

Louisiana Coastal Area, Louisiana
Ecosystem Restoration
Six Projects Authorized by Section 7006(e)(3)
of
Water Resources Development Act of 2007
USACE Response to Independent External Peer Review
December 2010

Independent External Peer Review (IEPR) was conducted for the subject projects in accordance with Department of the Army, U.S. Army Corps of Engineers (USACE), guidance *Civil Works Review Policy* (EC 1165-2-209) dated January 31, 2010, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, released December 16, 2004.

The Report of the Chief of Engineers for ecosystem restoration for the Louisiana Coastal Area, dated January 31, 2005, (hereinafter referred to as the "restoration plan"), described a program to address the most critical restoration needs to reduce the severe wetland losses occurring in Louisiana. The restoration plan included 15 near-term ecosystem restoration features, a demonstration project program, a beneficial use of dredged material program, a project modifications program, and a science and technology program. These features and programs were all aimed at addressing the critical restoration needs of coastal Louisiana. Congress authorized those features for construction in the Water Resources Development Act of 2007 (WRDA 2007) subject to the conditions recommended in the 2005 final report of the Chief of Engineers, if a favorable report of the Chief for each of the individual projects is completed not later than December 31, 2010. This document addresses six of the 15 near-term ecosystem restoration features described in the restoration plan. The six projects are:

- 1) Amite River Diversion Canal Modification
 - 2) Convey Atchafalaya River Water to Northern Terrebonne Marshes*
 - 3) Multipurpose Operation of Houma Navigation Lock*
 - 4) Small Diversion at Convent/Blind River
 - 5) Terrebonne Basin Barrier Shoreline Restoration
 - 6) Medium Diversion at White's Ditch
- * Convey Atchafalaya River Water to Northern Terrebonne Marshes and Multipurpose Operation of Houma Navigation Lock which were combined into a single feasibility analysis

The goal of the USACE Civil Works program is to deliver enduring and essential water resource solutions for the nation, through collaboration with partners and stakeholders. The USACE review processes are essential to ensuring the quality and credibility of USACE decision, implementation, and operations and maintenance documents and work products. In February 2010, USACE contracted with Battelle Memorial Institute to establish 5 committees to review the LCA 7006(e)(3) projects Integrated Feasibility Reports and Supplemental Environmental Impact Statements. IEPR provides an independent assessment of the economic, engineering, and environmental analysis of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of

alternatives and recommendations. Battelle, which is an Outside Eligible Organization—an organization that is described under Section 501(c)(3) of the U.S. Internal Revenue Code and that is independent, free from conflicts of interest, does not carry out or advocate for or against Federal water resources projects and that has experience establishing and administering review panels. The IEPR panels were made up of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted. Panel members were selected using the National Academies of Science (NAS) policy for selecting reviewers. USACE commends the independent external peer review panel for their comments which have been integral in the shaping the Final Integrated Feasibility Reports and Supplemental Environmental Impact Statements for the LCA 7006(e)(3) projects.

Overall, 75 Final IEPR Panel Comments were identified and documented on the LCA 7006(e)(3) projects. This document outlines the actions that have been taken to address the comments provided by each panel for each review.

Amite River Diversion Canal Modification

The natural hydrology in the study area has been modified by the building of the Amite River Diversion Canal (ARDC) and a railroad grade, leading to poor swamp health and ecosystem degradation. The recommended plan proposes to dredge openings in the existing Amite River Diversion Canal dredged material berm, construct conveyance channels, and establish vegetative plantings in the study area. The recommended plan would establish hydrologic connectivity between the ARDC and the Maurepas Swamp, allowing the swamp to drain during seasonal low-flow conditions in the Amite River and promoting the germination and survival of the seedlings of bald cypress and other trees. This connectivity would allow nutrients and sediments to be introduced into the swamp during flood events and localized rainfall events and improve biological productivity.

Overall, 11 Final IEPR Panel Comments were identified and documented. Of these, 8 were identified as having high significance, and 3 had medium significance.

According to the Final External Peer Review Report dated June 23, 2010 the ARDC Modification project was determined to substantively contribute to National Ecosystem Restoration (NER) and will be enhanced by coordination with other restoration projects in the LCA. Overall, the public involvement process and coordination with local authorities appeared to be comprehensive and extensive for this stage of the study. In general, the project will meet all of the objectives put forward to some extent; however, the degree to which it will meet the objectives will be monitored and evaluated in accordance with the Adaptive Management and Monitoring Plan. The majority of the Panel's comments focused on providing more detail and discussion to clarify issues in several areas. Most comments can therefore be addressed through revision of the existing report.

1. IEPR Comment – High Significance: The Hydrologic Engineering Center-River Analysis System (HEC-RAS) model does not accurately represent the hydrologic conditions necessary for project success and is not well documented.

USACE Response: Adopted

Action Taken: USACE concurs that additional documentation was needed in the report and this documentation would address how the HEC-RAS model accurately reflects the hydrologic conditions necessary for project success. Additional documentation and clarification on the HEC-RAS model was added to the main report and the Engineering Appendix (Appendix L) to further document the model. The hydrological analysis utilized available stage data in order to simulate and evaluate the proposed alternatives and select the recommended plan and the national ecosystem restoration (NER) plan.

The HEC-RAS model specifically quantified flow exchange and flood duration (or wetting and drying periods). The swamps were modeled as large storage areas. To simulate the flow exchange between the ARDC and the swamp, HEC-RAS allows a storage area to be connected to a channel (river reach), a lateral structure, or to another storage area. The best available existing data were used for model calibration. Stage data was collected at three locations. One station was in the ARDC, and two stations were in the swamp. The data was collected to demonstrate the response of the swamp with respect to stages in the ARDC. The computed stages in HEC-RAS model reflect the stages in the ARDC. The computed stages are generally within 0.2 to 0.3 feet of the observed stages in the swamp. Light Detection and Ranging (LIDAR) topographic data was further used to define the stage-volume relationships in the storage areas.

Additional text was added to Section 3.5.2 of the main report discussing the HEC-RAS model and how its estimation of dry days was used as an input component for the Wetland Value Assessment (WVA) model along with other the factors: tree stand maturity, stand structure, and salinity. The WVA model is utilized to estimate ecological and biological benefits resulting from the project and to justify the project. Additional text was also added to Appendix L regarding how the HEC-RAS model was used to support decisions for variable V3 in the WVA model. The computed daily water surface elevations were compared to the LIDAR topographic data in the storage areas. When the water surface elevation is below 1.0 feet North American Vertical Datum (NAVD) 88, the day was counted as a dry day. The consecutive number of days was used as an indicator of flood duration. The computed discharge was used as an indicator for the flow/exchange.

2. IEPR Comment – High Significance: The effects of relative sea level rise (RSLR) on alternative plans need to be explained in detail.

USACE Response: Adopted

Action Taken: USACE concurs that the effects of RSLR on alternative plans needed to further explained.

Section 5.2 of the report describes the data provided in Engineering Circular (EC) 1165-2-211, which depicts low, intermediate, and high RSLR estimates for the study area. Additional

language was added to Section 5.2 of the report, highlighting the impacts of RSLR on the LCA ARDC study area and the coastal region of Louisiana. Additional graphs depicting the impacts of RSLR and accretion have also been added to Section 5.2 of the report.

The low estimate for RSLR was considered when determining the output resulting from implementing of the final array of alternatives. All alternatives within the final array are composed of the same features and therefore, the impacts of RSLR would be similar for all alternatives. The intermediate and high rate scenarios of RSLR were run on the recommended plan and NER to determine its effects on the selected plans (See Section 3.5.2 and 3.8).

RSLR was considered in the development of the WVA model, which was used to develop the Habitat Units, a calculation to estimate the quality and extent of ecological and biological effects. RSLR was applied by adjusting the appropriate variables utilized as input in the model, based on past studies and feedback from local experts. The parameters considered when applying RSLR to the WVA model include salinity, water regime, stand maturity and stand structure. Section 3.7.12 of the report covers the sustainability and performance of the recommended plan, specifically the impacts of RSLR.

3. IEPR Comment – High Significance: Adaptive management is appropriate and should be developed and implemented.

USACE Response: Partially Adopted

Action Taken: USACE agrees that the principals of adaptive management are appropriate and should be implemented for this project. Although the use of adaptive management is not explicitly recommended for this project, it is the intent of the recommended plan to be adaptively managed within the current authority through the Operation and Maintenance (O&M) plan identified for the recommended plan in full coordination with the monitoring plan included in the recommended plan. The O&M plan includes a yearly inspection of the bank opening locations and conveyance channels to ensure that there are no flow interruptions, caused by such things as debris or fallen trees, which could worsen project performance. If monitoring data indicate that actions beyond yearly O&M would be needed, such actions (i.e changing the shape, size, branching, or number of conveyances channels or gaps) would be considered structural changes beyond the current adaptive management authority. The USACE and the State of Louisiana's Coastal Protection and Restoration Authority (CPRA) could then initiate the process for developing a new water resources project or pursue a design deficiency under the constructed project.

Action Not Taken:

As discussed above USACE has not included specific adaptive management measures under the adaptive management category. USACE determined there were minimal active adaptive management opportunities for the project, beyond modifications to the O&M plan, and that any lessons learned would be limited and would not likely apply to other coastal Louisiana restoration projects. While there are currently no apparent adaptive management opportunities, USACE can examine the performance of the project in the future. If it is determined during PED that explicit adaptive management could help achieve any unfulfilled project objectives, USACE can recommend adaptive management for the project at that time.

4. IEPR Comment – High Significance: The monitoring plan lacks relevance, justification, and methodology to properly evaluate the success of the project.

USACE Response: Adopted

Action to be Taken: USACE concurs that the draft monitoring plan required additional detail to specifically define how the success of the project would be evaluated. The monitoring plan was developed to the feasibility level, clarified and has outlined methodologies that will properly evaluate the success of the project. The feasibility level monitoring plan will be further revised in the preconstruction, engineering, and design (PED) phase to update as necessary the specific monitoring variables, monitoring locations, scientific uncertainties and uses of the monitoring results.

The feasibility level monitoring and adaptive management plan proposes direct measures where possible to assess project objectives. For example the numbers of saplings and water level are proposed monitoring elements. Habitat will continue to be monitored through Landsat (name indicating Land + Satellite) Thermal Mapper imagery scenes for habitat classification and land/water analysis and additional monitoring is proposed for water level, temperature, salinity, and dissolved oxygen. All of the variables contained within the Swamp Wetland Value Assessment (WVA) used to calculate project benefits (stand structure, stand maturity, water regime and mean high salinity during the growing season) are proposed to be monitored. These variables (not the WVA model itself) will be used to determine project success.

It was determined that fish and wildlife usage of the study area could be evaluated without directly measuring those variables. The monitoring plan proposes to monitor variables like water level, salinity, and vegetation that are system drivers for wildlife habitat. The data acquired on the system drivers of wildlife habitat will allow us to make assumptions about fish and wildlife without directly measuring them.

5. IEPR Comment – High Significance: The inclusion of vegetation plantings in all project alternatives warrants further justification as partial exclusion could have a substantial influence on selection of the Recommended Plan.

USACE Response: Adopted

Action Taken: USACE concurs that further justification of the requirement for vegetative plantings was needed, and it has been added to the report. Additional detail was added within Section 3.3 of the report clarifying the options considered while determining the implementation of vegetative plantings. The decision that vegetative plantings are imperative to the near-term success of the project was further described in Section 3.3.1.1 of the report. It was also determined that natural succession would not occur before the effects of RSLR. In order to establish a tree canopy prior permanent inundation, which occurs within 40 years of project construction, vegetative plantings are a necessary component of the proposed actions. Tree canopy would ensure that benefits are provided beyond forty years. Additional text describing scientific research, literature, and justification utilized for vegetative plantings was added to Section 3.3.1.1 of the report. Citations and references were also added regarding the basis for tree densities and nutria control.

6. IEPR Comment – High Significance: The cost-effectiveness and incremental cost analyses (CE/ICA) are not clearly explained and are not reported in a manner consistent with US Army Corps of Engineers (USACE) standard procedures (USACE, ER 1105-2-100, 2000, Appendix E).

USACE Response: Adopted

Action Taken: USACE concurs that additional detail behind the CE/ICA analysis was needed, and it was added to the Appendix K of the report consistent with USACE guidance in Engineering Regulation (ER) 1105-2-100. A reference to Appendix K was also added to Section 3.5.3 of the report.

Additional text describing the requirement for vegetative plantings within the final array of alternatives was added in Section 3.3.1.1 of the report. Alternatives excluding vegetative plantings were added to the preliminary array of alternatives and subsequently evaluated prior to the final array. This information was added to Section 3.3 of the report.

While the measures and alternatives recommended for the areas north and south of the ARDC are independent of each other, cost savings are obtained by combining the areas into one alternative (such as Alternative 39). These savings are result from the reductions in mobilization and demobilization costs incurred through the implementation of Alternatives 33, 34, and 35 separately. A description of cost differences between the alternatives was added to Section 3.5.1 of the report.

7. IEPR Comment – High Significance: The project costs have substantial uncertainty and inconsistencies that could affect the selection of the TSP.

USACE Response: Adopted

Action Taken: USACE concurs that the draft project costs had inconsistencies. The cost contingency was investigated and a corrected contingency value, with higher certainty and lower contingency was provided in Appendix L of the report and is reflected in the costs of the final array of alternatives. Additional explanation and the rationale specific to each risk listed in the risk register was added to Appendix L of the report.

8. IEPR Comment – High Significance: The WVA analysis of project benefits and its supporting documentation are incomplete; this could affect selection of the TSP.

USACE Response: Adopted

Action Taken: USACE concurs that the Wetland Value Assessment (WVA) analysis of project benefits and its supporting documentation were incomplete in the draft report. Further detail and documentation of the WVA model was added to the report in order to show the process by which project benefits were derived. Additional WVA discussion was also added to Appendix K of the report. This information included a more thorough breakdown of the model inputs, scoring spreadsheets, wetland classes, and the background information on the assumptions and judgments made for development of the model. The habitat types within the study area were

determined based on site visits and coordination with local researchers. The journal and research articles utilized for this analysis are found in Section 2.3.4.1 of the report.

Additional information on the impact/benefit areas was added to the report. The benefit areas were developed after examining the existing and sustainable conveyance channel systems in the swamps along Blind River. The benefit areas for the proposed channel conveyances were developed using the dimensions and configuration of these existing sustainable areas. The requested references to the primary and secondary impact/benefit areas were added to Section 3.5.2. The rationale behind the decision to utilize the Coastal Wetlands Planning, Protection and Restoration Act (CWPPRA) WVA modified swamp model for this project was added to Section 3.5.2 of the report. Additional discussion was added to Section 3.8 of the report describing the uncertainties inherent to the data utilized in the WVA model.

9. IEPR Comment – Medium Significance: The plan formulation – specifically, system-wide and project-specific problems, opportunities and objectives; management measures; the final array of alternatives; and selection of the TSP – needs additional explanation.

USACE Response: Adopted

Action Taken: USACE concurs that plan formulation should be further documented in the report. Additional explanation and description of the plan formulation process was added to the report to demonstrate the methodology utilized in the formulation of the final array and the recommended plan. The 2004 LCA Report problems, opportunities, needs, and objectives and those specified for this project are found in Sections 2.3.3, 2.3.5, 2.3.6, and 2.4.2, respectively. The objectives listed in the LCA 2004 report were added to Section 2.4.2 of the report.

The final report was also revised to ensure all the management measures listed in Table 3.2 are identified and described in Section 3.2.2. Discussions of how the project objectives are met by implementation of the final array of alternatives were added to Section 3.4 of the report. Additional discussions were also added to Section 3.7.11.1 describing the basis for selection of the Tentatively Selected Plan (TSP)/Recommend Plan on the CE/ICA analysis, the Conceptual Ecological Model (CEM), and the WVA model.

10. IEPR Comment – Medium Significance: Geotechnical stability of the proposed dredged material piles along channel cuts in native swamp should be discussed in terms of both design and constructability issues.

USACE Response: Adopted

Action Taken: USACE concurs that geotechnical stability should be further documented in the report. Further detail regarding this subsequent geotechnical analysis was included within the report. Additional language was added to Appendix L, Section 5 of the report stating the uncertainties involved with material placement, as well as any potential cost impacts associated with these uncertainties. A reference to this portion of the Appendix was included in Section 3.7.2 of the main report. Language was also added to Section 3.7.2 stating that the project construction schedule allows for soil consolidation, and reevaluation of vegetation type within these disposal areas (if needed). Vegetative plantings may be changed from bottomland

hardwoods to those appropriate for freshwater swamps if the material placement results in an elevation not suitable for these tree species.

Action to be Taken: A full geotechnical analysis will be conducted for this project during the pre-construction, engineering and design (PED) phase of this project.

11. IEPR Comment – Medium Significance: The overall geomorphic setting and basis of the designs proposed for channel conveyance networks need to be explained.

USACE Response: Adopted

Action Taken: USACE concurs that the overall geomorphic setting and basis of the designs proposed for channel conveyance networks needed to be explained further. Details regarding the geomorphic aspects of the recommended plan, including the proposed conveyance channels, were added to the report. The geotechnical assumptions made during the feasibility phases were added to Appendix L.

The surveys of the relict channels provided depictions of the dimensions of the channel, which are considered to be in hydraulic equilibrium. The design cross sections represent what is considered for construction and quantity estimation purposes and will equilibrate to a cross-section similar to those depicted by the surveys obtained. Further discussion was added to Section 3.7.2 of the report. Additional information regarding biomass accretion rates is found in Sections 2.3.3.2 and 5.2 of the report. A reference to these sections was added to Section 4.1.3 as well.

Action to be Taken: Slope dimensions will not be determined until a slope stability analysis is completed in the PED phase of this project. Once all pertinent information is gathered, such as geotechnical investigation and a full topographic survey, the final alignment and platform will be adjusted accordingly. Additional discussion was added to Appendix L of the report clarifying this.

Convey Atchafalaya River Water to Northern Terrebonne Marshes Multipurpose Operation of Houma Navigation Lock

The LCA Convey Atchafalaya River Water to Northern Terrebonne Marshes (ARTM) / Multipurpose Operation of the Houma Navigation Lock (MOHNL) study area is located in southeast coastal Louisiana, between the Atchafalaya River to the west, Bayou Lafourche to the east, and south of Houma, Louisiana. These two projects are hydrologically interlinked and subsequently have been analyzed and are presented as a combined feature. The recommended plan features consist of elimination of Gulf Intracoastal Waterway (GIWW) flow constrictions and construction of flow management features in the interior portions of the study area. The recommended plan features consist of improvement of several narrow sections of the GIWW that act as flow constrictions and construction of flow management features (small water control structures, channel bank gapping, and channel closures) in the interior portions of the Study Area.

The final IEPR report was received 25 June 2010. According to its findings, the Atchafalaya report follows conventional protocol and presents a logical sequence of identifying project objectives, alternatives considered, and the use of incremental cost analysis to identify the recommended plan. (The planning process used by USACE in this project was orderly, broad, and required substantial data acquisition and analysis. USACE personnel did an admirable job in development of this ambitious plan in a very short time. The details necessary to produce this plan were challenging and the final product reflects a solid effort. The overall plan formulation is to be commended. A summary of the issues raised during the review process and their resolution is outlined below.

Overall, 15 Final IEPR Panel Comments were identified and documented. Of these, 5 were identified as having high significance, 9 had medium significance, and 1 had low significance.

1. IEPR Comment – High Significance: More details on the proposed Morganza to the Gulf levee project and Houma Navigation Canal (HNC) lock are needed to understand how these major structural features affect the future without project (FWOP) conditions, can be operated to complement the Atchafalaya project, and influence the timing of benefits from the Atchafalaya project.

USACE Response: Adopted

Action Taken: USACE concurs that additional details were needed in the report to understand the relationships of these projects. A more complete description of the Morganza to the Gulf project, including the HNC lock complex, was added to Section 1.5.1. A map was also added to Section 1.5.1 (Figure 1.3). Assumptions for future without project conditions with respect to Morganza to the Gulf were added to Section 2.3.3 and 3.3.2. Assumptions about the effects of the Morganza to the Gulf project on wetlands in the project area were more clearly defined in Sections 2.3.3 and 3.3.2. A discussion of the assumptions used in the hydraulic modeling was added to the Hydraulics and Hydrology Annex to the Engineering Appendix Section L2-4.2. In lieu of a complete sensitivity analysis related to Morganza to the Gulf completion schedules, a discussion of likely impacts based on analysis of Alternative 7 results (the Alternative involving only the modified operation of the HNC lock complex) have been added to Section 3.10.

Action to be taken: Coordinated adaptive management between ARTM and Morganza to the Gulf will be necessary and is recommended in the ARTM report to optimize environmental benefits of both in the future. It was outside the scope of this study authorization to modify the alignment, purpose, or operation of the Morganza to the Gulf project (with the exception of the lock complex), but expanded study authority could be added to either the LCA or Morganza to the Gulf authority.

2. IEPR Comment – High Significance: Documentation on the Wetland Value Assessment (WVA) model needs to be added to Appendix M to demonstrate that the model is being appropriately applied and projected benefits accurately met.

USACE Response: Adopted

Action Taken: USACE concurs that the Wetland Value Assessment (WVA) analysis of project benefits and its supporting documentation were incomplete. More detail on how the WVA model interfaces with the hydraulics and hydrology model and the SAND2 model and how Average Annual Habitat Units (AAHUs) were generated was added to Appendix M. Summary spreadsheets of the SAND2 model determined wetland acreages, WVA values, and AAHUs were added as Annex 4 to Appendix M. Documentation on the theory and application of quantifying benefits of freshwater flow diversions was added as Annex 3 to Appendix M. Calibration results from studies involving sediment were added as Annex 2 to Appendix M.

3. IEPR Comment – High Significance: The use of the SAND2 model to model nutrients instead of a more complex model is not sufficiently justified to warrant its use for this project.

USACE Response: Partially Adopted

Action Taken: USACE concurs that the use of the SAND2 model needs further documentation and justification. Documentation on the theory and application of SAND2 in quantifying benefits of freshwater flow diversions was added as Annex 3 to Appendix M. The SAND2 model was certified prior to its use by the Corps for this project and while there are more complex models that could be used, the timing for the set up and certification of the model. The development of a more complex model would not affect the formulation and evaluation of alternative plans.

Action to be Taken: Additional refinement of the model variables based on collected data from the study area will be undertaken in the preconstruction, engineering, and design (PED) phase and the SAND2 model will be refined as necessary to further assist in the validation of the recommended plan and determine if a more complex model would be justified and warranted.

Action Not Taken: Unless there is compelling reason identified in the PED phase to utilize a different model, USACE will continue to use the SAND 2 model.

4. IEPR Comment – High Significance: Some relative sea level rise (RSLR) calculations do not appear to be consistent with EC 1165-2-211, and the analyses of results do not appear to fully comply with all of the EC 1165-2-211 requirements thus the risks to the project are not understood.

USACE Response: Adopted

Action Taken: USACE concurs that RSLR analysis did not appear consistent. Discrepancies between relative sea level rise values used in hydraulic analyses and benefits analyses were corrected. A discussion of the risk due to relative sea level rise was added to section 3.10.2 on risk and uncertainty.

5. IEPR Comment – High Significance: Given the large amount of dredging and disposal, the dredged material’s physical properties, quantities, and disposal methods are too general and need more detail.

USACE Response: Adopted

Action Taken: USACE concurs that the dredged material’s physical properties, quantities, and disposal methods were not fully described. Information regarding the assumptions relating to marsh impact and marsh creation due to dredging and disposal was documented and added to Sections 5.1, 5.6, and 5.10 in the report. A Phase 1 Environmental Site Assessment was performed and is described in Appendix N to further document the properties. Additionally the risk of hazardous waste was included in the risk analysis.

Action to be Taken: Further sampling of the dredged material will be completed during PED. During that time, the properties, quantities and suitable uses of the material will be determined. Additional identification of hazardous materials will be performed during testing and construction.

6. IEPR Comment – Medium Significance: Hydrology and hydraulics (H&H) modeling, including RMA-2 and RMA-11 2-D water surface modeling and modeling of salinity, needs to be better related to key estuarine species and their specific habitat requirements.

USACE Response: Adopted

Action taken: USACE concurs that the report was unclear on the modeling as it related to key estuarine species and their specific habitat requirements. Wet season and dry season isohaline maps for the future with and future without project conditions were added to Environmental Consequences Section 5.3 (Water Quality and Salinity). Discussion of impacts of salinity changes on key estuarine species was expanded accordingly in Sections 5.9 (Fisheries), 5.15.10.1 (Commercial Fisheries), and 5.15.10.2 (Oyster Leases).

7. IEPR Comment – Medium Significance: Sediment transport modeling was not performed to support statements that the project will distribute sediments to the study area, and conflicting/misleading statements regarding sediment delivery must be addressed.

USACE Response: Adopted

Action Taken: USACE concurs that there were conflicting statements regarding sediment delivery in the report. The conflicting/misleading statements regarding sediment delivery and distribution within the study area were clarified throughout the document. Sediment delivery is not a goal of the project and therefore the statement regarding sediment delivery was incorrect.

8. IEPR Comment – Medium Significance: Impacts to navigation, shoaling, and harmful algal blooms (HABs) are not described in sufficient detail under Environmental Consequences (Section 5.0).

USACE Response: Adopted

Action Taken: USACE concurs that additional detail should have been included on the impacts. A more detailed discussion on the detrimental effects associated with indirect/cumulative impacts was added to Sections 5.2.2 (Sedimentation and Erosion), 5.3 (Water Quality and Salinity), and 5.15.6 (Navigation). Discussion of interactions of the LCA-ARTM project with other future projects was added to Section 1.5.4.4 (Coastal Restoration Projects) and to Section 5.21 (Cumulative Impacts Summary).

9. IEPR Comment – Medium Significance: The impacts to navigation at the HNC and lock from the project are unclear, making it difficult to assess the potential impacts.

USACE Response: Adopted

Action Taken: USACE concurs that the report did not clearly identify if there would be impacts to navigation if a lock at Houma was constructed. The discussion of Houma Navigation Canal (HNC) navigation impacts, as addressed in Section 5.15.6 (Navigation), was expanded to include the current usage of the HNC, the operation of the HNC lock with and without project, and impacts to navigation with and without the project operations.

10. IEPR Comment – Medium Significance: The assumptions and data used to develop the cost estimates for the commercial fisheries are needed to justify the potential impacts to this industry.

USACE Response: Adopted

Action Taken: USACE concurs that the report did not clearly identify the assumptions and data used to develop the cost estimates. The report was revised to clearly identify the assumptions and data used to develop the cost estimates. Maps depicting the locations where draft restrictions would occur (Figures 5.34 thru 5.36) were added to Environmental Consequences Section 5.15.6 (Navigation). Navigation impacts were added to Environmental Consequences Section 5.15.6.

11. IEPR Comment – Medium Significance: The design of West Weir #2, specifically the sheet pile cell installation, is questionable because of the depth of water, the length of sheets, and the driving distance.

USACE Response: Adopted

Action Taken: USACE concurs that the design of the West Weir #2 was not properly documented. The Drawing S-220 was misleading and was revised. The drawing was “Not To Scale”, but was not marked as such. This designation was added to drawing S-220 to provide clarity. A break line was added to the cells to show that they extend well below the ground level. Elevation callouts were added to the ground surface to show the elevation of key points and pile tip elevations. A discussion of similar construction and driving distances was provided to the reviewer.

Action to be Taken: During the PED phase of the project, borings will be taken and a review of boring logs and driving distances will be completed as part of the detailed design of this feature.

12. IEPR Comment – Medium Significance: There is a discrepancy in the final cost analysis, which uses a 39% contingency rather than the 34% contingency determined in the risk analysis.

USACE Response: Adopted

Action Taken: USACE concurs that the contingency was not correctly applied to the final cost analysis in the draft report. The cost estimates were updated to include the latest contingency value of 34%. This is now reflected consistently in the final report.

13. IEPR Comment – Medium Significance: The Adaptive Management Plan (AMP) needs to be revised to provide more detail, including identifying critical management trigger points for project reassessment (or realignment) purposes.

USACE Response: Adopted

Action to be Taken: USACE concurs that the Adaptive Management plan will need to be further revised to provide more detail, including identifying critical management trigger points for project reassessment. The current Adaptive Management and Monitoring plan has been developed to the feasibility level and has outlined methodologies that will properly evaluate the success of the project and propose management actions. The feasibility level monitoring and adaptive management plan will be revised in the PED phase. During this revision, more details will be included, describing how monitoring data can elicit adaptive management actions and identifying more specific and definable trigger points. A summary decision matrix will be included in the plan revision during PED.

14. IEPR Comment – Medium Significance: The source and reliability of the assumptions used to estimate the Atchafalaya project costs, especially construction costs, do not include sufficient detail to make a determination regarding accuracy.

USACE Response: Adopted

Action Taken: USACE concurs that draft report cost assumptions did not include sufficient detail. The cost estimate section of the engineering appendix in the final report was updated to provide a more detailed description of the cost estimates and the source data.

Action to be taken: Lock operation costs will not have an effect on plan selection and will be refined in PED.

15. IEPR Comment – Low Significance: Additional documentation on the public involvement process is needed.

USACE Response: Adopted

Action Taken: USACE concurs that additional documentation was needed in the report. It should be noted that the IEPR review took place while the draft report was undergoing public

review. Section 6.0 in the final report now describes the public involvement process in more detail. In addition, Appendix G of the final report contains all comments received during the public review period along with a response to each comment.

Small Diversion at Convent/Blind River

The Small Diversion at Convent/Blind River project proposes to construct a diversion of freshwater from the Mississippi River in the vicinity of Romeville, Louisiana to provide freshwater, nutrients, and sediments to the Maurepas Swamp and reverse the trend of deterioration in the swamp. The Mississippi River levee system has cut off the Maurepas Swamp (and Blind River) from the natural periodic, flooding by the Mississippi River. Past construction of logging trails, drainage channels, pipelines and roads through the swamp has disrupted the natural flow and drainage patterns, impacting the biological productivity of the swamp.

Overall, 14 Final IEPR Panel Comments were identified and documented. Of these, 8 were identified as having high significance, 1 had medium significance, and 5 had low significance.

According to the Final External Peer Review Report (Date June 22, 2010), the IEPR Panel indicates that the USACE project delivery team (PDT) has presented rational and achievable structural alternatives which have been derived in accordance with USACE Planning Guidance in an effort to achieve the project objectives. The majority of the Panel's comments focused on providing more detail and discussion to clarify issues in several areas. Most comments can therefore be addressed through revision of the existing report.

1. IEPR Comment – High Significance: The proposed structural actions are well engineered but are based on data which lack resolution, accuracy, precision, and spatial distribution, thereby compromising the logic in the derivation of management measures.

USACE Response: Adopted

Action to be Taken: USACE concurs that the engineering data should be further supplemented. Existing available data were used during the feasibility study and further refinement of this data will not alter the formulation and evaluation and identification of the recommended plan. Additional data collection and design refinement in the preconstruction, engineering, and design (PED) phase and will further assist in refinement of the proposed measures and validation of the recommended plan. Additional information was added to the report in Section 3.8 to describe the additional data collection and design in PED.

2. IEPR Comment – High Significance: The hydrodynamic model (Environmental Fluid Dynamics Code [EFDC]) was not well documented and was improperly validated; key hydrologic components were not considered; and berm cuts were not modeled correctly.

USACE Response: Adopted

Action Taken: USACE concurs that the hydrodynamic model (Environmental Fluid Dynamics Code [EFDC]) was not well documented. Additional information was added to the report regarding the hydrologic model and hydraulic uncertainties (Section 3.8 and Appendix L). The project proposes a very flexible operation system and aggressive adaptive management program during the life of the project to meet the specified goals and objectives. Further validation of the model at this point would not affect the plan formulation and selection of the recommended plan since all of the other considered alternatives have higher costs and will not be as adaptable as the recommended plan.

Action to be Taken: Additional hydrologic modeling will be completed during PED to validate results, confirm plan selection and further refine project design. During the PED phase the hydraulic modeling will be expanded to include additional refinements to the results obtained during the feasibility phase. The areas where additional modeling will be conducted include downstream hydraulic benefits, effects of nutrients on downstream systems, water surface elevation control mechanisms as part of the operations system, and optimization of flow through the berm gaps for both flooding and drainage of the swamp.

3. IEPR Comment – High Significance: The engineering calculations do not provide accurate results, and the model validation process was not appropriate.

USACE Response: Adopted

Action Taken: USACE concurs that the engineering calculations were not sufficiently described in the draft report. The model and its uses were further documented within the final report (Appendix L and Section 3) to address this comment. The modeling used the available existing data to distinguish the differences between alternatives and to determine the appropriate flow volume to achieve the goals and objectives of the project. This project is based on an operations plan with a flow and control system that allows the project to be operated in an infinite number of modes for supplying water and nutrients to the swamp, preventing backflows, and supplying freshwater to the system. The model results show that a diversion of 3000 cubic feet per second (cfs) can be modulated and controlled to achieve the goals and objectives of the project, while not adversely affecting the existing flow stages currently affecting the area during storm events.

Action to be Taken: More refined modeling will be completed during PED to assist the development of the operations plan. Sufficient flexibility in the diversion rates will be available so that the system can be fully calibrated during the first year of full operation. The system does not lend itself to defined modeling methodologies since many of the variables are not measureable. For this reason there is maximum flexibility in the control aspects of the project to allow for post-construction calibration of the operations plan based on monitoring.

4. IEPR Comment – High Significance: The flood control impacts of the proposed improvements are not properly documented or addressed.

USACE Response: Adopted

Action Taken: USACE concurs that the flood control impacts were not adequately documented in the draft report. An analysis of existing storms and the diversion flows indicate that there will not be any adverse impacts to water surface elevations. Additional information was added to the report in Section 3.8 to document this. While there are no impacted structures in the project area a more detailed analysis of the project water surfaces will be undertaken during PED.

Action to be Taken: Additional modeling will support the operation of the diversion to assure that flood stages are not adversely affecting properties and verify the exact water surface elevations. The operation plan will be modified if necessary to alleviate any increased flooding conditions prior to finalization of the plans and specifications and construction. The modeling

will include the effects of sea level rise and the total effects on flood levels of differing sea level rise scenarios and project operation modes through the life of the project.

5. IEPR Comment – High Significance: The operation and management plan should be expanded to include actions designed to meet ecological goals, specifically pulsed and extended dry periods.

USACE Response: Adopted

Action to be Taken: USACE concurs that the operation and management plan should be expanded. The operations plan will be further developed as an integral part of the final design in PED. Sections 3.7.6 and 3.8 of the report were refined to reflect this.

The operation schedule will be based on certain sets of operational parameters that will then determine the control of the system. The operation plan will be based on numerous conditions that will then equate to the proper flow rates and control structure settings to achieve the optimal flow conditions for a multitude of external natural system conditions. In addition, the adaptive management program will be further developed to examine the control system and make adjustments to achieve the goals and objectives of the project. The swamp changes naturally from vegetative growth, leaf litter and storm debris, so the ability to monitor the swamp and make adjustments is critical from year to year and season to season.

6. IEPR Comment – High Significance: Equally spaced/sized berm cuts and culvert locations/sizes are not tailored to the specific topographical, hydraulic, and ecological features of the receiving habitat areas, or to the specific diversion alternatives.

USACE Response: Adopted

Action Taken: USACE concurs that the draft report did not document these features well, and additional information was added to the report regarding the proposed berm gaps and control structures (Section 3.7.3). The width and spacing of the gaps were standardized for the plan formulation process and will be further optimized to provide the optimal distribution of diverted flows prior to construction.

Action to be Taken: The optimization of the berm gaps and control structures will be undertaken in the PED phase.

7. IEPR Comment – High Significance: The extent of seepage and the potential impact that seepage may have on the project has not been considered and could be significant, affecting the hydrology and hydraulics of the study area.

USACE Response: Adopted

Action Taken: USACE concurs that seepage and seepage impacts were not adequately documented in the draft report. Additional information was added to the report discussing the extent of seepage and the potential impact that seepage may have on the project (Section 4.2.2.3). The soil structure in the areas outside the Mississippi River levees is primarily silty clays which have low permeabilities. There is no visible evidence or data which indicate any significant seepage from the Mississippi River to the Swamp, a distance of about 3 miles. The

study team evaluated the groundwater flow issue very early in the process and will continue to evaluate during PED. At this point in the project there is no evidence that indicates further modeling is required. If, during PED, the analysis of the River levee indicates that seepage may be more pronounced than currently observed, additional seepage modeling for the larger project area will be considered. There is a very low probability that seepage is an issue for this project because: 1.) the distance between the River and the swamp drainage canals is over three miles, and there is no indication that at the lower elevations near Hwy 3125 there is any water at the surface. The lack of water at the surface indicates the water level is very low a mile before the swamp drainage canals. This would indicate limited driving force for groundwater movement; 2.) the soils are in general silty clays which will have very low permeability which, unless there is a sand lens anomaly, indicates there is not a low permeability path between the River and the Swamp; and 3.) the flow measurements taken for six months in the Blind River near Hwy 61 indicate that there is essentially no positive outflow during dry periods when the River is high from spring rains in the Midwest.

8. IEPR Comment – High Significance: Because of the many uncertainties associated with predicting the project’s benefits, a sensitivity analysis for the Wetland Value Assessment (WVA) analysis should be conducted to demonstrate that the project will successfully provide benefits.

USACE Response: Adopted

Action Taken: USACE concurs that because of the many uncertainties associated with predicting the project’s benefits, a sensitivity analysis for the Wetland Value Assessment (WVA) analysis should be conducted to demonstrate that the project will successfully provide benefits. As part of the development of the WVA model variables, a sensitivity analysis was performed. The relative weights of the WVA variables were reviewed by USACE and other agency and academic experts. In addition, a literature review was conducted to summarize the available scientific knowledge supporting the relative weights of the variables and their role in supporting fish and wildlife within the respective communities. The variable weights were originally developed using a sensitivity analysis in which weights were adjusted until the model behaved as expected by an interdisciplinary expert team and a consensus was reached. As expected, the scientific literature to support specific numerical weightings of individual variables does not exist; however, there is general support for their relative values shown in the current equations.

The WVA was performed for a range of sea level rise rates (low, intermediate, and high), and a range of diversion inflow rates. Three habitat condition classes (levels of degradation) exist at the project site, 20-30 years-to-marsh, 30-50 years-to-marsh, and greater than 50 years-to-marsh. These were evaluated for each alternative plan for stand structure, stand maturity, water regime, and salinity for specified areas for each alternative. It should be noted that the project benefits reach far beyond the swamp. The Blind River episodes of low dissolved oxygen caused by both urban and agricultural runoff. This recommended plan will increase the flow in the River, direct the local runoff through the swamp for nutrient assimilation, and improve the water quality of the River. The freshwater will also improve the conditions of Lake Maurepas by providing a source of freshwater that has been missing for centuries. Determining the total ecological and economic benefit of the project may prove to be difficult due to the larger benefit area and possible uncertainties in the model and other parameters.

9. IEPR Comment –Medium Significance: The lack of data on sediment accretion rates and productivity in the forest system will prevent achieving the Project Objective of relating “swamp building” to river diversion.

USACE Response: Adopted

Action Taken: USACE concurs that sediment accretion rates and productivity should be further documented in the report. The report was modified to more thoroughly explain "swamp building" is not only based on elevation, but is intended to mean the production, health, and vigor of the swamp ecosystem which will be achieved by the project.

Estimates of accretion were based upon work by Shaffer et al. 2006. In areas of poor sediment, but sufficient freshwater and nutrients, swamps were able to develop accretions to balance RSLR. The sediment path will not be only by sediment reaching the swamp hydraulically, but also by dredging and pumping the dredged sediments from the diversion canal to the swamp. These costs are included in the operations plan for the project. The vegetative accretion rates will increase due to two primary factors: A. hydroperiod adjustment and B. nutrient addition. The proposed plan can allow for flooding and drying in areas of the swamp that will promote natural propagation of new cypress trees. The nutrient mass loading calculations indicate that the nutrient level will increase significantly, promoting a higher vegetative growth rate.

The feasibility level monitoring and adaptive management plan includes both pre- and post-diversion monitoring of sediment accretion, elevation, forest composition, and forest productivity.

Action to be Taken: When more project-specific design information is available in the preconstruction, engineering, and design (PED) phase, the monitoring and adaptive management plan will be revised and exact monitoring station locations will be established. The currently proposed number (8) of monitoring stations will be revisited during the PED phase and may be increased if warranted. The proposed monitoring is intended to determine ecological success, as defined by the project objectives, and will, consequently, inform operational adjustments to achieve project objectives.

10. IEPR Comment –Low Significance: The discussions on endangered and protected species and their habitats contain inconsistencies and inaccuracies which need to be corrected.

USACE Response: Adopted

Action Taken: USACE concurs that the discussions in the report need to be corrected. The report was modified based on the most current data. The inconsistencies regarding the proposed project and its effect on the Pallid sturgeon were clarified and the discussion revised. The discussion of the manatee and its distribution within the project area was revised. The discussion regarding the bald eagle was revised and corrected to clearly explain potential impacts to the bald eagles in the project area.

11. IEPR Comment –Low Significance: The needs of the railroads, which have only been informally discussed with them, may impact right-of-way acquisition and project design.

USACE Response: Adopted

Action Taken: USACE concurs that further discussion with the railroad will be required. The team contacted the Canadian National Railroad to affirm their cooperation on crossing the rail line with the transmission canal. The railroad is aware of both this project and the Hope Canal project, which also requires the relocation of the railroad to install culverts for transmission canals.

Action to be Taken: The team will continue to further refine the plans in PED and continue coordination with the railroads.

12. IEPR Comment –Low Significance: The report should differentiate between saline and freshwater marshes.

USACE Response: Adopted

Action Taken: USACE concurs that the report should differentiate between saline and freshwater marshes. The main report text was modified to indicate these are freshwater systems, and that the swamps will convert to marshes and then to open water, but all will be freshwater.

As indicated, the statement of need for the project indicates that if the project is not implemented there would be conversion of forested freshwater wetlands (Cypress and Tupelo) to marsh or open water. The statement of need for the project was modified to replace “or” with “and subsequently” to open water. This change acknowledges the fact that without project implementation the depth of water will increase and the marsh will subsequently be converted to open water. Additionally, “freshwater” was used as often as possible when making reference to the swamp. As indicated, this is a freshwater system and the conversion will be to a freshwater marsh or subsequently to open water. While salinity affects forested wetlands at very low levels, the salinity levels that have affected Maurepas Swamp and would affect the project area in the future are at a low level that would not result in the establishment of salt marshes. The project area will still be dominated by freshwater inputs and the conversion of forested freshwater wetlands will be to freshwater marshes and subsequently open water. The text was revised to clarify this fact.

13. IEPR Comment –Low Significance: The readability of the report would be significantly improved by providing references to the appropriate appendix in the narrative of the main report.

USACE Response: Adopted

Action Taken: USACE concurs that readability of the report would be improved by providing references to the appropriate appendix in the narrative of the main report. The main report was modified to include references to key appendix material.

14. IEPR Comment –Low Significance: There are typographical errors in the cost effectiveness/incremental cost analysis (CE/ICA) sections that need to be corrected so that results are accurately reported.

USACE Response: Adopted

Action Taken: USACE concurs that there were typographical errors in the draft report. Report inconsistencies in the CE/ICA sections were corrected in the final report so that results are accurately reported.

Terrebonne Basin Barrier Shoreline Restoration

The Terrebonne Basin Barrier Shoreline Restoration (TBBSR) Project provides for the restoration of the Timbalier and Isles Dernieres barrier island chains located in Terrebonne Parish and Lafourche Parish, Louisiana. The basin is separated from the Gulf of Mexico (GOM) by a chain of barrier islands, which serve as a natural barrier to storm events and reduce marine influences on interior wetlands within the basin. The purpose of the project is to address the critical near-term need for shoreline restoration in the study area. This would be achieved by enlarging the existing barrier islands (width and dune crest) and reducing the current number of breaches. Additional objectives include analyzing the current conditions of the barrier islands, assessing impacts from the hurricanes of 2005 and 2008, and reaffirming the validity of the findings of the Final Programmatic Environmental Impact Statement (PEIS) conducted for the 2004 LCA Report (USACE 2004b). The National Ecosystem Restoration (NER) Plan and the Recommended Plan includes the restoration of Raccoon Island to its minimal geomorphologic form and ecologic function, along with twenty-five (25) years of advanced fill and construction of a terminal groin. This plan also includes restoration of Whiskey and Trinity Islands to their minimal geomorphologic form and ecologic function along with five (5) years of advanced fill and restoration of Timbalier Island to its minimal geomorphologic form and ecologic function along with twenty-five (25) years of advanced fill. Approximately 5,840 acres would be restored.

Overall, the Panel agreed that the TBBSR project is a good project with the potential to provide benefits to the island habitats proposed to be restored by the Recommended Plan and, to some degree, the estuary and wetlands on the leeward side of the islands within Terrebonne Bay. Furthermore, the Panel agreed that monitoring after the implementation of this project could capture valuable data, approaches, and lessons that would enhance the capacity to perform similar efforts on other islands in the LCA and beyond. The majority of the Panel's comments focused on providing more detail and discussion to clarify issues in certain areas. Most comments can therefore be addressed through revision of the existing report.

Overall, 16 Final IEPR Panel Comments were identified and documented on the Terrebonne Basin Barrier Shoreline Restoration project. Four comments have been identified as High Significance, 9 comments as Medium Significance, and 3 comments as Low Significance.

1. IEPR Comment –High Significance: The evaluation of structural measures (i.e., offshore breakwaters and terminal groins) needs to include additional information and analysis to support their inclusion in the National Ecosystem Restoration (NER) plan, while revetments are excluded.

USACE Response: Adopted

Action Taken: USACE concurs that additional information should be included in the report on the evaluation of structural measures, as well as the analysis to support their inclusion in the NER plan. The report was refined, addressing this concern, in section 3.2.3 to add data on the effects of the breakwaters on Raccoon Island. Qualitative descriptions of the adverse effects of

hard structures on East Timbalier Island were added, and descriptions were supplemented with historical aerial photographs.

A section describing Terminal Groins and Groins was added to Section 3.2.3.1.1 that discusses why Groins were removed and why Terminal Groins were retained.

Shoreline armoring was excluded from consideration because revetments interfere with marine turtle nesting and with hatchling survival. In addition, they block shoreline and wrack-line feeding for a broad range of shore birds, including Federally listed species, such as Piping Plover. Three parallel revetments have been constructed by private interests on East Timbalier Island. One is completely submerged offshore, the second is still visible offshore, and the third, which was >300 feet upland six years ago, is now at the water's edge. Revetments stop neither erosion nor island migration. What is presently known as Wine Island was created by encircling a shoal with a rock dike and filling it with sediment dredged from the Houma Navigation Canal. It has been filled twice since 1991.

Revetments will interrupt normal movement of sand along the shoreline, longshore and cross-shore and result in long-term negative impact. Also, rocks placed on sediment can settle significantly. Some form of foundation protection (e.g., rock filled geotextile mats/sheets) is needed to limit this settlement. In some cases, the substrate may be too unstable to support rock structures, even with foundation protection. A rock shoreline would adversely impact threatened and endangered species such as the piping plover and the Kemp's Ridley sea turtle, by eliminating nesting and feeding areas (USACE, 2009). The Wetland Value Assessment (WVA) methodology, which quantifies habitat benefits of restoration projects, acknowledges this by assigning a considerably lower surf-zone habitat value for shorelines protected with revetments (CWPPRA, 2002). Therefore, revetments were eliminated because of their potential environmental impacts as noted in Section 3.2.3.1.1.

2. IEPR Comment –High Significance: Physical processes should be analyzed for the Terrebonne Basin barrier island system as a whole.

USACE Response: Adopted

Action Taken: USACE concurs that physical processes should be analyzed as a whole. A gap analysis was performed at the initiation of this project and determined that system-wide sediment transport models, wave and current modeling, geomorphic analyses of sand movement, and a sediment budget were not available. At that time the PDT determined that sufficient data existed to move forward with a feasibility-level assessment. These data included: hydrologic, topographic, bathymetric, geophysical, geotechnical, and magnetometer survey data. However, a significant reassessment of performance has been performed on the barrier shoreline landform migration patterns in response to storms, waves, and currents. This analysis of physical processes resulted in the PDT's re-visitation of the Terrebonne Basin barrier island system as a whole and the selection of the recommended plan. Text was added to Section 1.5.2.2 to summarize the gap analysis.

Additional detail has been added to Chapter 3 of Appendix L that describes the depth of closure analyses, including one field study conducted for similar restoration projects along the Terrebonne and Barataria basins that support this study's estimate. A qualitative description of the geomorphologic processes has been included in the main report, including gross estimates of longshore transport, interruption of bypassing at the inlets, etc.

The Bruun rule was examined for each island to determine the increase in shoreline erosion in response to accelerated sea level rise. This increase was then applied to the erosion rates derived from the USGS land loss rates. These rates were then compared to the background erosion rates based on the historical shoreline change atlas adopted for this study. The comparisons indicate that the adopted rates were conservative and more than account for the uncertainties in accelerated shoreline erosion due to accelerated sea level rise. Appendix L, Chapter L2 was revised to include this analysis.

Relative sea-level change analysis was performed in accordance with the EC 1165-2-211 18-step guidance developed by USACE. According to this guidance, the future subsidence rate remains constant, however, the future eustatic sea-level rise rate has three trends: historic (constant), intermediate (increase), and high (increase). Further, as demonstrated by the comparative analysis of the background erosion rates adopted for the study (described above), the uncertainties associated with land loss subsidence are more than accounted for. Chapter 3 in the Main report and Appendix L, Chapter L6 have been revised to reflect this.

Action to Be Taken: Due to the highly variable nature of the coastal processes within the Terrebonne Basin and the limitations of modeling barrier island restoration performance and response to structures with the GENESIS model, the recommendation to conduct combined wave and current modeling in the Pre-construction Engineering and Design Phase (PED) on a system-wide level to support the National Ecosystem Restoration (NER) Plan has been added to Annex L-3 of Appendix L and the main report including the Executive Summary and Chapter 8.

3. IEPR Comment –High Significance: More information from critically important studies regarding physical processes (including modeling, analysis, and prior project performance) needs to be provided in the Terrebonne report.

USACE Response: Adopted

Action Taken: USACE concurs that more information from critically important studies regarding physical processes (including modeling, analysis, and prior project performance) needs to be provided in the Terrebonne report. Discussions of previous studies and models have been enhanced, and sections have been added to address previous projects and the historically observed changes to the islands.

A section on impacts of sand removal from Ship Shoal on hydrodynamics and sediment transport has been added to the report. This was based on previous studies such as the *Environmental Investigation of the Long-Term Use of Ship Shoal Sand Resources for Large Scale Beach and Coastal Restoration in Louisiana* (Stone et al. 2009) and includes impacts on waves, current, and sediment suspension. Further, the previously identified borrow areas underwent mining impact assessments as described in Appendix L, Chapter L5.

Text was added to Section 1.5.1.9 of the Terrebonne main report stating that modeling results indicated that Ship Shoal has significant influence on wave dissipation but suggest that neither large-scale nor small-scale sand mining should result in abrupt changes in current patterns. A section on island migration has been added to Section 4 of the report. The section includes graphic comparisons of historic island shorelines. Two modes of island erosion are discussed in Section 4.2.2.2 of the Main Report. They are longshore sediment transport, the result of wave action suspending sediment that is transported by wave- and tide-driven longshore currents, and cross-shore sediment transport, the result of waves impacting the shoreline at a more-or-less normal angle.

Also, the last few paragraphs of Section 1.5.1.5 (Evaluation of CWPPRA Projects) discuss the major lessons learned from past CWPPRA projects and how they have been applied to the Terrebonne Project. This section has been expanded to discuss renourishment, which was recently added to the projects. Renourishment is an O&M measure that was added based on evaluation of the longevity of previous projects.

4. IEPR Comment –High Significance: The initial short-term impacts to habitat due to project construction need to be quantified in more detail and revisions to designs and construction should be considered to reduce potential impacts.

USACE Response: Adopted

Action Taken: USACE concurs that initial short-term impacts should be further documented. When this report was delivered for external review, consultation with the U.S Fish and Wildlife Service (USFWS) had not yet been completed. Subsequently, during Section 7 consultation, the study examined and quantified the initial short-term impacts to the habitat of the Piping Plover, West Indian Manatee, Sea Turtles, Brown Pelican and Colonial Nesting Birds. The following factors were considered: proximity of the action, distribution, timing, nature of the effect and duration. Also performed was an analysis for the effects of the action and a species response to the proposed action. Text was added and revised, to Section 3.6.7.1, that explains the short term impacts and the efforts made to avoid the existing vegetation and habitat. However, the majority of the existing habitat will be sacrificed during construction, but will be restored through the vegetative planting efforts immediately following construction in order to prolong the ecologic function of the island.

Supporting documentation was developed by USFWS and included in Appendix B (USFWS Coordination Act Report). The purpose of the documentation is to detail the input parameters and assumptions for each variable in the WVA model and document the rationale used to quantify the variables and associated suitability indices for each alternative in the final array. The variables are defined in Section 3.5.1 (Benefits Analysis). The documentation also includes the habit units (HUs) for each target year. This provides the “anticipated evolution toward reestablishment of habitat” since HU is a metric of ecological benefits. HUs are averaged over the period of analysis to determine the average annual habitat units (AAHUs).

In addition, there are mangrove stands and CWPPRA projects on Raccoon and Whiskey Island that will be avoided during construction. The text has been revised to state that construction equipment and construction-related activities will not be allowed in these areas.

Action to Be Taken: During construction, the contractor will maintain dedicated loading/unloading areas, staging areas, and access corridors to minimize impacts to the island. Furthermore, the staging of island construction will be conducted in a manner that minimizes impacts. For example, the beach components of the islands will be constructed first. During beach construction, the existing marshes will not be disturbed. Upon completion of the beach, the loading areas, staging areas, and access corridors will be relocated to facilitate marsh construction. This information was added to the text. The recommendation to conduct combined wave and current modeling in PED on a system-wide level to support the NER plan has been added to Annex L-3 of Appendix L and the main report including the Executive Summary and Chapter 8. Coordination will be maintained with USFWS throughout the construction phase.

5. IEPR Comment –Medium Significance: The accuracy of the predicted effects of storm events and sediment transport is uncertain.

USACE Response: Adopt In Part

Action Taken: USACE concurs that the draft report did not fully describe the predicted effects of storm events and sediment transport. The final report has been revised to include the justification for the assumptions and models used to predict storm events and sediment transport. A section was added to the report that identifies recommended research opportunities that will improve future barrier island restoration projects. Limited scale rectified aerial photographs post-Katrina and post-Gustav and Ike are available, and have been incorporated to verify the SBEACH model results along with the description of limitations of such an approach. It was determined that sufficient data existed to move forward with a feasibility-level assessment. The documentation of the existing data has been broadened.

Action not to be Taken: The PDT conducted a gap analysis at the initiation of this project and determined that system-wide sediment transport models, wave and current modeling, geomorphic analyses of sand movement, and a system-wide sediment budget were not available. The feasibility-level assessment was limited to existing data and analyses. No new data were collected because the PDT believes that the application of the existing data is sufficiently conservative to forecast performance relevant to future storm events and sediment transport.

6. IEPR Comment –Medium Significance: The economic criteria and approach used for overall project justification and plan formulation need to be clarified.

USACE Response: Adopted

Action Taken: USACE concurs that clarification was needed in the report to better describe the formulation and evaluation of alternatives and selection of the recommended plan. Section 3 was revised to provide further information summarizing the plan formulation process. The formulation process followed ER 1105-2-100. An initial list of measures was developed including 19 hard structural measures (i.e. revetments, groins, canal plugs, etc.) and 12 soft-structural measures (i.e. dune restoration, marsh creation, herbivore control, etc). Qualitative

screening of these measures resulted in the elimination of 15 measures and the retention of 16 measures to be carried forward for a more detailed evaluation in the second level of screening. These management measures were determined to be consistent with specific USACE policies for ecosystem restoration, and Federal laws, regulations, and Executive Orders.

The second level screening effort built on the initial screening process, with an emphasis on the combinations of measures that could be used to meet the specific objectives of the Study. As a result of the second level of screening, it was determined that a combination of beach, dune, and marsh restoration measures would be needed to achieve the primary objective of restoring geomorphic form and ecologic function. This screening process resulted in the elimination of seven additional measures. The beach, dune, and marsh components, as well as the measures that could provide supplemental benefits were carried forward.

The final screening effort, which built upon the second level screening process, evaluated the use of supplementary measures including sand fences, vegetative planting, herbivory control, breakwaters, terminal groins, and continuous revetments that would complement the beach, dune, and marsh measures. These measures were evaluated on an island-by-island basis.

After screening of the measures, five restoration plans, each consisting of a beach, dune, and marsh component, were developed for the seven islands. The plans were denoted as Plans A through E:

- Plan A – No-Action Alternative
- Plan B – Minimum Design Plan
- Plan C – Minimum Design Plan plus 5 years of advanced fill
- Plan D – Minimum Design Plan plus 10 years of advanced fill
- Plan E – Minimum Design Plan plus 25 years of advanced fill

Various combinations of islands, restoration plans (Plans A through E) and supplementary measures (breakwaters, terminal groins, etc.) were evaluated to determine the best combinations of features (i.e. alternatives) that would meet the planning objectives and that would be consistent with the 2004 LCA Study and 2007 WRDA authorization. Through an iterative process of plan formulation and screening, six alternatives were originally recommended for inclusion in the Final Array of Alternatives.

The NER Plan was selected because it represents a system-wide and cost-effective approach of restoring as many islands within the Terrebonne Basin barrier system which can be constructed with available sediment sources. A renourishment plan was also developed for the island to maintain their geomorphologic form and ecologic function throughout the 50-year period of analysis.

7. IEPR Comment –Medium Significance: Some of the assumptions used in the evaluation of alternatives need to be explained and supported in more detail.

USACE Response: Adopted

Action Taken: USACE concurs that some assumptions used in the evaluation of alternatives needed to be further explained and supported in more detail. In the refined report data has been updated, sections revised and inconsistencies reconciled.

A discussion has been added to Section 3 that describes the rationale for using the erosion rates published by Williams (1992). As stated in Appendix L, Section L3.2, the average long-term (1956–1988) rates of shoreline change developed for individual islands based on the atlas of shoreline changes in Louisiana by Williams et al. (1992) were used in this study. It was assumed that these historic rates apply to current conditions and during the 50-year period of analysis. Section L3.2 has been revised.

Section 3.6.3.3 of the report has been updated to include a discussion of wave height and storm surge mitigation based on a pilot study conducted by Stone et al. (2003). Stone et al. (2003) examined the effect of the Isles Dernieres barrier island chain on wave height and storm surge. It can be reasonably inferred that the Recommended Plan will reduce weather-induced erosion on the marshes north of Whiskey Island. Historical island dimensions were reviewed and analyzed and utilized in the determination of the appropriate height and width of a functioning barrier island in this area. The study learned that overwashing is an important barrier island function. Restoration of ecologic function of the barrier islands includes vegetating both the restored dunes and back barrier marsh platforms with native plants to provide wetland habitat for a diverse number of plant and animal species and to help retain sediment. This approach is supported by the Wetland Value Assessment (WVA) methodology, which has been chosen as the model to evaluate the ecosystem restoration project benefits. The WVA methodology states that the key habitat components--dune, supratidal (beach), and intertidal (marsh)--combine to provide the optimum metric by which the islands should be compared (CWPPRA, 2002).

8. IEPR Comment –Medium Significance: The role of barrier islands in enhancing and protecting mainland socioeconomic and business benefits is understated.

USACE Response: Adopted

Action Taken: USACE concurs that the role of barrier islands in enhancing and protecting mainland socioeconomic and business benefits was understated. The report was revised to address the socioeconomic interdependencies between the Terrebonne barrier islands and the adjacent communities. A narrative was added to Section 4.2.15 (Socioeconomics and Human Resources) that discusses the socioeconomic benefits of the Terrebonne Islands. The narrative highlights the importance of commercial fishing and the oil/gas industry to the surrounding communities. As the Terrebonne barrier islands and associated marshes diminish and disappear, the ecosystem for which they provide the habitat diminishes, and the opportunities for the people whose livelihoods depend on that ecosystem also diminish.

9. IEPR Comment: The Terrebonne report should explain that, although the objectives of the Terrebonne project will be met by the Tentatively Selected Plan (TSP) on a local scale, the project will not fully meet the LCA objective of restoring the geomorphologic form and function of the Terrebonne Basin barrier islands.

USACE Response: Adopted

Action Taken: USACE concurs that further discussion should be added to the report to discuss how the Recommended Plan will meet objectives. The plan was further formulated with the goal of making the best recommendation for the entire barrier island system because the system provides a multitude of benefits to the bay behind it. The recommended plan has been revised

from only recommending restoration of Whiskey Island, to additionally recommending the restoration of Raccoon Island, Whiskey Island, Trinity Island, and Timbalier Island. The four-island revised Recommended Plan meets the LCA objective of restoring the geomorphic form and function of the Terrebonne Basin barrier islands.

Action to Be Taken: The feasibility level monitoring and adaptive management plan will be refined in the preconstruction, engineering, and design (PED) phase. The PED revision will consider expanding the monitoring plan to better assess physical processes that govern the geomorphologic changes of the islands.

10. IEPR Comment –Medium Significance: The justification for parameter selection and model calculations as well as information on validation and application of the Wetland Value Assessment (WVA) models should be provided.

USACE Response: Adopted

Action Taken: USACE concurs that justification for the model parameter selection and model calculations as well as information on validation and application of the WVA models need to be better documented in the report. A reference to the WVA Barrier Island Community Model manual has been added to the report so that the reader will be able to access information regarding model development and parameterization. In addition, a Project Information Sheet (PIS) has been drafted by USFWS and is included Appendix B (USFWS Coordination Act Report) to detail the input parameters and assumptions for each variable in the WVA model. The variables are defined in Section 3.5.1 (Benefits Analysis). The PIS will also include the suitability indices (SI) for each target year and the rationale for their selection.

Habitat Suitability Index models, by definition, are intended to provide an index to habitat quality for a specified species or community. The Barrier Island model was developed with detailed consideration of peer reviewed scientific literature, existing data bases, as well as professional experiences. In addition, unpublished ecological studies and data sets, as well as professional judgments from many different federal and state agency personnel and academics were considered in developing and supporting the assumptions, variables, and other model components.

Action to Be Taken: Monitoring efforts proposed in the Monitoring and Adaptive Management Plan will be used to validate the model for future use in this project and other coastal Louisiana projects.

11. IEPR Comment –Medium Significance: The construction design and expected performance of the TSP should be described in greater detail.

USACE Response: Adopted

Action Taken: USACE concurs that greater detail should be used to describe the construction design and its expected performance.

A discussion of the construction considerations has been expanded to include construction sequencing. Evaluation of the island performance with renourishment has been included

throughout Section 5. A discussion of vegetative planting was added to Sections 3.6.7.2 and 3.6.7.3.. The discussion of the recommended plan in Section 3 has been expanded to qualitatively emphasize the impacts of not implementing the recommended plan. Section 3.6.3.3 of the report has been updated to include a qualitative discussion of wave height and storm surge mitigation based on a pilot study conducted by Stone et al. (2003). Stone et al. (2003) examined the effect of the Isles Dernieres barrier island chain on wave height and storm surge.

Action to Be Taken: During PED, the Recommended Plan will be further refined, addressing items such as monitoring, adaptive management and the cost associated with it.

12. IEPR Comment –Medium Significance: The description of the scope and cost-sharing for the Adaptive Management and Monitoring Plan requires additional detail, and the projected costs for its administration may be underestimated.

USACE Response: Adopted

Action to Be Taken: USACE concurs that costs for the adaptive management program may be underestimated. The draft document may have displayed errors in the projected cost. The team performed further reviews and corrected the mistakes in the final report. The monitoring and adaptive management plan will be further refined in the Preliminary Engineering and Design phase.

13. IEPR Comment –Medium Significance: The Abstract and Executive Summary (ES) should be expanded to include more specific descriptions of the TSP and NER plan and the Terrebonne main report should include graphic illustrations of these plans.

USACE Response: Adopted

Action Taken: USACE concurs that the report should include additional graphic illustrations. The report has been expanded with more specific descriptions of the Recommended/NER plan with graphic illustrations in the Executive Summary. Section 3 has been revised to identify the acreage of existing habitat that will be covered with fill during project construction. Also in Section 3, a brief discussion has been added stating that the CE/ICA analysis did not support a seven-island NER plan.

14. IEPR Comment –Low Significance: The approach used to calculate habitat acres created at Year 1 and subsequent years should be explained in more detail including whether the number of acres calculated includes existing habitat.

USACE Response: Adopted

Action Taken: USACE concurs and has provided expanded detail on the approach used to calculate existing and future habitat acres. Habitat acres were calculated using AutoCAD and are included as an additional summary provided in Main Report, Tables 3-8 through 3-16 and Appendix K, Tables K1-1 through K1-9. The study determined the number of acres of dune, supratidal, and intertidal habitat across the following target years: (TY): TY0, TY1, TY5, TY10, TY20, TY30, TY40, and TY50. Initial construction templates (TY1) were evolved in time to account for erosion and relative sea-level rise.

15. Comment –Low Significance: Information from the risk and uncertainty (R&U) analysis in Appendix L-5 should be brought forward into the main body of the Terrebonne report.

USACE Response: Adopted

Action Taken: USACE concurs that the summary of the risk analysis process and methods should have been included. In the final report a table showing the relationship and comparison of the 50%, 80%, and 100% confidence levels for contingency and associated project cost projections was added to Section 3.9.4. In addition, Table 3-51 shows cost, contingency, and fully funded cost of the Recommended Plan for each project element.

16. Comment –Low Significance: Minor editorial and technical revisions to the Terrebonne report should be made to improve the quality of the report.

USACE Response: Adopted

Action Taken: USACE concurs that there were minor editorial and technical revisions needed to the draft report. A technical review of the draft report has been performed and the issues identified have been resolved.

Medium Diversion at White Ditch

The LCA Medium Diversion at White Ditch (MDWD) project area is located on the east bank of the Mississippi River south of New Orleans in Plaquemines Parish near the town of Phoenix, Louisiana. The area includes a portion of the Breton Sound basin framed by the Mississippi River and the River aux Chenes ridge as well as the gulfward extent of the Breton Sound. The recommended plan, , which is also the national ecosystem restoration plan, will restore the supply and distribution of freshwater and sediment disrupted by the construction of the Mississippi River and Tributaries flood control system and the subsequent isolation of the area from Mississippi River flooding. The recommended plan includes a 35,000 cfs capacity gated box culvert diversion on the Mississippi River, with a delivery channel to be constructed in the vicinity of Phoenix, Louisiana.

The Panel generally agreed on its “assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used” (USACE, 2010; p. D-4) in the White Ditch report. In particular it is the Panel's opinion that the document sections and appendices related to economics were very well written, provided useful details about underlying costs and expected environmental outputs, and presented convincing arguments in support of plan selection. The Panel generally agreed that the project is technically sound, although some important details are missing as noted in the Final Panel Comments outlined below. Resolution of IEPR comments was achieved through a final teleconference between the PDT and IEPR team and appropriate revisions and additions were made to the report.

Overall, 19 Final IEPR Panel Comments were identified and documented on the LCA 7006(e)(3) Medium Diversion at White Ditch project. Four comments have been identified as High Significance, 7 comments as Medium Significance, and 8 comments as Low Significance.

1. IEPR Comment - High Significance: A systems analysis examining the cumulative effects of the existing and proposed diversion projects should be included to determine impacts that site-specific diversion operations will have on the overall system.

USACE Response: Adopted

Action to be taken: USACE concurs that a systems analysis examining the cumulative effects of the existing and proposed diversion projects should be performed. The effort described is scheduled to be undertaken by the USACE and the State of Louisiana as part of a future LCA project called the LCA Hydrodynamic Study. This study will evaluate multiple diversions on the Lower Mississippi River as a system. It will evaluate minimizing adverse impacts while seeking to provide benefits to the surrounding ecosystems. When complete, the separate study will aid all current and upcoming ecosystem restoration projects along the Lower Mississippi River. Reference of this study was added to the report.

The LCA Hydrodynamic Study has not been started, and therefore success measures have not been developed. Detail of how success measures will be evaluated is beyond the authorized scope and ability of the MDWD team to provide at this time.

2. IEPR Comment - High Significance: Documentation on the Boustany model is needed to determine whether the model is being appropriately applied.

USACE Response: Adopted

Action Taken: USACE concurs that additional documentation on the Boustany model should be added to the final report. The report was revised to include a comprehensive write-up that discusses modeling assumptions, input parameters, limitations, and their implications on plan formulation. This discussion includes how the ERDC-SAND2 model was used to run the Cost Effectiveness/Incremental Cost CE/IC analysis. This write-up was inserted as an Annex to the Engineering Appendix (Appendix L). The write-up includes an overall methods discussion. In addition, text was added in Chapter 3 to better explain the ERDC-SAND 2 model and its role in the project. The risk and uncertainty involved with the model was discussed in more detail, in addition to example projects that detailed the model's effectiveness near the project area. Additional references were also added to the report in appendix L to provide clarification of the accuracy and appropriateness of the model.

3. IEPR Comment - High Significance: The potential for substantial colonization of exotic and invasive species does exist and the approach to control these species as described in the White Ditch report is not feasible.

USACE Response: Adopted

Action Taken: USACE concurs that additional discussion of exotic and invasive species should be added to the report. Control of water hyacinth is considered in the adaptive management and monitoring plan and will be appropriately addressed as needed. At this stage, the primary measure to control invasive plant species is the proposed operation regime, which has been refined to a pulse scheme meant to minimize the proliferation of nuisance aquatic plants. Other measures will be considered and employed as needed. After IEPR review, a statement was added affirming that these measures will be considered in adaptive management actions where necessary and appropriate. No action to manage invasive species has been dismissed.

For clarification, Section 3.2.5 and table 3.3 list the reasons for eliminating prescribed burning and chemical control from detailed evaluation of measures that were considered for alternative formulation. However, as noted in Section 3.1.2 of the Conceptual Ecological Model report, these were not eliminated from the suite of potential actions available for control of invasive plants in the adaptive management plan.

The text in Section 5.7 was expanded to included the statement that nutria currently exist in the project area and would be expected to continue to negatively impact marsh vegetation under the no-action alternative as well as the action alternatives. While the benefits of the proposed diversion to native wetland plants would also incidentally increase habitat for nutria, the combined effects of fresh marsh restoration and the existing Louisiana Department of Wildlife and Fisheries nutria control (bounty) program should act to reduce potential negative effects of nutria herbivory by encouraging the proliferation of the two natural predators of nutria - alligators and human hunters.

4. IEPR Comment - High Significance: The Monitoring and Adaptive Management Plan provides adequate description of the monitoring and reporting systems and their costs, but little information on the potential range of adaptive management options and related costs.

USACE Response: Adopted

Action Taken: USACE concurs that the Monitoring and Adaptive Management Plan will need to be further revised to provide more detail, including further refining adaptive management options and costs. Feasibility level costs for adaptive management have been developed for the recommended plan and Section 7.2 of Monitoring and Adaptive Management Plan was expanded to clearly articulate how operations can be modified to manage negative outcomes, if potential negative outcomes should occur.

Due to the nature of this project, most adaptive management would focus on operation of the structure and costs for adaptive management are included in the recommended plan costs. As more is learned about sediment dispersal and marsh response, the operation can be adaptively managed to maximize project objectives.

Action to be Taken: During PED, the objectives section of Monitoring and Adaptive Management Plan will be refined and costs projections will be further refined. Additionally, better survey data and more refined modeling from the river and marsh will be available. Predicting specific adaptive management options and their associated costs would be appropriate at that time. The specifics of the design will become more refined as the plans are further developed. As more knowledge is gained on the refinement of the design, cost estimates will also be refined

5. IEPR Comment - Medium Significance: More information about the sources of the cost and environmental output figures used in the Cost Effectiveness/Incremental Cost Analysis (CE/IC) (Appendix K) needs to be provided.

USACE Response: Adopted

Action Taken: USACE concurs that more discussions should be added to the report regarding the CE/IC. This description was added to Section 3.5.3 of the Public Review Draft. The detailed estimate was completed after the CE/IC analysis in accordance with Corps engineering regulations. In the public review draft the WVA outputs reference the USFWS Coordination Act Report in Appendix B.

As discussed with Comment #2, the report was revised to include a comprehensive write-up that discusses modeling assumptions, input parameters, limitations, and their implications on plan formulation. This discussion includes how the ERDC-SAND2 model was used to run the Cost Effectiveness/Incremental Cost CE/IC. This write-up was inserted as an Annex to the Engineering Appendix (Appendix L). The write-up includes an overall methods discussion. In addition text was added in Chapter 3 to better explain the ERDC-SAND 2 model and its role in the project. The risk and uncertainty involved with the model was discussed in more detail in addition to example projects that detailed the model's effectiveness near the project area. Additional references were also added to the report in appendix L to provide clarification.

6. IEPR Comment – Medium Significance: The hydrology discussion is not complete, and the links between the hydrology and vegetative communities need to be explained.

USACE Response: Adopted

Action Taken: The USACE team concurs that additional information should be added to provide an overview of the linkage between hydrology and vegetative communities. This information was developed and was inserted into the report. This focused on estuarine drivers and processes. Seasonal tidal ranges and frequency of storm surges were added to Section 4.2.2. River stages and citations of river flows were also added. A statement was included in Section 4.2.3 concerning baseline salinity values in the project area. Maps were added to show existing salinity regime and salinity regimes under the proposed alternative. Maps were also added to compare and contrast the existing salinity conditions with the Recommended Plan.

7. IEPR Comment - Medium Significance: A planning objective of the White Ditch project is to design and operate the diversion in a manner that minimizes deposition and shoaling in the river, but details of how this will be accomplished are not provided.

USACE Response: Adopted

Action Taken: USACE concurs that additional discussion could be added to the report regarding induced shoaling. The induced shoaling planning “constraint” is to be avoided if possible. The dredging that will occur every ten years will occur in the channels within the project site itself not the Mississippi River. The main report was revised to address this issue based on the best available information. In 8.1 it is recommended that, as further information consistent with the reviewer’s recommendations for resolution is gathered during PED, design be refined to avoid and minimize shoaling, if necessary.

A statement was added to Section 3.8.1 to clarify that “If further analysis determines that the project increases maintenance dredging requirements for the Mississippi River, Baton Rouge to the Gulf of Mexico Project by inducing shoaling, the incremental costs of any additional maintenance dredging would be a 100 percent non-Federal responsibility.”

8. IEPR Comment - Medium Significance: The processes contributing to relative sea level rise, and the variability in processes other than global sea level rise, require further discussion and consideration.

USACE Response: Adopted

Action Taken: USACE concurs, and Section 3.4 was updated to discuss in detail the processes affected by the project. It explains their inter-relationship and how the project will influence them. Relative Sea Level Rise has been approximated for the project area and the information is available in the report. Relative Sea Level Rise considers sea level rise, organic and inorganic accretion, and subsidence in its total. Section 3.4.1 goes into detail on what would be expected to occur in a Future Without Project Scenario. Additionally, sub-section 3.5.5.3 was expanded with a table that shows the alternatives and their expected performance versus the various relative sea level rise scenarios over a 50 year planning horizon. A discussion of sea level rise in the future under different relative sea level rise scenarios is included in section 5.2.1.

Accretion rates were requested during ATR review and in IEPR. Because of the complexities involved with an estuarine system, it was determined that the ERDC-SAND 2 provides a much more robust analysis of overall project processes than accretion rates alone. The ERDC-SAND2 model considers all of the factors involved with accretion. Details on the ERDC-SAND2 and Salinity Regimes can be found in Appendix L. Details on the WVA can be found at the end of Appendix B. Additionally, Section 5.3.2.2.1 was revised to more accurately and adequately explain the anticipated changes to salinity regimes based on a year-long modeling run.

9. IEPR Comment - Medium Significance: More quantitative indices for each variable within the Wetland Value Assessment (WVA) model need to be provided.

USACE Response: Adopted

Action Taken: USACE concurred that more detail was needed. Text from the LCA Programmatic Environmental Impact Statement and the associated references were added to Section 3.5.2. A paragraph was added to “Community Model Variable Selection” under Section 3.5.2 that lists the variable types and initial settings of the WVA. Baseline values are given in the WVA appendix to the USFWS Coordination Act Report (Appendix B). References to other models that were used to parameterize this model in Section 3.5.2 were added.

10. IEPR Comment – Medium Significance: Lessons learned from related previous and ongoing diversion efforts, and how these data were considered in the assessment and comparison of proposed project alternatives, should be provided.

USACE Response: Adopted

Action Taken: USACE concurs that additional information should be added to the report. A table was added to Chapter 1 that contains detailed information related to similar and on-going projects and how this information was used in defining the White Ditch project. Table 1.1 presents the relevance of prior studies, reports, programs, and water projects to the MDWD Feasibility Study.

During the development of the MDWD Feasibility Report, a separate and unrelated decision was made to close the West Bay Diversion. Many of the lessons learned from West Bay were applied to the MDWD project and used to influence the operational controls and recommended operational regime.

The ERDC-SAND2 was used to predict the effectiveness of each of the final alternatives at building marsh. In order to gage the model’s effectiveness and accuracy, expected results from the Caernarvon Diversion were compared with actual observed results. This information confirmed that the model is accurate and was a good fit for the Breton Sound Basin, where the White Ditch diversion will be. This publication is provided in Appendix L.

11. IEPR Comment - Medium Significance: A more detailed description and justification of the irreversible and irretrievable commitments of resources is required to determine their significance.

USACE Response: Adopted

Action taken: USACE concurs that a more detailed description and discussion, to specifically identify what the permanent impacts from construction of the proposed diversion are expected to be and the magnitude and spacial extent of these impacts, is needed in the report. A paragraph specifically listing the types and magnitudes of these impacts to resources expected to occur as a result of the proposed project was added to Section 5.19 of the report. A description of potential Best Management Practices to minimize these impacts to resources was also expanded.

12. IEPR Comment - Low Significance: The reason for identifying a very specific numeric target for Objective C (1,328,580 cubic yards (cy)) is not clear, nor is it clear that this target is met by the Tentatively Selected Plan (TSP).

USACE Response: Adopted

Action taken: USACE concurs that a discussion of the numeric target should be further addressed in the report. The 1.3 million cy figure is the quantity of sediment required to offset the loss of 274.5 acres per year. Based on the available survey data, the average depth of open water in the study area is 2 ft. with approximately 1 ft. of soil structure above water required to support healthy marsh. This total of 3 ft. of soil structure is assumed to be needed to support healthy marsh in the future. The 1.3 million cy figure is the volume of sediment needed to fill the 274.5 acres to an average depth of 3ft. This discussion was added to 2.4.3 Desired Future Conditions of the Public Review Draft. The numeric target is correct in both cases referenced by the reviewers. However, one utilized “dry” sediment and the other “wet” or bulked sediment. New language was added to Section 3.9.6. Numeric target has been revised to 1.3 million Cubic Yards.

13. IEPR Comment - Low Significance: The model calibration analysis should be revised when more accurate data are available.

USACE Response: Adopted

Action to be Taken: USACE concurs that the model analysis should be revised as more data becomes available. The model will continue to be recalibrated with the updated data in the ensuing phases. The recalibration of the model will not affect the plan formulation and selection of the recommended plan. A qualified geomorphologist that is familiar with the region will review the model setup for consistency with known marsh characteristics relative to inundation and salinity regimes. A graphic showing modeled base-case has been added to the revised version of the Engineering Appendix (L).

14. IEPR Comment - Low Significance: The Real Estate Plan (Appendix J) requires an explanation of the source of the per acre real estate easement, acquisition costs and cost adjustment factors that were used to generate Total Real Estate Costs

USACE Response: Adopted

Action Taken: USACE concurs that the Real Estate cost details should be presented in Appendix J. The 'unit costs' used to generate Total Real Estate Costs were derived from a Gross Appraisal that was performed in November 2009. Information used in the Gross Appraisal was obtained from the Parish Assessor's office, comparable sales, and interviews with local

appraisers and landowners. The Sales Comparison Approach was used in the appraisal to derive current fair market value. Appendix J contains all pertinent details related to Real Estate costs.

15. IEPR Comment - Low Significance: The basis of the estimates of incidental recreational benefits associated with the alternatives that are presented in Section 3.5.5.1 of the White Ditch report and referenced back to Annex 1 of Appendix K need to be explained.

USACE Response: Adopted

Action Taken: USACE concurs that the basis of the estimates of incidental recreational benefits associated with the alternatives that are presented in Section 3.5.4.1 of the White Ditch report and referenced back to Annex 1 of Appendix K need to be explained. Appendix K was revised to remove this reference and a complete discussion is included in Annex1. The report was also revised to better explain the differences in net present value of the four alternatives, subjective interpretations of data and assumptions.

16. IEPR Comment - Low Significance: It is not clear whether potential impacts associated with the proposed flow constrictors have been fully considered.

USACE Response: Adopted

Action Taken: USACE concurs that the report was not clear on whether potential impacts associated with the proposed flow constrictors were fully considered. It was determined the inconsistent naming of this feature type was part of the issue. The text of the entire report, including figures, was updated to reflect the new naming of the structures as “notched weirs”.

Early in alternative development it was recognized that maintaining fisheries access was a planning constraint. As a result of the IEPR comment, text was added to explain why maintaining ingress/egress access to the marsh is important to fisheries. The potential impacts to fisheries resources by notched weirs (flow constrictors) was addressed and expanded in direct impacts discussion 5.9.2 thru 5.9.5 and 5.10.2 thru 5.10.5. A statement was added to several direct impacts discussions that the notched weirs are not expected to block boat access to or from River aux Chenes.

17. IEPR Comment - Low Significance: The overarching problems motivating the White Ditch project, their magnitude, and the need for project implementation should be clearly and specifically stated in an introductory paragraph.

USACE Response: Adopted

Action Taken: USACE concurs that the introductory paragraph should be revised. The Executive Summary of the report was revised to clearly state the problems, specifically identify the magnitude of the problems, and clearly articulate the value of constructing the project to resolve the problems.

18. IEPR Comment - Low Significance: The discussion of fulfilling project goals and objectives is not complete.

USACE Response: Adopted

Action Taken: USACE concurs and Section 3.9.7 of the main report was revised and expanded to include all appropriate details on how the project fulfills the project goals and objectives.

19. IEPR Comment - Low Significance: The report and appendices should receive a technical review that includes linking data presented in the White Ditch report with specific tables in appendices where the data were developed, and a map detailing the locations of all significant projects and features.

USACE Response: Adopted

Action Taken: USACE concurs and the final report underwent a technical review to ensure consistency and provide clarity.