosystems and the services they provide. The selected plan acknowledges the potential impacts of accelerated sea level rise and subsidence and proscribes measures to address these impacts through monitoring and adaptive management.

HQUSACE Assessment: The comment is resolved.

2. Account for long term success/sustainability in the formulation process. The report states that "(T)hose projects are not necessarily meant to provide large-scale restoration or sustainability functions. Rather, they are meant to serve as an interim response to prevent damage beyond a "point of no return" so that future projects – selected on the basis of a shared long-term Vision – will have a better chance of success." This purpose needs further elaboration and discussion in the report. There is no detailed assessment or figure about where erosion and land loss are occurring in the planning area and how this interim response prevents or reduces going past this 'point of no return.' If this is an interim plan, what locations and management measures / alternatives would provide the best foundation for future actions to improve long term success? Because ecosystem restoration projects are intended to be self-sustaining, it is critical that planning take into account the variables that have an effect on the long-term success of any restoration project (see references in ER 1165-2-501 paragraph 6, and EP 1165-2-502 paragraph 7.f.)

MVN Response to Comment 2.A.2: Concur.

Discussion: The January 2005 LCA Chief's Report highlights the MRGO closure and restoration as a near-term plan; however, the ecosystem landscape has changed since January

2005 as the result of hurricanes and the MRGO closure. The MRGO ecosystem restoration plan is one component of the comprehensive ecosystem restoration needed in the Pontchartrain Basin.

Continued collaboration and adaptive management will be important to ensure long-term sustainability of the basin. In an estuary, sustainability should be viewed differently than in other Federal actions. The constructed project will change over time. For example, marsh settles and degrades which benefits fish. Even if the project doesn't look the same in 50 years, it can still provide an ecosystem service over the project life.

Required Action: The MRGO plan should be put in the perspective of long-term plans, such as LACPR, so the reader knows where/how the MRGO ecosystem restoration plan fits into these long-range plans. Describe sustainability in terms of function rather than a specific landscape.

Action Taken: Text has been added to the MRGO report to better describe the dynamics of the estuarine system and how it relates to sustainability. Graphics are being developed to show the MRGO Ecosystem Restoration Plan TSP in the context of other authorized projects as well as the conclusions and recommendations of the LACPR technical report.

The report states that “(T)hose projects are not necessarily meant to provide large-scale restoration or sustainability functions. Rather, they are meant to serve as an interim response to prevent damage beyond a “point of no return” so that future projects – selected on the basis of a shared long-term Vision – will have a better chance of success.” The comment states that this purpose needs further elaboration and discussion in the report. To address this comment, the following text has been added to Section 1.1. “Study Purpose and Scope:”

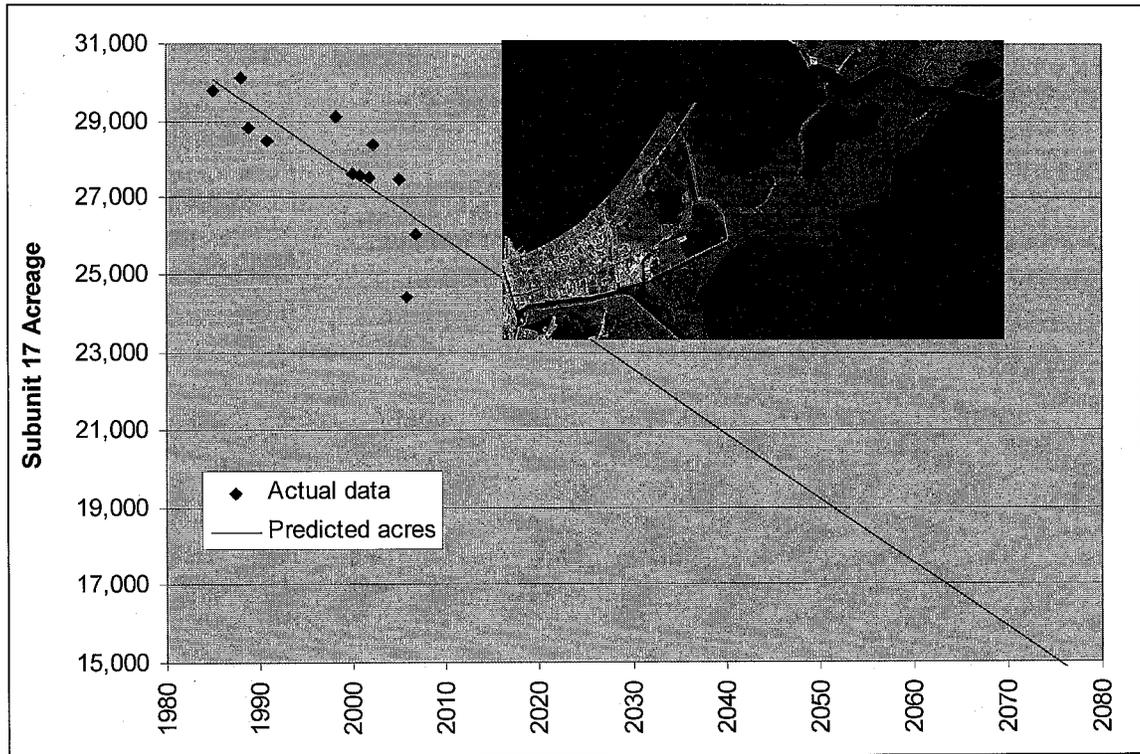
The study purpose is to develop alternative plans to restore natural features and processes in the Lake Borgne ecosystem and areas affected by the MRGO channel. Construction recommendations will be developed in concert with large-scale comprehensive ecosystem restoration plans for the region. As noted in the Louisiana-Mississippi Gulf Coast Ecosystem Restoration Working Group Roadmap for Restoring Ecosystem Resiliency and Sustainability, the MRGO Ecosystem Restoration Plan will not necessarily provide comprehensive ecosystem restoration for the entire study area. The implementation of the MRGO Ecosystem Restoration Plan is viewed as an initial response to prevent damage beyond a “point of no return” in the areas affected by the channel.

The comment also states: “There is no detailed assessment or figure about where erosion and land loss are occurring in the planning area and how this interim response prevents or reduces going past this ‘point of no return.’” To address this comment, land loss rates were used in the calculation of benefits, and a discussion of the analysis was added in 2.7.1 as follows:

WVA requires estimates of Future With Project and Future Without Project marsh acreages. Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. FWOP subunit wetland acreages were determined via a linear trendline through those data (Figure 1). Where applicable,

annual net acreage benefits associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

Figure 1. Actual and predicted acreage for subunit 17.



The SAND2 (Sediment and Nutrient Diversion) method was used to predict accretion rates in areas benefitted by freshwater diversions. This model is an Engineering Research and Development Center (ERDC) revision of the SAND1 (Boustany-ERDC spreadsheet model) used in the Louisiana Coastal Protection and Restoration Final Technical Report (LACPR). The WVA model used this engineering input to assess benefits. Given the great uncertainties regarding future subsidence rate changes, sea-level rise changes, and many other factors that might affect future wetland loss rates over the project life, there is considerable uncertainty regarding the accuracy of the predicted river diversion benefits. However, the SAND2 model provides an objective means for comparing alternative measures and plans.

Utilizing the predicted FWOP wetland acreage as a basis, the SAND2 model calculates FWP benefits (in acres) via the accretion of suspended sediments (land building) together with the effects of nitrogen additions. The nitrogen benefits (in acres) are calculated as the grams of nitrogen required to produce a wetland acre multiplied by the grams of introduced nitrogen (less nitrogen lost to denitrification) = wetland acres created/supported via introduced nitrogen.

Sustainability

The benefits analysis utilized for the MRGO Ecosystem Restoration Plan considers sustainability inherently. Because the WVA methodology utilizes historic land loss rates in the calculation of benefits, areas that have historically been more susceptible

to risks such as tropical storms, subsidence, and sea level rise, will have fewer AAHUs than areas that have not been as susceptible to these factors. The SAND2 methodology accounts for the greater sustainability of features nourished by the freshwater diversion by assigning more AHHUs to features in the diversion influence area. Additionally, the WVA methodology assigns greater benefits to natural restoration features than protection features like shoreline protection that require maintenance.

Graphics have also been developed to show where land loss has historically occurred, and where it is projected to occur.

The commenter asked “If this is an interim plan, what locations and management measures/alternatives would provide the best foundation for future actions to improve long term success?” To answer this question, the importance of the Violet Freshwater Diversion as a key restoration foundation has been emphasized throughout the text; the following language was added to S.3.6:

The implementation of the authorized Violet Freshwater Diversion restores a key ecosystem process, creates a foundation for other restoration features, and contributes to the long-term success of the plan. Restoring the link between the Mississippi River and the estuary provides freshwater, nutrients and sediment, and increases the sustainability of the plan. A freshwater diversion is necessary to restore historic salinity gradients and achieve the habitat and salinity objectives adopted for this study.

The significance of critical landscape features has also been emphasized and a map has been added as follows:

HQUSACE Assessment: The comment is partially resolved. The report has improved graphics and analysis relating to sustainability and critical landscape features. However, the response does not adequately address the high sea level rise scenario where a majority of the benefits are lost. Recommend taking a performance based approach. 1) Evaluating throughout the plan formulation process sea level rise scenarios starting with the objectives to determine the overall performance of management measures as they face increasing loads from SLR. This strategy in conjunction with understanding how habitats will transition with sea level rise could result in an alternative that is a transition habitat plan that is more efficient and complete by acknowledging habitat transitions as a FWP condition. The transition alternative would state that a sustainable plan for some areas includes transitions and in others they need to be made more robust to be sustainable under the SLR scenarios with protection.

Lastly, HQUSACE does not agree with the MVN argument that sustainability for the MRGO ecosystem proposal should be viewed differently than other Federal actions. Neither the report nor the above response has provided a basis in law and policy to support the district's view of sustainability. HQUSACE requests that MVN develop an issue paper laying out the basis to support the limited OMRR&R proposed in the selected plan.

MVN Response: As per MVD CG guidance, no changes will be made to the TSP necessitating another 45 day public review period. Therefore, reformulation as recommended would not be policy compliant (reference 6 July 2011 Memorandum for MVN Commander Guidance for Completing the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study). Restoration of the salinity regime is a primary objective of the plan to restore natural processes and ecosystem function. Therefore, suggesting that habitat will transition to a more homogenous and saline condition in the FWP condition invalidates the goals and objectives of the plan, is not reflective of current trends (decreasing salinity in the study area due to existing projects and changing conditions), and is counter to peer-reviewed forecast conditions based on data. Monitoring and adaptive management actions associated with sea level rise will be included in the plan.

Potential OMRR&R actions for the three sea level rise scenarios will be provided in the plan.

HQUSACE Assessment: The comment is resolved. Note: HQUSACE is not bound by policy decisions made by the MVD commander.

3. Comparison of Plans and Development of Alternatives. Alternatives were compared by their restoration objectives as well as by using the IWR incremental analysis program. However, they were not compared or analyzed in context of the team's 'Guiding Principles.' Recommend evaluating the management measures and plans for resilience and sustainability before they are consolidated for the IWR plan.

MVN Response to Comment 2.A.3: Concur/Non-concur.

Discussion: The guiding principles can be related to the initial array of alternatives, but reformulation is not necessary to address this comment, because these principles are inherent

in the formulation and screening of measures. Guiding principles were used to formulate plans: objectives and metrics were used to evaluate plans.

Required Action: The report should be revised to describe resiliency and sustainability of alternatives; however, IWR-PLAN does not need to be rerun.

Action Taken: An evaluation of the plans and principles (e.g. sustainability) has been added to the report as follows:

Environmental Planning Guiding Principles Analysis

All plans address the plan formulation guiding principles. The differences between the plans are a matter of scale. Consequently, the degree to which each plan follows the guiding principles is generally also a matter of scale.

“Relatively intact estuarine ecosystems are a key attribute in coastal Louisiana, and alternatives should seek to enhance the resilience and self-sustainability of the estuarine environments, including protection of existing high-quality estuaries.”

Because all of the plans include the Violet Freshwater Diversion, all plans enhance the resilience and self-sustainability of the estuary. However, the plans vary in their ability to protect, maintain and restore the form of the ecosystem. Plans that do not provide extensive protection and restoration on the East Orleans landbridge, Biloxi Marsh, and the MRGO/Lake Borgne Landbridge (Plans #2 to #5) may not contain all of the features needed to maintain and restore the form and function of the estuary. The need to protect existing high quality estuaries is better addressed by Plans #6 to #19, which include increasing scales of restoration and protection in these areas. Plans #16 to #19 include backfilling portions of the MRGO channel and restoration to historic conditions.

“Restoration of key processes and dynamics are critical to the long-term health of the ecosystem.”

The Violet Diversion restores a key process of the estuary and is a component of every plan. However, the plans vary in the extent they restore biodiversity and promote accretion through sediment placement, vegetative planting, and shoreline protection. Plans #2 to #11 provide incremental scales of marsh restoration and shoreline protection features that would promote accretion and restore biodiversity. Plans #12 to #15 do not increase marsh restoration, although additional shoreline protection features would help protect existing vegetation. Plans #16 to #19 incrementally increase the amount of marsh restored, with plan #19 providing the greatest amount of restoration.

“Measures and alternatives must seek to maximize the combined benefits of diversions that seek to restore natural processes with mechanical marsh creation measures.”

All plans seek to maximize the combined benefits of diversions. However, plans that include the most restoration features in the area benefitted by the diversion (Plans #7 to #19) better address the goal of combining the benefits of diversions with mechanical marsh creation measures. Plan #7 is the first plan to include all of the proposed marsh restoration features in the immediate influence area of the diversion (Central Wetlands, Golden Triangle, MRGO/Lake Borgne Landbridge, and areas adjacent to Lake Borgne and Mississippi Sound) with the exception of backfilling portions of the MRGO channel. Plans #16 to #19 would maximize the amount of marsh benefitted by the diversion by including these measures.

“Additional sources of sediments should be sought where feasible; recognizing that such measures should not contribute to ecosystem degradation in the source area.”

All of the plans require significant amounts of sediments to restore and nourish sediment-deprived marsh. Alternative sediment sources were considered and are discussed in Section 2.5.3.1. The smaller plans better address this principle because the potential for environmental damage from obtaining and/or transporting borrow material is on a smaller scale than the larger plans. However, the potential adverse environmental impacts associated with obtaining and transporting borrow material must be considered in context with the long-term benefits associated with these actions.

“Measures should be combined synergistically to maximize possible cumulative benefits. Thus, the position of features within the landscape has a direct influence on the potential benefits derived.”

Plan #7 is a cohesive plan that reasonably maximizes cumulative benefits. Plans #8 to #19 continue to incrementally increase the potential for cumulative benefits; however, the incremental benefits associated with Plans #8 to #15 are minor. Plan #16, which is the first plan to include backfilling portions of the MRGO, maximizes the potential for synergistic benefits.

“Flexibility is required in project design and implementation to permit adaptive management as conditions change and more is learned.”

All of the 19 Best Buy plans include plans for the Violet Diversion, which offers the greatest opportunity for continued adaptive management.

“A concerted monitoring and adaptive management program should be a component of the restoration plan.”

All of the plans would include a concerted monitoring and adaptive management plan.

HQUSACE Assessment: The above paragraphs partially respond to the comment. There is little or no discussion describing the associated risks with habitats transitioning and the likelihood that the adaptive management plan would be able to mitigate such transitions. Also, there is no discussion of the cost of adaptively managing the project under the three SLR scenarios. A section on adaptive management measures and their likelihood of success should inform which TSP is more sustainable and meets the objective of maintaining existing balance of habitat types. In other words, some areas may be left to transition from one habitat to another (risk acceptance) while others we would mitigate for through management measures.

MVN Response: Restoration of the salinity regime is a primary objective of the plan to restore natural processes and ecosystem function. Therefore, suggesting that habitat will transition to a more homogenous and saline condition in the FWP condition invalidates the goals and objectives of the plan, is not reflective of current trends (decreasing salinity in the study area due to existing projects and changing conditions), and is counter to peer-reviewed forecast conditions based on data. Monitoring and adaptive management actions associated with sea level rise will be included in the plan, as well as estimated costs. The Monitoring and Adaptive Management Plan is a separate attachment to the draft document and will be summarized in the final version of the main report.

HQUSACE Assessment: The comment is resolved.

4. Develop a Systematic Risk Analysis into the Formulation of Plans and Alternatives.

a. Risk and uncertainty should be considered in identifying the NER plan. (ER 1105-2-100, paragraph, E-39). This may be done through a sensitivity analysis to determine which assumptions the measures, plans alternatives and recommendations are sensitive to and how changes in those assumptions would impact the performance and sustainability of the alternatives.

MVN Response to Comment 2.A.4.a: Concur

Discussion: The uncertainties associated with the oil spill should be recognized in the report. Risk and uncertainties should be used to identify the NER plan.

Required Action: A discussion of risk factors and how they would impact the performance and sustainability of the alternatives will be added to the report.

Action Taken: Section 2.9.2 Risk and Uncertainties has been moved to Section 2.8.1 and revised to evaluate the plans in the final array in terms of relative risks and uncertainties as follows:

2.8.1 Risks and Uncertainties

Risk is the product of the likelihood of failure and its consequences. There are significant risks and uncertainties associated with all ecosystem restoration plans in the study area. The adaptive management plan will address specific risks and uncertainties associated with the implementation of the selected plan, and potential changes to the plan to respond to and minimize the potential effects of these unknown variables that could affect plan performance and/or costs. The following section describes major sources of risk and uncertainty and how they could impact each plan in the final array.

Tropical Storms

Tropical storm events can directly and indirectly contribute to coastal land loss through erosion from increased wave energies, removal and/or scouring of vegetation from storm surge, and saltwater intrusion into estuaries and interior wetlands. Wetland loss and degradation of large areas can occur in a short period of time from storms. Approximately 52,480 acres of marsh were permanently or temporarily converted to open water in the study area following Hurricane Katrina, an area roughly equivalent to the amount of restoration proposed by the TSP (Barras 2009). There is a risk that a single storm event, or multiple storms in a short period of time, could significantly reduce or eliminate anticipated benefits of restoration plans in areas susceptible to storm surge and shearing. All of the features of the TSP (and the associated costs and benefits) are at some risk from storm damage. The extent of potential damage is dependent upon several unknown variables, including: the track and intensity of the storm, the development stage of the project, changes in future conditions in the study area, and variability of project performance from forecast conditions due to other factors of risk and uncertainty.

Sediment-rich areas impacted by storms are able to re-vegetate naturally if they are not disturbed by additional storms (Barras 2009). Therefore, the proposed placement of dredged material in the study area could promote the natural recovery of areas affected by storms. The nutrients and suspended solids associated with the freshwater diversion would also assist in minimizing the adverse affects of storms to restored marsh.

Brackish and saline marsh communities appear to be more resilient to shearing than fresh and intermediate communities (Barras 2009). The majority of fresh and intermediate marsh areas proposed for restoration in the TSP are located in the Central Wetlands, where storm damage risk is reduced by the Chalmette Loop Levee. Intermediate marsh restoration proposed along the Lake Borgne/MRGO Landbridge would remain susceptible to storm surge and shearing. However, these areas would be more resilient than the existing marsh due to the anticipated benefits of proposed shoreline protection, dredged material placement, vegetative planting, and nourishment from the proposed freshwater diversion. Although these areas could be significantly damaged by a storm event, the proposed action would decrease the extent of damage and increase the likelihood that these areas could recover naturally compared to existing and future without project conditions.

The brackish features in the Terre aux Boeufs and Hopedale areas are located in interior areas that are less susceptible to scouring and removal of vegetation than areas directly adjacent to large open water areas. The anticipated benefits of restoration in these areas could be significantly reduced by a storm, particularly if marsh vegetation was not well established. Some of the sediment placed in these

areas could be lost in a storm event. However, because there is a buffer between these features and large open water areas, it is less likely that the benefits of restoration features in this area would be lost entirely.

Depending on the track and intensity of the storm, the proposed ridge feature at Bayou La Loutre could reduce potential storm damage to adjacent areas, including features LM3 and BM1. The ridge feature would be more resilient when fully vegetated than during construction. However, if the ridge feature was damaged during construction, it is likely that sediment would be dispersed throughout the adjacent marsh areas, benefitting those areas while reducing or eliminating the benefit to the proposed ridge.

The predicted benefits of Features EM1, EM2, EM3, and EM4 are at risk of scouring and shearing from storms. Depending on the track and intensity of a storm, the benefits in these areas could be significantly reduced. However, without restoration, the destruction of these areas could increase storm damage risk in the study area.

The benefits of shoreline protection features could be reduced by a storm through the displacement of rocks and damage to the structures. Repair of storm damage to these features would increase the anticipated costs to maintain the anticipated erosion reduction benefits, reducing the cost-effectiveness of these features.

Climate Change

Extreme changes in climate could result in conditions that cannot support the types of habitat restored, reducing the effectiveness of the restoration plan. Extreme climate change could essentially eliminate the benefits of vegetative plantings, if the change resulted in fatality. The adaptive management plan includes provisions for monitoring climate change and triggers for adjusting plan implementation to these potential changes.

Increased Sea Level Rise

Increased sea level rise could convert emergent wetlands to shallow open water, and shallow open water to deeper water habitat, reducing or eliminating the effectiveness of restoration plans. Proposed restoration features adjacent to open water are more susceptible to the affects of increased sea level rise than more interior areas. A detailed analysis of potential sea level rise impacts is included in Section 2.8.1.

Analytical Variability

Future conditions are inherently uncertain. The forecast of future conditions is limited by existing science and technology. Future conditions described in this study are based on an analysis of historic trends and the best available information. Some variation between forecast conditions and reality is certain. The TSP was developed in a risk-aware framework to minimize the degree to which these variations would affect planning decisions. However, errors in analysis or discrepancies between forecast and actual conditions could affect the effectiveness of the TSP.

The costs developed for the restoration features in the plan formulation phase were based on the best available information and relied upon information from similar projects constructed in the study area. However, survey data currently being collected and analyzed to develop feasibility level design for each plan feature in the TSP could significantly change the anticipated costs. Contingencies of 20 to 30 percent were added to all cost estimates based on the level of uncertainty to produce conservative worst-case scenario costs that are likely to decrease when detailed

engineering information was collected and analyzed. However, given the changeable nature of the project area, some costs could increase when site specific geotechnical and survey data are applied. There is a risk that some features in the TSP may not be as cost-effective as preliminary investigations indicated. To address this risk, the cost-effectiveness of features will be re-evaluated when detailed information is available.

There is significant in-house institutional knowledge related to the design and construction of shoreline protection, freshwater diversions, and marsh restoration features. However, knowledge of ridge restoration and cypress swamp restoration is limited, because no similar projects have been constructed in the study area by the USACE or others. There is a risk that assumptions applied in the feasibility level design of these features may be inaccurate. These uncertainties may result in changes in the design and implementation of these restoration features that could affect estimated costs or benefits.

There are also risks associated with the assessment of benefits. The WVA process relies heavily on professional experience, institutionalized knowledge and generalized assumptions. The benefits assessment relies on forecast future conditions that are based on historical trends that could change in the future. Given the uncertainties associated with the WVA model, future conditions could result in an over- or under-estimation of benefits. The ecological benefits of the freshwater diversion were evaluated using a modified Boustany method developed by PDT members at USFWS and ERDC. There is a risk that the model may under- or over-estimate the ecological benefits of the diversion.

Hydrodynamic modeling was used to develop the design and operation of the freshwater diversion to meet salinity targets that were adopted by the PDT. These salinity targets were developed for the estuary to restore historic habitat types, mimic natural overbank flooding and create optimal conditions for fisheries. The hydrodynamic modeling for this study incorporated several assumptions about future conditions, if these assumptions are invalid, the effect of the diversion may be over or under-estimated.

All of the models used in this study are abstract mathematical representations of reality. Models simulate complex systems by simplifying real processes into expressions of their most basic variables. These tools assist with finding optimal solutions to problems, testing hypothetical situations, and forecasting future conditions based on observed data. No model can account for all relevant variables in a system. The interpretation of model outputs must consider the limitations, strengths, weaknesses and assumptions inherent in model inputs and framework. Inaccurate assumptions or input errors could change benefits predicted by models used in this study. The potential for significant changes due to errors has been reduced through technical review, sensitivity analyses, and quality assurance procedures. However, there is inherent risk in reducing complex natural systems into the results of mathematic expressions driven by the simplified interaction of key variables.

Implementation

The timing and availability of financial resources for implementation is a major uncertainty that must be considered. If the plan is not implemented in the near future, the problems in the study area will continue to degrade conditions. The impact of the uncertainties associated with the future condition of the study area could increase

restoration costs, decrease restoration benefits, or both. These uncertainties will be monitored and evaluated in accordance with the Adaptive Management Plan.

All plans in the final array of alternatives require phased implementation, which can reduce risk. With phased implementation, costs are expended periodically, rather than all at once, which reduces risk to the monetary investment. Phased implementation also provides the opportunity to adjust project design and construction from lessons learned from projects constructed in the initial phase.

Flexibility is required in project design and implementation to permit adaptive management as conditions change and to adjust for lessons learned. The tentatively selected plan adaptive management plan addresses specific risks and uncertainties associated with the plan, and how the potential impacts of these risks and uncertainties would be minimized through adaptive management.

The relative risk of each plan is based on the differences in consequences. Because it has the lowest benefits and costs, Plan A involves no action, and therefore the risk to the ecosystem is greatest under this scenario. The risk associated with Plan B is less than Plan A, because some key restoration features, such as the Violet Diversion, would be implemented. Plan B reduces the risk to some critical landscape features, but does not provide as much restoration and protection as Plan C. The risk to ecosystem form and function is less with Plan C than Plans A and B, because it includes more actions to protect and restore key geographic components of the ecosystem. Plan D provides the most restoration features of all of the plans evaluated in the final array, and further decreases the risk to ecosystem form and function.

Additionally, the following text has been added in Section S.3.6:

Some features of the plan are more susceptible to these risks and uncertainties. Management measures were assessed for each of the following four sustainability factors:

- 1. Elevation – Features at higher elevations are more sustainable under relative sea level rise, e.g. ridges, than features at marsh elevation.*
- 2. Freshwater influence – Features that are influenced by rivers or river diversions have a sustainable source of freshwater and sediment to nourish them and aid in accretion.*
- 3. Wave energy – Features that are protected from wave energy (e.g. interior marsh) are more sustainable than features subjected to high wave energy.*
- 4. Natural features – Features that are natural, living features of the ecosystem such as marsh are more sustainable than hard structures such as rock that subside more quickly and cannot sustain themselves and therefore require more O&M.*

The most sustainable features are the freshwater diversion, cypress swamp restoration, and ridge habitat restoration. Shoreline protection features are less sustainable than other features, but are considered critical to address erosion. These features protect the marsh from wave energy, and increase the sustainability of the marsh by allowing natural vegetative shoreline stabilization to occur.

As recognition of the uncertainty associated with the oil spill, the Feasibility Report and DEIS includes the following paragraph:

The impacts of the Deepwater Horizon oil spill on coastal Louisiana are uncertain at this time. This spill may impact USACE water resources projects and studies within the Louisiana coastal area. Potential impacts include factors such as changes to existing or baseline conditions, as well as changes to FWOP and FWP conditions. The USACE will continue to monitor and closely coordinate with other Federal and state resource agencies and local sponsors in determining how to best address potential problems associated with the oil spill that may adversely impact USACE water resources development projects/studies. This may include revisions to proposed actions as well as the generation of supplemental environmental analysis and documentation for specific projects/studies as warranted by changing conditions.

HQUSACE Assessment: The issue is partially resolved. The above information is a good addition to the report; it should now be used to assess the performance of the management measures that would comprise the NER plan.

MVN Response: The assessment of management measure performance will be expanded to assess individual recommended actions rather than management types in general.

HQUSACE Assessment: The comment is resolved, pending future assessments as discussed above.

b. Risk and Uncertainties Section 2.5.4: Risks are identified as climate change, sea level rise, subsidence rates, and coastal storm events that could all accelerate the degradation of the study area. These are large uncertainties affecting future conditions in the study area as noted in the report. However, this section of the report fails to evaluate the management measures or plans against these conditions. They could be used to evaluate the management measures against the risks giving us a ranking of the measures and plans that are most likely succeed.

MVN Response to Comment 2.A.4.b: Concur

Discussion: This section of the document was intended to characterize major risks and uncertainties that were evaluated throughout the planning process.

Required Action: Demonstrate that measures and plans were evaluated in terms of risk and uncertainty.

Action Taken: Section 2.5.4 has been re-named “Risk-Informed Planning Framework.” Section 2.9.2 Risk and Uncertainties has been moved to Section 2.8.1 and evaluates the plans in the final array in terms of relative risks and uncertainties as follows:

2.5.4 Risk-Informed Planning Framework

There are numerous risks and uncertainties associated with ecosystem restoration that must be considered in the planning process. Sources of risk and uncertainties

fall into two general categories: errors in analysis and the variability of natural, social, and economic situations.

Future conditions are inherently uncertain. The forecast of future conditions is limited by existing science and technology. Future conditions described in this study are based on an analysis of historic trends and the best available information. Some variation between forecast conditions and reality is certain. The degree to which these variations would affect planning decisions made in this study can be limited by recognizing risks and uncertainties in the decision-making process.

Large uncertainties affect future conditions in the study area, including: climate change; sea level rise rates; subsidence rates; timing of tropical storm events; changes in frequency and intensity of tropical storm events; and/or changes in drought conditions. All of these factors could contribute to the acceleration of degradation of the study area, changing forecast conditions and the effectiveness of restoration plans.

There are also significant economic and social uncertainties that could affect planning for this study. The timing and availability of financial resources for implementation is a major uncertainty that must be considered. Therefore, planning for this study will address the risks and uncertainties associated with all alternatives throughout the study process. The MRGO Ecosystem Restoration Plan Feasibility Study will be conducted within a risk-informed framework, aware of the challenges that risks and uncertainties present to the development, evaluation, and implementation of alternatives.

HQUSACE Assessment: The comment is resolved by the above response.

c. The risk analysis used for the alternatives should be incorporated in a systematic manner earlier in the formulation process for the management measures and plans. For example, establish scenarios for each risk factor (i.e. number and size of coastal storms that and sea level rise) and then apply them to the management measures to see how well they perform. This analysis may refine the mix and quantity of the project objectives.

MVN Response to Comment 2.A.4.c: Concur/Non-Concur

Discussion: Risk was incorporated in the calculation of benefits which formed the basis for the CE/ICA analysis. All of the features of the TSP (and the associated costs and benefits) are at some risk from storm damage. The extent of potential damage is dependent upon several unknown variables, including: the track and intensity of potential storms, the development stage of the project, changes in future conditions in the study area, and variability of project performance from forecast conditions due to other factors of risk and uncertainty. The most accurate way to incorporate the effects of these risks in the development and evaluation of plans is based on historical land loss data.

Required Action: The report will be revised to better explain how risk analysis was used in the development and screening of plans.

Action Taken: New sections on risk and uncertainty have been added to the report as follows:

2.6.1.1 Risk and Uncertainty Associated with Restoration Measures Types

All restoration measure types are subject to the general risks and uncertainties discussed in Section 2.5.4. Risk is considered to be the product of the likelihood of project failure and the consequences of that failure. The following section discusses specific risks associated with each restoration measure type.

Freshwater Diversion

The diversion of significant quantities of river water typically leads to unintended consequences, such as sedimentation and shoaling in the main river downstream of the diversion and sedimentation in interior distribution channels after the flow is diverted. The likelihood of shoaling and sedimentation is moderate. The consequences of shoaling and sedimentation are higher maintenance costs, which would decrease the cost effectiveness of the measure.

Specific risks and uncertainties associated with relative sea level rise in the formulation of freshwater diversion plans include a loss of benefits, changes in assumed conditions, and inadequate structure design. The consequences of inadequate structure design could be significant. To limit the likelihood of plan failure, increased relative sea level rise is incorporated into the design of freshwater diversion structures.

The SAND2 (Sediment and Nutrient Diversion) method uses sediment and nutrient inputs to predict accretion rates in areas affected by freshwater diversions. Ideally, sediment loads in the river at proposed diversion sites would be used in these calculations. Due to data limitations, the known data from the Tarbert's Landing was used in the analysis of these features. There is some uncertainty associated with not using site-specific data for the analysis. However the risk is minimal because the data being used came from a nearby station and the sites that were evaluated appear to occur in areas of higher sediment concentration in the Mississippi River.

SAND2 uses the average water depth of the project area along with the sediment load introduced into the area from the river to project future acres of marsh restored and nourished. If the assumed average water depth is greater or the introduced sediment load is less than what was assumed, a decrease in the projected benefits could occur.

The implementation of other authorized and planned freshwater diversions is uncertain. Freshwater diversion alternative plans will consider the potential impacts of other freshwater diversion, while being formulated to produce benefits independent of other diversions. It is very likely that the assumptions made in this study regarding other authorized and planned freshwater diversion projects will be inaccurate. However, by developing freshwater diversion alternatives that produce benefits independent of other plans, the consequences of this risk are decreased.

Uncertainties associated with river water constituents that may have unintended consequences include: increased total suspended sediments, turbidity, and organic/nutrient enrichment of the water column; disturbance and release of possible contaminants; decrease in water temperatures; and the possible release of oxygen depleting substances (organic or anaerobic sediments) as well as possibly increasing dissolved oxygen (DO) levels. These impacts would be minimized to the extent practicable through the implementation of stormwater pollution prevention

plans (SWPPPs), the ITM protocols, and other applicable best management practices (BMPs). The likelihood that river water constituents may have unintended effects is moderate. However, the consequences of these effects are likely to be temporary and localized in nature, and therefore are unlikely to significantly affect overall project success.

Hydrologic Restoration Measures

Restoration of hydrologic function can result in unexpected changes to circulation, salinity and water quality. Relative sea level rise could result in changes in assumed conditions, which could decrease the benefit of hydrologic restoration measures. The likelihood of failure associated with these risks is low, if sufficient analyses are conducted using accurate information.

Marsh Restoration and Marsh Nourishment

Marsh restoration and nourishment measures are susceptible to tropical storms, wind-driven erosion, saltwater intrusion, herbivory, invasive species, and lack of freshwater and nutrients. These problems contribute to the need for restoration, while posing the greatest risks to their success. Marsh restoration measures in interior areas are less susceptible to these risks than areas exposed to open water. However, without the restoration and protection of areas adjacent to open water, interior marshes will become increasingly exposed to these forces as the exterior marsh degrades.

It is very likely that one or more of these risk factors will affect project performance, with a moderate risk of project failure. The consequences of these risks can be complete or partial project failure and loss of investment. However, the consequences of failure must be considered on an individual project basis and include an analysis of the consequences of no action. The effects of these risks were minimized by incorporating lessons learned from previously constructed projects in the formulation of alternatives and incorporating these risk factors into the calculation of benefits.

Swamp Restoration and Swamp Nourishment

Saltwater intrusion and unsuitable water levels are the greatest risks associated with cypress swamp restoration. Therefore, these features were only planned for areas where salinity and water levels can be controlled to some extent (inside the levee system). The location of cypress swamp features inside of the levees significantly reduces the likelihood of failure.

Invasive species and herbivory are also to cypress swamp restoration. Chinese tallow trees could out-compete native species and herbivory could destroy juvenile and newly established trees. Implementation methods for these features would incorporate controls to prevent loss of benefits from invasive species and herbivory.

Shoreline Protection

Subsidence, sea level rise, wave action, inaccurate or incomplete data, and design failures are the primary risks associated with shoreline protection features. Subsidence and wave energy are unavoidable, and therefore must be carefully considered in the design of alternative measures to avoid unacceptable consequences. Inaccurate or insufficient survey data or human error could result in design failures, reducing the effectiveness of these features. Appropriate

maintenance and repair of these features will contribute to project success. The likelihood that one or more of these factors will affect project performance is moderate. The consequences of failure could result in a significant or total loss of benefits.

Ridge Restoration

Lack of technical knowledge is a risk associated with ridge restoration features. Very few coastal ridge restoration projects have been constructed, and there is limited data to contribute to the successful design and implementation of these features. The lack of knowledge could jeopardize project success, and the consequences of failure could result in a significant or total loss of benefits that this feature provides.

In addition to the technical challenges of coastal ridge restoration, other factors threaten the success of these projects. Tropical storms, subsidence, sea level rise, saltwater intrusion, and invasive species are risks that can jeopardize the success of ridge restoration measures. The likelihood of failure due to these factors is moderate. The consequences of failure would be a partial or total loss of benefit. However, the consequences of failure must be considered on an individual project basis and include an analysis of the consequences of no action.

Restoration/Creation of Forested Habitat

Invasive species and herbivory are risks associated with forested habitat restoration. Chinese tallow trees could out-compete native species and herbivory can destroy juvenile and newly established trees. Implementation methods for these features would incorporate controls to prevent loss of benefits from invasive species and herbivory to reduce risk.

Barrier Island Restoration

The primary risk associated with barrier island restoration is significant loss of benefits due to erosion and tropical storm events. Because these measures are exposed to the open Gulf, losses to wave energy can be significant. These risks are unavoidable and are inherent to the changeable nature of these geographic features. The consequences of these risks can be complete project failure and loss of investment. Additionally, the opportunity cost of investing in a higher-risk restoration measure when a lower-risk measure could have been implemented must also be considered. However, the consequences of project failure must be balanced with a consideration of the consequences of no restoration.

Submerged Aquatic Vegetation (SAV) Pilot Projects

Lack of technical knowledge is a limiting factor associated with SAV features. Very few SAV restoration projects have been constructed, and there is limited data to contribute to the successful design and implementation of these features. SAV are also fragile components of the ecosystem that are very susceptible to storm events. Given these limitations, the likelihood of failure is moderate to high. The consequences of failure are a partial or total loss of benefit and investment. The opportunity cost of investing in a higher-risk restoration measure when a lower-risk measure could have been implemented must also be considered, along with the consequences of no action.

Artificial Oyster Reefs

There is limited data on artificial oyster reef success as a means of shoreline stabilization and erosion prevention. The lack of data on oyster reef development for structural purposes is a risk to the successful design and implementation of these features. Climate change, saltwater intrusion, and over-freshening also present a risk to the successful implementation of artificial oyster reefs. If habitat conditions are not conducive to the propagation of oysters, the measures would be ineffective. It is moderately likely that these risks will result in project failure, and the consequences would be a partial or total loss of benefit and investment.

HQUSACE Assessment: The comment is partially resolved. The above information provides the level of detail needed for the risk assessment associated with the restoration being proposed. What is now needed is a risk mitigation strategy for each habitat type. This could be detailed out in an adaptive management plan but summarized in the main report by types of actions taken to either mitigate or accept the risk of habitat transition. Then the WOP and WP conditions could be measured by performance...the likelihood that the habitat types and values are sustained.

MVN Response: Risk mitigation strategy by habitat type will be included in the monitoring and adaptive management plan and summarized in the main report by types of actions taken to mitigate habitat transitioning.

HQUSACE Assessment: The comment is resolved.

d. The planning areas should be evaluated to determine which planning units are most at risk due to the risk factors. For example, the Bayou La Loutre ridge may be the one area that needs to have the greatest risk reduction as we are investing in the surge barrier in this area. If the planning units in the study area that have the greatest risk are identified, this information would help the Corps establish priorities for the management measures. Risk = the likelihood of failure x the consequences. This analysis may refine the mix and quantity of the project objectives by including a NED 'type' component to enhance the formulation and prioritization.

MVN Response to Comment 2.A.4.d: Concur

Discussion: Because benefits calculations incorporate historic land loss rates, areas with the highest historical land loss rates do not perform as well in CE/ICA. However, there is a high amount of residual risk associated with not protecting and restoring areas with high land loss rates, because as these areas degrade and eventually disappear, areas with lower land loss rates will become more vulnerable.

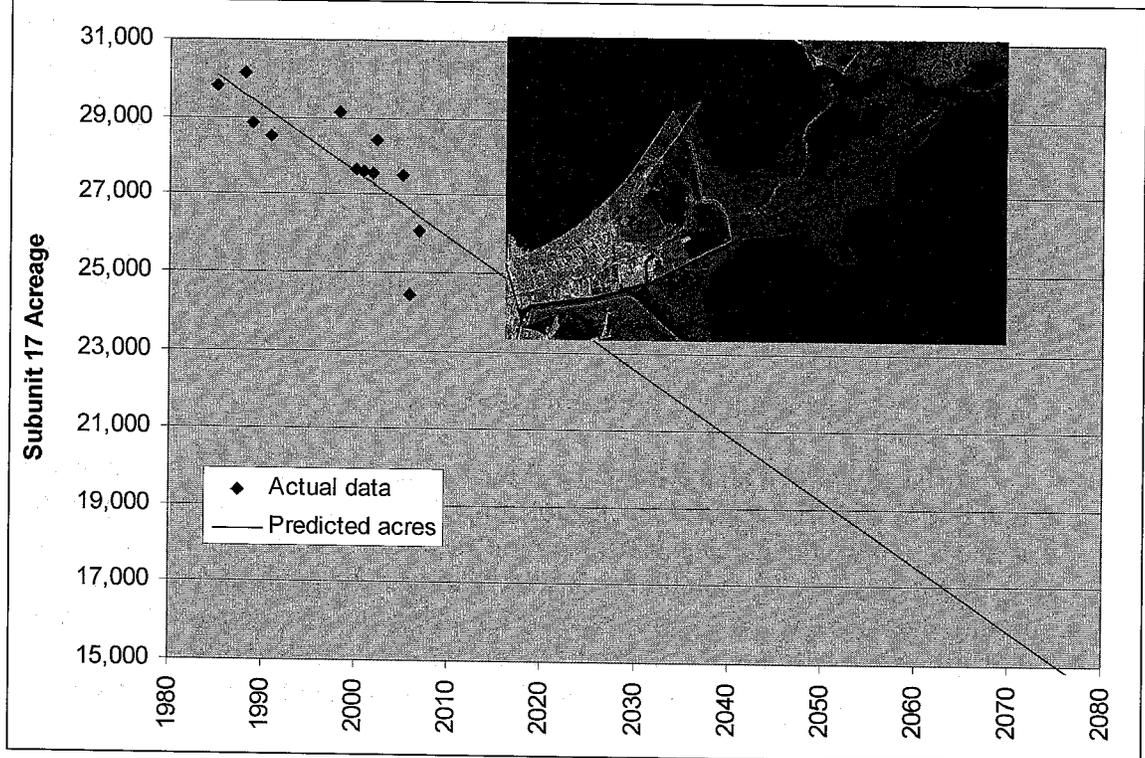
Required Action: Analysis of how risk was incorporated in the development, evaluation, selection and prioritization processes will be added to the report.

Action Taken: The report has been revised to describe how plans perform in terms of ecosystem sustainability in coastal Louisiana. Plans are tied to critical landscape features. Note: Planning subunit descriptions in Tables 2-4 and 2-5 have been changed for consistency

with how the subunits are described in other parts of the report. Land loss rates were used in the calculation of benefits, and a discussion of the analysis was added in 2.7.1 as follows:

WVA requires estimates of FWP and FWOP marsh acreages. Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. FWOP subunit wetland acreages were determined via a linear trendline through those data (Figure 1). Where applicable, annual net acreage benefits associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

Figure 1. Actual and predicted acreage for subunit 17.



The SAND2 (Sediment and Nutrient Diversion) method was used to predict accretion rates in areas benefitted by freshwater diversions. This model is an Engineering Research and Development Center (ERDC) revision of the SAND1 (Boustany-ERDC spreadsheet model) used in the Louisiana Coastal Protection and Restoration Final Technical Report (LACPR). The WVA model used this engineering input to assess benefits. Given the great uncertainties regarding future subsidence rate changes, sea-level rise changes, and many other factors that might affect future wetland loss rates over the project life, there is considerable uncertainty regarding the accuracy of the predicted river diversion benefits. However, the SAND2 model provides an objective means for comparing alternative measures and plans.

Utilizing the predicted FWOP wetland acreage as a basis, the SAND2 model calculates FWP benefits (in acres) via the accretion of suspended sediments (land building) together with the effects of nitrogen additions. The nitrogen benefits (in acres) are calculated as the grams of nitrogen required to produce a wetland acre

multiplied by the grams of introduced nitrogen (less nitrogen lost to denitrification) = wetland acres created/supported via introduced nitrogen.

Sustainability

The benefits analysis utilized for the MRGO Ecosystem Restoration Plan considers sustainability inherently. Because the WVA methodology utilizes historic land loss rates in the calculation of benefits, areas that have historically been more susceptible to risks such as tropical storms, subsidence, and sea level rise, will have fewer AAHUs than areas that have not been as susceptible to these factors. The SAND2 methodology accounts for the greater sustainability of features nourished by the freshwater diversion by assigning more AHHUs to features in the diversion influence area. Additionally, the WVA methodology assigns greater benefits to natural restoration features than protection features like shoreline protection that require maintenance.

HQUSACE Assessment: The comment is partially resolved. This is a good description of the methodology but it is not transparent in the model results that are shown in the ICA tables. Recommend establishing a sustainability index that can be linked to the measures and best buy plans.

MVN Response: A sustainability index linked to measures and best buy plans will be developed and included in the final report.

HQUSACE Assessment: The comment is resolved.

e. Consider developing another formulation framework for incorporating risk by evaluating the measures in context of the lines of defense noted in the report. Are there locations in the study area that are more defensible to the risk factors? By identifying the high risk areas for land loss in the plan area units and then evaluating how it can be mitigated would help rank the plans. In this framework the plans that include critical components like the cypress swamp and ridge habitat may be ranked higher even though they are more costly.

MVN Response to Comment 2.A.4.e: Concur

Discussion: Because benefits calculations incorporate historic land loss rates, areas with the highest historical land loss rates do not perform as well in CE/ICA. However, there is a high amount of residual risk associated with not protecting and restoring areas with high land loss rates, because as these areas degrade and eventually disappear, areas with lower land loss rates will become more vulnerable. Because of this residual risk, in the long-term, only areas located behind storm damage risk reduction features are more defensible to risk.

Required Action: Discuss residual risks for the with-project condition for the higher priority, more sustainable measures if lower priority measures are not implemented.

Action Taken: The following information has been added to the Sea Level Rise Section:

Wetland Acreage Predictions under Increased SLR Rates

For the medium and high scenarios, the future wetland loss rates were increased to simulate effects of increased wetland submergence. Using Corps-predicted future water levels (based on the Shell Beach gage) under medium and high sea-level rise scenarios, those water levels were converted into relative sea level rise (RSLR) rates, assuming that those water levels incorporate both subsidence and sea level rise effects. By subtracting the average accretion value of 7.4 mm/yr (an average of accretion measurements obtained throughout the project area), from the year 2011 baseline RSLR rate of 10.24 mm/yr, a net baseline submergence rate of 2.84 mm/yr was calculated. Likewise, the 7.4 mm/yr average accretion value was subtracted from predicted future submergence rates under both the medium and high SLR scenarios. To calculate future wetland loss rates under increased SLR scenarios, the baseline wetland loss rate, in acres lost per year, was multiplied by the year X submergence rate ratio (i.e., Submergence Rate Year X/Submergence Rate Year 2011).

Based on research conducted at the Madison Bay wetland loss hotspot in the Terrebonne Basin, it appears that when submergence reaches a certain critical threshold, plant productivity decreases rapidly and the marsh undergoes a rapid loss or collapse, when there is there inadequate sediment accretion to counter submergence. According to (Nyman et al. 2006), that threshold is 10 mm/yr. Under the high SLR scenario, this submergence threshold is reached in year 2023. It was assumed that once that threshold was reached, the marsh would undergo rapid collapse and be totally converted to open water in 10 years. Consequently, under the high SLR scenario, marshes not receiving additional sediment would totally disappear by year 2033.

Collapse threshold thresholds were not applied to the wetlands receiving increased input of suspended sediment from the proposed Violet Diversion (i.e., the central wetlands, the south Lake Borgne marshes, east Orleans landbridge, and the inner Biloxi marshes). For those areas, future with-project acreages were determined using the SAND2 model benefits with high wetland loss rates due to accelerating submergence.

Assessment of Feature Sustainability under Relative Sea Level Rise

Features contained within the final array of alternatives were assessed on a Yes/No scale for each of the following four sustainability factors:

5. Elevation – Features at higher elevations are more sustainable under relative sea level rise, e.g. ridges, than features at marsh elevation. (Y = features that are higher than marsh elevation; N = features that are at marsh elevation)
6. Freshwater influence – Features that are influenced by rivers or river diversions have a sustainable source of freshwater and sediment to nourish them and aid in accretion. (Y = features nourished by freshwater; N = features not nourished by fresh water)
7. Wave energy – Features that are protected from wave energy (e.g. interior marsh) are more sustainable than features subjected to high wave energy. (Y = features protected from high wave energy; N = features not protected from high wave energy)
8. Natural features – Features that are natural, living features of the ecosystem such as marsh are more sustainable than hard structures such as rock that subside more quickly and cannot sustain themselves and therefore require more O&M. (Y = natural features; N = hard features)

After each feature or groups of features was assessed for each sustainability factor, the feature was assigned numerical and qualitative scores as follows:

- Sustainability factors were converted to points: Yes (Y) = 1 point. No (N) = 0 points. If a feature included more than one component and received a Yes score for one component and a No score for the other component, it received a half point.
- Points were then totaled and converted into a qualitative score as follows: 0 = Poor; 1 = Fair; 2 = Good; 3 = Very Good; 4 = Excellent.

Table x-x. Sustainability under relative sea level rise by feature.

Location	ID	Plans	Sustainability Factors				Score	
			Elev.	FW Influ.	Wave Energy	Natural feature		
Lower Pearl River	EM2	B, C (TSP), D	N	Y	N	Y	2	Good
	EM3	C (TSP), D	N	Y	Y	Y	3	Very Good
	EM4	C (TSP), D	N	Y	N	Y	2	Good
East Orleans Landbridge	EM1	B, C (TSP), D	N	N	N	Y	1	Fair
	EM5	D	N	N	N	Y	1	Fair
	ES1	C (TSP), D	N	N	N	N	0	Poor
	ES2	C (TSP), D	N	N	N	N	0	Poor
	ES3	C (TSP), D	N	N	N	N	0	Poor
Bayou Savage	EV1	D	N	N	N	N	0	Poor
MRGO Channel	MRGO1	B, C (TSP), D	N	N	N	N	0	Poor
	MRGO2	B, C (TSP), D	N	N	N	N	0	Poor
	MRGO3	B, C (TSP), D	N	N	N	N	0	Poor
	MRGO4	B, C (TSP), D	N	N	N	N	0	Poor
	MRGO5	B, C (TSP), D	N	Y	N	Y/N	1.5	Fair/Good
	MRGO6	B, C (TSP), D	N	N	N	N	0	Poor
	MRGO7	B, C (TSP), D	N	Y	N	Y/N	1.5	Fair/Good
	MRGO8	C (TSP), D	N	Y	N	Y/N	1.5	Fair/Good
South Lake Borgne	LM1	B, C (TSP), D	N	Y	N	Y	2	Good
	LM2	B, C (TSP), D	N	Y	N	Y	2	Good
	LM3	B, C (TSP), D	N	Y	N	Y	2	Good
	LM4	C (TSP), D	N	Y	Y	Y	3	Very Good
	LS1	C (TSP), D	N	N	N	N	0	Poor
Central Wetlands Swamp	CC1 – CC6	B, C (TSP), D	Y	Y	Y	Y	4	Excellent
Central Wetlands Marsh	CM1-CM5	C (TSP), D	N	Y	Y	Y	3	Very Good
Terre aux Boeufs	TM1	B, C (TSP), D	N	N	Y	Y	2	Good
	TM2	B, C (TSP), D	N	N	Y	Y	2	Good
	TM7	C (TSP), D	N	N	Y	Y	2	Good
	TM8	C (TSP), D	N	N	Y	Y	2	Good
Hopedale	HM1	C (TSP), D	N	N	Y	Y	2	Good
Bayou La Loutre Ridge	BR1	B, C (TSP), D	Y	Y	Y	Y	4	Excellent
Biloxi	BS1	C (TSP), D	N	N	N	N	0	Poor

Location	ID	Plans	Sustainability Factors				Score	
			Elev.	FW Influ.	Wave Energy	Natural feature		
Marsh	BS2	C (TSP), D	N	N	N	N	0	Poor
	BM1	C (TSP), D	N	Y	N	Y	2	Good

If the sustainability scores are averaged, Plans B, C, and D are all in the range of Fair to Good sustainability. All plans include the most sustainable types of features, i.e. the cypress swamp and ridge habitat. The smallest plan, Plan B is marginally more sustainable simply because it includes the least number of features. For Plans C and D, sustainability decreases marginally as less sustainable features, such as shoreline protection, are added.

Since plans B, C, and D cannot be substantially differentiated based on relative sea level rise, a detailed WVA analysis of the three relative sea level rise scenarios was only performed on the TSP (Plan C). Table x-x below shows the net acres projected under each of the three relative sea level rise scenarios based on feature locations.

Table x-x. Robustness of features in TSP under all relative sea level rise scenarios.

Feature Location	Net Acres			Robust under all scenarios?
	Low RSLR	Medium RSLR	High RSLR	
Lower Pearl River	1056	905	0	No
East Orleans Landbridge	819	642	0	No
MRGO Channel	95	75	0	No
South Lake Borgne	6326	5031	0	No
Central Wetlands Swamp	3793	4914	7340	Yes
Central Wetlands Marsh	6478	4785	0	No
Terre Aux Boeufs	2937	2165	0	No
Hopedale	244	181	0	No
Bayou La Loutre Ridge	14	25	48	Yes
Biloxi Marsh	2809	2220	0	No
Biloxi Marsh (Bayou La Loutre Outer Shoreline)	49	48	0	No

Although it may seem counterintuitive that the net acres for ridge and swamp increase as relative sea level rise increases, the reason is that the WVA calculation subtracts existing and future marsh acres from the ridge and swamp footprints. As relative sea level rise increases, the marsh acres decrease; therefore, the ridge and swamp net acres increase. Another difference is in the marsh and swamp WVA calculations. The marsh WVAs take into account changing water to land ratios over time, while the swamp WVA procedures simply multiply quality by total project area. In general, ridge and swamp are more sustainable than marsh because they have a higher elevation and would be less affected by relative sea level rise. In general, the most sustainable features will be those with higher elevations; features being nourished by diversions; and the diversion itself.

HQUSACE Assessment: The comment is partially resolved. The above information substantially improves the assessment of the TSP, but the building blocks (assessment of reliability of the measures under different SLR scenarios) should to be added as noted in comments above. A further formulation will be required to address the loss of almost all benefits under the high SLC to make the plan more robust. This is where the risk management plan through the adaptive management plan practices could respond to the high SLR scenario.

MVN Response: As per MVD CG guidance, no changes will be made to the TSP necessitating another 45 day public review period. Therefore, reformulation as recommended would not be policy compliant (reference 6 July 2011 Memorandum for MVN Commander Guidance for Completing the Mississippi River Gulf Outlet (MRGO) Ecosystem Restoration Plan Feasibility Study). Monitoring and adaptive management actions associated with sea level rise will be included in the plan.

HQUSACE Assessment: The comment is resolved. Note: HQUSACE is not bound by policy decisions made by the MVD commander.

f. Results of the incremental analysis should be synthesized with other decision making criteria (for example significance of outputs, acceptability, completeness, effectiveness, risk and uncertainty, reasonableness of costs) pg 2-67

MVN Response to Comment 2.A.4.f: Concur

Discussion: The discussion of the CE/ICA should include the consideration of other factors.

Required Action: Revise report to include other decision factors that were considered in selection of the final array.

Action Taken: The section on selection of the final array has been revised to include factors that were considered in addition to the CE/ICA as follows:

2.7.3 Selection of the Final Array of Alternatives

In the cost effectiveness/incremental cost analysis described in the previous section, measures were combined into alternatives and evaluated based solely on costs and outputs. In order to select a final array of alternatives from the 19 Best Buy plans, the following additional considerations were synthesized into the decision making process:

- *Environmental Planning Guiding Principles*
- *Risk and Uncertainty*
- *Four Planning Criteria (efficiency, effectiveness, acceptability, completeness)*

The following sections describe how these principles and criteria were used to select plans to carry forward into the final array of alternatives for further analysis.

Environmental Planning Guiding Principles

All plans address the plan formulation guiding principles. The differences between the plans are a matter of scale. Consequently, the degree to which each plan follows the guiding principles is generally also a matter of scale.

Principle 1 - Relatively intact estuarine ecosystems are a key attribute in coastal Louisiana, and alternatives should seek to enhance the resilience and self-sustainability of the estuarine environments, including protection of existing high-quality estuaries.

Because all of the plans include the Violet Freshwater Diversion, all plans enhance the resilience and self-sustainability of the estuary. However, the plans vary in their ability to protect, maintain and restore the form of the ecosystem. Plans that do not provide extensive protection and restoration on the East Orleans Landbridge, Biloxi Marsh, and the MRGO/Lake Borgne Landbridge (Plans #2 to #5) may not contain all of the features needed to maintain and restore the form and function of the estuary. The need to protect existing high quality estuaries is better addressed by Plans #6 to #19, which include increasing scales of restoration and protection in these areas. Plans #16 to #19 include backfilling portions of the MRGO channel, and better address the need for an intact system and restoration to historic conditions.

Principle 2 - Restoration of key processes and dynamics are critical to the long-term health of the ecosystem.

The Violet Diversion restores a key process of the estuary and is a component of every plan. However, the plans vary in the extent they restore biodiversity and promote accretion through sediment placement, vegetative planting, and shoreline protection. Plans #2 to #11 provide incremental scales of marsh restoration and shoreline protection features that would promote accretion and restore biodiversity. Plans #12 to #15 do not increase marsh restoration, although additional shoreline protection features would help protect existing vegetation. Plans #16 to #19 incrementally increase the amount of marsh restored, with Plan #19 providing the greatest amount of restoration.

Principle 3 - Measures and alternatives must seek to maximize the combined benefits of diversions that seek to restore natural processes with mechanical marsh creation measures.

All plans seek to maximize the combined benefits of diversions. However, plans that include the most restoration features in the area benefitted by the diversion (Plans #7 to #19) better address the goal of combining the benefits of diversions with mechanical marsh creation measures. Plan #7 is the first plan to include all of the proposed marsh restoration features in the immediate influence area of the diversion (Central Wetlands, Golden Triangle, MRGO/Lake Borgne Landbridge, and areas adjacent to Lake Borgne and Mississippi Sound) with the exception of backfilling portions of the MRGO channel. Plans #16 to #19 would maximize the amount of marsh benefitted by the diversion by including these measures.

Principle 4 - Additional sources of sediments should be sought where feasible; recognizing that such measures should not contribute to ecosystem degradation in the source area.

All of the plans require significant amounts of sediments to restore and nourish sediment-deprived marsh. Alternative sediment sources were considered and are discussed in Section 2.5.3.1. The smaller plans better address this principle because the potential for environmental damage from obtaining and/or transporting borrow material is on a smaller scale than the larger plans. However, the potential adverse environmental impacts associated with obtaining and transporting borrow material must be considered in context with the long-term benefits associated with these actions.

Principle 5 - Measures should be combined synergistically to maximize possible cumulative benefits. Thus, the position of features within the landscape has a direct influence on the potential benefits derived.

Plans #2 to #5 work synergistically over the areas that they include, but do not include any features in the Biloxi Marsh. Therefore do not address restoration in a critical landscape feature necessary to maintain the form and function of the overall ecosystem. These plans do not capitalize on existing and planned foreshore protection measures. Plan #6 does not include ES3 and LM1, which are key pieces in a comprehensive shoreline protection plan for Lake Borgne. Plan #7 is a cohesive plan that reasonably maximizes cumulative benefits. Plans #8 to #19 continue to incrementally increase the potential for cumulative benefits; however, the incremental benefits associated with Plans #8 to #15 are minor. Plan #16, which is the first plan to include backfilling portions of the MRGO, maximizes the potential for synergistic benefits.

Principle 6 - Flexibility is required in project design and implementation to permit adaptive management as conditions change and more is learned.

All of the 19 Best Buy plans include plans for the Violet Diversion, which offers the greatest opportunity for continued adaptive management.

Principle 7 - A concerted monitoring and adaptive management program should be a component of the restoration plan.

All of the plans would include a concerted monitoring and adaptive management plan.

Risk and Uncertainty

In general, the larger the plan, the higher the uncertainty of producing expected outputs. Plans increase in size from Plan #1 (no action) to Plan #19 (largest plan). Conversely, the smaller the plan, the higher the residual risks in terms of ecosystem degradation and potential resulting storm surge increases in the future.

As described in Section 2.6.1.1, Risk and Uncertainty Associated with Restoration Measures Types, risk and uncertainty vary by measure type. Except for the No Action alternative, all Best Buy plans include a freshwater diversion, forested swamp restoration, and forested ridge restoration, so the risks and uncertainties associated with those features are the same for all plans. Risks and uncertainties associated with individual plans vary based on the amount and location of marsh restoration/nourishment and shoreline protection, which is discussed in the following section along with the application of the four planning criteria.

Rationale for Selection of the Final Array

In addition to the No Action Plan (Plan #1), three action plans (Plans #2, #7, and #10) were selected for the final array of alternatives.

Plan #2 was selected for further consideration for the following reasons:

- Plan #2 is the least costly Best Buy Plan.*
- Plan #2 contains the least amount of marsh restoration and nourishment and therefore has the least uncertainty associated with obtaining sufficient quantities of borrow material.*
- Plan #2 contains the least amount of rock protection. Hard structures, such as rock protection, are less acceptable to some stakeholders than natural features. Shoreline protection measures are not self-sustaining and have risk of failure under the higher relative sea level rise scenarios.*

Plan #2 does not achieve all of the goals of the study, but it does include some restoration measures for all of the targeted habitat types. Plan #2 would restore or protect 9,518 acres of fresh and intermediate marsh, 10,253 acres of brackish marsh, and 10,431 acres of cypress swamp. Plan #2 does not meet the target acre objectives for brackish marsh. Plan #2 has no features in the Biloxi Marsh and only includes one feature on the East Orleans Landbridge; therefore, Plan #2 does not fully address the objective to restore and protect critical landscape features for storm surge reduction and significant residual risks associated with not restoring and protecting critical landscape features.

Plan #7 was selected for further consideration for the following reasons:

- Plan #7 is the least costly Best Buy Plan that meets all of the objectives, including reasonably maximizing restoration and protection of the Biloxi Marsh and East Orleans Landbridge.*
- Plan #7 is the least costly Best Buy plan to include Feature LS1, which is a key Lake Borgne restoration component. Feature LS1 would work synergistically with the Bayou Dupre and West of Shell Beach shoreline protection features currently under construction, and Feature LM2 to restore and protect the Proctor Point area.*
- Plan #7 is a complete plan for the Lake Borgne ecosystem and the areas affected by the MRGO. For example, Plan #7 addresses the gaps left by*

existing and authorized restoration projects. Plan #7 includes the necessary shoreline protection and marsh restoration features to form a complete plan for the ecosystem.

Plan #10 was selected for further consideration for the following reasons:

- Plan #10 improves upon Plan #7 by further protecting critical landscape features, and better meets the storm surge objectives. It contains additional shoreline protection in the Biloxi Marsh and additional marsh restoration in the East Orleans Landbridge both of which are critical landscape features.
- Plan #10 is the least costly Best Buy plan to include a Submerged Aquatic Vegetation (SAV) project. SAV restoration measures are presented as pilot projects because of uncertainties surrounding the re-establishment of SAV beds.

The remainder of the Best Buy plans were not selected because they were either not significantly different from one of the selected plans or they were too expensive. Plans #3 to #6 were not selected because all of the measures in Plans #3 to #6 are contained in #7, which was selected for the final array. Plans #3 to #5 also do not meet the objectives for brackish habitat or contribute substantially to the restoration and protection of the East Orleans Landbridge and the Biloxi Marsh. Plan #6 includes restoration features in the Biloxi Marsh and more features that protect the East Orleans Landbridge; however, Plan #6 does not meet the target for increasing brackish marsh.

Plans #8 and #9 were not selected because all of the measures contained in Plans #8 and #9 are also contained in Plan #10, which was selected for the final array. Plan #8 includes more shoreline protection features in the MRGO. Plan #9 includes the additional features in Plan #8 as well as additional features in the East Orleans Landbridge.

Plans #11 to #19 were not selected because although they would provide additional benefits, they are the most expensive plans providing diminishing returns at increasing financial risk and uncertainty. Plan #11 adds additional protection features along the MRGO/Lake Borgne Landbridge. The incremental cost difference between Plans #10 and #11 is relatively small. However the incremental cost per unit of output is relatively low.

Plan #12 includes the features in Plan #11 and increases the amount of shoreline protection and marsh restoration in the Biloxi Marsh at a relatively low incremental cost. However, it was determined that Plan #10 met the storm surge objective, and that Plan #12 would not be carried forward, although it may better meet this objective. Potential risks and uncertainties regarding extensive foreshore protection in the Biloxi Marsh were raised by some Federal partner agencies, and were an additional consideration in the decision to not carry this alternative forward.

The incremental costs associated with Plans #13 to #15 were not considered reasonable for the relatively minor amount of associated costs. Plans #16 to #19 provide a substantial increase in benefits (by filling in large portions of the MRGO channel), but the total estimated construction costs are considered too great for the associated ecosystem outputs.

Measures Not Included in the Final Array

The following measures were not included in the final array because they are the least cost effective and/or they have high risk and uncertainty:

- *Marsh creation and shoreline protection on the Breton Sound side of Biloxi marshes north of Morgan Harbor – These measures would be exposed to high wave action and would not perform well under higher levels of sea level rise.*
- *Backfilling in the MRGO channel - These plans have the highest uncertainty associated with obtaining sufficient quantities of borrow material.*
- *Large ridge restoration measure - Lack of technical knowledge is a risk associated with ridge restoration features. Very few coastal ridge restoration projects have been constructed, and there is limited data to contribute to the successful design and implementation of these features. The lack of knowledge could jeopardize project success, and the consequences of failure could result in a significant or total loss of benefits. By including the smaller ridge restoration measure in the final array, these risks are reduced without eliminating all of the benefits of this unique habitat type.*
- *Florissant marsh restoration – This measure is not cost effective and would contribute little to the overall plan.*

HQUSACE Assessment: The above information partially resolves the comment. Need more description about where the principles came from, how they support the planning goals and objectives, and the description of actions. As noted earlier, the need for an adaptive management plan is noted, although one is not included with the report.

MVN Response: Additional information about the origins of the Guiding Principles and how they support the planning framework will be included in the final report. The Adaptive Management Plan was provided as Appendix T of the EIS. It will be revised as noted throughout this PGM and summarized in the final main report.

HQUSACE Assessment: The comment is resolved in concept, pending revisions discussed above.

g. Risk and uncertainty should be addressed relative to the costs and outputs of alternative plans.

MVN Response to Comment 2.A.4.g: Concur

Discussion: Risk and uncertainty will be addressed qualitatively relative to the performance of alternative plans given the current designs and anticipated costs.

Required Action: Revise report as described above.

Action Taken: The following paragraph has been added to section 2.8.1 Risk and Uncertainty:

The relative risk of each plan is based on the differences in consequences. Because it has the lowest benefits and costs, Plan A involves no action, and therefore the risk to the ecosystem is greatest under this scenario. The risk associated with Plan B is less than Plan A, because some key restoration features, such as the Violet Diversion, would be implemented. Plan B reduces the risk to some critical landscape features, but does not provide as much restoration and protection as Plan C. The risk to ecosystem form and function is less with Plan C than Plans A and B, because it includes more actions to protect and restore key geographic components of the ecosystem. Plan D provides the most restoration features of all of the plans evaluated in the final array, and further decreases the risk to ecosystem form and function.

HQUSACE Assessment: The comment is resolved.

h. The need for the analysis and evaluation above is consistent with NRC 2006 report that cast doubts on about the feasibility of sustaining wetlands into the future. "Full restoration of past wetland cover and function will not be possible."

MVN Response to Comment 2.A.4.h: Concur

Discussion: Full restoration of historic land cover will not be possible. However, ecosystem function may be restored to a less degraded, more natural state, so that a sustainable land cover configuration can be established. This concept needs to be better articulated in the report.

Required Action: Language will be added in the report to better explain the risks and uncertainties that informed the planning process from Step 1, Identify Problems and Opportunities.

Action Taken: See Comment #2.A.4.a for text revisions/additions.

HQUSACE Assessment: The comment is resolved.

5. Establish critical planning units as noted in the VE discussion into the formulation. The VE study recommended "develop alternative strategies for implementation; Stabilize East Orleans land bridge and Lake Borgne shorelines and contiguous marsh areas only. Develop a long term sustainable project alternative based on sediment capture." Recommend developing a phased implementation strategy based a systematic assessment of risk factors that will affect sustainability since it is understood that this is a partial solution.

MVN Response to Comment 2.A.5: Concur.

Discussion: HQUSACE felt that the section on Value Engineering (VE) was out of place in the report. They suggested that it might be appropriate to include a VE Appendix.

The VE section was placed in the report where it occurred in the planning sequence. The section's placement will be reconsidered.

The TSP does "stabilize East Orleans land bridge and Lake Borgne shorelines and contiguous marsh areas only". A sustainable alternative based on sediment capture would require the use of Mississippi River sediment (the only substantial sediment source in the study area). As noted in the discussion of alternative borrow sources, due to several factors (infrastructure located between river and marsh areas, depth of the river, location of sediment sources in the river) the only feasible alternative for the distribution of river sediment into the study area is dredge and transport by barge. Therefore, an alternative based on sediment capture would not be cost-effective. As noted in the VE section of the report, alternative implementation strategies should be considered in the detailed design phase.

Required Action: Review the role of the VE

Action Taken: The VE section was moved to 2.10.1. The section has been revised to evaluate the primary suggestions developed by the VE Team and how those suggestions were incorporated into the TSP.

HQUSACE Assessment: The comment is resolved, however it is noted that the TSP is not sustainable under all SLR scenarios.

6. Further develop a Systems Perspective for Plan Development. Section 2.5.6 Study Objectives Metrics and Table 2-7 goals objectives and metrics need to be developed further so the goals are incorporated into the screening of the plans. For example, sustainability and resilience (adaptive capacity) could be used to screen the plans. Objective 8 – multiple lines of defense concept is good but not applied in the formulation. What are they and where are they in the planning area. This could provide a context for prioritizing the management measures from a systems perspective.

MVN Response to Comment 2.A.6: Concur.

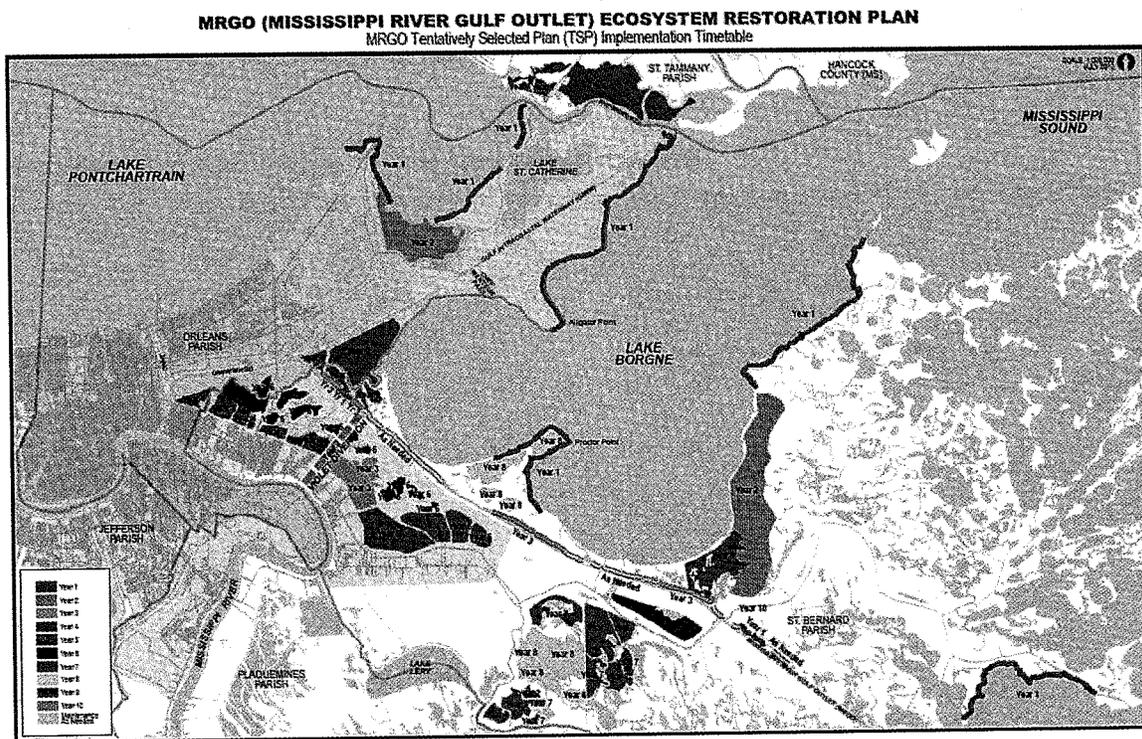
Discussion: HQUSACE suggested adding a map similar to the borrow site map showing the implementation order of measures and a description of why measures appear in that order.

The report contains a phased 10-year implementation strategy. Marsh restoration measures in areas having the lowest land loss rates (i.e. most sustainable) would be constructed first in order to maximize benefits. The 'multiple lines of defense' concept is considered in the evaluation of the plans in terms of storm damage risk reduction through restoration of critical landscape features.

Required Action: Add language demonstrating that measures and/or plans are screened with respect to study objectives.

Action Taken: A discussion of how land loss rates were factored into the implementation plan to maximize benefits and sustainability by constructing areas with the lowest land loss

rates first has been added to the report. The following map showing implementation order has also been added:



HQUSACE Assessment: The comment is resolved.

7. Miscellaneous.

a. The hydrodynamics and salinity modeling for MRGO indicate these conditions were altered, but are now improving. How would the closure of the MRGO be treated since its closure can be considered a measure implemented for restoration? Will circulation patterns return to pre closure conditions? A figure showing salinity gradients before and after MRGO would help.

MVN Response to Comment 2.A.7.a: Concur.

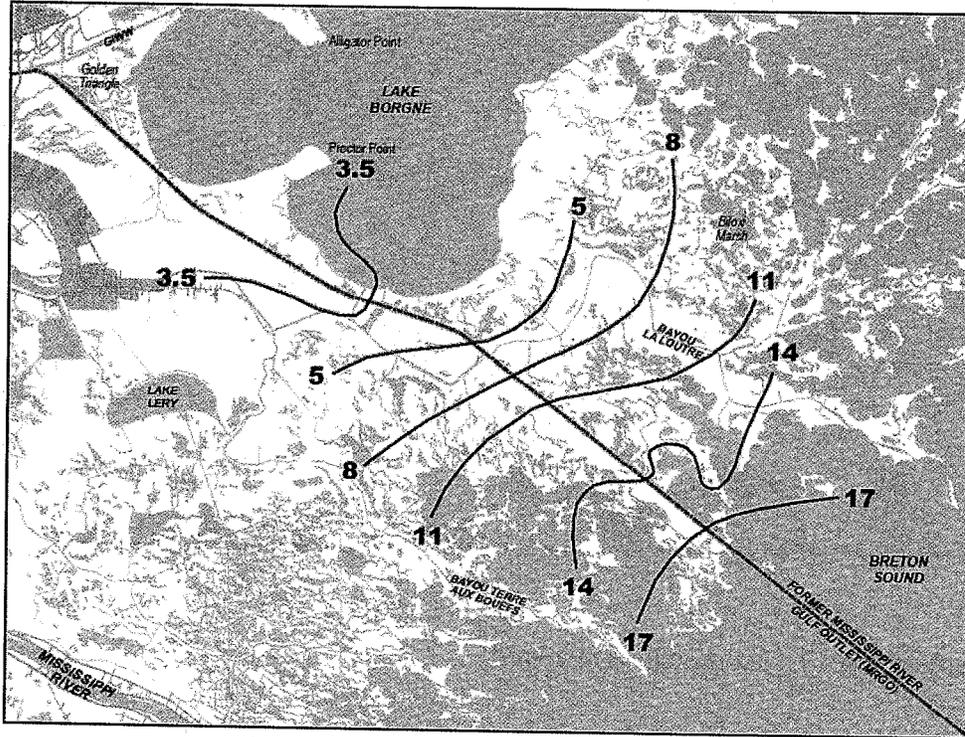
Discussion: Pre- and post-closure salinity maps were presented in the background slides. The MRGO closure is considered an existing condition, and is a navigation de-authorization feature that provides incidental restoration benefits. The hydrodynamic modeling for the study included the closure. The closure at Bayou La Loutre restores some hydrological function and reduces salinity, but does not fully restore the salinity regime needed to sustain historic habitat types.

Required Action: Disclose that the with-MRGO Closure feature is part of the existing condition.

Action Taken: The report has been revised to include discussion of pre-MRGO, post-MRGO, and post-MRGO closure salinity conditions in the estuary. Figures have been added to the report, which highlight the impact of the channel construction on salinities, as well as the beneficial impacts of the closure structure. As depicted in the following map series, the closure structure does not fully restore salinity conditions in the estuary, but has had a significant impact.

MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN

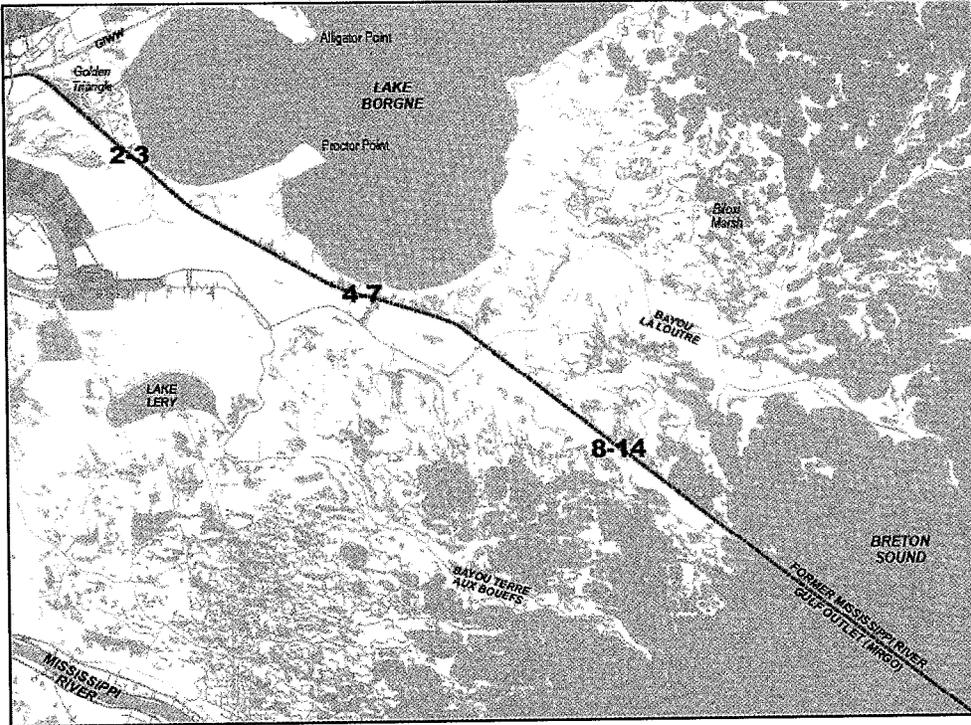
Historic Average Isohalines



The US Fish and Wildlife Service and the Texas A&M Research Foundation undertook a review of the hydrological and biological background of the MRGO project area in 1958 and continued research through 1961. This graphic is a reproduction of "Pre-Project Isohalines (Average)" from the study. The study indicates that historically, salinities in and around Lake Borgne were much lower than they are today. During the study period in the late 1950's to early 1960's, habitat around Lake Borgne supported intermediate marsh species, rather than the brackish species present today.

Source: Texas A&M Research Foundation, April 1959-March 1961.
SCALE 1:200,000
JULY 2010

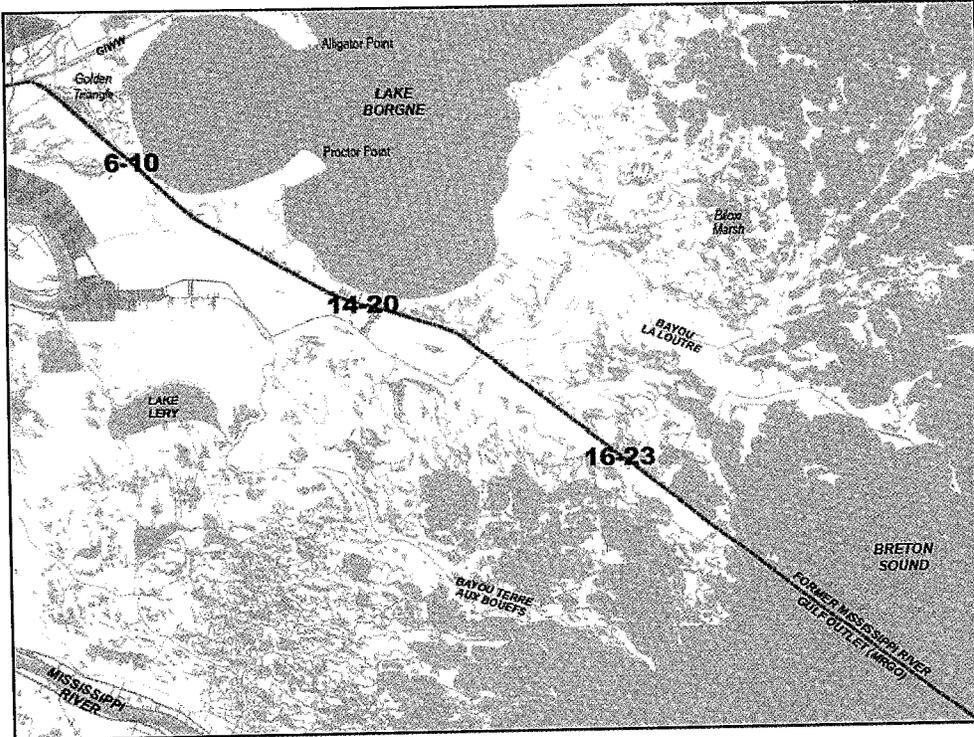
MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN
Average Salinity 1959 to 1961 (in parts per thousand)



The US Fish and Wildlife Service and the Texas A&M Research Foundation measured salinity in three areas at nine sites (three sites per area) in the study area between 1959 and 1961. Average monthly salinities were averaged to determine the annual average salinity during this period.

Source: El-Sayed, 1961.
SCALE 1:200,000
JULY 2010

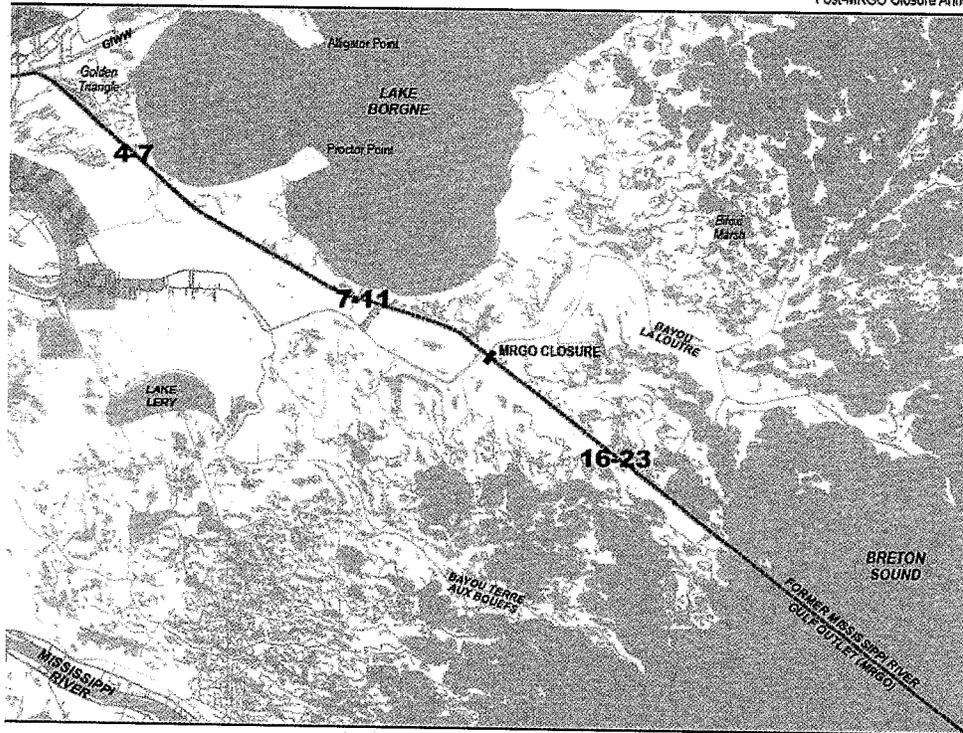
MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN
Annual Average Salinity 1990 to 2008 (in parts per thousand)



This graphic shows average salinity in parts per thousand from data collected between 1990 and 2008. The ranges depicted in this map are outputs of the data collected from the UNO Mass Balance model. The UNO Mass Balance model is a mathematical tool that performs first-order approximations of mass transfer due to physical inputs like water level, flow, and salinity. The model was selected for use in this study because it has been demonstrated to accurately characterize salinity variability on monthly time scales in the Lake Ponchartraine/Lake Borgne regions (McCorquodale, et al., 2006).

Source: University of New Orleans, 2010.
SCALE 1:200,000
JULY 2010

MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN
 Post-MRGO Closure Annual Average Salinity (in parts per thousand)



This graphic shows average annual salinity in parts per thousand generated in the UNO Mass Balance model. These values show predicted decreases in salinity following the construction of the closure near Bayou La Loutre and at the MRGO Surge Barrier. Salinity data for the post closure period are limited, but these model results are consistent with observed salinity reductions in the area following the construction of the closure near Bayou La Loutre. The UNO Mass Balance model is a mathematical tool that performs first-order approximations of mass transfer due to physical inputs like water level, flow, and salinity. This model was selected for use in this study because it has been demonstrated to accurately characterize salinity variability on monthly time scales in the Lake Pontchartrain/Lake Borgne regions (McCorquodale, et al., 2008).

Source: University of New Orleans, 2010.

SCALE 1:200,000
 JULY 2010

HQUSACE Assessment: The issue is resolved.

b. The teams guiding principles noted below were used for the Violet Freshwater Diversion. Why not use them for other screening purposes like the 19 plans assembled for the IWR Plan?

- Restore habitat in the Lake Borgne ecosystem and areas affect by MRGO, prevent storm damage
- Restore key processes and dynamics in the estuary
- Enhance the resilience a self sustainability of the estuary
- Maximize the combined benefits of freshwater diversion that seek to restore natural processes
- Combine measures synergistically to maximize possible cumulative benefits

MVN Response to Comment 2.A.7.b: Concur.

Discussion: The guiding principles should be used to help screen the 19 alternatives. See also Comment 2.A.3.

Required Action: Describe in the report how the 19 plans line up to the principles (e.g. sustainability) as they pertain to initial screening.

Action Taken: An evaluation of the plans in terms of the guiding principles (e.g. sustainability) has been added to the report as follows:

Environmental Planning Guiding Principles Analysis

All plans address the plan formulation guiding principles. The differences between the plans are a matter of scale. Consequently, the degree to which each plan follows the guiding principles is generally also a matter of scale.

“Relatively intact estuarine ecosystems are a key attribute in coastal Louisiana, and alternatives should seek to enhance the resilience and self-sustainability of the estuarine environments, including protection of existing high-quality estuaries.”

Because all of the plans include the Violet Freshwater Diversion, all plans enhance the resilience and self-sustainability of the estuary. However, the plans vary in their ability to protect, maintain and restore the form of the ecosystem. Plans that do not provide extensive protection and restoration on the East Orleans Landbridge, Biloxi Marsh, and the MRGO/Lake Borgne Landbridge (Plans #2 to #5) may not contain all of the features needed to maintain and restore the form and function of the estuary. The need to protect existing high quality estuaries is addressed by Plans #6 to #19, which include increasing scales of restoration and protection in these areas.

“Restoration of key processes and dynamics are critical to the long-term health of the ecosystem.”

The Violet Diversion restores a key process of the estuary and is a component of every plan. However, the plans vary in the extent they restore biodiversity and

promote accretion through sediment placement, vegetative planting, and shoreline protection. Plans #2 to #11 provide incremental scales of marsh restoration and shoreline protection features that would promote accretion and restore biodiversity. Plans #12 to #15 do not increase marsh restoration, although additional shoreline protection features would help protect existing vegetation. Plans #16 to #19 incrementally increase the amount of marsh restored, with plan #19 providing the greatest amount of restoration.

“Measures and alternatives must seek to maximize the combined benefits of diversions that seek to restore natural processes with mechanical marsh creation measures.”

All plans seek to maximize the combined benefits of diversions. However, plans that include the most restoration features in the area benefitted by the diversion (Plans #7 to #19) better address the goal of combining the benefits of diversions with mechanical marsh creation measures. Plan #7 is the first plan to include all of the proposed marsh restoration features in the immediate influence area of the diversion (Central Wetlands, Golden Triangle, MRGO/Lake Borgne Landbridge, and areas adjacent to Lake Borgne and Mississippi Sound) with the exception of backfilling portions of the MRGO channel. Plans #16 to #19 would maximize the amount of marsh benefitted by the diversion by including these measures.

“Additional sources of sediments should be sought where feasible; recognizing that such measures should not contribute to ecosystem degradation in the source area.”

All of the plans require significant amounts of sediments to restore and nourish sediment-deprived marsh. Alternative sediment sources were considered and are discussed in Section 2.5.3.1. The smaller plans better address this principle because the potential for environmental damage from obtaining and/or transporting borrow material is on a smaller scale than the larger plans. However, the potential adverse environmental impacts associated with obtaining and transporting borrow material must be considered in context with the long-term benefits associated with these actions.

“Measures should be combined synergistically to maximize possible cumulative benefits. Thus, the position of features within the landscape has a direct influence on the potential benefits derived.”

Plans #2 to #5 work synergistically over the areas that they include, but do not include any features in the Biloxi Marsh. Therefore do not address restoration in a critical landscape feature necessary to maintain the form and function of the overall ecosystem. These plans also fail to capitalize on existing and planned foreshore protection measures. Plan #6 does not include ES3 and LM1, which are key pieces in a comprehensive shoreline protection plan for Lake Borgne. Plan #7 is a cohesive plan that reasonably maximizes cumulative benefits. Plans #8 to #19 continue to incrementally increase the potential for cumulative benefits; however, the incremental benefits associated with Plans #8 to #15 are minor. Plan #16, which is the first plan to include backfilling portions of the MRGO, maximizes the potential for synergistic benefits.

“Flexibility is required in project design and implementation to permit adaptive management as conditions change and more is learned.”

All of the 19 Best Buy plans include plans for the Violet Diversion, which offers the greatest opportunity for continued adaptive management.

“A concerted monitoring and adaptive management program should be a component of the restoration plan.”

All of the plans would include a concerted monitoring and adaptive management plan.

HQUSACE Assessment: The issue is resolved.

c. The use of the IWR model creates Geographic subareas. The geographic subareas are not explained or consistent with other geographic subareas noted in the report. The subareas could have been a screening of planning units shown earlier in the report. Relationship between subunits and problems in Table 2-5 is good but it is not carried forward in the geographic screening process and the subarea best buys

MVN Response to Comment 2.A.7.c: Concur.

Discussion: HQUSACE noted the inconsistent use of planning subunits throughout the report. MVN explained that the geographic subunits used for IWR Plan are either equivalent to the subunits mentioned earlier in the report or are rollups of multiple subunits that have the same problems and opportunities. Geographic screening was conducted based on the nexus between the area and MRGO effects and the Lake Borgne ecosystem. The subarea best buy plans are cost-effective scales of addressing problems and opportunities in the geographic areas. The LACPR subareas in Attachment E are freshwater influence areas for multiple diversions rather than subunits and are not applicable to the MRGO plan which only includes one diversion.

Required Action: Revise report for consistent descriptions of geographic subareas.

Action Taken: Subunits will be better described for consistency throughout the document. Text has been added as follows:

The Biloxi Marsh geographic area consists of Subunits 07 Biloxi Marshes Interior and 18 Eloi Bay. These subunits compose a unique geomorphologic feature that has been identified as a critical landscape feature for storm surge damage risk reduction. The primary problems in this area are the lack of freshwater and sediment, and wind driven shoreline erosion. Unlike other subunits, this area has relatively low subsidence rates due to its unique geomorphology. The Bayou La Loutre Ridge is located in the Biloxi Marsh subarea; however, because it was determined that some scale of ridge needed to be included in the plan, these restoration features were evaluated separately.

The East Orleans/South Lake Borgne geographic area is composed of Subunits (36a) Pearl River Mouth – LA, 17 East Orleans Landbridge, 05 Bayou Sauvage, 40 South Lake Borgne and 26 Lake Borgne. Subunits 36a, 17, and 05 form the East

Orleans Landbridge area, recognized as a critical landscape feature with respect to storm surge damage risk reduction. Subunit 40 South Lake Borgne covers the MRGO/Lake Borgne Landbridge, the strip of marsh separating the MRGO from the lake. The spatial integrity of the MRGO/Lake Borgne Landbridge was compromised by the construction of the channel. South Lake Borgne is considered a critical landscape feature to protect the form and function of the estuary. These subunits were grouped together because the areas are contiguous and considered critical geomorphologic features. Because these areas are important to the overall integrity of the estuary, IWR was used to facilitate the development of the most cost-effective combination of measures for all components of the area.

The Terre aux Bouefs/ Hopedale geographic area is composed of Subunits 23 Jean Louis Robin and 21 Hopedale. These subunits are south of the MRGO and have been primarily affected by the channel through the placement of spoil material and hydrologic changes. Bayou Terre aux Bouefs forms the boundary of Subunit 23, and is considered to be the southeast boundary of the hydrologic impacts of the channel.

The Central Wetlands (Subunit 13) is isolated from the rest of the study area by levees, and was considered a separate geographic area for this reason. Additionally, the Central Wetlands presents a unique set of problems and opportunities because of its proximity to the Mississippi River and the containment provided by the levees. Similarly, the Florissant area (Subunit 19) is isolated from other portions of the study area, and was therefore evaluated separately.

HQUSACE Assessment: The issue is resolved.

d. Evaluation of Alternative Plans Section 2.8: A cost risk analysis should be applied to the sea level rise scenarios. What is the rate of loss in the planning area and was it factored into the amount of restoration needed? If the project was completed today, then what will be left in 50 years? How was the rate of land loss factored into the plans?

MVN Response to Comment 2.A.7.d: Non-concur.

Discussion: The rate of loss varies across the planning area and was factored into the calculation of benefits. Rather than holding benefits constant over the three relative sea level rise scenarios, the team formulated a plan for the historic/low relative sea level rise scenario and then assessed the change in outputs for the intermediate and high sea level rise scenarios. Therefore, a cost risk analysis based on the relative sea level rise scenarios is not needed.

The expectation is that a smaller number of acres will be left at the end of 50 years than what is constructed. The magnitude of that loss will be determined by the actual relative sea level rise rate. For the TSP, the team evaluated the remaining acres for each of the relative sea level rise scenarios, which will be included in a table in the report.

The reason for not overbuilding marsh to maintain benefits at an intermediate or high relative sea level rise scenario is that it would then not function as marsh at the historic/low relative sea level rise scenario. The diversion structure; however, was designed to the intermediate relative sea level rise scenario to give it operational flexibility to be adaptively managed under various relative sea level rise scenarios.

Required Action: Add discussion above to the report as well as a table showing future with and without wetland acres at the end of 50 years for each of the relative sea level rise scenarios.

Action Taken: The following table will be included in the feasibility report and EIS:

TSP Subarea	Net Acres (TY50)	TY 1 Acres FWOP	TY 1 Acres FWP	TY 50 Acres FWOP	TY 50 Acres FWP
Biloxi	3,013	56,237	55,930	42,602	45,615
Central Wetlands	9,543	16,324	18,218	11,841	21,384
East Orleans Landbridge	7,546	48,570	42,788	36,323	43,869
Terre aux Boeufs	5,566	10,823	10,846	7,763	13,329
Hopedale	299	1,363	1,365	1,064	1,363
Total	25,967	133,317	129,147	99,593	125,560

Note: Acres are based on functioning marsh, not just acres of dredge and fill.

HQUSACE Assessment: The issue is resolved.

B. Plan Formulation.

1. Habitat Switching Objective 6, Table 2-7, page 2-48. Objective 6 in Section 2.5.6 of the report is as follows: “Restore any habitat switched in the restoration of another habitat type (i.e., plan should be self-mitigating).”

As written, it appears that this objective is proposing mitigation for restoration actions undertaken as part of the MRGO project. For example, the discussion of Alternative B on page 2-71 states, in part, that “Additionally, 10,456 acres of brackish marsh would be converted to another habitat type that would not be restored elsewhere in the study area. Therefore, it did not meet the objective to add to the total amount of each habitat type in the study area by compensating for any habitat switching”. It is noted that the brackish marsh that requires compensation is being returned to historic pre-MRGO habitat types, such as fresh marsh, intermediate marsh and cypress swamp. Restoring the brackish marsh to the historic condition should be seen as a habitat improvement, and not as an adverse impact that requires compensatory mitigation. This requirement for compensatory mitigation clearly is at odds with paragraph 9.a of EP 1165-2-502 that states, in part, “Since the purpose of ecosystem restoration is to provide environmental benefits, projects should be formulated and designed to avoid any requirements for compensatory fish and wildlife mitigation.”

In the discussion of Alternative B on page 2-71, it is pointed out the Alt. B does not meet the habitat switching objective and other objectives, and was not selected as TSP for this reason. The tentatively selected plan Alternative C, as discussed on page 2-72 is the first plan that meets all the objectives (ostensibly, including the habitat switching objective). While it is

unclear from the AFB report how much of the cost differential between Alternatives B and C is due to compensatory mitigation measures, it is noted that the cost difference between Alt. B and Alt. C is about \$1.2 billion (Alt. B is \$1.7 billion, Alt. C is \$2.9 billion). It is likely that a significant piece of the \$1.2 billion cost difference is due to compensatory mitigation requirements, given that a deficit of 18,303 acres of habitat has been identified for Alt. B, and an increase of 4,442 acres has been shown for Alt. C. Table 2 in Tab 3, Environmental Compliance shows that the great majority of the negative impacts of habitat switching experienced under the TSP is accounted for by converting brackish marsh to the less-saline intermediate marsh (19,970 acres of 23,876 acres total). The report is not transparent about the proposed compensatory mitigation requirement for the restoration action, in that none of the restoration features displayed in Table 3-1 for the recommended plan (Alt. C) are specifically identified as mitigation measures, although some of these features surely must fit that category because all objectives, including the habitat switching objective, are satisfied.

Also, the need to mitigate calls into question whether restoration of some of the existing habitats to the historic condition is appropriate or practicable, if doing so results in unacceptable adverse impacts that require mitigation. Mitigating for a restoration action also works against the justification for carrying out any particular feature, in that the lost habitat outputs should be subtracted from the with-project habitat outputs, and the mitigation costs should be specifically identified as such, and not lumped in with proposed restoration features. The implications of these lost habitat outputs would have significant effects in the CE/ICA process and are also likely to have a major impact on the assembly of the selected plan.

In summary, the proposal to require compensatory mitigation for ecosystem restoration actions is not in compliance with Corps policy, and the formulation of the tentatively selected plan is called into question. HQUSACE requests that Objective 6 be deleted from the report, and the implications of the deletion of this objective on the plan formulation process be evaluated. HQUSACE suggests that the various measures (i.e., compensatory mitigation measures and other measures) simply be evaluated using the standard Corps of Engineers 6-step planning process.

MVN Response to Comment 2.B.1: Concur.

Discussion: The objective was intended to assist with the development of a complete plan that restores biodiversity and improves the quantity and quality of habitat in the areas affected by the channel and in the Lake Borgne ecosystem. Compensatory mitigation for restoration is not needed. In the process of restoring historic habitat types, areas will experience beneficial changes to historic ecological function. In order to restore historic biodiversity, some amount of restoration is needed for each habitat type to restore and maintain a functioning system. The objective is unnecessary. The intent of the objective has been clarified to improve and increase essential constituent habitat types of the system.

Required Action: Modify the report to clearly show that mitigation is not required and habitat switching does not require additional restoration as mitigation.

Action Taken: The terms habitat switching, mitigation, and compensation have been deleted from the report. References to “habitat switching” removed in Section S.3.6, Table S-3, 2.4.2, Table 2-4. It has been clarified in the report that in order to restore biodiversity and ecosystem function, an increase in quantity and quality of key habitat components of the ecosystem is needed. The revised objectives are as follows (In S.3.2 and 2.5.6):

1. Meet salinity targets identified by Chatry et al. 1983 (see Figure 2-1).
2. Increase cypress swamp habitat in the Central Wetlands by approximately 9,500 acres.
3. Increase fresh/intermediate marsh in the study area by approximately 6,800 acres.
4. Increase brackish marsh in the study area by approximately 18,100 acres.
5. Restore 3,900 acres of various marsh types adjacent to the channel lost to increased tides and salinity.
6. Restore ridge habitat along Bayou La Loutre.
7. Restore critical landscape features that provide hurricane and storm damage risk reduction in the study area (i.e. areas located in the Biloxi Marshes, the East Orleans Landbridge, and forested habitats).

HQUSACE Assessment: The issue is resolved.

2. Habitat Targets, Table 2-9. The “Additional” category in Table 2-9, page 2-51 of the report should be defined.

MVN Response to Comment 2.B.2: Concur.

Discussion/Required Action: Define the “additional” category in Table 2-9.

Action Taken: The additional habitat target has been better defined as follows:
Restore 3,900 acres of various marsh types adjacent to the channel lost to increased tides and salinity.

HQUSACE Assessment: The issue is resolved.

3. Justification needed for accretion rate, Section 2.10.1, page 2-102. The report should provide support for the assertion that the restored marsh vegetation is expected to accrete at rate sufficient to counter the historic sea level rise (which is also the forecast rate of seal level rise). The accretion rate is an important factor in evaluating the long-term performance and sustainability of the restored marshes.

MVN Response to Comment 2.B.3: Concur.

Discussion: HQUSACE suggested using the LCA White Ditch report as an example of how to describe a reasonable range of expected accretion rates.

The analysis of accretion rates in White Ditch is based on the SAND2 methodology that predicts improved accretion rates based on the input of freshwater, nutrients, and suspended solids. This methodology was also utilized in the MRGO study for areas influenced by the Violet Freshwater Diversion. Additionally, the MRGO study conducted additional accretion analyses to determine current rates of accretion and a most-probable future accretion condition.

Required Action: Include accretion analysis in report and review White Ditch as an example.

Action Taken: A discussion of the SAND2 methodology and applied accretion research has been included in the document and new text has been added in section 2.8.2 Relative Sea Level Rise Scenarios as follows:

Based on research conducted at the Madison Bay wetland loss hotspot in the Terrebonne Basin, it appears that when submergence reaches a certain critical threshold, plant productivity decreases rapidly and the marsh undergoes a rapid loss or collapse, when there is there inadequate sediment accretion to counter submergence. According to (Nyman et al. 2006), that threshold is 10 mm/yr. Under the high SLR scenario, this submergence threshold is reached in year 2023. It was assumed that once that threshold was reached, the marsh would undergo rapid collapse and be totally converted to open water in 10 years. Consequently, under the high SLR scenario, marshes not receiving additional sediment would totally disappear by year 2033.

Collapse thresholds were not applied to the wetlands receiving increased input of suspended sediment from the proposed Violet Diversion (i.e., the central wetlands, the south Lake Borgne marshes, east Orleans landbridge, and the inner Biloxi marshes). For those areas, future with-project acreages were determined using the SAND2 model benefits with high wetland loss rates due to accelerating submergence.

HQUSACE Assessment: The issue is resolved.

4. Incomplete assessment of sediment budget. The USACE conceptual sediment management plan key findings summarized in the report state that the sustainability of the entire coast in its current configuration is questionable. Are there configurations that are considered more sustainable and how do they factor into the FWOP discussion?. Also Figure 2-5, Louisiana Conceptual Sediment Budget study area needs more discussion and a legend.

MVN Response to Comment 2.B.4: Concur.

Discussion: The NRC statement “the sustainability of the entire coast in its current configuration is questionable” raises the question of what, if any, configuration would be sustainable. The report recognizes that a large amount of sediment is needed (approx. 150 million cubic yards of material) and identifies the available sources. Marsh restoration is not a measure that can be overbuilt and still function as intended. Plans are not being formulated to include re-nourishment because the MRGO ecosystem restoration plan is just one

component of the overall comprehensive plan for the Pontchartrain Basin rather than the final long-term solution.

Required Action: Add a legend to Figure 2-5 and more discussion on sediment resources.

Action Taken: A statement has been added to the report that there is no feasible physical configuration that would be more sustainable, as the study area is located in an abandoned delta. The term “sediment budget” has been removed from section 2.5.3. The section was revised by the PDT geologist for clarity. Text revised as follows:

The majority of the study area is situated within the abandoned St. Bernard Delta of the Mississippi River. Active sedimentation related to delta growth ceased in this area over 1000 years ago. Since delta abandonment, the processes of erosion and relative subsidence have dominated the landscape resulting in land loss and habitat switching. More recently, the construction of levees along the Mississippi River has eliminated the periodic floods that provided freshwater, sediment and nutrients to the study area. In addition, upstream reservoirs, changes in agricultural practices and land uses, and bank stabilization measures have reduced average sediment loads in the lower Mississippi River by approximately 67 percent since the 1950s (Kesel 1988). Sediments in the Mississippi River that could be used to build land in critical areas are lost from the system once the River reaches the Gulf of Mexico.

The surface and shallow subsurface of the study area is composed mainly of organic clay and clay. Coarser sediments are confined mainly to the Mississippi River and the Chandeleur Islands chain. As land areas erode, much of the material is oxidized or transported away via suspension. The remaining sediment is distributed throughout the marshes, bays, and lakes. Detailed investigations to quantify the distribution of eroded and transported sediments over this extensive study area have not been conducted to date. However, there are no significant land areas being formed within the study area from deposition of eroded marsh sediments indicating a net loss of material from the system.

The USACE has developed a conceptual sediment study to determine the amount of sediment available for restoration efforts throughout coastal Louisiana. The purpose of this initial effort is to document what is known about present-day sediment transport processes and pathways, coastal and nearshore volume changes, and sources and sinks of sediment for the Louisiana coast. In the study area, the primary focus areas include the Mississippi River, Chandeleur Sound, portions of Breton Sound, and the Mississippi River birdsfoot delta.

HQUSACE Assessment: The issue is not resolved. The following statement is troubling, because it implies that the plan formulation process is incomplete. “Plans are not being formulated to include re-nourishment because the MRGO ecosystem restoration plan is just one component of the overall comprehensive plan for the Pontchartrain Basin rather than the final long-term solution.”

Also, if no periodic renourishment is proposed for the project, the plan is clearly not consistent with long-standing Corps policy on OMRR&R. This is an important consideration

given that the tentatively recommended plan would restore or nourish approximately 49,000 acres of marsh and cypress swamps.

Lastly, as noted elsewhere, there is a need for an adaptive management plan in order to have a successful project. Given that a reasonable adaptive management and monitoring plan has not been provided, HQUSACE considers the TSP to be incomplete.

MVN Response: The Adaptive Management Plan was provided as Appendix T of the EIS. It will be revised to include potential re-nourishment measures. OMRR&R will be included in the final report.

HQUSACE Assessment: The issue is resolved in concept, pending assessment of the promised OMRR&R measures.

5. Distinguish between restoration and coastal protection for existing habitat. Page 2-74 presents the justification for adding maintenance of the existing foreshore protection adjacent to the former MRGO channel to all of the alternatives, in order to maintain the existing bank line and prevent further land loss along the Lake Borgne landbridge. Again, justification is limited due to the lack of risk analysis used in the formulation process as discussed above. Please consider formulating this measure similar to a coastal storm damage reduction project.

MVN Response to Comment 2.B.5: Concur.

Discussion: Measures to prevent land loss along the MRGO Lake Borgne landbridge are critical because the ecological consequences are high if this area fails. The proposed measures are the best way to protect the landbridge. These features have been recommended in prior studies and they are still the correct action.

Required Action: Include maps showing land loss rates, erosion rates, etc. to show how different measures correspond to different problems, e.g. relative sea level rise vs. erosion.

Action Taken: Discussion of the use of land loss rates in the formulation process and calculation of benefits has been added to the report. The following text has been added Section 2.7.3 Selection of the Final Array of Alternatives to describe the risk factors and to justify why the landbridge protection measures are included:

The MRGO features would prevent future land loss and restore previously degraded wetlands; stabilize and restore the endangered, critical Lake Borgne rim geomorphic structure; and protect vital socioeconomic resources, such as developments located adjacent to the MRGO.

The Lake Borgne estuarine complex is deteriorating and recent analysis indicates that the rate of wetland loss in the area is accelerating. Rapid action is required to protect the integrity of the southern Lake Borgne shoreline and to prevent continued

erosion of the MRGO channel banks. Without action, critical landscape components that make up the Lake Borgne estuary would be lost and future efforts to restore other parts of the ecosystem would be much more difficult and expensive if not impossible.

The following previous studies have described the need for bank stabilization along the MRGO:

- EA #47, MRGO Foreshore Protection (1985); MRGO St. Bernard Parish, Louisiana, Reconnaissance Report (1988)
- EA #72, MRGO Breton Sound Jetty Repairs (1988)
- EA #152, MRGO St. Bernard Parish, LA, Bank Stabilization, Miles 50.5 to 55.0 (1991)
- EA #162, Mississippi River – Gulf Outlet, St. Bernard and Plaquemines Parishes, LA – Marsh Enhancement/Creation and Berm Construction (1992)
- EA #244, MRGO Back Dike (CWPPRA), Disposal Area Marsh Protection, Back Dike (1996)
- EA #247, MRGO St. Bernard Parish, LA, Bank Stabilization Miles 55.0 to 56.1 (1996); MRGO North Bank Foreshore Protection Evaluation (1996)
- EA #255, MRGO, LA, Wetland Creation, Miles 15.0 to 23.0, St. Bernard and Plaquemines Parish, LA (1997)
- EA #269, MRGO, LA, South of Lake Borgne Additional Disposal Areas, St. Bernard Parish, LA (1998)
- EA #274, MRGO, Additional Disposal Areas, Hopedale Marshes (1998)
- Coast 2050: Toward a Sustainable Coastal Louisiana (1998)
- EA #288, MRGO Mile 43 to Mile 41 North Bank Stabilization, St. Bernard Parish, LA (1999)
- EA #269-B, MRGO, South of Lake Borgne Additional Disposal Areas plus Deflection Dike and Floatation Channels, St. Bernard Parish, LA (2000)
- EA #277, MRGO, LA, Shell Beach Disposal Areas, St. Bernard Parish, LA (2001)
- MRGO Reevaluation Study (2002)
- EA #349, MRGO, Miles 32-27, Additional Disposal Areas – Hopedale Marshes, St. Bernard Parish, LA (2002)
- EA #355, MRGO Mile 27.0 to 0 (2003)
- EA #361, MRGO, LA, Test Installation of Articulated Concrete Mattressing, Miles 39.0 to 38.0 (2003)
- Lake Borgne and MRGO Shoreline Protection between Doulluts Canal and Lena Lagoon (CWPPRA 2003)

- *EA #354, MRGO, Additional Disposal Area Designation Miles 66.0 to 49.0, St. Bernard Parish, LA (2004)*
- *EA #402 Lake Borgne – MRGO, Shoreline Protection Project, St. Bernard Parish, LA (2004)*
- *EA #403 MRGO, Hopper Dredging Miles 27.0 To 66.0 (2004)*
- *EA #411, MRGO, Installation of Articulated Concrete Mattressing, Miles 37.4 to 36.5, St. Bernard Parish, Louisiana (2004)*
- *Ecological Review, Lake Borgne and MRGO Shoreline Protection (2005)*
- *LCA (2005)*
- *Louisiana Coastal Impact Assistance Program (2006)*
- *Environmental Assessment for the Lake Borgne Shoreline Protection Project (2006)*
- *LACPR (2006)*
- *Integrated Ecosystem Restoration and Hurricane Protection: Louisiana's Comprehensive Master Plan for a Sustainable Coast (2007)*

HQUSACE Assessment: The comment is resolved.

6. Combining measures into alternative plans, Section 2.7.2. This section fails to develop a logical process for screening other than by geographic area. There are 50 individual measures; they could be clustered by critical landscape planning units based on the goals objectives and metrics in table 2-7. The links between planning units, ecological function and objectives would be the first round, followed by assessing the measures based on resilience and sustainability.

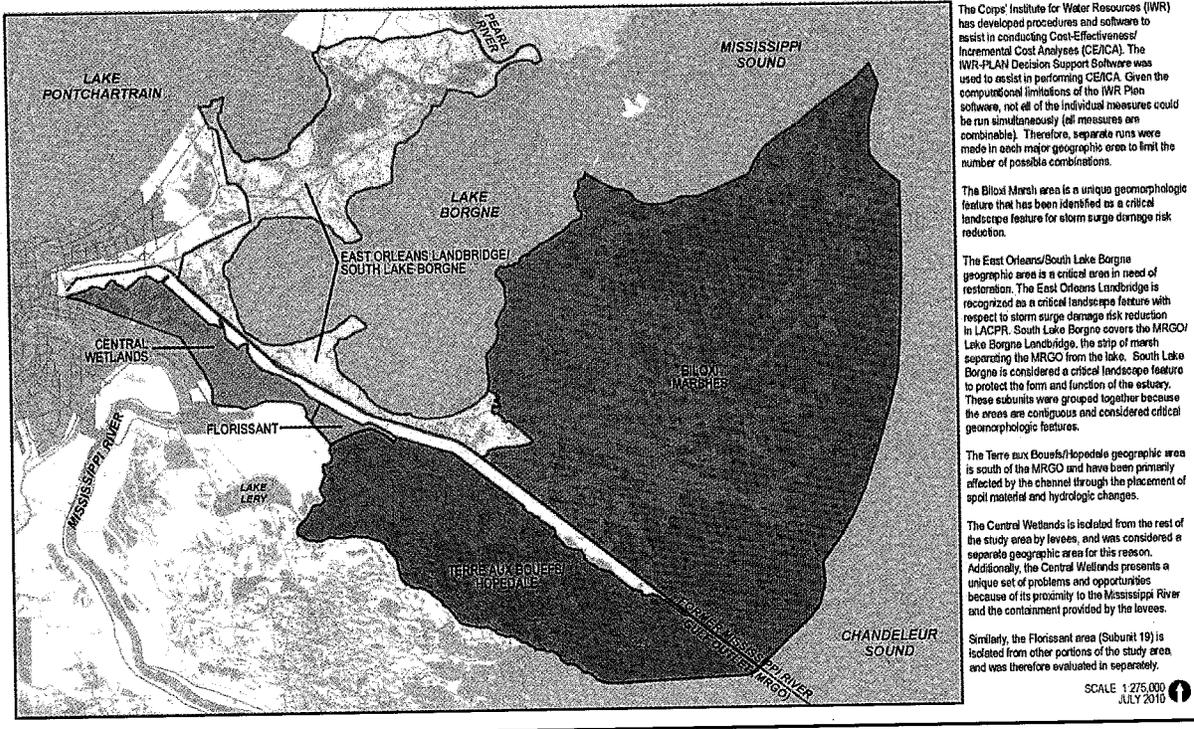
MVN Response to Comment 2.B.6: Concur

Discussion: The geographic areas were not used as a screening tool, but are simply a work-around for the limitations of IWR. No measures were excluded from the final array through the use of the geographic subunit best buys, as the largest plan was always selected (i.e. all the measures in that geographic area). The work-around could have been habitat types; however, the PDT felt that some amount of restoration in each of the geographic areas was needed to address the study authority (habitat types, areas affected by the channel, and storm damage risk reduction).

Required Action: Include discussion of how sustainability is inherently incorporated into the CE/ICA through the use of historic land loss rates in the calculation of benefits.

Action Taken: A map illustrating the geographic subareas has been added to the report as follows:

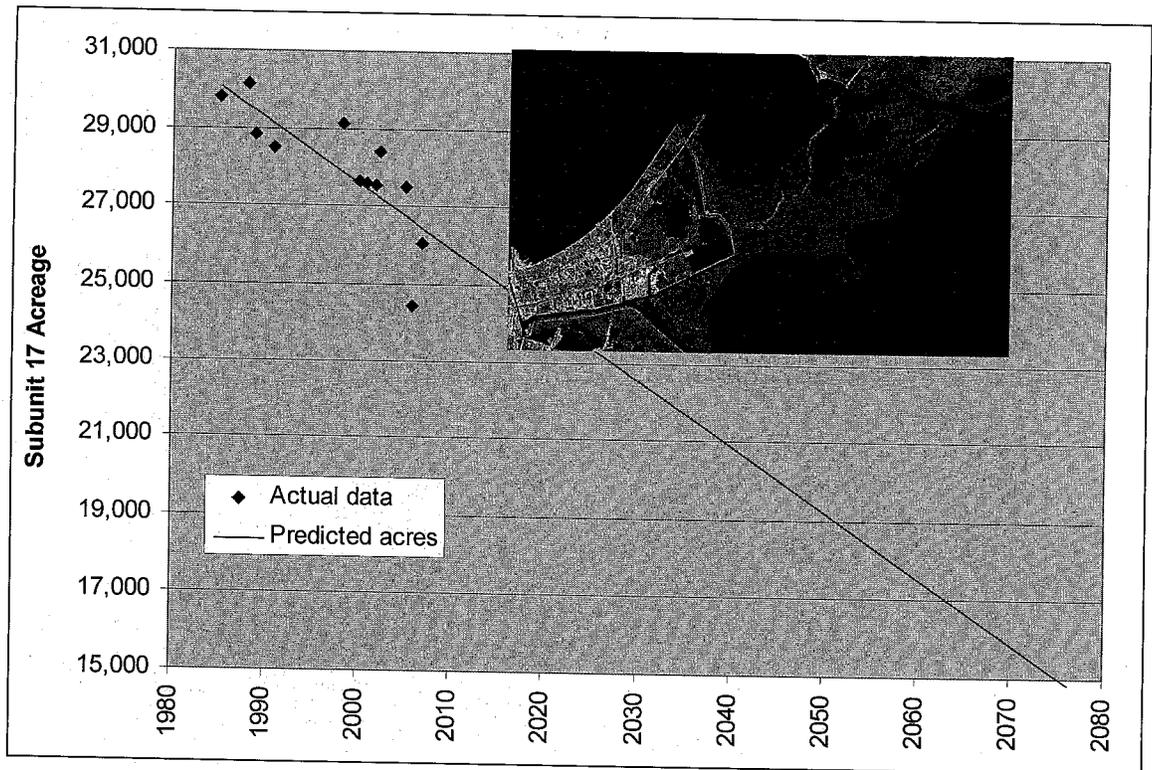
MISSISSIPPI RIVER GULF OUTLET (MRGO) ECOSYSTEM RESTORATION PLAN
Geographic Sub-Areas



Land loss rates were used in the calculation of benefits, and a discussion of the analysis was added in 2.7.1 as follows:

WVA requires estimates of FWP and FWOP marsh acreages. Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. FWOP subunit wetland acreages were determined via a linear trendline through those data (Figure 1). Where applicable, annual net acreage benefits associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

Figure 1. Actual and predicted acreage for subunit 17.



The SAND2 (Sediment and Nutrient Diversion) method was used to predict accretion rates in areas affected by freshwater diversions based on sediment and nutrients inputs. This model is an Engineering Research and Development Center (ERDC) revision of the SAND1 (Boustany-ERDC spreadsheet model) used in the Louisiana Coastal Protection and Restoration Final Technical Report (LACPR). The WVA model used this engineering input to assess benefits. Given the great uncertainties regarding future subsidence rate changes, sea-level rise changes, and many other factors that might affect future wetland loss rates over the project life, there is considerable uncertainty regarding the accuracy of the predicted river diversion benefits. However, the SAND2 model provides an objective means for comparing alternative measures and plans.

Utilizing the predicted FWOP wetland acreage as a basis, the SAND2 model calculates FWP benefits (in acres) via the accretion of suspended sediments (land building) together with the effects of nitrogen additions. The nitrogen benefits (in acres) are calculated as the grams of nitrogen required to produce a wetland acre multiplied by the grams of introduced nitrogen (less nitrogen lost to denitrification) = wetland acres created/supported via introduced nitrogen.

Sustainability

The benefits analysis utilized for the MRGO Ecosystem Restoration Plan considers sustainability inherently. Because the WVA methodology utilizes historic land loss rates in the calculation of benefits, areas that have historically been more susceptible to risks such as tropical storms, subsidence, and sea level rise, will have fewer AAHUs than areas that have not been as susceptible to these factors. The SAND2 methodology accounts for the greater sustainability of features nourished by the freshwater diversion by assigning more AHHUs to features in the diversion influence

area. Additionally, the WVA methodology assigns greater benefits to natural restoration features than protection features like shoreline protection that require maintenance.

HQUSACE Assessment: The comment is resolved.

7. O &M status of existing foreshore dikes, Table 3-1, Section 3.1. The features of the TSP found in this table include six reaches of existing foreshore dikes totaling about 11.5 miles in length that would be repaired or maintained by the proposed ecosystem restoration project. A brief explanation of the current status of O &M responsibilities (if any) should be added to Section 3.1 of the report.

MVN Response to Comment 2.B.7: Concur.

Discussion: MVN clarified that there is no ongoing O&M because the channel has been de-authorized.

Required Action: Add a brief explanation of the current status of O &M responsibilities (if any) to Section 3.1 of the report.

Action Taken: The report was revised to clarify that there is no ongoing O&M because the channel has been de-authorized. Some repairs were made following Hurricane Katrina. The following text has been added to 2.7.3:

Maintenance of existing bank stabilization maintenance features along the north shore of the MRGO are the lowest cost features evaluated for this study. Maintenance of these features has ceased since the de-authorization of the channel. The closure structure at Bayou La Loutre is being maintained by the State of Louisiana.

HQUSACE Assessment: The comment is partially resolved. Maintaining these features is included in the TSP, yet no non-Federal sponsor to carry out the OMRR&R is included in the report. The report should discuss how, or whether, these features would be maintained if a sponsor is not identified, should include the timeline for the disappearance of the existing bank stabilization features if not maintained, and summarize the implications in a no-maintenance condition for the environment and the MRGO ecosystem restoration plan.

MVN Response: The report will note that at this time, these features will not be maintained unless a non-federal sponsor is identified and funds are appropriated for implementation. Alternatives for maintenance of these features, such as the use of funds previously allocated for the maintenance dredging of the channel will also be discussed. The report will discuss the potential consequences of no action with respect to these features.

HQUSACE Assessment: The issue is resolved.

8. Future without-project condition, Section 2.3. The future-without project condition section of the report is unacceptable, because it contains little quantified information (the only exception is a land loss estimate), and there is very limited discussion of the implications to the human environment if these conditions were to come to pass. Section 2.3 of the report gives a list of systemic problems in the study area that would persist. These are not quantified as outputs for comparison for a FWOP and WP analysis. This problem of identifying quantifiable objectives persists in the report in the description of the study area opportunities which is an assessment of the impacts from MRGO by planning subunits. In this section subunits are clustered into study areas that include a summary Table 2-4. An assessment MRGO impacts in this table does not quantify the impacts. Recommend: 1) develop rationale for why the study areas were created (function or type?), identify quantifiable impacts by subareas based on MRGO impacts; 2) substantiate the objectives identified and quantified in Section 2.5.6; 3) modify Table 2-4 to address comments noted above. In addition the FWOP Table 2-4 should be revised to put in context of other impact generators in the study area. For example the Coastal Impact Assistance Program is based on the impacts from oil and gas production. How much of the MRGO impacts is part of an already degraded system caused by others? Distinguish between short term and long term MRGO impacts and discuss how the study area is evolving in context of other impact drivers. Significant supplementation of this section of the feasibility report is required prior to the public release of the document.

MVN Response to Comment 2.B.8:

Discussion: HQUSACE was concerned by the lack of quantitative data describing the future without project condition. The report should describe the various drivers of degradation and the consequences for each significant resource category.

MVN explained that much of the future without project information is in the EIS and will be pulled into the feasibility report. Of the various drivers in the basin, levees and the MRGO are larger drivers of degradation than oil and gas infrastructure. The footprint of oil and gas in the Pontchartrain Basin is much smaller than in the Barataria Basin.

Required Action: Additional future without project information from the EIS will be summarized and included in the Feasibility Report.

Action Taken: Information from the EIS will be pulled into the feasibility report. The following discussion from the LCA report on land loss drivers has been added to Section 1.4.2 MRGO Environmental Impacts:

The cumulative effects of human and natural activities in the coastal area have severely degraded the deltaic processes and shifted the coastal area from a condition of net land building to one of net land loss. While many studies have been conducted to identify the major contributing factors (e.g., Boesch et al. 1994; Turner 1997; Penland et al. 2000), most studies agree that land loss and the degradation of the coastal ecosystem are the result of both natural and human induced factors,

producing conditions where wetland vegetation can no longer survive and wetlands are lost. Establishing the relative contribution of natural and human-induced factors is difficult. In many cases, the changes in hydrologic and ecologic processes manifest gradually over decades and in large areas, while other effects occur over single days and impact relatively localized areas.

The following is the revised Future without Project Section:

FUTURE WITHOUT PROJECT CONDITION

The No-Action Alternative is an analysis of the Future without Project (FWOP) Conditions for the period of analysis. Chapter 4 of the EIS, Environmental Consequences, describes the potential direct, indirect, and cumulative impacts of the No-Action Alternative for the MRGO Ecosystem Restoration Study in detail.

The No-Action Alternative would have no direct beneficial or adverse impacts. Most of the indirect and cumulative impacts resulting from the No-Action Alternative are related to coastal land loss, which is expected to continue into the future without action.

Without action, the key systemic problems in the study area would persist over the period of analysis (2011 to 2065).

- **Land loss:** 131,100 acres of emergent wetlands are projected to be converted to open water (USGS 2010).
- **Bank/shoreline erosion:** Erosion would continue to threaten the littoral structure of the ecosystem and the integrity of critical landscape features.
- **Habitat change and loss:** Wetland losses, saltwater intrusion, and further modification of natural hydrology would result in an increasingly homogenous system. Rare and unique habitat would become increasingly scarce.
- **Modification of natural hydrology:** Land loss would result in the convergence of open water areas into larger waterbodies, further altering the study area hydrology.
- **Decreased freshwater, sediment, and nutrient inputs:** Authorized freshwater diversions in the study area would not fully address the need for additional freshwater, sediments, and nutrients in the study area to nourish emergent vegetation and counteract subsidence and sea level rise.
- **Saltwater intrusion:** The channel closures at Bayou La Loutre and the IHNC are projected to decrease saltwater intrusion into the IHNC and Lake Pontchartrain via the former navigation channel. However, land loss and shoreline erosion would continue to allow more saline waters into the study area estuaries.
- **Retreating and eroding barrier islands:** The entire Chandeleur Island chain is projected to convert to subsurface shoals within the period of analysis.
- **Ridge habitat degradation and destruction:** The Bayou La Loutre ridge would continue to subside to marsh elevation.
- **Invasive species and herbivory:** Without action, invasive vegetation will continue to out-compete native species. Nutria would continue to destroy emergent wetlands.

- **Increasing susceptibility to storm surge:** As emergent vegetation along the marsh edge continues to degrade and erode, interior marshes and human development will become increasingly exposed to the open waters of the Gulf of Mexico.

Other Restoration Efforts

Wetland losses in the Louisiana study area would be offset to some extent by other Federal, state, local, and private restoration efforts, which were predicted by the LCA study to create, restore and/or protect approximately 64,410 net acres in the study area (LCA Subprovince 1). These numbers are based on a 20-year project life for CWPPRA projects and 50-year project life for all others evaluated.

In addition, more recent restoration efforts would also cumulatively interact to help offset losses of soil resources in the study area, including the following:

- CWPPRA PO-30 Lake Borgne Shoreline Protection project.
- The MRGO 2006 Lake Borgne Shoreline Protection, (Doullut's Canal to Jahncke's Ditch), St. Bernard Parish, LA (06-C-0210) project.
- The MRGO 2007 North Bank Foreshore Dike Construction and Repairs, Mile 44.4 to Mile 39.9 (Non-Continuous), St. Bernard Parish, LA (07-C-0089) project.

WRDA 2007 authorizes the LCA Plan near-term restoration features, including construction and additional investigations. Implementation of the LCA program WRDA 2007 passed would provide positive cumulative impacts in reducing the loss of wetlands throughout the study area.

Other ongoing restoration projects include the Parish Coastal Wetlands Restoration Program ("Christmas Tree Program"), State of Louisiana projects, CIAP projects, civil works mitigation projects, regulatory permit mitigation projects, LDNR/NRCS/Soil and Water Conservation Committee Vegetation Planting Program, and private restoration efforts.

Coastal Land Loss

Land loss in the study area is expected to continue over the 50-year period of analysis. Without action, coastal vegetated resources would continue to decline, including bankline erosion and sloughing of the shoreline, and continued fragmentation and conversion of existing brackish and saline marsh to shallow open water habitats. Both human induced impacts and natural processes would contribute to the continued loss of vegetated habitats, including: continued shoreline erosion and subsidence, increased saltwater intrusion, increased water velocities, and increased herbivory.

The LCA Study (USACE 2004) estimated coastal Louisiana would continue to lose land at a rate of approximately 6,600 acres per year over the next 50 years. It is estimated that an additional net loss of 328,000 acres may occur by 2050, which is almost 10 percent of Louisiana's remaining coastal wetlands.

Wetland acreage data (1985 through 2006) was obtained from the USGS for each of the study area subunits. FWOP subunit wetland acreages were determined via a linear trendline through those data. Where applicable, annual net acreage benefits

associated with pre-existing or soon to be constructed restoration projects were added to the base subunit FWOP acreages to obtain revised FWOP subunit acreages.

With no action, 131,100 acres of emergent wetlands in the Louisiana portion of the study area are predicted to be lost over the period of analysis (USGS 2010). Overall, the majority of direct land loss is expected to occur from interior wetlands. However, substantial wetland losses are also predicted to occur due to shoreline erosion. If the land bridges are breached, existing vegetated wetlands along these critical land bridges would be converted to open water; and those wetlands remaining in the area would be exposed to greater hydrologic forcing factors (tidal flow and wave action).

Environmental Consequences of Coastal Land Loss

Adverse impacts that would result from the loss of important and essential vegetated habitats used by fish and wildlife are the loss of shelter, nesting, feeding, roosting, cover, nursery, and other life requirements for fish and wildlife; loss of productivity; loss of transitional habitat between estuarine and marine environments; and increased inter- and intraspecific competition between resident and migratory fish and wildlife species for decreasing wetland resources. This loss would also reduce the availability of important stopover habitats used by migrating neotropical birds. The loss and deterioration of transitional wetland habitats would continue to impact all federally threatened and/or endangered listed species that utilize the study area including: Gulf sturgeon, green sea turtle, hawksbill sea turtle, Kemp's Ridley sea turtle, leatherback sea turtle, loggerhead sea turtle, piping plover, and the West Indian manatee.

Cultural Resources

Erosion and land loss would also continue to adversely affect existing cultural resources in the study area. The loss of land within the study area threatens the existence and integrity of these sites.

Recreation and Aesthetics

Recreational areas may be affected both positively and negatively by the various projects that would be implemented without the MRGO ecosystem projects. Generally, projects that improve access to recreation areas or increase the diversity of species in an area would be beneficial to recreation. Projects that impede access to open waters or limit birding, hunting or fishing areas would be detrimental to recreation.

The borrow pits that would be created to supply material for structural projects may benefit recreational fishing by providing additional public access to fishing, additional ponds for freshwater fishing or for fish hatcheries, and additional habitat for waterfowl. If the borrow pits are large and in areas where there never was a recreational area, the borrow pits may provide entirely new recreation opportunities.

Marsh creation projects would benefit recreation by providing additional land for birding and hunting, but may be detrimental for recreational boating as open waters are removed. Shoreline restoration projects would reduce risk for recreational areas and would generally benefit recreation by providing increased areas for bird nesting. Shoreline erosion reduction projects cause silt and sediment to accumulate along shorelines, which facilitates access to the water providing a benefit for recreational fishing.

Subsistence bankline erosion and sloughing of the shoreline and conversion of existing fragmented wetlands to open water habitats would persist, possibly resulting in degraded viewsapes for those traveling the study area's designated scenic streams.

Socioeconomic Consequences of Coastal Land Loss

The continued coast wide decline of emergent wetlands would contribute to the deterioration of substrate upon which infrastructure features (e.g., levees; oil, gas and water pipelines, telephone and electric transmission wires) are constructed. The effects of land loss and degradation would lead to increased costs for maintaining and repairing existing infrastructure. These increased costs would likely be passed on to consumers. An increase in the cost of oil and natural gas infrastructure in Louisiana would likely increase prices for these commodities nationally.

While hydrodynamic models show some benefits from additional marsh, island, and landbridge habitat, the effects of allowing existing features to degrade in these areas are even more pronounced (USACE 2009). Hurricane storm damage risk reduction systems cannot fully depend on coastal landscape features because of the vulnerability of these features to single storm events. However, the FWOP condition could pose a hazard to the efficacy of the \$14.45 billion Federal investment in risk reduction systems, because the buffer between the structural system components and open water would continue to deteriorate.

The loss of wetlands in the study area would likely alter the detritus-based food web of the oyster thereby reducing the localized carrying capacity for oyster leases in the area. The resultant decline in oyster production in and near the study area would likely result in a local reduction of oysters, which could lead to higher local oyster prices as leases farther from ports would be relied upon to maintain harvests. There could be similar impacts to nearby state oyster seed grounds in Lake Borgne. This impact could reduce the local availability of seed oysters used to sustain the local oyster lease productivity. Because Louisiana and Western Mississippi Sound produce between 60 to 65 percent of the nation's oysters, these adverse impacts would affect oyster availability and prices across the country.

Continued land loss in the study area would gradually change the estuarine system to a saltwater system. This change could have adverse impacts to estuarine fisheries, as study area wetlands provide nursery and foraging habitats for a variety of economically important marine species. Negative impacts to the productivity of fisheries in the study area would affect the availability and cost of seafood nationally.

Continued degradation and loss of emergent wetlands in the study area would contribute to increased sedimentation and maintenance of the GIWW navigation channel. As the wetlands in the Golden Triangle fragment and convert to open water, the protection afforded to the GIWW from Lake Borgne wind-driven waves would be reduced. Some vessels utilizing the GIWW, especially barge traffic, would be subjected to more open water conditions as the land bridge continues to erode, thereby exposing this waterway directly to Lake Borgne. The integrity of the GIWW as an inland, protected waterway is paramount to its function for navigation and commerce. Costs to maintain this protection would likely increase if the land bridge breached.

Future Hydrology

Programs such as CWPPRA, CIAP, and LCA as well as ongoing hurricane protection projects would have indirect impacts on hydrology in the study area. The sector gates on the GIWW and Bayou Bienvenue would alter flow patterns in and near the western end of the study area. Construction of this storm surge barrier structure would include dredging of an access channel on the Lake Borgne side of the floodwall (USACE, 2008). The access channel would connect the MRGO with the GIWW across the Golden Triangle, but would close off an existing connection. The net effect has been determined to be negligible. The gates across Bayou Bienvenue and the GIWW would remain open, except when a storm surge is present or anticipated.

Construction of the storm surge barrier structure would alter the flow path of tidal propagation into the Central Wetlands area through the Bayou Bienvenue Control Structure. Prior to the construction of this project, tidal flow in and out of the Bayou Bienvenue Control Structure came from multiple directions (i.e. from across the MRGO as well as from north and from south in the MRGO). With this barrier in place, the tidal flow no longer comes from the south in the MRGO. Likewise the completed MRGO closure structure at the La Loutre Ridge has altered tidal flow paths to the Bayou Dupre Control Structure. The tidal connection with Breton Sound via the MRGO has been severed.

Cumulative Impacts

Cumulative impacts would be the synergistic effect of no action on hydrology with the additive combination of similar wetland degradation and wetland loss impacts to hydrology and hydraulics throughout coastal Louisiana, as well as the benefits and impacts to other state and Federal projects in the vicinity as detailed in the EIS.

Future Salinity Conditions

Hydrodynamic modeling was conducted for this study to determine historic, baseline, and future conditions in the study area. This effort is described in detail in Annex 1 of the Engineering Appendix for the study.

FWOP conditions are examined based on the final disposition of future diversions. FWOP scenarios include the baseline conditions at Violet Siphon, Caernarvon, and Bonnet Carré Spillway leakage and openings. Planned diversions at Maurepas Swamp (Convent/Blind River, Hope Canal/Maurepas Swamp River Reintroduction), Caernarvon operation modifications, and the Central Wetlands Waste Water Treatment Program are also included in the FWOP conditions.

Planned diversions from the lower Mississippi River located below the Caernarvon Diversion were not included in the hydrodynamic model. The Bertrandville Siphon, Bohemia Mississippi River Reintroduction, Delta Building Diversion (North of Ft. St. Phillip), White Ditch, Bayou LaMoque and the Benney's Bay Diversion were deemed to be sufficiently removed from the Lake Borgne ecosystem to preclude significant influence on salinity conditions in the area. Additionally, there is little available information as to the proposed operational schemes for these diversions. The inflow due to existing cuts, overflows and diversions in the Mississippi River reach from Baptiste Collette to Bohemia was approximated as 12% of the River flow.

The freshwater diversion for the Violet Siphon was modeled as 100 cfs, which is assumed to be the average. Historic data were used in the model to include Bonnet Carré Spillway openings with a maximum flow of 240,000 cfs. The combined diversions into the Maurepas swamp area (Convent/Blind River Diversion, Hope Canal/Maurepas Swamp River Reintroduction) have a potential capacity of 4,500 cfs in the FWOP scenario. The Central Wetlands Waste Water Treatment Program flow totaled approximately 30 cfs.

Input flows for the Caernarvon diversion were increased by roughly 25 percent, which is consistent with the projected modifications to operations. The increase is calculated by increasing the actual flows for 2007 and 2008, in which the structure was operated to pulse large flows, by 25 percent. The resulting flows were then smoothed so as to eliminate rapid changes that might induce numerical instabilities in the model.

The hydrodynamic model results indicate that the planned diversions reduce salinities in the study area. However, the salinity reductions do not restore pre-MRGO conditions in the Lake Borgne ecosystem. Additional freshwater is needed to achieve the salinity targets developed for this study, as described in Section 2.5.6.

Future Water Quality

The FWOP includes direct adverse and beneficial impacts on water quality from the implementation of freshwater diversions or other programs, such as CWPPRA, CIAP, and LCA, within the study area. These diversions could have both adverse and beneficial impacts to water quality, as discussed in detail in the EIS. Current water quality conditions would likely persist and coastal wetlands could continue to be affected by natural and man-made factors that have both beneficial and adverse effects on water quality. The continual loss of emergent wetland plants under existing conditions, some of which absorb and transform pollutants in the air and water, could reduce the amount of pollution absorbed/transformed, which would likely have direct adverse effects on water quality.

Future Soils

The ongoing conversion of wetlands to shallow open water under existing conditions would continue in the FWOP. The projected loss of wetlands in the study area is 131,091 acres over the 50-year period of analysis; this would include the loss of wetland soil types over this area. The Clovelly muck and Lafitte muck soil types would primarily be lost, with some loss of Fausse clay soils. Net primary productivity within the study area would continue to decline and existing wetland vegetation would continue to diminish.

Cumulative impacts of the projected loss of soil resources from the study area would be in addition to the loss of soil resources throughout Louisiana and Mississippi. The LCA Study (USACE, 2004) estimated coastal Louisiana would continue to lose land at a rate of approximately 6,600 acres per year over the next 50 years. It is estimated that an additional net loss of 328,000 acres may occur by 2050, which is almost 10 percent of Louisiana's remaining coastal wetlands. However, these wetland soil losses would be offset to some extent by restoration projects implemented through other programs.

Future Barrier Island Resources

Chandeleur and Breton Islands would continue to deteriorate without the implementation of a restoration program. It is projected that by 2014, Breton Island would have no remaining subaerial acreage and the entire Chandeleur Island chain (that includes Breton Island) would be completely eroded. Without the Chandeleur and Breton Barrier Islands, important gradients and ecotones would not exist in landward bays and wetlands, resulting in decreases in estuarine habitat complexity followed by decreases in overall species diversity and biomass (Hester et al., 2005).

Future Coastal Vegetation Resources

Marsh habitat would continue to be restored through other restoration projects and programs, such as the Coastal Wetlands Planning, Protection and Reservation Act (CWPPRA), the Coastal Impact Assistance Program (CIAP), and the Louisiana Coastal Area (LCA), but not at a magnitude to completely restore natural processes and features vital to the long-term success of the watershed. Without action, the coastal vegetation resources of the project area would continue to decline through bankline erosion, sloughing of the shoreline, and continued fragmentation and conversion of existing brackish and saline marsh to shallow open water habitats. Continuing adverse impacts to coastal vegetation would result from both human activities and natural processes including continued shoreline erosion and subsidence, increased saltwater intrusion, increased water velocities, and increased herbivory.

Future Wildlife Resources

Without an extensive ecosystem restoration plan, marsh habitat in the study area would continue to be restored through other restoration projects and programs, such as those authorized for construction through CWPPRA, CIAP, and LCA; these projects would indirectly and cumulatively benefit wildlife, but not on a large enough scale to completely restore natural processes and features vital to the long-term success of the watershed.

Habitat quality would decline as wetlands continue to deteriorate and fragment, specifically in the critical landbridges within the study area. As interior wetlands convert to open water, there would be an expected loss of species richness. The continued degradation and loss of wetland habitat would also likely result in a localized decrease in wildlife use of the area. In general, for most amphibians, reptiles, birds, and mammals, the fresh, intermediate, and brackish wetlands are required or preferred to open water habitats (Chabreck, 1988).

Future Aquatic and Fisheries Resources

The persistence of existing conditions, such as wetland fragmentation and emergent wetland loss, as well as, shoreline and bank line erosion contributing to the continued degradation of aquatic habitat would continue in the FWOP. Over time, this would result in a substantial decrease of habitat needed for support the life stages of numerous fish species, therefore reducing the area's ability to adequately support fishery resources. Distribution and abundance of aquatic organisms would likely decrease, indirectly impacting species linked in the food web to directly

affected species. Reduction in emergent wetlands would result in shifts of predator/prey relationships, decline in fish productivity, and reduced recreational fishing opportunities.

Continued restoration of emergent marsh and shoreline habitat, authorized through programs such as CWPPRA, CIAP, and LCA, as detailed in chapter 2, would benefit aquatic and fishery resources; however, these would not be as beneficial on a large scale as the MRGO Restoration program, which would restore natural processes and features vital to long-term success of aquatic and fisheries resources.

Future Storm Surge and Wave Conditions

Water levels are expected to be similar or greater than existing conditions in the future. Because of the uncertainty and wide ranges inherent in sea level rise projections, the MsCIP and the LACPR efforts used scenarios to evaluate the effects of different relative sea level rise rates (eustatic sea level rise combined with subsidence) over a 50-year planning period. The relative sea level rise values used for the MsCIP scenarios were 0 feet, 2 feet, and 3.4 feet (USACE 2008b). The relative sea level rise values used for the LACPR scenarios were 1.3 feet and 2.6 feet, and deltaic rates of 1.9 feet and 3.2 feet (USACE 2009). Because a variety of factors affect the height of storm surge, at this stage of scientific knowledge it is difficult to quantify the effect of wetland loss in the study area on storm surge.

The IHNC Surge Barrier will alter flow patterns in and near the middle end of the study area (Lake Borgne and eastern Lake Pontchartrain). For construction of this structure, an access channel was dredged on the Lake Borgne side of the floodwall (USACE 2008c). Modeling indicates that the net effect will be negligible. The gates across Bayou Bienvenue and the GIWW would remain open, except when storm surge is anticipated. This configuration would prevent salt-water intrusion into the Central Wetlands in storm situations, while not impeding tidal flows under normal circumstances. The concrete surge barrier across the MRGO channel south of Bayou Bienvenue will stop tidal flow on the channel, but the closure structure at Bayou La Loutre has a greater impact on non-storm flows in the MRGO. Nevertheless, the water flows near the sector gates are anticipated to be greater than preconstruction conditions. Additionally, modeling scenarios indicate that the Chalmette Loop Levee would raise the water levels by up to 0.1 foot (0.03 meter), with marshes experiencing up to 7 hours of additional wetted period per day (USACE 2008c).

HQUSACE Assessment: The comment is resolved by inclusion of the above information in the report.

9. Constraints. The report identifies the cost of O&M as a constraint. Although any potential non-Federal sponsor may prefer a lower O&M cost, precluding alternatives with higher O&M cost may eliminate alternatives that could be a NER plan. O&M cost should be considered in the cost side of the analysis and will be part of the cost effectiveness evaluation. The district should remove any reference to O&M as a constraint and should not screen any alternatives based upon O&M costs.

MVN Response to Comment 2.B.9: Concur.

Discussion: MVN explained that the intent of the constraint was not related to cost, but rather the need for ecosystem restoration projects to be self-sustaining.

Required Action: O&M should be deleted as a constraint.

Action Taken: Deleted the O&M constraint from feasibility report sections S.3.3 and 2.5.2.

HQUSACE Assessment: The issue is resolved.

10. Identification of sponsor and inclusion of sponsor letter. As described in Section 4.3 on page 4-5, the study is currently being fully Federally funded pursuant to Section 7012(b) of WRDA 2007, and a project sponsor has yet to be confirmed, although the states of Mississippi and Louisiana (who must divide the non-Federal cost share under Section 3083 of WRDA 2007) have been identified as potential sponsors. Similarly, as described in Section 4.4 on page 4-5 of the report, the views of the non-Federal sponsors are not yet known but MVN plans to seek letters of interest prior to releasing the report for public review. Identification of a non-Federal sponsor or sponsors and confirmation of their support for the project and willingness to provide necessary local cooperation will be necessary in order for the report to be finally approved as an implementable plan, as required by ER 1105-2-100, Appendix G, at G-9.

MVN Response to Comment 2.B.10: Concur.

Discussion: Corps implementation guidance dated – for Section 7012 of WRDA 2007 states that although the cost of the study is 100% Federal, implementation of a project would be cost shared 65/35 with a non-Federal sponsor.

Required Action: Seek letters of interest from the local sponsors prior to releasing the report for public review.

Action Taken: MVN will follow the partnership agreement procedures to seek resolution of this issue. Letter requesting letter of intent was sent to the States of Louisiana on 23 July 2010 and Mississippi on 29 July 2010.

HQUSACE Assessment: The issue is resolved. Letters have been received from the states of Louisiana and Mississippi, although it is noted that the State of Louisiana is of the position that they have no obligations whatsoever to support the MRGO ecosystem plan, including no LERRDS, cost-share or OMRR&R responsibilities.

11. Cost sharing for Violet Diversion. It appears that a prior agency policy decision on the cost sharing of the Violet freshwater diversion was made at some point; otherwise, it is not clear why the report consistently applies Section 103 cost sharing to the Violet Diversion, notwithstanding Section 3083 of WRDA 2007, which directs that the Federal share shall be 75 percent. Section 1.1 of the report states that the entire project is subject to section 103 of WRDA 198 as amended. Similarly, Section 1.2 on page 1-3 of report states that the violet diversion project costs will be divided between the states of Louisiana and Mississippi but

makes no mention of the 75 percent Federal share covered in Section 3083. Section 4.3 on page 4-5 of the report states that “because the Violet Freshwater Diversion is proposed as part of this plan, it is currently estimated as part of the total plan costs and subject to the same cost-share.” Further clarification is requested from HQUSACE, MVD, or MVN regarding the basis for adopting 65-35 cost sharing for the entire project, notwithstanding the language of Section 3083.

MVN Response to Comment 2.B.11: Concur.

Discussion: MVN recommended that the non-Federal sponsor and cost-share requirements of this plan component be consistent with those described in WRDA 2007 Section 3083. HQUSACE agreed that without additional information, the diversion would be cost shared under Section 3083. MVN OC would like additional clarification on what the diversion is needed for and how it will be operated.

Required Action: MVN OC will work on draft implementation guidance to provide to HQ and MVN.

Action Taken: For purposes of the draft report, the report will acknowledge this feature and will note it is being further reviewed for details on implementation under Section 3083. The following language has been added to Section 2.2:

When implementation funds are appropriated, a non-Federal sponsor would need to be identified. The States of Louisiana and Mississippi have been identified as potential non-Federal sponsors for the plan. Cost-sharing for the Plan is subject to the rules for ecosystem restoration projects established in Section 210 of WRDA 1996, with the exception of the Violet Freshwater Diversion, which would be divided between the States of Louisiana and Mississippi as stipulated in WRDA 2007, Section 3083. Accordingly, the non-Federal share will be 35 percent of the implementation costs. Non-Federal sponsors are responsible for 100 percent of lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRD), and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). The value of LERRD is credited to the 35 percent share.

And the following statement is included in Section 5.3:

The non-Federal cost-share for the Violet Freshwater Diversion will be divided between the States of Louisiana and Mississippi as stipulated in WRDA 2007, Section 3083.

HQUSACE Assessment: The issue is resolved.

12. Feasibility level of design. As noted in MVN-OC counsel comments included in Tab 5 of the report, the report is not expected to reach a full feasibility level of design prior to public release of the report. MVN should address the question of whether the report provides sufficient detail to allow the public an adequate opportunity to review the project. If further information will be needed to afford such an opportunity, a subsequent public review period might be required.

MVN Response to Comment 2.B.12: Concur.

Discussion: The Draft Feasibility Report and EIS will fully disclose the limitations of the current design level and associated risks, as well as describe on-going engineering activities. Feasibility level design will be complete for inclusion in the Final Feasibility Report and EIS. MVN sees "recon" and "preliminary design" as synonymous terms. "Preliminary design" will be used throughout for consistency. Further design in the feasibility phase will have equal effects on all alternatives and will not affect the plan selection.

Required Action: Clarify the level of detail in the cost estimates used for plan comparison. Ensure that the Cost Estimate for the TSP meets the required level of detail for feasibility reports.

Action Taken: The MII estimate for the study will be complete and included in the draft report. Refined cost estimates are being developed based on incoming survey and geotechnical data. The refined cost estimates will be reviewed and certified by the Cost-PCX prior to the release of the final report. The following section will be added to the draft report:

Cost Estimate of the Tentatively Recommended Plan

The Engineering Appendix provides the preliminary design costs for all measures and the summary cost estimates for the final array of alternatives considered in detail - Alternatives B, C, and D. These cost analyses are deemed adequate for making a federal interest determination. Further, these estimates allow for the use of the cost effectiveness and incremental cost analyses (CE/ICA) optimization comparison and selection of a tentatively selected plan (TSP) in accordance with Corps Ecosystem Restoration policy. The MII cost estimate and narrative summary is provided in the Engineering Appendix. This appendix also provides the scheduled construction costs for the TSP.

#.1 Incremental Cost Schedule and Fully Funded Estimate

Tables X-1 and X-2 provide the Incremental Cost Schedule estimate and the Fully Funded Cost Schedule estimate, respectively, for the TSP. These scheduled costs follow the construction implementation schedule provided in the Engineering Appendix for this study. The general approach to the project scheduling is that designs precede real estate actions and relocations, which in turn precede construction. The construction contracts are ordered in precedence of the most sustainable measure, and therefore highest priority measure, for the TSP first. The schedule for construction is ten years. The actual construction schedule may vary as conditions warrant, but this is assumed to be a reasonable implementation schedule. This construction schedule was generated and reviewed by Engineering and Construction Division, the Project Manager, and Plan Formulators and is deemed reasonable for the purpose of this report.

Table #-1
Incremental Cost Schedule – Tentatively Selected Plan
MRGO Ecosystem Restoration Project
 (October 2010 Price Levels, \$000's)

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Real Estate											
Relocations											
Construction											
S&A											
PED											
Total											

Table #2
Fully Funded Cost Estimate
MRGO Ecosystem Restoration Project
 (\$000's)

Item	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Total
Real Estate											
Relocations											
Constructio											
S&A											
PED											
Total											

#.2 Operations and Maintenance

Operations and maintenance (O&M) costs were estimated, and are presented in the Engineering Appendix. Unit prices for this work were taken from the measure cost estimates, with some contingency added. These O&M tasks are discussed below:

{Description to be added}

#.3 Authorized Maximum Cost of Project – Section 902 Limit

The authorized plan in WRDA 2007 does not state (in the legislation) a cost limit or estimate. Public Law 109-234, which clarified Public Law 109-148, deemed that \$75,000,000, was needed for the closure of the MRGO channel and to develop a plan for the “repair, construction, or provision of measures or structures necessary to protect, restore, or increase wetlands, to prevent saltwater intrusion or storm surge.” The actual costs of those measures that were yet undetermined was not estimated. That authorized amount of \$75,000,000 was used to close the MRGO channel and to perform this study. This Feasibility Report provides the estimate to construct and otherwise provide for the protection, restoration, an increase of wetlands and reduction of saltwater intrusion. Therefore, Section 902 of WRDA 1986, the maximum cost growth on an authorized project, does not apply.

HQUSACE Assessment: The issue is resolved.

13. Use of MRGO channel as borrow source. One of the significant issues cited in the report is the concern that the MRGO channel is currently barred from use as a borrow source for dredged material. The only provision of law available to support this purported restriction was language in House Report 109-359 stating that funds provided by DOD’s 2005 supplemental appropriations act, P.L. 109-148 (Hurricanes in the Gulf of Mexico and Pandemic Influenza Act) were not available for use in dredging the MRGO channel. This limitation appears to have been intended to ensure that the channel would not be used for navigation purposes, not necessarily to bar use of material from the channel for ecosystem restoration activities. Furthermore, even if this language was intended to preclude the use of those 2005 funds to dredge the channel as a borrow site for the ecosystem restoration features, there is no basis as to why this limitation would apply to other funds later appropriated to carry out the MRGO project once a favorable report is issued. Clarification of this issue is requested.

MVN Response to Comment 2.B.13: Concur.

Discussion: MVN explained that the use of the MRGO as a borrow source is publically unacceptable; however, the use of borrow material from the MRGO will be reconsidered if consultation with NMFS and USFWS pursuant to the Endangered Species Act indicates that the use of Lake Borgne as a borrow source to the extent currently proposed

illustrated above, MRGO dredging for borrow is a publicly sensitive issue that was adamantly opposed in some scoping comments.

Since Lake Borgne dredging raises issues because it is designated critical habitat for the threatened Gulf sturgeon, a trade off analysis has been conducted. Due to the public acceptability factor, the lake is the preferred choice while recognizing some higher costs and environmental impacts. A consultation with NMFS on the critical habitat impacts will be conducted during the public comment period. The plan that is presented may be further refined as a result of this consultation.

Analyses were conducted for using the MRGO as a potential borrow source between the closures at Bayou Bienvenue (IHNC Surge Barrier) and Bayou La Loutre. Assuming dredging to -40' by 500' with a 1' over-depth, approximately 15.5 million cubic yards of material would be available for use in restoration projects.

The practicability and acceptability of the use of the MRGO must also be considered. "An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes" (40 CFR 230.10 emphasis added). The purpose of the study is to restore areas affected by the MRGO. The area that was dredged to create the channel is the most directly affected area.

Degrading the MRGO spoil banks south of the Chalmette Loop Levee to marsh elevation was considered as a restoration feature that would also provide material. This alternative was rejected by the majority of the PDT, because the spoil bank provides more storm surge protection than it would as marsh.

HQUSACE Assessment: The issue is resolved by the incorporation of the above language into the report. However, it is important to point out that should the ESA consultation determine that dredging the identified critical habitat in Lake Borgne is not acceptable, the District will have to evaluate alternative borrow sites, including the MRGO channel, or reduce the scale of the plan to a level compatible with the available sediments. The issue of public acceptability would have to be addressed should the MRGO channel be used as a borrow source in the future.

C. Real Estate.

1. Page 12, Real Estate Plan. On page 12 of the REP, remove the first two paragraphs under Estates. Since the request for approval of the non-standard estates will be in a separate memorandum, the arguments for approval should be in that document, not this one.

MVN Response to Comment 2.C.1: Concur.

represents unacceptable impacts to Gulf sturgeon. Most of the borrow material is currently located in critical habitat.

HQUSACE believes that MVN's interpretation is an over-reading of the borrow prohibition and stressed the importance of evaluating the MRGO channel as a potential borrow source.

Required Action: Further evaluate the use of the channel as a borrow source.

Action Taken: The following discussion has been added to Section 2.5.3.2 Potential Borrow Sources:

MRGO Channel

Public preference for filling in the channel and restoring the area to historic conditions is documented in the Scoping Report for this study and numerous other public documents:

- *The Final Environmental Impact Statement (EIS) for the Mississippi River-Gulf Outlet (MRGO), Louisiana, and Lake Borgne – Wetland Creation and Shoreline Protection Project, a USACE document, states that “use of the MRGO channel as a borrow source was considered to be contrary to the Congressional intent, as described in House Report No. 109-359, that funds provided in P.L. 109-148 for authorized operation and maintenance activities along the MRGO not be used to conduct any dredging of the MRGO channel.”*
- *Louisiana House Concurrent Resolution 34 (2005) to “suspend any current appropriations or authorizations for expenditure of funds to dredge the Mississippi River Gulf Outlet, to direct the United States Army Corps of Engineers not to engage in any dredging activities on the Mississippi River Gulf Outlet, and to begin the necessary process to return the waterway to wetlands marsh status as close as possible to what it was prior to establishment of the canal.”*
- *“MRGO Must Go A Guide for the Army Corps Congressionally-Directed Closure of the Mississippi River Gulf Outlet” (Endorsed by LSU, Coalition to Restore Coastal Louisiana, Lake Pontchartrain Basin Foundation, Environmental Defense Fund, Gulf Restoration Network, National Wildlife Federation, Louisiana Wildlife Federation, American Rivers, and St. Bernard Parish).*

Dredging the MRGO to obtain borrow material for wetland restoration is a potentially unacceptable alternative. However, because Lake Borgne (the closest available borrow source) is critical habitat for Gulf sturgeon, all viable alternatives must be investigated to avoid and minimize potential impacts to critical habitat to the extent practicable.

The PDT analyzed MRGO as a borrow option for marsh creation features. Using the channel could supply <10% of the identified 150+ million cubic yards of sediment need for the entire TSP. Dredging the channel would provide some cost savings (estimated at ~\$20 million) over the Lake Borgne option. As

Required Action: Remove the first two paragraphs under Estates. Provide an outline of the process forward and timing for developing the request for non-standard estates memorandum.

Action Taken: Two paragraphs removed. Draft non-standard estates memorandum included as follows:

*MRGO ECOSYSTEM RESTORATION PLAN FEASIBILITY STUDY
REQUEST FOR APPROVAL
NON-STANDARD ESTATE
WETLAND CREATION AND RESTORATION EASEMENT*

- 1. This is a request for approval of the non-standard Wetland Creation and Restoration Easement for the MRGO Ecosystem Restoration project. A copy of the proposed estate is enclosed.*
- 2. The project purpose and description is contained within the Real Estate Plan.*
- 3. A map depicting the location of the wetland creation and restoration sites is included in the Real Estate Plan on Page 2 of Exhibit A.*
- 4. Approval of the non-standard Wetland Creation and Restoration Easement is requested because there is no standard easement that includes the real estate rights necessary for construction of certain project features. The project includes disposal of dredged material in designated areas to use it beneficially to enhance existing marsh and to propagate the growth of marsh in waterbottoms.*
- 5. The Wetland Creation and Restoration Easement provides all the necessary rights to protect the marsh as well as the marsh that will naturally propagate in the project areas. The only potential use of the property, given its location and physical characteristics, is for recreation (fishing and hunting) and mineral development. Recreational uses will not impact the viability of the project. The Wetland Creation and Restoration Easement prohibits the construction of structures, operation of vehicles, excavation of the land, disposal of material, cutting of trees, and the use of the surface for mineral exploration without prior approval by the United States.*
- 6. The District recognizes that fee title is required as a general rule for all lands required for the construction and operation and maintenance of the project. Notwithstanding that fee title is generally the interest that must be provided to support ecosystem restoration projects, there are circumstances where it may be appropriate to utilize permanent easements instead of fee. One of the allowable exceptions to the policy is where project lands consist of the bed and immediate bank of a watercourse for the installation of features that improve habitat for aquatic resources. Based on the explanation provided in the main body of the REP and in the paragraphs directly above, both the District and the Non-Federal Sponsor are of the opinion that acquiring the Wetland Creation and Restoration Easement is more advantageous to the Government than acquiring a Fee estate. The cost of acquiring the Wetland Creation and Restoration Easement is less than the cost of acquiring Fee Excluding Minerals (with restrictions on use of the surface).*
- 7. The Wetland Creation and Restoration Easement was written using language from several standard estates such as the Perpetual Beach Nourishment*

Easement, the Perpetual Beach Storm Damage Reduction Easement, and the Flowage Easement (Permanent Flooding).

8. From the Perpetual Beach Nourishment Easement, the estate includes the following language:

"A perpetual and assignable easement and right-of-way in, on, over and across (the land described in Schedule A) (Tract No. _____) to construct, operate, maintain, patrol, repair, renourish and replace beach berm and appurtenances thereto, including the right to borrow and/or deposit fill."

For the Wetlands Creation and Restoration Easement, the phrase "replace beach berm and appurtenances thereto" was removed and replaced with, "replace wetlands and associated coastal habitats".

Additional language taken from the Perpetual Beach Nourishment Easement includes the following:

-- "to trim, cut, fell and remove therefrom trees, underbrush, obstructions, and any other vegetation, structures or obstacles within the limits of the easement"

-- "subject to existing easements for public roads and highways, public utilities, railroads and pipelines; reserving, however, to the grantor(s), (his) (her) (its) (their) (heirs), successors and assigns, all such rights and privileges as may be used without interfering with or abridging the rights and easement hereby acquired;"

9. Language for this easement was also extracted from the Perpetual Beach Storm Damage Reduction Easement. The phrases used were:

-- "to accomplish any alterations of contours on said land; to plant vegetation on said land," and

-- "to move, store and remove equipment and supplies."

10. The standard Flowage Easement (Permanent Flooding) contains language which prohibits construction or maintenance of structures and excavation or placement of landfill. This language was used within the Wetlands Creation and Restoration Easement.

11. Additional language not found within standard estates was added: including the right "to construct dikes and to install, alter, relocate, repair or plug cuts in the banks of dikes; to construct, operate and maintain pipelines for the purpose of dredge or spoil material transport and deposition." prohibit trimming, cutting felling or removal of trees or other vegetation without approval.

The non-standard estate allows for the Grantor to retain mineral rights, but restricts the use of surface for the purpose of drilling and extracting oil, gas and other minerals.

12. A similar non-standard Wetland Creation and Restoration Easement was previously approved for the 2004 LCA Project Report.

13. Enclosed is a written statement from Office of Counsel (MVN), indicating the legal sufficiency of the Non-Standard Estate.

14. Also enclosed is a Quality Control Checklist, Request to Deviate from Guidance as to Appropriate Interest to Acquire and/or Request for Approval of Use of Non-Standard Estate.

HQUSACE Assessment: The issue is resolved.

2. Additional relocations. Other than for the railroad, the report does not have information on any other proposed facility/utility relocations. Any new information on

required relocations must be added to the REP as the need becomes apparent. Also, an attorney opinion of compensability for the relocations is needed.

MVN Response to Comment 2.C.2: Concur.

Discussion: Additional information regarding relocations has been developed and will be added to the report. The process of obtaining an opinion of compensability for relocations will be added to the report.

Required Action: Add relocations to report.

Action Taken: The following text has been added to the report:

A survey was conducted of utilities/facilities that will be impacted by the proposed project. A determination of compensable interests will be developed through:

- 1. Identification of facilities to be relocated (i.e., roads, railroads, pipelines, utilities, bridges, etc.).*
- 2. Evaluation of applicable relocation costs, as well as whether the Government must pay or reimburse for these relocations to provide like services or improvement for those impacted by the project by MVN Real Estate and Office of Council.*

HQUSACE Assessment: The comment has been resolved by the above discussion.

3. Sponsor Capability Assessment. When the non-Federal sponsor for the project is identified, the district must prepare a Sponsor Capability Assessment.

MVN Response to Comment 2.C.3: Concur.

Discussion: This action needs to be undertaken prior to the Final Report. A blank Sponsor Capability Assessment can be included in the Draft.

Required Action: Prepare a Sponsor Capability Assessment.

Action Taken: A blank Sponsor Capability Assessment has been added to the Draft Report as follows:

**ASSESSMENT OF NON-FEDERAL SPONSOR'S
REAL ESTATE ACQUISITION CAPABILITY**

I. Legal Authority:

- a. Does the sponsor have legal authority to acquire and hold title to real property for project purposes?*
- b. Does the sponsor have the power of eminent domain for this project?*
- c. Does the sponsor have "quick take" authority for this project?*

- d. Are any of the lands/interests in land required for the project located outside the sponsor's political boundary?
- e. Are any of the lands/interests in land required for the project owned by an entity whose property the sponsor cannot condemn?

II. Human Resource Requirements:

- a. Will the sponsor's in-house staff require training to become familiar with the real estate requirements of Federal projects including P.L. 91-646, as amended?
- b. If the answer to I1 .a. is "yes," has a reasonable plan been developed to provide such training?
- c. Does the sponsor's in-house staff have sufficient real estate acquisition experience to meet its responsibilities for the project?
- d. Is the sponsor's projected in-house staffing level sufficient considering its other workload, if any, and the project schedule?
- e. Can the sponsor obtain contractor support, if required in a timely fashion?
- f. Will the sponsor likely request USACE assistance in acquiring real estate?

III. Other Project Variables:

- a. Will the sponsor's staff be located within reasonable proximity to the project site?
- b. Has the sponsor approved the project/real estate schedule/milestones?

IV. Overall Assessment:

- a. Has the sponsor performed satisfactorily on other USACE projects?
- b. With regard to this project, the sponsor is anticipated to be: highly capable/fully capable/moderately capable/marginally capable/insufficiently capable.

V. Coordination:

- a. Has this assessment been coordinated with the sponsor?
- b. Does the sponsor concur with this assessment?

HQUSACE Assessment: The issue is resolved.

4. Nonstandard estates. As described on Section 4.1.1 on page 4-1, the report indicates that nonstandard estates are likely to be recommended in lieu of traditional fee estates in order to implement the project. Such estates will need to be reviewed and approved by HQUSACE, and supported with written justification.

MVN Response to Comment 2.C.4: Concur.

Discussion: See Comment C.1. above.

Required Action: Remove the first two paragraphs under Estates. Provide an outline of the process forward for developing the request for non-standard estates memorandum.

Action Taken: A draft memorandum has been developed and will be reviewed by MVN-OC. See Comment 2.C.1 above for draft non-standard estates. Following approval at the District level, approvals will be sought from MVD and HQ.

HQUSACE Assessment: The comment has been resolved by the above discussion.

D. Cost Engineering.

1. Comparative Cost estimates. A comparative cost estimate (screening level) of the various alternatives is missing in the report. Provide an output report of comparative cost estimates used in formulating the TSP. Guidance for developing screening level cost estimates is prescribed in ER 1110-2-1302 (see par. 14.c) and ETL 1110-2-573 (see par 2.4.1).

MVN Response to Comment 2.D.1: Concur.

Discussion: These are available and are included in the Engineering Appendix. A summary will be provided in the report.

Required Action: Provide an output report of comparative cost estimates used in formulating the TSP.

Action Taken: A table of comparative cost estimates has been added to the report as follows:

IWR GROUP NAME	SOLUTION LABEL	IWR CODE	FEATURE TYPE	ANNUAL AVERAGE COST	AAHUS
Biloxi Marsh	081	A	Marsh Creation	5,873,225	373
Biloxi Marsh	042	B	Marsh Creation	6,446,604	73
Biloxi Marsh	020	C	Marsh Creation	4,796,356	159
Biloxi Marsh	013sp	F	Shoreline Protection	2,639,700	179
Biloxi Marsh	014sp	G	Shoreline Protection	4,414,464	142
Biloxi Marsh	98asp	H	Shoreline Protection	2,171,273	66
Biloxi Marsh	98bsp	I	Shoreline Protection	4,863,397	120
Biloxi Marsh	111sp	J	Shoreline Protection	1,901,045	58
Biloxi Marsh	017sp	K	Shoreline Protection	1,239,152	31
Biloxi Marsh	107sp	L	Shoreline Protection	1,223,905	35
Biloxi Marsh	029asp	M	Shoreline Protection	2,084,680	137
Biloxi Marsh	110sp	N	Shoreline Protection	4,994,804	130
Biloxi Marsh	81sp	P	Shoreline Protection	4,335,439	185
E. Orleans/S. Lake Borgne	010a	A	Marsh Creation	1,318,785	147
E. Orleans/S. Lake Borgne	010b	B	Marsh Creation	7,610,542	578
E. Orleans/S. Lake Borgne	011	C	Marsh Creation	648,743	156
E. Orleans/S. Lake Borgne	007	D	Marsh Creation	1,889,288	89
E. Orleans/S. Lake Borgne	009	E	Marsh Creation	2,385,457	500
E. Orleans/S. Lake Borgne	005sp	F	Shoreline Protection	758,201	74
E. Orleans/S. Lake Borgne	006sp	G	Shoreline Protection	958,944	77
E. Orleans/S. Lake Borgne	007sp	H	Shoreline Protection	3,012,971	188
E. Orleans/S. Lake Borgne	090	I	Breakwater for SAV	330,464	15

IWR GROUP NAME	SOLUTION LABEL	IWR CODE	FEATURE TYPE	ANNUAL AVERAGE COST	AAHUS
E. Orleans/S. Lake Borgne	028	J	Marsh Creation	1,236,516	84
E. Orleans/S. Lake Borgne	014	K	Marsh Creation	5,911,103	832
E. Orleans/S. Lake Borgne	015a	L	Marsh Creation	2,348,644	551
E. Orleans/S. Lake Borgne	008sp	M	Shoreline Protection	1,979,597	128
E. Orleans/S. Lake Borgne	015c	N	Marsh Creation	1,965,753	569
MRGO Channel	024	A	Channel Narrowing Marsh Creation	1,400,723	22
MRGO Channel	021	B	O&M Shoreline Protection	340,306	20
MRGO Channel	022	C	O&M Shoreline Protection	326,590	20
MRGO Channel	025	D	O&M Shoreline Protection	175,561	7
MRGO Channel	027	E	Channel Narrowing Shoreline Protection	1,770,019	32
MRGO Channel	026	F	Channel Narrowing Shoreline Protection	2,736,228	40
MRGO Channel	087	G	Shoreline Protection	316,098	5
MRGO Channel	104	H	O&M Shoreline Protection	104,483	3
Terre aux Boeufs/Hopedale	002a	A	Marsh Creation	2,266,837	358
Terre aux Boeufs/Hopedale	002b	B	Marsh Creation	9,815,257	823
Terre aux Boeufs/Hopedale	002c	C	Marsh Creation	5,087,244	552
Terre aux Boeufs/Hopedale	245	D	Marsh Creation	4,829,628	1545
Terre aux Boeufs/Hopedale	190	J	Marsh Creation	2,054,465	186
Terre aux Boeufs/Hopedale	029bsp + 028	J	Shoreline Protection	1,696,275	232
Central Wetlands	N/A	N/A	Swamp only	42,742,248	1381
Central Wetlands	N/A	N/A	Swamp + Marsh Creation	51,148,908	1985
Ridge	N/A	N/A	Partial Ridge	865,399	8
Ridge	N/A	N/A	Full Ridge	1,510,834	14
Florissant	N/A	N/A	Marsh Creation	1,576,410	12

HQUSACE Assessment: The issue is resolved.

2. **Peer Review.** Dr. Checks report shows conflicting information pertaining to the level of design data. Comment 3171195 states "All quantities and costs at this stage are of recon detail" whereas comment 3175277 states "The estimates in the draft feasibility report are based on preliminary designs". Also, it is not very clear whether the comments on cost engineering are based on the review of the comparative cost estimates. Clarification is requested.

MVN Response to Comment 2.D.2: Concur.

Discussion: The Draft Feasibility Report and EIS will fully disclose the limitations of the current design level and associated risks, as well as describe on-going engineering activities. Feasibility level design will be complete for inclusion in the Final Feasibility Report and EIS. MVN sees "recon" and "preliminary design" as synonymous terms. "Preliminary design" will be used throughout for consistency. Further design in the feasibility phase will have equal effects on all alternatives and will not affect the plan selection.

Required Action: Clarify the level of detail in the cost estimates used for plan comparison.

Action Taken: See Comments 2.B.12 for new section on cost estimates.

HQUSACE Assessment: The issue is resolved.

3. Summary Report. Costs shown on Table S-5 are not presented in accordance with the Civil Works Work Breakdown Structure. Also, it is not very clear whether the costs for the different features included contingencies.

MVN Response to Comment 2.D.3: Concur.

Discussion: Costs include contingencies. For the alternatives analysis, the contingencies were not based on a cost risk analysis but they will be for the draft report. The costs will again be refined for the final report.

Required Action: Revise cost table in the Draft report to clearly describe contingencies.

Action Taken: Mii estimates are being finalized. See Comment 2.B.12 above for revised Table S-5.

HQUSACE Assessment: The issue is resolved.

4. Real Estate Costs. A price level date is not stated in Exhibit B, Chart of Accounts. It is not explicit whether the costs are in constant dollar or inflated.

MVN Response to Comment 2.D.4: Concur.

Discussion: A price level will be added. It will be verified and documented that Real Estate Costs and Cost Engineering used the same price levels.

Required Action: Include a price level date in Exhibit B, Chart of Accounts and be explicit about whether the costs are in constant dollar or inflated.

Action Taken: Exhibit B, Chart of Accounts has been revised to clarify costs are shown in constant dollars.

HQUSACE Assessment: The issue is resolved.

3. HQUSACE review of the December 2010 AFB and EIS.

A. General Comments.

1. Sponsor support for project. Part S.2.2 on page S-1 of the executive summary and part 1.2 on page 1-3 of the main report both state that “The States of Louisiana and Mississippi disagree with the USACE over the cost-share requirements for plan implementation and suggest that plan implementation should be full (100%) federal cost.” This language is not an accurate representation of either state’s expressed support or willingness to provide its required local cooperation for the project. As stated in the State of Mississippi’s letter, provided on page 4-10 and paraphrased in part 4.4 on pages 4-7 to 4-8 of the report, the State of Mississippi supports the project and agrees with the applicable cost share for the project. While the State of Mississippi notes its belief that the Corps should pursue “full Federal expense funding of the project”, Mississippi does not condition its willingness to participate as a sponsor in the project on full Federal expense funding. This contrasts materially from the State of Louisiana’s letter, included on page 4-9 and paraphrased in part 4.4 on page 4-8 of the report. Mississippi explicitly disputes the Corps’ interpretation of the applicable cost sharing for the project and asserts that the Louisiana “has **no** financial obligations (including but not limited to cost share, land rights acquisitions, operations and maintenance obligations) as non-Federal sponsor with respect to the Mississippi River Gulf Outlet Ecosystem Restoration Project (emphasis in original).” These differing views should be distinguished by separate discussions in both parts of the report, similar to how the views are paraphrased in parts 4.4 and 4.5 on pages 4-7 to -4-8 of the report.

MVN Response: The distinction will be made in the final report.

HQUSACE Assessment: The comment is closed, pending further clarification.

2. OMRR&R. It appears that no standard O & M, such as periodic renourishment with sediments, would be performed for the approximately 49,000 acres of marsh and swamp that would be restored or nourished under the tentatively selected plan. This determination is supported by the cost estimate for OMRR&R as the Engineering Appendix, as follows;

OMRR&R cost estimates were developed for the TSP. These costs include yearly operation and maintenance costs as well as refurbishment and major rehabilitation. The estimates are based on data from existing structures of similar size, maintenance requirements, and operating criteria. Costs were developed for refurbishment and major rehabilitation based on data from existing structures of similar size and maintenance requirements, and operating criteria. The estimated yearly O&M cost is \$1,300,000. This cost does not include monitoring and adaptive management costs which are discussed in the main report.

While the above description of OMRR&R specifically mentions structures, it is silent on other project features, such marshes and swamps. In addition, the estimated annual O&M cost of \$1,300,000 clearly is not adequate to support any needed periodic renourishment. Corps of Engineers guidance states that the "intent of restoration is to partially or fully

reestablish the attributes of a naturalistic, functioning, and self-regulating system." In addition, Section 210 of the WRDA 1996 establishes that non-Federal sponsors are required to provide 100 percent of lands, easements, rights-of-way, utility or public facility relocations, and dredged or excavated material disposal areas (LERRD), and operation, maintenance, repair, rehabilitation, and replacement (OMRR&R). It is the sponsor's responsibility under OMRR&R to ensure the sustainability of the project.

Please be advised that the proposal to complete the initial project construction and allow these sites to gradually disappear is very unlikely to find support with HQUSACE leadership. However, if the intent is to purposefully allow the project to degrade over time, the re-degraded future condition has to be accounted for in the analysis of project benefits, as do any incidental benefits (such as decreased storm surges or decreased wave energies) that disappear over time.

Lastly, should a determination be made to include standard OMRR&R practices (such as periodic renourishment of the restored wetlands) into the recommended plan, an analysis of sediment quantities and availability must be conducted in order to support the estimated costs of future O&M activities.

MVN Response: The final plan will include potential OMRR&R actions and cost estimates for all sea level rise scenarios in the adaptive management plan. In keeping with the nature of the ecosystem and geomorphology of the study area, it is acknowledged that the project benefits will change over time. These changes are reflected in the WVA assignation of benefits.

HQUSACE Assessment: The issue is resolved in concept, but requires HQUSACE concurrence that the proposed OMRR&R plan is appropriate and adequate.

3. Rate of sea level rise used to estimate outputs for TSP is unclear. The rate of sea level rise used to estimate the benefits of the TSP is not clearly identified in the feasibility report, page 2-139. While the calculations of sea level rise rates appear to have been completed in accordance with EC 1165-2-211, the selected rate of sea level change has not been clearly identified, although the reader may infer from the description of the project benefits that the "low" rate has been chosen. The report should be clarified to state which rate of sea level rise is used in the presentation of project outputs.

MVN Response: It will be clarified that historic rates were utilized in the quantification of benefits.

HQUSACE Assessment: The issue is resolved.

4. Cost allocation tables. The report needs to show the allocation of cost between the Federal share and the Non-Federal share for the TSP components.

MVN Response: Cost share will be included in the final document.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

5. Separable elements. Ecosystem restoration consists of separable features undertaken to return a degraded condition to a less degraded condition. Separable element is any part of a project which has separately assigned benefits and costs, and which can be implemented as a separate action (at a later date or as a separate project). Separable elements so considered are similar to the planning concept of last added increments, with the added idea of separation or detachment of the increment from the whole. The documentation needs to show the individual costs and benefits of each of the individual elements included in each alternative. For example, show the cost of the Violet diversion and the benefits gained from the diversion.

MVN Response: Costs and benefits for each measure will be included in the final version of the main report.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

B. Plan Formulation, Plan Selection and Adaptive Management.

1. Description of Violet Diversion inconsistent. The description of the proposed Violet Diversion is inconsistent between the feasibility report and EIS. The width, length and depth of the channel, the size of the box culverts, the need to relocate roads and railroad bridges, and other factors are not consistently discussed among the various parts of the report. A partial list is as follows;

- Pages 3-4 and 3-5, feasibility report
- Page 2-106 EIS
- Pages 11 and 12 of EIS Appendix E, 404(b)(1) Guidelines Analysis
- Page 12, EIS Appendix F, CZM consistency determination
- Page 56, EIS Appendix G, biological assessment

The feasibility report, EIS and all appendices should be cross-checked to ensure that the correct information has been provided throughout the various documents.

MVN Response: Concur. More rigorous quality assurance will be conducted prior to the release of the final report.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

2. Feasibility level information not available for Violet Diversion. Page 2-105 of the EIS and page 11 of EIS Appendix E state that the design of the diversion has not been developed to a feasibility level of detail. Therefore, an analysis of potential affects cannot be conducted in order to recommend this feature for construction, without the completion of a supplemental environmental assessment. Should it be true that the EIS does not contain an adequate analysis to support a recommendation, HQUSACE requests that the Violet Diversion measure be removed from the MRGO study and completed in a separate effort. Please be advised that HQUSACE would likely be unwilling to support making a recommendation to the Chief of Engineers based on incomplete or inadequate NEPA documentation. Furthermore, given that an adequate analysis has not been completed, it seems premature to assume the appropriate supplemental NEPA document would be an environmental assessment, and not an environmental impact statement.

MVN Response: Violet Freshwater Diversion is being recommended for additional analysis in the final recommendations for the plan.

HQUSACE Assessment: The issue is resolved.

3. St. Bernard Parish Council opposition to proposed Violet Diversion alternative. Page 2-98 of the feasibility report and page 7-2 of the EIS refer to a resolution passed by the St. Bernard Parish Council adamantly opposing the preferred location for the proposed Violet Diversion. This declaration against the proposed location seems to be at odds with a determination on pages 2-150 and 2-151 of the feasibility report that Alternatives C and D meet the Acceptability criterion. The Principles and Guidelines define acceptability as "the workability and viability of the alternative plan with respect to acceptance by State and local entities and the public and compatibility with existing laws, regulations, and public policies." The adamant opposition of the St. Bernard Parish Council calls into question whether the Acceptability criterion has truly been met for Alternatives C and D.

MVN Response: Opposition to a plan does not make it infeasible or unacceptable. The extent to which a plan is welcome or satisfactory is considered in the determination of acceptability; however, these are qualitative dimensions, not absolutes. "If a plan cannot be done for legitimate reasons, it is not feasible. If a plan has opposition or is not the favored plan of the non-Federal partner that does not make it infeasible or unacceptable. That simply makes it unpopular. If a plan requires changes in laws or authorities, that alone doesn't make it unacceptable. That only makes it difficult." (IWR Report 96-R-21, Planning Manual, pp. 170). The existing analysis identifying the Sinclair Tract as the most feasible location for the diversion will be retained in the final report, as per MVD guidance. However, the measure is not being recommended for construction in this study, and further analyses may indicate that another site is more preferable or a locally preferred alternative may be developed.

HQUSACE Assessment: The issue is resolved.

4. AAHU outputs are inconsistent. The HU outputs and Annual Costs of Plans 2, 7 and 10 in Table 2-26 on page 2-53 of the EIS do not match the corresponding Measure AAHUs and annual estimated costs for Plans B, C and D as displayed in Table 2-27 on page 2-55 of the EIS. These two tables appear to represent the same plans, and therefore should use the same figures for these categories. Please reconcile any inconsistencies, as needed.

MVN Response: It will be noted that the numbers in column 2 of Table 2-26 and column 3 of Table 2-27 are not consistent due to the subsequent determined infeasibility of JS-1 and inclusion of MRGO 1-7 in all plans and MRGO 8 in C and D.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

5. Plan Formulation Strategy and Project Performance: Based on the existing formulation and given that the SLR scenarios are all assumed equally plausible, then the TSP is only 66% likely to produce benefits. To make the TSP more reliable, the report should contain a discussion of the risk reduction measures capable of mitigating for poor project performance. This discussion would involve a screening process starting with a qualitative assessment of the objectives against the risks and uncertainties associated with SLR and subsidence and erosion and water quality by asking the questions...are the objectives obtainable based on the expected changes in those variables. If so how confident are we that they are obtainable? The assessment should lead towards establishing performance targets in which to measure project performance against or modifying the objectives if they are not obtainable. It should factor in the likelihood of habitats transitioning during the period of analysis. Consider the following formulation for an integrated assessment:

- a. Step 1: Assess the management measures against the risks and uncertainties to determine the performance in meeting the objectives. The sustainability factors identified could be the basis for this.
 - i. Each habitat should be ranked based on the sustainability factors and the type of management measures required for sustaining it over time increments using the management measures identified in the report.
 - ii. Evaluate in geomorphologic terms by looking at the sensitivity of the results against the habitat transitioning timeframes. (This assumes that habitat transitioning is a project constraint).
- b. Step 2: Formulate the combination of risk based measures in conjunction with adaptive management measures to determine the likelihood of meeting the objectives through adaptive management responses.
- c. Step 3: Compare the WP and WOP performance based on the risk reduction measures.

This assessment should inform the formulation of the project metrics and measures table 2-7 as well as formulating the problems, opportunities and constraints sections.

MVN Response: A discussion of risk reduction measures capable of mitigating for poor project performance will be included in the monitoring and adaptive management plan and summarized in the main report.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

6. Adaptive management and monitoring plan. The discussion on page 3-21 of the feasibility study should be revised to present a summary of the adaptive management and monitoring plan (AD&M plan) that is found in the appendices to the EIS. Also, this section should be strengthened to state that the AD&M plan is an integral part of the recommended plan, consistent with Section 2039 of WRDA 2007, and not merely a recommended plan feature. HQUSACE recommends this change in order to avoid the possible perception of some readers that the AD&M plan is merely an “add-on” feature. Lastly, Objective 6 on page 14 of the AD&M plan should be deleted, consistent with the MVN response to comment 2.B.1, above.

MVN Response: The discussion of the monitoring and adaptive management plan will be revised in the main report as recommended. The objective will be deleted in the monitoring and adaptive management plan.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

7. Adaptive Management and Risk and Uncertainty Assessments: The adaptive management plan provides rationale and structure for evaluation of project performance based on assessment metrics; however, it fails to provide a structured response plan for failed performance based on the SLR guidance. As stated in numerous places in the report, success is dependent on our capacity to manage adaptive change; consequently, the adaptive management plan should include a risk management plan that describes the likelihood that the adaptive management measures will be employed, at what point they will occur, the recovery time and likelihood of success and at what cost. The risk assessment portion of the risk management plan should address the SLR scenarios and likelihood of habitat transitioning.

Action Required: Develop an adaptive management plan that incorporates a response plan based on a risk assessment and risk management methodology that can provide input into improving project output reliability and costs.

MVN Response: The monitoring and adaptive management plan will be revised to include a response plan.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

8. Adaptive Management and SLR. The report states that the adaptive management plan will address specific risk and uncertainty associated with the implementation of the selected plan, and potential changes to the plan in order to respond to and minimize the potential effects of key uncertainties associated with SLR in conjunction with subsidence that could affect plan performance and or costs. Also section WRDA 2007 2039 guidance requires that an adaptive management plan be developed for all ecosystem restoration projects. And MRGO Principle 7 states a concerted monitoring and adaptive management program should be a component of the restoration plan. The adaptive management plan is a response to improve sustainability based on potential changed conditions so it should be formulated around project sustainability factors. Since the principle drivers are SLR, the SLR guidance EC 1165-2-211 provides a methodology for the formulation strategy:

EC 1165-2-211 formulation steps that need to be incorporated into the Adaptive Management Plan include:

- Step 15. Assess project performance for each sea-level change scenario
- Step 16. Calculate the risk for each project design alternative combined with each sea-level rise Scenario at 5-year increments OR reasonable increments based on both period of analysis and scope of study.
- Step 17. Assess risk and reevaluate project design alternatives. Consider at a minimum: planning for adaptive management¹, designing to facilitate future modifications, and designing for a more aggressive future sea-level change scenario.
- Step 18. Select project designs that best accommodate the range of sea-level change scenarios.

The adaptive management plan should be modified to include EC 1165-2-211 and any changes addressed in the main report.

MVN Response: The monitoring and adaptive management plan will be revised to be compliant with EC 1165-2-211.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

9. The Review Plan dated April 2009 needs to be updated with current schedule and scope information.

MVN Response: The Review Plan is being updated.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

10. The ATR is substantially incomplete. Of the 188 comments received, approximately 9 comments are closed, 10 are open and the remainder "evaluation not conducted." Recommend that ATR certification be complete prior to release of the Draft Report (but it's already been released).

MVN Response: All open comments were addressed at the AFB and a path forward for resolution was developed. This is documented in the revised draft PGM that was distributed to the vertical team electronically on 5 Aug 2010. Also please reference the 05 Oct 10 CECW-MVD Memorandum Subject: Mississippi River Gulf Outlet Ecosystem Restoration Plan Feasibility Study - Alternative Formulation Briefing Documentation Package providing HQUSACE approval for the release of the draft document for simultaneous public and HQUSACE review upon receipt of acceptable LOIs; 09 Nov 10 ASA(CW) Memorandum Subject: Mississippi River Gulf Outlet - Supplemental Report of the Chief of Engineers in Response to the Water Resources Development Act of 2007 directing MVN to complete the report; and 15 Nov 10 CECW-MVD Memorandum Subject: Mississippi River Gulf Outlet Ecosystem Restoration Supplemental Report, directing MVN to revise the report in coordination with MVD and HQ and release for public review. Documentation of RIT coordination on report revisions can be provided if necessary. As the plan has subsequently been reviewed through the IEPR process and another ATR will be performed prior to the release of the final report, this comment is considered resolved.

HQUSACE Assessment: The issue is resolved.

11. Sea Level Rise, Section 2.8.2: Different project components have differing susceptibilities to a given rate of sea level rise. Measures should be evaluated per SLC through sensitivity analysis and performance measured against the different SLR scenarios.

MVN Response: All measures will be assessed for susceptibility to SLR.

HQUSACE Assessment: The issue is resolved, pending confirmation of the proposed revisions.

12. Many of the figures need scale and directional marks.

MVN Response: All figures lacking scales and directional marks will be revised to include them.

HQUSACE Assessment: The issue is resolved.

13. Section 2.8.1 Risks and Uncertainty, partially resolves the original comments. Recommend a table that does a qualitative assessment of risk factors and then ranking them in criticality and then a discussion on how they will be mitigated. This should be done in conjunction with the project risk management plan and cost and schedule risk analysis that are still to be completed.

14. Was the WVA model certified? More detail should be added to page 2-92.

MVN Response: More information about WVA certification will be included in the final report.

HQUSACE Assessment: The issue was resolved through HQUSACE agreement to use sensitivity analysis to test the viability of the assumptions made in the WVA for the marsh modules. Certification would be considered after the sensitivity analysis has been completed.

15. How was habitat scarcity, contribution to overall ecosystem function, and contribution to critical landscape features evaluated for alternative plan combinations on page 2-92.

MVN Response: All of the Violet Diversion Alternative locations provide the same benefits in terms of decreasing habitat scarcity, restoring ecosystem function, and benefits to critical landscape features.

HQUSACE Assessment: The issue is resolved.

16. How was it determined that Goal #3, "Achieve ecosystem sustainability to the greatest degree possible" was achieved for the TSP?

MVN Response: It is noted that "in general, the most sustainable features will be those will higher elevations; features being nourished by diversions; and the diversion itself." Because all plans include the diversion, the TSP includes more features nourished by the diversion and at higher elevations than Plan B, and the additional features included in Plan D are less sustainable (shoreline protection), the TSP is the most sustainable plan that achieves the goals and objectives of the study in a cost-effective manner. Therefore, the TSP is the most sustainable plan possible in the USACE planning framework of cost-effectiveness. A statement to this effect will be added to Section 2.10 of the final report.

HQUSACE Assessment: The issue is resolved.

17. Page 2-63 Habitat Objectives, reference direct and indirect habitat impacts from MRGO 1956-2008a and reference Section 2.1.4. This reference does not exist in the stated location.

MVN Response: There is a typo on page 2-61 incorrectly referencing Section 1.4.2. This will be corrected in the final report.

HQUSACE Assessment: The issue is resolved

18. The report states that "(A)ctive sedimentation ceased 1000 years ago. Erosion and relative subsidence have dominated the landscape resulting in land loss and habitat switching." How has this geomorphology and propensity for habitat switching in the

study area been incorporated into the objectives, goals and TSP that there has been historic habitat switching in the study area?

MVN Response: The complete statement is: “Active sedimentation **related to delta growth** ceased in this area over 1000 years ago” (emphasis added). Sedimentation from marsh accretion and settling of suspended sediments distributed in waterbodies still occurs. Planning for this study was conducted in a framework aware of the highly dynamic nature of the study area, and this is noted throughout the report. The spatial distribution of wetland habitats in portions of study area has been, and continues to be, in constant flux. Construction of the MRGO impacted the natural geomorphology and hydrology of the St. Bernard Deltaic Complex. The majority of habitat shifts that have occurred adjacent to the channel, particularly north of Bayou La Loutre, are directly attributable to the MRGO. The goals, objectives, and TSP were formulated recognizing the changes caused by the channel and represent an attempt to restore the estuary to a less degraded, more natural state.

HQUSACE Assessment: The issue is resolved.

19. Recommendations for additional study 3-21 states that “Due to the uncertainties associated with sustaining Louisiana’s coast through sediment placement, a sediment-needs and sources inventory should be developed. How did this limitation impact the study and TSP?”

MVN Response: The PDT investigated a variety of borrow sources. In some instances, sources were not utilized because of their identification for use in multiple other projects, e.g. Lake Lery. A comprehensive inventory of available sources, their volumes, and any constraints associated with their use would facilitate the identification of available sediment for projects throughout the area. The draft report will include information on the sediment sources investigated for this project; a comprehensive survey is not needed to facilitate the MRGO plan.

HQUSACE Assessment: The issue is resolved.

20. Noted that the TSP is dependent on other projects. Which projects are most critical to the realization of the TSP? This dependency raises the question of whether the TSP is a complete plan. Please clarify as needed.

MVN Response: The TSP is a complete plan because it recognizes these dependencies and incorporates them into the recommended plan. These projects are listed under the “Action by Others” heading starting on pp. 3-21. The following projects are critical to achieve the anticipated benefits of the plan (Violet Freshwater Diversion will be added to this list in the final report): Convent/Blind freshwater diversion; the authorized project features described in the selected plan for the “Final Environmental Impact Statement (EIS) for the Mississippi River-Gulf Outlet (MRGO), Louisiana, and Lake Borgne – Wetland Creation and Shoreline Protection Project; CWPRRA PO-72 shoreline

protection; a private wetland mitigation bank; and the Orleans/St. Bernard Parishes Wastewater Treatment CIAP project.

HQUSACE Assessment: The issue is resolved. The outputs of the Violet Diversion have been subtracted from the projected benefits for the MRGO project, because Violet Diversion has been identified for further study in the MRGO recommendations section. The potential contributions of the other projects in the area have been assessed in terms of risks and uncertainties.

21. Recommend showing plans that result from the CE/ICA results in map form to give the public another way to compare the various plans.

MVN Response: Maps showing all 19 plans will be provided in the final report.

HQUSACE Assessment: The issue is resolved.

C. Environmental Compliance.

1. Environmental Justice. The summary of environmental justice in the tables on page 4-8 of the EIS and page 2-147 of the feasibility report could be improved by stating that while low-income and minority populations are found within the study area, the adverse affects (which are mostly temporary) on these populations are not disproportionate.

MVN Response: Concur. The clarification will be made.

HQUSACE Assessment: The issue is resolved.

2. Endangered Species Act. The feasibility report, EIS and biological assessment state that formal consultation under the ESA would be pursued for the pallid sturgeon and gulf sturgeon. HQUSACE requests that the estimated dates of completion for the biological opinions be included in the draft report. It is noted that page 6-10 of the EIS states that formal consultation would not be initiated until just prior to the publication of the draft report.

Given that the biological assessment has been completed, but that consultation has not started, the basis for the estimated costs of the monitoring program should be explained. Also, it is noted that page 2-161 of the feasibility report states that continued coordination would take place with NMFS and other stakeholders to avoid and minimize impacts during the design and implementation phases of the project. It is unclear how the monitoring cost estimates in the feasibility report were developed, and whether costs and contingencies can be developed to account for any project changes that may occur during the design and implementation phases.

HQUSACE also asks whether any ESA "mitigation" is likely to be required for either of the affected listed species (pallid and gulf sturgeons). The potential for adverse affects to the gulf sturgeon appear to be substantial, i.e., approximately 20,000 acres of critical

habitat impacted, yet no potential mitigation measures are discussed in the report. In addition to the impacts associated with 19,573 acres of dredging, page 4-102 of the EIS states that the construction of shoreline protection features would result in the permanent loss of 471 acres of critical habitat. While it is understood that the proposed wetland enhancements would result in some gains for T & E species, page 2-161 of the report acknowledges that some trade-offs in habitat for the gulf sturgeon are necessary. The trade-offs referred to in this statement are not clear, and should be described.

Lastly, HQUSACE recommends the following revisions:

- The affects to the pallid sturgeon should be included the ESA section of Table 2-38, on page 144 of the feasibility report for Plans B, C and D, given that a “may affect” determination has been made for this species.
- Third sentence, second paragraph, page 6-10 of EIS discusses affects to pallid sturgeon and piping plover. It appears that the sentence is missing the phrase “may affect, but” following the phrase about critical habitat.
- Page 97 of the biological assessment (Appendix G), first full paragraph. This paragraph states that the project would not result in adverse modification of critical habitat and will not adversely affect the species as a whole. It is clear that the project would adversely affect critical habitat, given that at a minimum 471 acres would be permanently lost through conversion to shoreline protection features, as stated on page 4-102 of the EIS. Also, the language of this section of the report is unclear, especially the part about “will not affect the species as a whole.” HQUSACE requests that this section be revised to use standard ESA terminology to the degree possible, for example, discussing the overall affects of the work in terms of jeopardy to the species or adverse modification of critical habitat instead of “will not affect the species as a whole”.

MVN Response: It is likely that critical habitat monitoring or mitigation will be required for the MRGO ecosystem restoration project. Consultation for impacts to T&E species and their critical habitat is ongoing. Once consultation is complete all commitments made during consultation will be included as a component of the project as it enters PED.

HQUSACE Assessment: The issue is resolved. Monitoring has been agreed to by the Corps for the gulf sturgeon, and is described in the feasibility report. No compensatory mitigation measures are required for the sturgeon.

3. Environmental compliance. As indicated in section 5.6 on page 5-7 and throughout section 6 of the environmental impact statement, substantial environmental compliance remains pending. Completion of these items will be needed prior to final approval of the report. This office also notes that in a number of instances, such as in part 6.2 on page 6-1 of the EIS, certain descriptions of environmental compliance actions are outdated (“will be provided to the LDEQ on August 20, 2010”). The descriptions of environmental compliance actions should be brought up to date.

MVN Response: Concur. The revisions will be made in the final report.

HQUSACE Assessment: The issue is resolved, through compliance with applicable laws and executive orders.

D. Legal and Real Estate Issues.

1. Local cooperation requirements. Part 4.3 on page 4-6 of the report, while discussing the division of plan responsibilities, cost sharing, and other non-Federal cooperation required for the project, does not contained a detailed list of local cooperation requirements. These need to be added as required by ER 1105-2-100 para. 4-3(b)(2) (“The non-Federal sponsor cost sharing requirements, including their responsibilities for implementation and operation of the project must be clearly documented.”). This office recommends that the District consult the recently approved reports for the Louisiana Coastal Area 6 projects for items relevant to ecosystem recreation as a starting template. It should be noted, however, that these items will need to be supplemented to address the sponsor’s cost sharing, public access, and other local cooperation responsibilities related to the recreation elements of the project.

MVN Response: The revisions will be made in the final report to the extent practicable without an identified NFS.

HQUSACE Assessment: The issue is resolved.

2. Non-federal cost share allocation for Violet Diversion. Part 4.3 on page 4-6 of the report correctly says that the 25 percent non-Federal cost share specifically applicable to the Violet Diversion will be allocated between the states of Mississippi and Louisiana. However, it does not provide a specific numerical allocation of the non-Federal share between these two states. This allocation will need to be included in order to ensure that the project’s non-Federal cost sharing is sufficiently defined and that the non-Federal interests are agreeable to their allocated cost share responsibilities. If it cannot be included due to the States failure to agree on a allocation percentage, this should be acknowledged.

MVN Response: As the Violet Freshwater Diversion is no longer recommended for construction, no further action in response to this comment is anticipated.

HQUSACE Assessment: The issue is resolved.

3. Secretary vs. Assistant Secretary. Part 3 on page 3-16 of the report states that “Title VII of WRDA 2007 authorizes the Assistant Secretary of the Army to carry out the LCA ecosystem restoration program substantially in accordance with the restoration . . .” Consistent with the statute, the words “Assistant Secretary” should be replaced with simply “Secretary”.

MVN Response: Concur. The revision will be made.

HQUSACE Assessment: The issue is resolved.

4. Study authority. Part 1.2 on page 1-3 of the draft environment impact statement includes a paraphrase of the study authority for the project. This should be replaced with a verbatim quote from the statutory language, similar to the approach in the main report.

MVN Response: Concur. The revision will be made.

HQUSACE Assessment: The issue is resolved.

5. Non-standard estate. Part 4.1.1.2 on page 4-2 of the report includes a “non-standard” wetland creation and restoration easement. Corps policy requires that nonstandard states be specially justified – this office notes that additional justification has been provided in the Real Estate Plan. This should be reviewed and approved by CEMP-CR and CECC-R.

MVN Response: Coordination with CEMP-CR and CECC-R on this issue is on-going.

HQUSACE Assessment: The comment is closed. The proposed real estate interest was not examined in detail because of negative recommendation of the chief’s report.

6. No NFS has been identified. The State of Louisiana believes that this should be a full federally funded project. Does acquiring less than fee and using a NSE make sense under that scenario? Approval of deviation from fee and use of NSE should be coordinated with NFS, if one is identified.

MVN Response: If identified, these issues will be coordinated with the NFS.

HQUSACE Assessment: The comment is closed. The proposed real estate interest was not examined in detail because of negative recommendation of the chief’s report.

7. Real Estate Plan. The Real Estate plan should be revised as follows in order to clarify several issues.

- a. Non-Federal Sponsors. Page 5 of the REP says that the states of Louisiana and Mississippi are potential non-Federal sponsors for the project. It is clear from the letters included in Sections 4.4 of the feasibility report that the State of Louisiana may not be considered a potential sponsor given their position that the project should be carried out at full Federal expense. The letter explicitly states that the State of Louisiana does not accept any responsibilities or obligations for any part of the project, including cost-share, provision of LERRDs or O & M. The State of Mississippi has said that they are willing to cost share part of the Violet Diversion project, but will be requesting that the entire project be funded by the Federal government. This section of the REP should be revised to clarify the positions of the states of Louisiana and Mississippi.

MVN Response: Concur. This information will be added to the document. In addition, the direction from Assistant Secretary Darcy is to complete the study without commitment from a NFS.

HQUSACE Assessment: The issue is resolved.

- b. Use of non-standard estates. The rationale for proposing interests less than fee has not been provided. Given that a non-Federal sponsor has not been identified for the proposed plan, HQUSACE questions the basis for this determination. In addition the discussion of the use of non-standard estates mentions landowner attitude as additional consideration for acquiring less than fee, but goes on to state that the district does not know the landowners attitudes, and speculates that landowners would prefer less than fee acquisition for needed properties. Finally, the discussion states that acquisition of easements, including non-standard easements, would cost less than fee simple acquisition, but it does not indicate what the savings would be, or how this figure was determined. In general, there should be significant savings to justify the additional risks of acquiring less than fee interest.

MVN Response: Concur. A "Request to Deviate from Fee Acquisition" was sent up separately from the report. This request outlines the justifications for requesting an estate less than fee. It also addresses the concerns mentioned above. This request will be included as a Appendix to the Real Estate Plan.

HQUSACE Assessment: The comment is closed. The proposed real estate interest was not examined in detail because of negative recommendation of the chief's report.

- c. Mineral exploration. Concerning mineral explorations and mineral rights, the discussion notes that the district contacted someone from Louisiana who stated that cross-drilling will not adversely affect the project, but has no documentation beyond that. Is cross- drilling the only way that owners will be able to reach the minerals in the project area?

MVN Response: Further information is included in the "Request to Deviate from Fee Acquisition" regarding the Louisiana Geological Survey expert on directional drilling. It is assumed that any other exploration method would compromise benefits. Directional drilling is a common method for extracting minerals and is the anticipated, viable method that would be utilized.

HQUSACE Assessment: The comment is closed. The proposed real estate interest was not examined in detail because of negative recommendation of the chief's report.

- d. Use of the term "police powers". HQUSACE recommends that page 17 of the REP and page 4-1 of the feasibility report be revised to better describe the

nature of the protection afforded to wetlands through the Clean Water Act and other Federal laws and Executive Orders. The reference to police powers should be deleted, and discussion of the regulatory program pursuant to Section 404 of the Clean Water Act, as jointly administered by the Corps of Engineers and USEPA, should be added. In addition, a brief summary of E.O. 11990 could be included in this section.

MVN Response: Concur. This term will be deleted and suggested information included.

HQUSACE Assessment: The issue is resolved.

- e. Plan implementation schedule. Page 22 of the REP says that construction phases have not been identified at this time. This statement should be compared to Table 4-1 of the feasibility report, which shows costs related to project construction for FY11 through FY 26.

MVN Response: Concur. The report will be updated to reflect the revised Implementation Schedule.

HQUSACE Assessment: The issue is resolved.

- f. Oyster leases identified as an environmental issue. Page 23 of the REP discusses oyster leases as an environmental issue, although it would be better characterized as a social and economic issue. Suggest that this entire discussion be deleted.

MVN Response: Concur. This discussion will be deleted.

HQUSACE Assessment: The issue is resolved.

5. HQUSACE comments on April 2012 Final Report

1. Importance of Violet Diversion. Numerous parts of the report emphasize the critical importance of the Violet Diversion to the success and long term sustainability of the MRGO project area. As stated on pages 2-94 to 2-95 and page 3-1 of the report, reconnecting the Mississippi River to the Lake Bourne area is needed to fully restore and maintain habitats impacted by the construction of the MRGO. Given that the Federally Identified Plan (FIP) does not include the Violet Diversion, it is difficult to see how the plan meets the “completeness” criterion of the Principles and Guidelines given that the effects on the restoration outputs appear to be significant. While it is recognized that the construction of Violet Diversion is already authorized and that future study of this feature is recommended, it does not seem to be prudent to assume that the diversion will ultimately be constructed given the strong opposition of St. Bernard Parish government.

HQUSACE recommends that a sensitivity analysis be conducted to evaluate the benefits and long-term sustainability of the FIP with and without the construction of the Violet

Diversion. As currently written, it appears that Sections 2 and 3 of the report assume that the Violet Diversion is in place. Section 3.10 describing the (FIP) should be revised as needed following the sensitivity analysis to discuss the FIP with and without the diversion in place. Lastly, Section 2 and the various tables within (e.g., Tables 2-26, 2-28 and 2-29) should be similarly revised as needed following completion of the sensitivity analysis.

MVN Response: *The report recommends additional study of the Violet Diversion. Benefits of the plan are presented by tier and only the tier 3 components include the influence of a diversion. All references to the Freshwater Diversion at Violet as a key driver were revised to state that "salinity is a key driver of the system."*

HQUSACE Assessment: The issue is resolved.

2. Relative Sea Level Rise Considerations and OMRR&R. Rationale must be provided for the determination that wetlands that exhibit a ratio of 64% land to 36% water do not require OMRR&R (Note: the time period used for this determination is not explicit; is a period of analysis of 50 years intended?). While the report notes that the 64/36 ratio is assumed to be optimal, it is also noted that this condition may also be indicative of marsh break-up and deterioration. The assumptions underlying this determination should be discussed, including but not limited to, the localized differences in geological subsidence, the period of analysis, and the presence or absence of Violet Diversion. Lastly, the report should characterize why the 64/36 ratio is deemed to be optimal (e.g., highest AAHU output, greatest chance of long-term sustainability, etc.) and how this optimal condition supports the recommended plan.

With regard to operations and maintenance, the feasibility report identifies OMRR&R actions and costs only for various shore protection features of the FIP, but does not include any OMRR&R for features such as marsh, cypress swamp or ridge habitat. Given that the great majority of coastal Louisiana is known to be subsiding and is also vulnerable to future sea level rise, the claim that the 47,000 acres of marsh and 10,000 acres of cypress swamp does not appear to be supportable based on the information presented in the report. At a minimum, the feasibility report should explain why this study area is not affected by relative sea level rise as other projects such as the Barataria Basin Barrier Shoreline project or other projects that have included substantial OMRR&R components. Adding to this concern is the fact that if OMRR&R is indeed determined to be necessary, but the costs have not been accounted for in the final array of alternatives, the CE/ICA may need to be re-run to determine if these costs could affect plan selection. In addition, if OMRR&R is needed, the recommended plan costs will likely need to be re-certified.

Also, the lack of OMRR&R for many of the project features raises a legal issue under the project's statutory authorization and the longstanding requirement that sponsors perform OMRR&R for ecosystem restoration projects as a general matter. Moreover, it runs counter to the approach taken by USACE on multiple other LCA area projects for ecosystem restoration projects. In those cases, including on LCA 6 and BBBS, the

District specifically identified activities required of the sponsor to ensure the project was sustainable and continued to provide its intended benefits. The report should (1) document in more complete detail the costs, limited or not, which will be associated with the OMRR&R needs of the MRGO project, (2) specifically identify the full range of likely as well as possible OMRR&R activities which could be required, and (3) stating explicitly in the report that regardless of the nature or cost of OMRR&R, the sponsor will be obligated to perform that OMRR&R at its own expense. Lastly, the reference to EC 1165-2-211 on page 2-38 report should be revised to cite the updated guidance EC 1165-2-212, released on 1 October 2011.

MVN Response: The plan has been revised to include OMRR&R for all features. The report has been revised in relevant areas to reflect that the historic rate was selected because it is supported by data. The difference in net acres is provided in “Table 2-31 Robustness of Features in FIP under All Relative Sea Level Rise Scenarios” which has been revised with updated WVA information and to provide AAHUs as well as net acres. IWR Plan was run multiple times to test various scenarios and to determine the sensitivity of features upon plan selection. Costs were recertified with the inclusion of the OMRR&R elements for each feature.

HQUSACE Assessment: The issue is resolved.

3. Costs and Benefits of Recommended Plan. The feasibility report presents costs for the FIP without the Violet Diversion, but includes benefits that would only occur if the Violet Diversion is in operation. The rationale for including the benefits of Violet Diversion in the FIP is that the diversion is authorized in Section 3083 of WRDA 2007, and is therefore reasonable to assume that it will be built, i.e., is part of the future without-project condition. One of the fundamental tasks of a feasibility report is to explain the costs of the recommended plan, as well as the benefits of that plan. For environmental restoration projects, the NER is the plan that reasonably maximizes ecosystem restoration benefits compared to costs as noted in ER 1105-2-100 paragraph 2-3 (f) (1). Given that the feasibility report describes the benefits of the Violet Diversion but does not include the costs of this feature, it is not possible to determine that the FIP reasonably maximizes outputs compared to costs. In addition, if the Violet Diversion is part of the future without-project condition, the benefits of the diversion are also part of the without-project condition, and should not be counted in the benefit stream of the MRGO FIP.

MVN Response: The Federally Identified Plan provides costs and benefits separated into three tiers. Separating the features into tiers helps discern the distinct benefits of each part of the plan. Placing a study of the Violet Diversion into tier 3 separates the potential benefits of that feature from the pieces of tier 1 and tier 2. The implementation plan defers construction of the tier 3 features until completion of the Violet project. The information is provided in Table 4-1 on pages 4-3 through 4-5.

HQUSACE Assessment: The issue is resolved.

4. Biological Opinion. The biological opinion for the project has not yet been received from NOAA/NMFS. The FIP has the potential to result in adverse affects on habitats identified as critical to the gulf sturgeon, and it is unknown whether the biological opinion will require any measures (such as take limits or dredging windows) that could impact the availability and cost of dredged materials or other factors of project implementation. The FIP should be evaluated once the biological opinion has been received, and the plan should be revised, if needed.

MVN Response: The Biological Opinion from the National Marine Fisheries Service was received on 4 May 2012. It concluded "It is NMFS' biological opinion that the action, as proposed, may affect, but is not likely to adversely affect sea turtles and Gulf sturgeon. It is also our opinion that the project is likely to adversely affect Gulf sturgeon critical habitat, but is not likely to destroy or adversely modify it." No incidental take is authorized in the opinion. The opinion contains two Conservation Recommendations calling for data collection that will be adopted in the plan.

HQUSACE Assessment: The issue is resolved.

5. Adaptive Management and Plan Formulation Process. The study does not formulate alternatives that address the problems identified within a system view- it addresses only the symptoms of the problem. This approach results in a ecosystem restoration plan that is not self regulating and that has significant maintenance requirements. The very large adaptive management costs (\$747 million) appear to indicate a serious problem in the plan formulation/plan selection process such that reevaluation of the alternatives is required. Restoration projects need to address the cause of the degradation not just replace the habitat that has been degraded. Once the cause has been addressed, the project should have an improved potential for long-term survival as a self-regulating system.

ER 1105-2-100 E-30 c. Planning for Ecosystem Restoration. Restoration projects should be conceived in a systems context, considering aquatic (including marine, estuarine and riverine), wetland and terrestrial complexes, as appropriate, in order to improve the potential for long-term survival as self-regulating, functioning systems. This system view will be applied both in examination of the problems and the development of alternative means for their solution. Consideration should be given to the interconnectedness and dynamics of natural systems, along with human activities in the landscape, which may influence the results of restoration measures.

ER 1105-2-100 E-30 k. Operational Effectiveness. Because self-regulation is a key goal of ecosystem restoration, it is generally more desirable to pursue ecosystem restoration projects that have limited maintenance requirements. However, because of irreversible cultural modifications in the landscape, there will be instances where O&M measures may be essential to the functioning of the project. Operation and maintenance costs should be considered in evaluating the costs and benefits for alternatives for ecosystem restoration projects.

Implementation Guidance for Section 2039. Costly adaptive management plans may indicate the need to reevaluate the formulation of the ecosystem restoration project.

HQUSACE has serious concerns that the very high cost of the adaptive management plan (\$747 million) strongly suggests that the FIP is not sustainable in the long-term, and requests that MVN re-examine the plan selection process to focus on those restoration measures and plan elements that are more robust (provide a higher chance of success) in the face of uncertainty about relative sea level rise and future salinity conditions in the study area.

MVN Response: The plan has been revised to move costs from the adaptive management program into OMRR&R. This provided more certainty in the estimated project benefits, more clearly defined non-Federal responsibilities, and reduced the adaptive management costs to \$190 million. The plan was formulated from a systems perspective and contains elements that address the key causes of ecosystem degradation in the study area.

HQUSACE Assessment: The issue is resolved.

6. Potential non-Federal Sponsors. Part S.2.2 on page S-1 of the executive summary and parts 1.2 and 4.3 on pages 1-3 and 4-2 of the main report respectively state that “The States of Louisiana and Mississippi disagree with the USACE over the cost-share requirements for plan implementation and suggest that plan implementation should be full (100%) federal cost.” This language is not an accurate representation of either state’s expressed support or willingness to provide its required local cooperation for the project. As stated in the State of Mississippi’s letter, provided on page 4-10 and paraphrased in part 4.4 on pages 4-7 to 4-8 of the report, the State of Mississippi supports the project and agrees with the applicable cost share for the project. While the State of Mississippi notes its belief that the Corps should pursue” full Federal expense funding of the project”, Mississippi does not condition its willingness to participate as a sponsor in the project on full Federal expense funding. This contrasts materially from the State of Louisiana’s letter, included on page 4-9 and paraphrased in part 4.4 on page 4-8 of the report. Mississippi explicitly disputes the Corps’ interpretation of the applicable cost sharing for the project and asserts that the Louisiana “ has **no** financial obligations (including but not limited to cost share, land rights acquisitions, operations and maintenance obligations) as non-Federal sponsor with respect to the Mississippi River Gulf Outlet Ecosystem Restoration Project (emphasis in original).” These differing views should be distinguished by separate discussions in both parts of the report, similar to how the views are paraphrased in parts 4.4 and 4.5 on pages 4-7 and 4-8 of the report.

MVN Response: Letters from both states have been included in the feasibility report on pages 4-18 and 4-19. The position of the State of Louisiana is described on page 4-16 and highlights the state’s view that the project should be undertaken at full Federal expense. The position of the State of Mississippi with regards to the Violet Diversion

project is highlighted in their letter of support and is discussed in the report text on page 4-17.

HQUSACE Assessment: The issue is resolved.

7. LCA near term project authority. Part 1.2 on pages 1-1 to 1-3 of the report discusses a number of statutory provisions affecting USACE's authority to study and implement the project. This discussion should include a cite to and discussion of Section 7006(c)(1)(A) and its relationship to the MRGO study and project. As noted in part 2.7.2.1 on page 2-117 and part 3.6 on page 3-17 of the report, both the near-term project authority provided by Section 7006(c)(1)(A) and the outlet closure and modification authority provided by Section 7013 will need to be addressed in the MRGO study and thus should be explicitly acknowledged and addressed in the general "project authority" discussion of the report.

MVN Response: Text addressing the 7006 authority has been added to the feasibility report on page 1-3.

HQUSACE Assessment: The issue is resolved.

8. State of Mississippi participation in project. Part 4.12 on page 4-4 of the report includes a summary of the views of Louisiana, but no accompanying summary of the view of Mississippi. This should be added or the issue of Mississippi's participation or non-participation in the project should be otherwise clarified.

MVN Response: The views of the State of Mississippi have been added to the report in Section 4.8 on pages 4-17 and 4-19.

HQUSACE Assessment: The issue is resolved.

9. Sponsor letter of intent. The report does not appear to include a letter of intent from Mississippi. From other parts of the report, Mississippi is mentioned as a sponsor of the project. This discrepancy should be clarified and corrected as appropriate. If Mississippi is sponsoring project, a letter of intent is required by ER 1105-2-100, Appendix G, at G-9 ("The non-Federal sponsor's acceptance of, or desired departures from, the terms of the applicable model PCA must be presented, including: 1) applicable cost sharing and financial policies; 2) policies regarding provision and valuation of non-Federal lands, easements, rights-of-way, and disposal areas provided by non-Federal sponsors; 3) policies governing non-Federal project construction; and, 4) other provisions required by law and policy for new start construction projects.").

MVN Response: A letter of intent from the State of Mississippi has been added to the feasibility report on page 4-19.

HQUSACE Assessment: The issue is resolved.

10. Recommendations. The report does not appear to include a recommendation section. This section is a standard requirement for feasibility reports, and particularly important given the unusual nature of the Corps recommendation for this project, which is expected to identify a federal plan whose implementation remains subject to a willing non-Federal sponsor coming forward. Some sort of recommendation or conclusion section should be added to the report.

MVN Response: Recommendations have been added to the feasibility report in Section 4.2 on pages 4-2 through 4-6.

HQUSACE Assessment: The issue is resolved.

11. Items of local cooperation. Aside from a limited summary of non-Federal cost sharing, LERRD, and OMRR&R requirements in part 4.3 on page 4-2 and part 4.11 on page 4-4, the report does not appear to include a detailed list of required items of local cooperation for the project. These need to be added as required by ER 1105-2-100 para. 4-3(b)(2) (“The non-Federal sponsor cost sharing requirements, including their responsibilities for implementation and operation of the project must be clearly documented.”). As this office recalls, it recently provided advice to the MVD RIT staff on changes to a list of items of local cooperation, perhaps for the Chief’s Report, which could serve as list for the report as well.

MVN Response: The following has been added to Section 4.4 on pages 4-12 through 4-15.

Federal implementation of the recommended project for Tier 1, Tier 2 and Tier 3B would be subject to the non-Federal sponsor agreeing to comply with applicable Federal laws and policies, including but not limited to:

Provide 35 percent of total ecosystem restoration costs as further specified below:

a. Provide 35 percent of total ecosystem restoration costs as further specified below:

1. Provide the non-Federal share of design costs allocated by the Government to ecosystem restoration in accordance with the terms of a design agreement entered into prior to commencement of design work for the ecosystem restoration features;

2. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated by the Government to ecosystem restoration;

3. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and

construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the ecosystem restoration features;

4. Provide, during construction, any additional funds necessary to make its total contribution for ecosystem restoration equal to 35 percent of total ecosystem restoration costs;

b. Provide 50 percent of total recreation costs as further specified below:

1. Provide the non-Federal share of design costs allocated by the Government to recreation in accordance with the terms of a design agreement entered into prior to commencement of design work for the recreation features;

2. Provide, during the first year of construction, any additional funds necessary to pay the full non-Federal share of design costs allocated by the Government to recreation;

3. Provide all lands, easements, and rights-of-way, including those required for relocations, the borrowing of material, and the disposal of dredged or excavated material; perform or ensure the performance of all relocations; and construct all improvements required on lands, easements, and rights-of-way to enable the disposal of dredged or excavated material all as determined by the Government to be required or to be necessary for the construction, operation, and maintenance of the recreation features;

4. Provide, during construction, any additional funds necessary to make its total contribution for recreation equal to 50 percent of total recreation costs;

c. Provide, during construction, 100 percent of the total recreation costs that exceed an amount equal to 10 percent of the Federal share of total ecosystem restoration costs;

d. Provide the non-Federal share of that portion of the costs of mitigation and data recovery activities associated with historic preservation, that are in excess of 1 percent of the total amount authorized to be appropriated for the project;

e. Not use funds provided by a Federal agency under any other Federal program, to satisfy, in whole or in part, the non-Federal share of the cost of the project unless the Federal agency that provides the funds determines that the funds are authorized to be used to carry out the project;

f. Prevent obstructions or encroachments on the project (including prescribing and enforcing regulations to prevent such obstructions or encroachments) such as any new developments on project lands, easements, and rights-of-way or

the addition of facilities which might reduce the outputs produced by the ecosystem restoration features, hinder operation and maintenance of the project, or interfere with the project's proper function;

g. Not use project or lands, easements, and rights-of-way required for the project as a wetlands bank or mitigation credit for any other project;

h. Keep the recreation features, and access roads, parking areas, and other associated public use facilities, open and available to all on equal terms;

i. Comply with all applicable provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, Public Law 91-646, as amended (42 U.S.C. 4601-4655), and the Uniform Regulations contained in 49 CFR Part 24, in acquiring lands, easements, and rights-of-way required for construction, operation, and maintenance of the project, including those necessary for relocations, the borrowing of materials, or the disposal of dredged or excavated material; and inform all affected persons of applicable benefits, policies, and procedures in connection with said Act;

j. For so long as the project remains authorized, operate, maintain, repair, rehabilitate, and replace the project, or functional portions of the project, including any mitigation features, at no cost to the Federal Government, in a manner compatible with the project's authorized purposes and in accordance with applicable Federal and State laws and regulations and any specific directions prescribed by the Federal Government;

k. Give the Federal Government a right to enter, at reasonable times and in a reasonable manner, upon property that the non-Federal sponsor owns or controls for access to the project for the purpose of completing, inspecting, operating, maintaining, repairing, rehabilitating, or replacing the project;

l. Hold and save the United States free from all damages arising from the construction, operation, maintenance, repair, rehabilitation, and replacement of the project and any betterments, except for damages due to the fault or negligence of the United States or its contractors;

m. Keep and maintain books, records, documents, or other evidence pertaining to costs and expenses incurred pursuant to the project, for a minimum of 3 years after completion of the accounting for which such books, records, documents, or other evidence are required, to the extent and in such detail as will properly reflect total project costs, and in accordance with the standards for financial management systems set forth in the Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments at 32 Code of Federal Regulations (CFR) Section 33.20;

- n. Comply with Section 221 of Public Law 91-611, Flood Control Act of 1970, as amended (42 U.S.C. 1962d-5), and Section 103 of the Water Resources Development Act of 1986, Public Law 99-662, as amended (33 U.S.C. 2213), which provides that the Secretary of the Army shall not commence the construction of any water resources project or separable element thereof, until the non-Federal sponsor has entered into a written agreement to furnish its required cooperation for the project or separable element;
- o. Comply with all applicable Federal and State laws and regulations, including, but not limited to: Section 601 of the Civil Rights Act of 1964, Public Law 88-352 (42 U.S.C. 2000d) and Department of Defense Directive 5500.11 issued pursuant thereto; Army Regulation 600-7, entitled "Nondiscrimination on the Basis of Handicap in Programs and Activities Assisted or Conducted by the Department of the Army"; and all applicable Federal labor standards requirements including, but not limited to, 40 U.S.C. 3141- 3148 and 40 U.S.C. 3701 – 3708 (revising, codifying and enacting without substantial change the provisions of the Davis-Bacon Act (formerly 40 U.S.C. 276a et seq.), the Contract Work Hours and Safety Standards Act (formerly 40 U.S.C. 327 et seq.), and the Copeland Anti-Kickback Act (formerly 40 U.S.C. 276c et seq.);
- p. Perform, or ensure performance of, any investigations for hazardous substances that are determined necessary to identify the existence and extent of any hazardous substances regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Public Law 96-510, as amended (42 U.S.C. 9601-9675), that may exist in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project. However, for lands that the Federal Government determines to be subject to the navigation servitude, only the Federal Government shall perform such investigations unless the Federal Government provides the non-Federal sponsor with prior specific written direction, in which case the non-Federal sponsor shall perform such investigations in accordance with such written direction;
- q. Assume, as between the Federal Government and the non-Federal sponsor, complete financial responsibility for all necessary cleanup and response costs of any hazardous substances regulated under CERCLA that are located in, on, or under lands, easements, or rights-of-way that the Federal Government determines to be required for construction, operation, and maintenance of the project;
- r. Agree, as between the Federal Government and the non-Federal sponsor, that the non-Federal sponsor shall be considered the operator of the project for the purpose of CERCLA liability, and to the maximum extent practicable,

operate, maintain, repair, rehabilitate, and replace the project in a manner that will not cause liability to arise under CERCLA.

HQUSACE Assessment: The issue is resolved.

12. Draft Chief's Report. The draft Chief's report included in the submitted materials does not include a list of items of local cooperation. Notwithstanding that the State of Louisiana current is unwilling to serve as the project sponsor, the Chief's Report needs to include all items of local cooperation in order to ensure that once the project is authorized for construction by virtue of the Chief's issuance of the report, and a sponsor steps forward, the appropriate non-Federal participation is clear as a matter of law to give USACE clear direction on what to insist on from the non-Federal sponsor.

MVN Response: The items of local cooperation were added to the feasibility report on page 4-12 through 4-15. Because no further action is recommended in the Chief's Report the items are not provided in that document.

HQUSACE Assessment: The issue is resolved.

13. Non-federal cost share allocation for Violet Diversion. Part 4.3 on page 4-6 of the report correctly that the 25 percent non-Federal cost share specifically applicable to the Violet Diversion will be allocated between the states of Mississippi and Louisiana. However, it still does not provide a specific numerical allocation of the non-Federal share between these two states. This allocation will need to be included in order to ensure that the project's non-Federal cost sharing is sufficiently defined and that the non-Federal interests are agreeable to their allocated cost share responsibilities. If it cannot be included due to the States failure to agree on an allocation percentage, this should be acknowledged.

MVN Response: The cost share for the Violet Diversion project is addressed in text added to the feasibility report on page 4-15.

HQUSACE Assessment: The issue is resolved.

14. Non-standard estate. Part 4.1.1.2 on page 4-2 of the report includes a "non-standard" wetland creation and restoration easement. Corps policy requires that nonstandard states be specially justified – this office notes that additional justification has been provided in the Real Estate Plan. This should be reviewed and approved by CEMP-CR and CECC-R.

MVN Response: Real Estate requirements are addressed in the feasibility report in Section 4.9 on pages 4-20 through 4-21. Standard estates for fee acquisition of lands are identified in the plan.

HQUSACE Assessment: The issue is resolved.

State and Agency Review.

Only one comment received as part of the State and Agency review for this project was deemed significant, and worthy of a response from the Corps. The US Fish and Wildlife Service requested that the MRGO plan add analysis of the Breton Island National Wildlife Refuge. USFWS is of the opinion that the construction of the MRGO channel may have adversely affected the sediment supply and transport system in the vicinity of the refuge, and that this situation may have lead to increased erosion of the barrier islands at the site

In response to the USFWS request, the following language has been added to the Chief's Report for the MRGO study.

Along with Tier 3 features, a need was identified for further study in collaboration with the U.S. Fish and Wildlife Service to investigate erosion of Breton Island National Wildlife Refuge under existing authorities. The study is not linked to salinity conditions in the estuary or the Violet Diversion but is an important part of addressing the needs of the coastal system. This effort would build upon previous work with the Service to identify restoration needs and plans for the Nation's second oldest refuge. Any solutions deemed implementable would be consistent with existing policy.