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U.S. ARMY CORPS OF ENGINEERS
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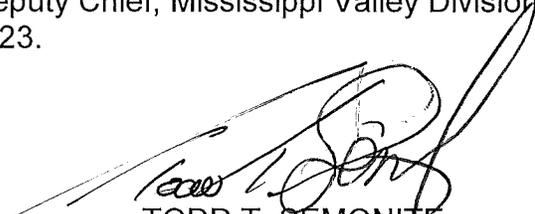
CECW-MVD

MEMORANDUM FOR ASSISTANT SECRETARY OF THE ARMY (CIVIL WORKS)

SUBJECT: Southwest Coastal, Louisiana, Hurricane and Storm Damage Risk Reduction and Ecosystem Restoration - Final Agency Response to Independent External Peer Review

1. An Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, Engineering Circular (EC) 1165-2-214, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).
2. The IEPR was conducted by Battelle Memorial Institute. The IEPR panel consisted of five panel members with technical expertise in civil works planning, economics, biology/environmental, hydrology/hydraulic engineering, and civil/geotechnical engineering.
3. The enclosed document contains the approved final written responses of the U.S. Army Corps of Engineers (USACE) to the issues raised and recommendations contained in the IEPR Report. The IEPR Report and final written USACE responses will be posted on the Internet, as required by EC 1165-2-214.
4. If you have any questions on this matter, please contact me or have a member of your staff contact Joe Redican, Deputy Chief, Mississippi Valley Division Regional Integration Team, at (202) 761-4523.

Encl



TODD T. SEMONITE
Lieutenant General, USA
Commanding

**Southwest Coastal Louisiana Feasibility Study
Integrated Draft Feasibility Report/Environmental Impact Statement
U.S. Army Corps of Engineers Response to Independent External Peer Review
July 2016**

Independent External Peer Review (IEPR) was conducted for the subject study in accordance with Section 2034 of the Water Resources Development Act of 2007, Engineering Circular 1165-2-214, and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (2004).

The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide scientifically sound, sustainable water resources solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people. Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for the USACE was engaged to conduct the IEPR of the Southwest Coastal Louisiana Feasibility Study, Integrated Draft Feasibility Report/Environmental Impact Statement (IDFR/EIS).

The Battelle appointed an IEPR panel to review the draft report and supporting documents that was issued on December 20, 2013. The Final IEPR Report was issued in October 2015. Eighteen comments were documented with two comments identified as having medium/high significance. Ten comments were identified as having medium significance, and six comments were low significance. The following discussions present the final responses to these comments.

The Southwest Coastal Louisiana Feasibility Study is a Hurricane Storm Damage Risk Reduction and Ecosystem Restoration study that evaluates opportunities to implement a risk reduction system and ecosystem measures in southwest coastal Louisiana. These opportunities include features such as levees, floodgates, nonstructural risk reduction measures, marsh restoration, shoreline protection, and chenier reforestation

- 1. Comment –*Medium/High Significance*: The accuracy of the hydrologic and hydraulic modeling underpinning of the analyses is not well-described and documented, and it is unclear how inaccuracies may affect estimates of the relative performance of National Economic Development (NED) alternatives.**

The comment details that there is insufficient documentation to assess the soundness of the H&H methods and models, and whether the H&H analyses provide reasonably accurate estimates of risk and relative performance of structural and non-structural plans. This comment includes two recommendations for resolution; one was adopted and one was not adopted.

Recommendation 1 - USACE Response: Adopted

Action Taken: The IEPR panel recommended that the report provide additional documentation on the accuracy of the H&H models and how modeling inaccuracies could affect the relative performance of NED plans.

Additional discussion was included in the final report (Chapter 4) and the Climate Preparedness and Resilience Register (Appendix O) to explain that even though the study area is particularly susceptible to the effect of relative sea-level rise (RSLR), H&H modeling inaccuracies were not viewed as detrimental to the overall objective and intent of the study. Additional documentation explained that an over-estimation of stage/damages would not likely undermine the plan justification (see Appendix O).

Recommendation 2 - USACE Response: Not Adopted

The IEPR panel also recommended conducting scenario analysis and/or sensitivity analysis to assess how H&H modeling inaccuracies could have affected the relative performance of various plans and the extent of structures

included in the non-structural NED TSP, and describe the implications in the Engineering Appendix. At the time of the release of the draft report, conducting scenario analysis and/or sensitivity analysis to address uncertainties was not warranted. Data and assumptions used to analyze the alternatives were consistent throughout the process and were expected to affect each of the alternatives in the same way and thus not provide an advantage or disadvantage to any particular alternative.

Some uncertainties were removed based on the additional data collected under the feasibility-level of design analysis. The report was revised to update the uncertainties summarized in Chapter 4. The study determined that new information collected to resolve uncertainties would not have changed the TSP decision. Minor changes to the TSP, such as cost increases or decreases, were documented in Section 4.1.9 of the final report.

- 2. Comment – *Medium/High Significance*: Many property owners, especially those who are part of vulnerable populations, may not be able to meet the criteria for qualifying for non-structural measures and associated Federal assistance.**

The comment details that the criteria for eligibility to participate in the NED TSP and associated expenses may discourage the participation of property owners and may place members of vulnerable populations at a significant disadvantage. This comment includes three recommendations for resolution and all were adopted.

Recommendations 1, 2, and 3 - USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) that an appendix be created with more detail on the steps required for the public to participate in the TSP, including in layman's terms on how property owners may go about fulfilling the requirements, (2) that examples of the expenses that a property owner can expect to incur under various scenarios be included, and (3) that the appendix describe methods for assisting members of vulnerable populations in meeting the eligibility criteria (such as the removal of hazardous, toxic, or radioactive waste (HTRW)).

The final report includes a Nonstructural Implementation Plan (Appendix L) and contains information about the eligibility criteria and other conditions (such as the presence of HTRW) a homeowner must meet in order to participate in the project. Both the final report and Appendix L include plain language to better explain what must be done by property owners in order to qualify for nonstructural measures and also included general types of expenses a property owner could expect to incur under various scenarios.

- 3. Comment – *Medium Significance*: The omission of the flood damage reduction benefits to nearly one-third of the industrial properties may have narrowed the extent of the NED TSP.**

The comment details that omitting the benefits to the 27 non-responding industrial facilities may have contributed to the elimination of NED TSP structural measures, the inclusion of which could have led to a further reduction in the economically justified risk of flood damages and losses in the study area. This comment includes two recommendations for resolution, both were not adopted.

Recommendations 1 and 2 - USACE Response: Not Adopted

The IEPR panel recommended that the study (1) calculate the flood damage reduction benefits from structural measures to the 27 non-responding industrial facilities by using the information provided by the 44 responding facilities, and (2) re-calculate the BCRs of the structural measures by including the flood damage reduction benefits to all 71 industrial facilities.

The NED recommended plan did not include any industrial facilities. Those facilities that did respond to the initial query for information were found to produce few if any NED benefits because they generally had provisions in place for risk management. Examples of these provisions include berms around facilities and

elevated structures (structures either raised on pilings or on earthen material brought in.) In addition, many facilities required water access for navigation rendering them largely cost inefficient, or technically infeasible, for application of risk reduction measures. This was also apparent of many non-responding facilities through observation. As a result industrial facilities were dropped from consideration.

- 4. Comment – *Medium Significance*: The implementation of the NED TSP alternatives is at risk due to lack of support for the involuntary participation/eminent domain aspect of the non-structural measures, and long-term commitments on the part of the non-Federal sponsor and local entities may not be realized.**

The comment details that the NED TSP plan may not be fully implementable due to public and political opposition to involuntary participation in the non-structural measures, and the risk that the expected benefits may not be realized is not fully explained in the Draft IFR/EIS. This comment includes three recommendations for resolution; two of which were adopted and one that was not adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action Taken: The IEPR panel recommended that study (1) provide a full summary in the Draft IFR/EIS of the risk associated with lack of participation in the NED TSP, including a discussion of the information gleaned from stakeholder and public comments, and (2) consider summarizing several sensitivities showing benefits that can be achieved using various percentages of voluntary participation that are less than 100%.

The report was revised to update the participation rate uncertainties summarized in Chapter 4. Investment in the voluntary nonstructural recommended plan would only be made for those structures volunteering to participate, as a result there is little associated risk in a reduced level of participation. The evaluation of the available structure by structure cost and economic data verified that reduced levels of participation would result in a corresponding and essentially linear change in project costs and benefits. With costs and benefits reduced in a generally uniform manner the project BCR and justification would not be effected and therefore would not change the TSP decision. Discussion of these uncertainties are documented in Section 4.1.9 of the final report.

Recommendation 3 - USACE Response: Not Adopted

The third recommendation, (3) discuss the impact of failure on the part of local entities to implement local long-term commitments such as enforcement of easements, covenants, and control agreements in terms of potential reduced benefits, was not adopted. The final report includes a discussion of the Hazard Mitigation plan put in place by each of the three Parishes in the study area. Each of these plans were updated in 2015 and were found to be consistent with the study objectives and supportive of the NED recommended plan. A summary of the Parish hazard mitigation plans can be found in Section 4.2.9. Although any failure by local entities to enforce requirements under the National Flood Insurance Program was not discussed in the report, lack of enforcement would not necessarily undermine the project benefits. Project benefits are accrued upon each individual structure raising and therefor are generally independent of any potential failure of local enforcement of requirement under the National Flood Insurance Program.

- 5. Comment – *Medium Significance*: The validity and potential implications of the NED TSP assumption that 100% of homeowners will participate in voluntary structure-raising are not well-documented.**

The comment details that if the 100% participation rate is not met, the ability of the NED TSP to achieve the project goals may be affected. This comment includes two recommendations for resolution, both were not adopted.

Recommendations 1 and 2 - USACE Response: Not Adopted

The IEPR panel recommended that the study (1) review the literature and the experience of other comparable projects to determine a probable “realized” participation rate perform a quantitative analysis of the residual risk to resident’s lives and to evacuation infrastructure under each alternative, and (2) conduct an analysis of the impact of the “realized” rate on the BCR to determine the sensitivity of participation levels.

The use of a 100% participation rate affords the identification of the maximum extent of the recommended plan. The 2012 State Master plan projects an estimated participation rate of 85%. The evaluation of the available structure by structure cost and economic data also verified that reduced levels of participation would result in a corresponding and essentially linear change in project costs and benefits. With costs and benefits reduced in a generally uniform manner the project BCR and justification would not be effected and therefore would not change the TSP decision. General discussion of the participation rate variability is documented in Section 4.1.9 of the final report.

- 6. Comment – *Medium Significance*: The single management measure selected for hydrology and salinity control in the National Ecosystem Restoration (NER) TSP may not be sufficient to achieve the salinity objective, and the process used to select that measure is not sufficiently described.**

The comment details that the absence of a clear rationale for selecting the Cameron-Creole Spillway (measure 74a) as the sole H&S control measure in the TSP, as well as insufficient analysis supporting the performance of this measure in achieving the specific salinity targets in Planning Objective #2, increases the uncertainty that the salinity issues are adequately addressed. This comment includes two recommendations for resolution that were adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action Taken: The IEPR panel recommended that (1) the study explain in the report the rationale and process used to reduce the 49 H&S control measures in the Hydrologic and Salinity Control to the one measure included in the NER TSP (Cameron-Creole Spillway [feature 74a]), and (2) provide in the report analysis or evidence indicating that the Cameron-Creole Spillway (feature 74a) has a reasonable likelihood of achieving Planning Objective #2.

The PDT determined that additional evaluation was required to verify the selection and performance of the Cameron-Creole Spillway (feature 74a). The final report did not recommend this feature for construction but did include a recommendation for additional study of the Hydrologic and Salinity Control measures.

- 7. Comment – *Medium Significance*: The voluntary nature of adopting changes to local building codes and zoning regulations pose an unacknowledged risk of not achieving the NED TSP benefits.**

The comment details that there is no recognition in the Draft IFR/EIS that the NED net benefits of the TSP may not be achieved due to reliance on the voluntary nature of two of the six measures in the NED TSP. This comment included one recommendation for resolution that was not adopted.

Recommendation 1 - USACE Response: Not Adopted

The panel recommended acknowledging in the report that there is a risk that the anticipated NED TSP benefits from reduction in damages from hurricane and storm surge flooding might not be realized because implementation of two of the six measures of the NED TSP rest with voluntary actions of local government over which USACE or the NFS have no control.

USACE acknowledge that measures 4, 5 & 6 are voluntary in nature but explained that since no NED benefits were claimed by the USACE for implementation of the local government controlled land use regulation changes that the USACE cannot control, there is no error in the calculated NED benefits. In addition, the final report includes a discussion of the hazard mitigation plans put in place by each of the three Parishes in the study area. Each of these hazard mitigation plans were updated in 2015 and were found to be consistent with the study objectives and supportive of the NED recommended plan. A summary of the Parish hazard mitigation plans can be found in Section 4.2.9.

8. Comment – *Medium Significance*: The selection of the flood plain increments for the NED TSP appears arbitrary because no rationale is provided.

The comment details it is not clear if the current floodplain elevation increments evaluation results in the most cost-effective or comprehensive TSP, with all beneficial measures being included. This comment includes one recommendation for resolution that was not adopted.

Recommendation 1 - USACE Response: Not Adopted

The IEPR panel recommended using existing data to test the impact of different floodplain elevation increments on the chosen measures, the TSP selected, and the overall BCR.

The stages used to evaluate the floodplain increments for the NED alternative plans represent the typical levels of probability for which stages are developed. The economic evaluations are fundamentally dependent on the understanding of the probability associated a given stage condition. While an intermediate stage probability relationship could be extrapolated the greatest accuracy and reliability lies in the quantitatively established relationships. The probability increments evaluated for this study are consistent with Federal practice.

9. Comment - *Medium Significance*: The risk of funding not being available for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the TSPs is not fully explained.

The comment details the Draft IFR/EIS does not fully discuss the funding mechanism for OMRR&R or the risk that funding may not be available to fully implement OMRR&R over the life of the TSP. This comment includes two recommendations for resolution, both were not adopted.

Recommendations 1 and 2 - USACE Response: Not Adopted

The IEPR panel recommended (1) describing how funding uncertainties may affect the success of the TSP and (2) describing any Federal contingency potentially available if OMRR&R funding is absent or inadequate year-to-year.

The report explained in Sec. 4.1.8 that the non-Federal sponsor is required to perform all OMRR&R actions in order to assure the success of the project. In recognition of this requirement, the non-Federal sponsor has signed a Letter of Intent during the feasibility study (where OMRR&R needs are identified), and will also sign a Project Partnership Agreement (PPA) at construction initiation that clarifies and outlines the non-Federal sponsor OMRR&R requirements.

10. Comment – *Medium Significance*: Using Rough Order of Magnitude (ROM) for real estate and navigation feature costs may under- or overestimate the benefit-cost ratios for the non-structural program, which increases the uncertainty of selection of non-structural measures in the TSP.

The comment details that by relying on ROM estimates for some important real estate and navigation costs, the benefit-cost ratios for the TSP are less certain. This comment includes two recommendations for resolution, both were not adopted.

Recommendations 1 and 2 - USACE Response: Not Adopted

The panel recommended (1) locating available cost information on the real estate and navigation cost components and incorporating them into the analyses and report, in order to reduce reliance on rough order of magnitude cost, and (2) if more detailed costs are not available, the panel recommended conducting sensitivity analyses around the rough order of magnitude cost to determine the importance of varying cost assumptions on the benefit-cost ratios.

The report, per ER 1105-2-101, incorporated risk and uncertainty into the economic analysis. The comment on ROM real estate costs applied to the draft report recommendation which contained an involuntary acquisition component for structures located in the regulatory floodway or for structures requiring elevation greater than 13 feet above ground level. These components have since been removed from the final report. As such, the ROM real estate cost estimates that were associated with involuntary acquisition are no longer applicable. Additional information was added to the final report to explain how cost uncertainties are incorporated final certified cost.

11. Comment – *Medium Significance*: The rationale for the selection of Plan CM-4 (NER TSP) over Plan CM-2 is not well-documented.

The comment details the draft report did not provide a complete explanation (including budget constraints) for selecting Plan CM-4 as the NER TSP over Plan CM-2, which affects the completeness of the report. This comment includes one recommendation for resolution that was adopted.

Recommendation 1 - USACE Response: Adopted

Action Taken: The panel recommended providing in the report a more complete explanation of the rationale, constraints, and considerations that were used to select Plan CM-4 over Plan CM-2 as the NER TSP.

The final report explained that selecting CM-4 as the TSP was due to its cost-effectiveness. The report explained while CM-2 could be selected if the USACE and sponsor agreed it was worth the additional cost, the linear increase in costs and benefits from CM-4 to CM-2 was more a matter of determining whether or not objectives can be met with the first comprehensive plan on the cost-effective scale. Section 2.12 of the report explained that to select a plan other than CM-4, additional benefits would have to be purchased at roughly the same cost as those for the TSP.

12. Comment – *Medium Significance*: The potential that shorelines to the west of the segmented breakwaters might experience increased erosion is not discussed.

The comment details a complete understanding of the environmental consequences resulting from the segmented breakwaters is not possible without a discussion of potential effects on lee side shoreline erosion. This comment includes one recommendation for resolution that was adopted.

Recommendation 1 - USACE Response: Adopted

Action Taken: The panel recommended including in the report a brief discussion of the potential influence that construction of offshore segmented breakwaters may have on both longshore sediment transport and lee side erosion.

The final report (Sec. 3.3.1) was modified to include discussions on the potential influence of offshore segmented breakwaters on sediment transportation.

13. Comment – *Low Significance*: The influence of proposed sediment borrow pits in the Gulf of Mexico on the nearshore wave climate and the potential for induced erosion are not discussed.

The comment details that a complete understanding of the environmental consequences resulting from the proposed Gulf borrow pits in the TSP is not possible without acknowledging the potential for altered sediment transport and erosion patterns along the coastline areas in the lee of borrow pits. This comment includes two recommendations for resolution and both were adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action To Be Taken: The IEPR panel recommended (1) including in the report a brief discussion of the potential influence of proposed sediment borrow pits in the Gulf on the nearshore wave climate and erosion processes and requested that the team, and (2) analyze the potential influence on longshore sediment transport and lee side erosion resulting from the proposed sediment borrow pits in the Gulf.

Additional clarifying text about previous modeling efforts and the potential effects of borrow areas on increased erosion rates was added to Chapter 3 of the final report. Detailed modeling of specific borrow areas proposed for this study will be conducted during the PED phase. The previous modeling was cited to increase the confidence in the statement that no significant increase in wave energy or erosion processes would occur.

14. Comment – *Low Significance*: The Real Estate Appendix makes certain unsupported assumptions about the Involuntary and Voluntary Programs that could affect NED TSP implementation costs.

The comment details that while the assumptions do not affect the economic feasibility of the NED TSP, the lack of documentation affects the completeness of the Real Estate Appendix and the combined effect of these two assumptions does have a potential to affect NED TSP implementation costs. This comment includes two recommendations for resolution and both were adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) documenting the empirical basis of these two assumptions in the Real Estate Appendix, and (2) if there is no empirical basis for the assumptions, the team should perform a sensitivity analysis of the cost of the NED TSP to a reasonable range of the two percentages assumed in the Real Estate Appendix and recalculate the BCRs using the results of the sensitivity analysis.

Changes were made to the draft report that clarified assumptions about the involuntary and voluntary implementation costs based on the IEPR comment. The recommended plan in the final report does not contain any acquisitions on either a voluntary or involuntary manner (the basis for the ‘unsupported’ cost assumptions). These changes to the final recommended plan eliminate the concerns about unsupported real estate cost assumptions since no real estate will now be acquired. All costs associated with the recommended plan are either administrative costs to oversee the project or temporary relocation benefits for tenants.

15. Comment – *Low Significance*: Residual flood risk is minimally discussed and a plan for communicating the residual risk to affected populations is not included in the Draft IFR/EIS.

The comment details that the residual flood risk to structures and the public after implementation of the NED TSP should be communicated and will be important to the success of the project. This comment includes two recommendations, both were adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) including a full discussion of residual flood risk associated with the NED TSP that includes public health/safety, critical infrastructure, and evacuation capability, and (2) developing and including a plan for communicating residual risk to the public.

Appendix D of the final report discusses the residual flood risk associated with the NED TSP. The final report recommends development of a Floodplain Management Plan (FMP) as part of the NED TSP. The FMP would be developed in concert with the USACE and it is a mechanism by which residual risk can be communicated to the public. Details of the communication plan will be developed under the PED phase.

16. Comment – *Low Significance*: There is no supporting information provided for the \$100 million in mitigation costs for the structural alternatives.

The comment details that there is a lack of sourcing and rationale for the \$100 million mitigation plan which prevents the Panel from assessing the appropriateness of the costs. This comment includes one recommendation for resolution that was adopted.

Recommendation 1 - USACE Response: Adopted

Action Taken: The IEPR panel recommended providing a basis for the mitigation cost assumptions and discussing the rationale for structural feature mitigation. The original cost estimates were developed for proposed structural alternatives based upon visual inspection of habitat types potentially impacted along proposed structural alternative routes, professional judgment, experience with similar hurricane and flood risk reduction structural systems, and based on engineering assumptions of right-of-way footprints. The rough order of magnitude costs were used for screening of alternatives. Background information on the mitigation cost assumptions can be found in Sec. 2.5.4.1.

17. Comment – *Low Significance*: The Draft IFR/EIS does not explain how the Other Social Effects (OSE) ratings were constructed and how the ratings were determined.

The comment details that while OSE does not affect the selection of the NED TSP and NER TSP, completeness of the document would be improved by a thorough explanation of the metrics used and scores in Table 3-1. This comment includes four recommendations for resolution and all four were adopted.

Recommendations 1, 2, 3, and 4 - USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) defining the construction of each of the Social Factors and Metrics, (2) describing the process of scoring the four alternatives, (3) identifying who did the scoring, and (4) describing how this metric relates to the Social Vulnerability Index.

Additional detailed information explaining the development and scoring of the social vulnerability index and metrics is described in Sec. 1.2.8. More information on the background of the Other Social Effects analysis is included in the Other Social Effects Appendix that was submitted with the final report (see Appendix A, Annex P). The OSE section was prepared by the Environmental Team in accordance with Engineering Regulation (ER) 1105-2-100, Planning Guidance Notebook, ER 1105-2-101, Planning Guidance, Risk Analysis for Flood Damage Reduction Studies, Engineering Circular (EC) 1105-2-409, and follows the guidance set forth by the USACE Institute for Water Resources (IWR) in applying OSE in alternatives analysis (USACE, 2013). The handbook describes the procedures for analyzing and using OSE criteria in the planning process by identifying seven social factors that describe the social fabric of a community. The scoring for the social vulnerability index was completed in accordance with the referenced guidance. It considers multiple elements of the study area including social profile, health and safety, economic vitality, resiliency, and employment opportunities. The

scoring ranks the parish populations against each other to determine an overall social vulnerability rating. Appendix A, Annex P contains the full Other Social Effects analysis. .

18. Comment – *Low Significance*: A summary of the stakeholder and public comments received in 2015 on the Draft IRF/EIS and USACE responses have not been included in the document.

The comment details that the stakeholder and public comments received during 2015 on the Draft IFR/EIS were not summarized or addressed in the Draft IFR/EIS in compliance with NEPA. This comment includes two recommendations for resolution and both were adopted.

Recommendations 1 and 2 - USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) developing and including a full summary of all comments, grouped by theme, received on the Draft IFR/EIS and (2) including responses, by theme, to the comments.

A “Comment and Response” Appendix listing all comments received during the 20 March 2015 until 4 May 2015 comment period was included in with the final report. Responses to the comments have also been included in the final version of this appendix.

Final Independent External Peer Review Report Revisions to the Southwest Coastal Louisiana Feasibility Study

Executive Summary

PROJECT BACKGROUND AND PURPOSE

The purpose of the Southwest Coastal Louisiana Draft Integrated Feasibility Report and Environmental Impact Statement (IFR/EIS) is to develop an integrated plan for hurricane/storm damage risk reduction and coastal restoration for the southwest Louisiana parishes of Cameron, Calcasieu, and Vermilion.

The study area is located in the southwest corner of Louisiana. It covers over 4,700 square miles and consists of three parishes (Calcasieu, Cameron, and Vermilion) and three major hydrologic basins (Calcasieu/Sabine, Mermentau, and Teche/Vermilion). The dominant hydrologic features are the Calcasieu, Sabine, Neches, Mermentau, and Vermilion rivers, as well as Calcasieu, Sabine, Grand, and White lakes. Man-made channels include the Sabine-Neches Waterway, Calcasieu Ship Channel, Gulf Intracoastal Waterway, Mermentau Ship Channel, and Freshwater Bayou Canal Navigational Channel. Various water control structures in the area include the Calcasieu and Leland Bowman Locks, the Freshwater Bayou Canal Lock, the Schooner Bayou Canal Structure, and the Catfish Point Control Structure. The Gulf of Mexico coastline is another major water resource of the area. The major highways are LA Highway 82 and LA Highway 27. The Coastal Protection and Restoration Authority of Louisiana is the non-Federal sponsor. The estimated cost for a potentially recommended plan could range from the hundreds of millions to several billion dollars.

This multi-purpose study has the potential to significantly affect national economic, environmental, and social interests, simply due to the study area location. The study area is part of one of the largest expanses of coastal wetlands in the contiguous United States and is significant on a national level.

The Southwest Coastal Louisiana Draft IFR/EIS has been conducted to meet the USACE modernized planning initiative (Specific, Measurable, Attainable, Risk Informed, Timely or SMART Planning), which is to complete investigations leading to a decision in less time by using a risk-informed evaluation with less detailed information.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The U.S. Army Corps of Engineers (USACE) is conducting an Independent External Peer Review (IEPR) of revisions to and public comments on the Southwest Coastal Louisiana Draft IFR/EIS (hereinafter: Revisions to the Southwest Coastal Louisiana Feasibility Study IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Revisions to the Southwest Coastal Louisiana Feasibility

Study. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Battelle engaged four of the five panel members that had conducted the IEPR of the original Southwest Coastal Louisiana Feasibility Study in 2014: Dr. Ken Casavant, Dr. John Loomis, Ms. Kay Crouch, and Dr. Brian Bledsoe. The fifth panel member from the original IEPR (Dr. Ralph Ellis) was not required for this IEPR of the revisions because USACE stated that no changes had been made to the civil/geotechnical engineering portion of the review documents. Dr. Casavant, Dr. Loomis, and Ms. Crouch are all members of the Louisiana Water Resources Council (LWRC) Primary Panel and Dr. Bledsoe is a member of the LWRC Candidate Pool.

The Panel received electronic versions of the Revisions to the Southwest Coastal Louisiana Feasibility Study (1,322 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2014), USACE prepared the charge questions, which were included in the revised draft and final Work Plans.

The USACE Project Delivery Team briefed the Panel and Battelle during a kick-off meeting held via teleconference prior to the start of the review to provide the Panel an opportunity to ask questions of USACE and clarify uncertainties. Other than Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process. The Panel produced individual comments in response to the charge questions.

IEPR panel members reviewed the Revisions to the Southwest Coastal Louisiana Feasibility Study documents individually. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, 18 Final Panel Comments were identified and documented. Of these, two were identified as having medium/high significance, six had a medium significance, and ten had medium/low significance.

Battelle received public comments from USACE on the Southwest Coastal Louisiana Feasibility Study (approximately 440 total pages of comments) and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Revisions to the Southwest Coastal Louisiana Feasibility Study review documents. After completing its review, the Panel confirmed that no new issues or concerns were identified that warranted a separate Final Panel Comment; rather, the Panel was able to reference issues identified in the public comments in a few of the Final Panel Comments.

Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Revisions to the Southwest Coastal Louisiana Feasibility Study review documents. Table ES-1 lists the

Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the IFR/EIS is well-written and logically constructed and the Project Delivery Team is to be commended for compiling a concise yet information-rich set of documents within the constraints for the SMART planning process. The Panel did identify several elements of the project that should be clarified or revised.

Economics: From an economics standpoint, the Panel was impressed with the structure-by-structure residential analysis to determine the economic feasibility of structure raising and they recognized that this effort will likely make project implementation easier. In addition, they were complimentary on the efforts made to survey the affected industrial facilities about replacement costs and depth-percentage-damage relationships. However, the Panel had concerns because some industrial facilities did not respond to the survey and therefore some flood reduction benefits were completely omitted, perhaps contributing to the elimination of National Economic Development (NED) structural measures. The Panel believes that efforts could have been made to estimate the benefits to the non-responding facilities by treating the facilities that did respond as a non-random sample. In addition, the Panel noted that there was no acknowledgement in the Draft IFR/EIS of the risk involved in relying on the autonomous parish governments to adopt more restrictive zoning and land use regulations, which is one of the non-structural measures in the NED Tentatively Selected Plan (TSP). The Panel suggests that the Draft IFR/EIS should include a discussion of the risk that some benefits might not be realized because two of the six non-structural measures rest with voluntary actions by the parish governments. The Panel also commented on the absence of background justification for some assumptions made in the Real Estate Appendix, namely that 5% of the residences in the Involuntary Program proposed for elevation will need to be acquired and that 2% of the residences in the Voluntary Program are occupied by rental tenants. Some documentation should be added to the Draft IFR/EIS of the empirical basis of these two assumptions. Finally, the Draft IFR/EIS could benefit from an explanation of how the Other Social Effects ratings were constructed and a summary of the scoring process and how the metric relates to the Social Vulnerability Index.

Hydraulic and Hydrologic Engineering: In terms of hydraulic and hydrologic (H&H) engineering, the TSP is very holistic and will substantively contribute to NED and National Ecological Restoration (NER) goals, with the emphasis on non-structural solutions appearing to be the correct approach. The Panel also noted that the revisions include an improved discussion of risks and uncertainties related to climate change, extreme events, and model limitations. However, the Panel was concerned that there was insufficient documentation provided on the H&H modeling accuracy, including how any inaccuracies may affect estimates of relative performance of NED alternatives, which has implications for the accuracy of risk estimates of the various plans. The Panel recommends that additional documentation on model accuracy be added to the Draft IFR/EIS, as well as the results of a scenario or sensitivity analysis to determine how modeling inaccuracies might affect the relative performance of the plans, with the implications being described in the Engineering Appendix. Another issue identified by the Panel was the lack of a clear rationale for selecting the Cameron-Creole Spillway as the sole hydrologic and salinity (H&S) measure in the NER TSP; the process of prioritization and reduction of the original 49 H&S control measures to one should be explained in the Draft IFR/EIS. The Panel also noted that the rationale behind why Plan CM-4 was selected as the NER TSP over the Best Buy alternative Plan CM-2 was not clearly described and the Panel suggested that a more complete explanation of that selection process be included in the Draft IFR/EIS. Finally, the Panel encourages USACE to include two additional brief discussions in the Draft IFR/EIS: one on the potential for the offshore segmented breakwater to have

influence on longshore sediment transport and lee side erosion, and one on the potential influence of the proposed sediment borrow pits on nearshore wave climate and erosion processes.

Environmental/Biology: With respect to the environmental and biology (including National Environmental Policy Act [NEPA]) part of the Draft IFR/EIS, the Panel felt that the revised sections of the NER TSP are detailed and comprehensive, providing a great deal of additional information on the measures, which was lacking in the previously reviewed version of the report. One finding of importance was that the criteria for qualifying for Federal assistance with non-structural measures might be unachievable for many property owners, particularly for vulnerable populations. The Draft IFR/EIS should clearly lay out the steps required to fulfill the requirements, what the potential expenses may be, and how vulnerable population members can get assistance in meeting eligibility criteria and assistance. There was some Panel concern about the risk of the expected benefits not being realized due to eminent domain opposition; if the NED TSP cannot be fully implemented without involuntary participation (e.g., eminent domain), which is a part of the NED TSP that seems to have substantial opposition, then the Draft IFR/EIS should include a full summary of this risk and consider including a sensitivity analysis on how benefits would be affected at different levels (less than 100%) of voluntary participation. Another risk that was not discussed in the report relates to the availability of funding for operation and maintenance, repair, replacement and rehabilitation (OMRR&R). Since annual funding is uncertain, the Draft IFR/EIS should include a risk-based discussion of what might happen to the NED and NER TSPs if funding were unavailable or decreased. The Panel also recommended that residual risk to affected populations be discussed in full detail (including public health/safety, critical infrastructure, and evacuation capability) and that a residual risk communication plan be included in the Draft IFR/EIS. Finally, although the Panel is aware that the public comment period ended just before the review documents were provided for the IEPR, NEPA requires that a full summary of public comments be included in the Draft IFR/EIS as well as USACE's response to those comments.

Civil Works Planning: Overall, the planning process was found to be clear and logical. The Panel did note that the selection of the flood plain increments (0-25, 25-50 years) appeared to be arbitrary because no rationale was provided on how they were chosen. The Draft IFR/EIS would benefit from a description of the selection process and the results of a sensitivity analysis showing how the benefit-cost ratio might be affected by different increments. In addition, the Panel questioned the validity of the NED TSP assumption that 100% of homeowners would participate in voluntary structure raising. The Panel recommended that a full description of that assumption should be added to the Draft IFR/EIS. The Panel also noted that the use of Rough Order of Magnitude (ROM) for real estate and navigation costs, while commonly used, may over- or underestimate the benefit-cost ratios (BCRs) for the non-structural program. The Panel recommended that, where possible, actual cost components be located and included in the analyses to ensure more certain BCRs. Finally, the Panel would like to see a more in-depth discussion on the mitigation plan added to the Draft IFR/EIS, including documentation of its \$100 million cost.

Table ES-1. Overview of 18 Final Panel Comments Identified by the Revisions to the Southwest Coastal Louisiana Feasibility Study IEPR Panel

No.	Final Panel Comment	
Significance – Medium/High		
1	The accuracy of the hydrologic and hydraulic modeling underpinning most of the analyses is not well-described and documented, and it is unclear how inaccuracies may affect estimates of the relative performance of National Economic Development (NED) alternatives.	Lourdes
2	Many property owners, especially those who are part of vulnerable populations, may not be able to meet the criteria for qualifying for non-structural measures and associated Federal assistance.	Bill
Significance – Medium		
3	The omission of the flood damage reduction benefits to nearly one-third of the industrial properties may have narrowed the extent of the NED TSP.	Keven
4	The implementation of the NED TSP alternatives is at risk due to lack of support for the involuntary participation/ eminent domain aspect of the non-structural measures, and long-term commitments on the part of the non-Federal sponsor and local entities may not be realized.	Andy
5	The validity and potential implications of the NED TSP assumption that 100% of homeowners will participate in voluntary structure-raising are not well-documented.	Andy
6	The single management measure selected for hydrology and salinity control in the National Ecosystem Restoration (NER) TSP may not be sufficient to achieve the salinity objective, and the process used to select that measure is not sufficiently described.	CPRA
7	The voluntary nature of adopting changes to local building codes and zoning regulations poses an unacknowledged risk of not achieving the NED TSP benefits.	Andy
8	The selection of the flood plain increments for the NED TSP appears arbitrary because no rationale is provided.	Keven
Significance – Medium/Low		
9	The risk of funding not being available for operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the TSPs is not fully explained.	Andy
10	Using Rough Order of Magnitude (ROM) for real estate costs may under- or overestimate the benefit-cost ratios for the non-structural program, which increases the uncertainty of selection of non-structural measures in the TSP.	Keven
11	The rationale for the selection of Plan CM-4 (NER TSP) over Plan CM-2 is not well-documented.	Andy

Table ES-1, continued. Overview of 18 Final Panel Comments Identified by the Revisions to the Southwest Coastal Louisiana Feasibility Study IEPR Panel

No.	Final Panel Comment	
12	The potential that shorelines to the west of the segmented breakwaters might experience increased erosion is not discussed.	CPRA
13	The influence of proposed sediment borrow pits in the Gulf of Mexico on the nearshore wave climate and the potential for induced erosion are not discussed.	CPRA
14	The Real Estate Appendix makes certain unsupported assumptions about the Involuntary and Voluntary Programs that could affect NED TSP implementation costs.	Karen V
15	Residual flood risk is minimally discussed and a plan for communicating the residual risk to affected populations is not included in the Draft IFR/EIS.	Tim/ Lourdes
16	There is no supporting information provided for the \$100 million in mitigation costs for the structural alternatives.	Bill
17	The Draft IFR/EIS does not explain how the Other Social Effects (OSE) ratings were constructed and how the ratings were determined.	Bill
18	A summary of the stakeholder and public comments received in 2015 on the Draft IRF/EIS and USACE responses have not been included in the document.	Bill