Independent External Peer Review of the Sabine Pass to Galveston Bay, Texas; Draft Integrated Feasibility Report – Environmental Impact Statement

Final Report

2015-11-20

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Prepared for: Department of the Army
US. Army Corps of Engineers
Flood Risk Management Center of Expertise, Baltimore District

LMI Contract/Delivery Order No: W912HQ-15-R-0002/0001
APMI Sub-Contract/Release No: 1552/001

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Executive Summary

Project Background and Purpose

The LMI Team, consisting of Logistic Management Institute (LMI) and Analysis Planning and Management Institute (APMI), has performed an Independent External Peer Review (IEPR) for the U.S. Army Corps of Engineers (USACE) of the report entitled *Sabine Pass to Galveston Bay, Texas, Coastal Storm Risk Management and Ecosystem Restoration Draft Integrated Feasibility Report – Environmental Impact Statement* (Sabine Pass DIFR-EIS). The Sabine Pass DIFR-EIS has been published as part of the USACE effort to conduct the Coastal Texas Protection and Restoration Study authorized by the US Congress in 2004.

The purpose of the IEPR is to analyze the adequacy and acceptability of methods, modeling, data, and analyses that have been used to develop the Tentatively Selected Plan documented in the Sabine Pass DIFR-EIS and appendices.

Independent External Peer Review Process

Under the guidance of LMI, APMI performed the IEPR in accordance with the procedures described in the Department of the Army, USACE Engineer Circular (EC) No. 1165-2-214, *Civil Works Review*, dated 15 December 2012.

The IEPR review was conducted by a panel of subject matter experts with relevant expertise and experience in civil works planning/economics, biological resources and environmental law compliance, and hydrology and hydraulics/coastal engineering. The panel was "charged" with providing a broad technical evaluation of the material contained in the Sabine Pass DIFR-EIS and appendices.

LMI and APMI provided impartial, independent assistance free of conflict of interest to federal government organizations. LMI, APMI and the IEPR panel for this IEPR review have not been involved in any capacity with the projects documented in the Sabine Pass DIFR-EIS. In addition, neither LMI nor APMI has advocated for or against any federal water resources projects and has no real or perceived conflict of interest for conducting IEPRs. For these reasons, LMI and APMI were suitable for upholding the principles of independence in all aspects of managing the IEPR.

Results of the Independent External Peer Review

The IEPR panel recognizes the significant amount of USACE effort, analysis, and documentation that has gone into preparing the Sabine Pass DIFR-EIS. The panel acknowledges the USACE for its systematic approach to conducting the overall Coastal Texas Protection and Restoration Study with the many scientific, technical, and engineering analyses and studies that are required to develop an effective plan to mitigate the effects of coastal storms, restore important coastal aquatic ecosystems, and protect this nationally important and complex region.

The panel believes that there are several ways that the Sabine Pass DIFR-EIS can be improved by clarifying some of the documentation and by describing some issues in greater depth. Also, the panel believes that the understanding and clarity of the document can be helped greatly by pulling together material about some specific subjects in one place rather than presenting the material scattered in a number of different places throughout the document.

The panel believes that there are several specific areas that require additional analysis and documentation to confirm or support the conclusions presented in the DIFR-EIS. These analyses should be conducted before confirming the Tentatively Selected Plan (TSP) to be sure that the additional data and information do not reveal unacceptable risk or unintended or unacceptable consequences that could require changing the plans.

There were a total of 19 final comments. Of these, 8 are identified as having high significance, 2 as Medium/High significance, 5 as Medium significance, 1 as Medium/Low significance, and 3 of Low significance. The following paragraphs provide a summary of these panel comments in the specific areas of engineering, environment, and economics areas.

Engineering

The study area and related level of engineering effort is extensive. The panel recommends some changes to the documentation for clarity. Most significantly, several specific subjects need to be discussed in greater depth, particularly where the specific engineering subjects concern major design considerations or the ability of the reader to follow the analysis and reasoning in the documentation. These include the following: unintended consequences, joint probabilities, and the overall report organization. In the case of unintended consequences the discussion appears to be quite limited compared to the range of outcomes in a program of the scope addressed in the documentation. Moreover, while joint probabilities are clearly addressed the text is limited in scope and uses variables that are not well defined. The most significant finding in the review of the engineering elements of the documentation is the weakness of organization of the text. This was brought up several times in public comments, as well, most notably by the US Environmental Protection Agency. Specifically, the engineering documentation needs to be revised in such a way that subject matter can be located in a single location in the documentation and with references to or from relevant related sections. Other significant comments include the absence of a discussion of sediment transport impacts, a clear discussion of modeling and analytical sensitivity analysis, and a substantive discussion of secondary influences of local water surface elevation. Once these deficiencies are addressed the panel believes that the documentation will be stronger, both in presentation of the relevant information and support of the findings of the extensive analysis.

Environment

The DIFR-EIS includes appropriate methods for analyzing project impacts. However, the panel recommends changes to the document for clarity and to address issues pertinent to meaningful analysis. Key project impacts and important specifics regarding mitigation and monitoring plans critical to the justification and implementation of the project are not included or adequately discussed. This includes specific issues with regard to hazardous, toxic, and radioactive waste risk assessment that are not sufficiently addressed in the materials provided for review**.** Additionally, the DIFR-EIS lacks substantive details in regard to elements of the impact assessment and subsequent mitigation and monitoring plans. The panel recognizes that more detailed information to support the assessment of environmental impacts and mitigation approaches, specifically including more detailed analysis of mitigation and monitoring, will be added to the Final Integrated Feasibility Report – Environmental Impact Statement.

Economics

Overall, the economic analysis of the Sabine Pass project seemed adequate. However, one area of concern is the accuracy of the ground elevation data that was the basis for the first floor elevation of all

structures and the elevation at which automobiles were located. With the subsidence that is occurring in much of the Gulf Coast Region, it is questionable whether the use of NAVD88 topographic data provides accurate ground elevations. If these data are not accurate, benefit estimates could be significantly misrepresented. This issue is of high significance. Other areas of lower significance are the lack of identification of the risk measures included in HEC-FDA runs and the need for additional discussion in the DIFR-EIS on the guidance on selecting the National Economic Development Plan. Also, consideration might want to be given to recommending a plan with a higher level of performance than the National Economic Development Plan.

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1 Introduction

1.1 Introduction and Report Overview

This Independent External Peer Review (IEPR) Report provides the results of the IEPR conducted for the report entitled *Sabine Pass to Galveston Bay, Texas, Coastal Storm Risk Management and Ecosystem Restoration, Draft Integrated Feasibility Report – Environmental Impact Statement* (referred to hereafter as the Sabine Pass DIFR-EIS).

This IEPR report contains the comments of the IEPR panel convened to review the Sabine Pass DIFR-EIS. The report also contains a description of the IEPR objectives and process, an overview of the Sabine Pass project as analyzed in the Sabine DIFR-EIS, a summary of the IEPR panel members' expertise, and discussion of observations and comments by the IEPR panel.

Section 1 of the IEPR Report provides a description of the objectives of this effort, general background information on the IEPR, and a brief introduction to APMI, the contractor that managed the IEPR process and supported and assisted the IEPR panel. Section 2 provides an overview of the project analyzed in the Sabine Pass DIFR-EIS. Section 3 summarizes the process followed to perform the IEPR. Section 4 describes the IEPR panel composition and the panel members' expertise. Section 5 presents a summary of the IEPR panel comments. References are listed in Section 6. Appendix A of this IEPR Report lists the final IEPR panel comments. Appendix B provides the "charge" provided to the panel for the IEPR of the Sabine Pass DIFR-EIS. Appendix C includes the completed organizational conflict of interest forms completed by LMI and APMI. Appendix D provides a description of the IEPR panel and provides the panel members' résumés.

1.2 Independent External Peer Review Overview

The USACE lifecycle review strategy for Civil Works products provides for a review of all Civil Works projects from initial planning through the project phases of design; construction; and operation, maintenance, repair, replacement and rehabilitation (OMRR&R). The strategy provides procedures for ensuring the quality and credibility of USACE decisions, implementation, and operations and maintenance documents and work products.

Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The USACE conducts IEPRs as part of implementing the USACE review strategy described above. Using IEPRs in the review process is called for and described in Department of the Army, USACE Engineer Circular (EC) No. 1165-2-214, *Civil Works Review*, dated 15 December 2012.

1.3 Independent External Peer Review Objective

The objective of the IEPR for the Sabine Pass DIFR-EIS was to perform an independent review as called for in EC 1165-2-214.

The IEPR was conducted by a panel of subject matter experts with extensive experience in engineering, economics, and environmental analyses used in USACE Civil Works projects. The IEPR panel was supported and assisted by LMI and APMI, both not-for-profit companies.

The panel was "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall study in the areas of engineering, economics, and environment. The IEPR panel members analyzed the adequacy and acceptability of methods, modeling, data, and analyses documented in the Sabine Pass DIFR-EIS. The independent expert reviewers identified, recommended, and commented upon assumptions underlying the analyses and evaluated the soundness of models and planning methods. They evaluated data, the use of models, analyses, assumptions, and other scientific and engineering methodologies. The reviewers offered opinions as to whether there are sufficient technical analyses upon which to base the ability to implement the project. The review was limited to a technical review and did not a involve policy review.

1.4 LMI Team Qualifications

Both LMI and APMI are not-for-profit science and technology organizations that provide impartial, independent assistance free of conflict of interest with federal government organizations. These organizations have not performed or advocated for or against any federal water resources projects and have no real or perceived conflict of interest for conducting IEPRs. LMI, APMI, and the IEPR panel for this IEPR review have not been involved in any capacity with the projects documented in the Sabine Pass DIFR-EIS. The LMI Team is free from conflict of interest with USACE and any other national, regional, or local public, private, or nonprofit entities regarding water management or with interests and litigation relating to water management in the Sabine Pass to Galveston Bay area.

2 Project Description

The US Congress authorized the Coastal Texas Protection and Restoration Study in 2004. The purpose of the study is to recommend for Congressional approval a regional coastal storm risk management and ecosystem restoration project that encompasses the six coastal counties of the upper Texas coast between Sabine Pass and Galveston Bay (Figure 1 below).

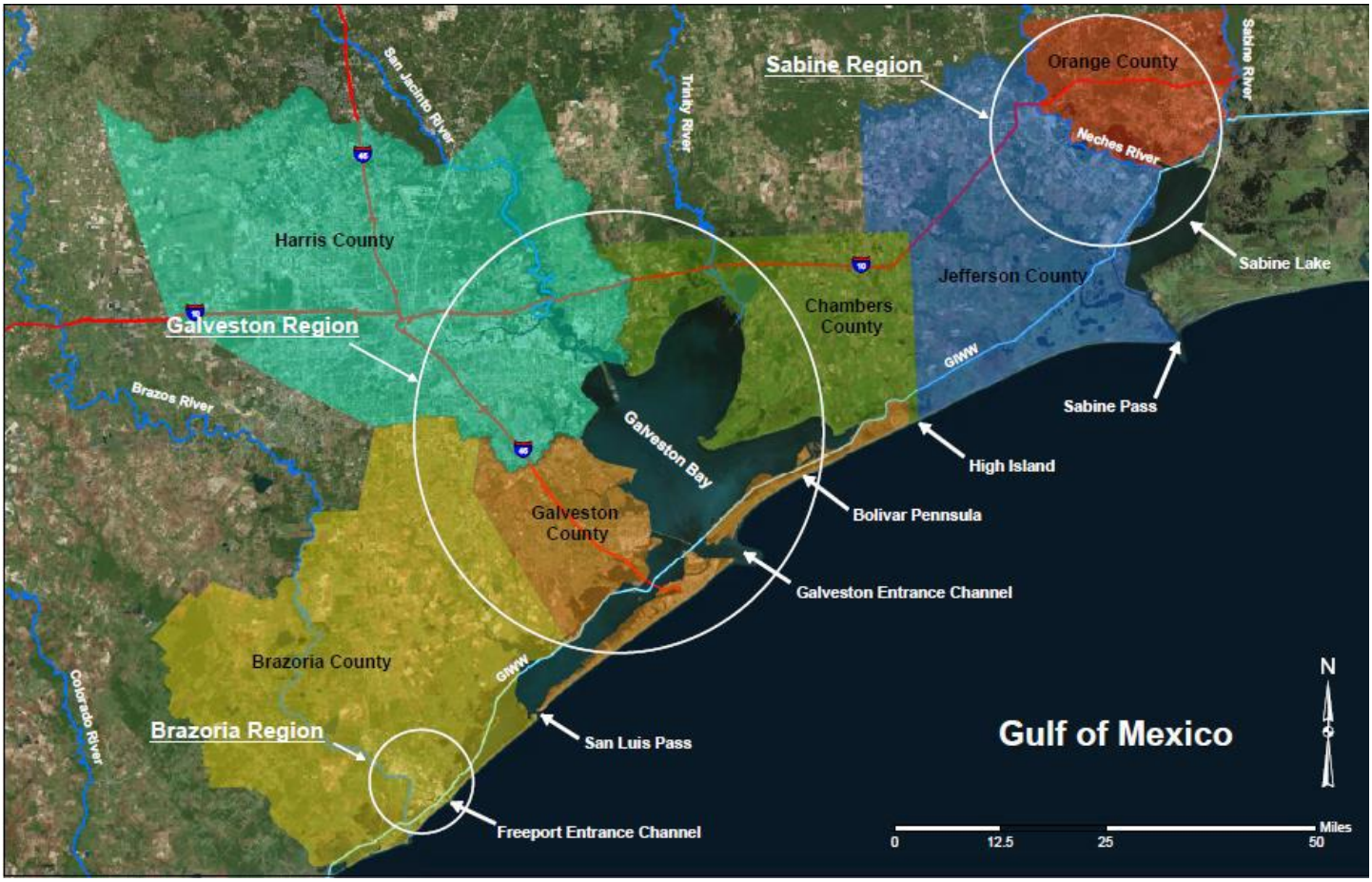

Figure 1. Sabine Pass to Galveston Bay, Texas, Study Area for the Texas Coastal Protection and Restoration Study

The study area has seen a number of major historical surge events in the past 120 years. The most notable is the 1900 Storm, which inundated most of the island city of Galveston, Texas, and adjacent areas on the mainland. The storm was responsible for over 8,000 deaths and up to $30 million in property damage. The 1915 Storm also made landfall at Galveston with a surge height of 16 feet. Other major hurricanes and major storm events include the following: Audrey (1957), Carla (1961), Alicia (1983), Bonnie (1986), Chantal (1989), Jerry (1989), Frances (1998), and Rita (2005). Hurricane Ike struck the upper Texas coast in 2008 and was the third-costliest storm in U.S. history, causing an estimated $29 billion in property damage.

The Congressional authorization for the Coastal Texas Protection and Restoration Study directed the Secretary of the Army to study the region using an integrated and coordinated approach to locating and implementing opportunities for coastal storm risk management and ecosystem restoration. To carry out the study, the USACE has divided the study region into three subregions—Sabine, Galveston, and Brazoria—shown in Figure 1 on page 10.

The USACE Galveston District is currently conducting a study of two of the three subregions – the Sabine region in the north and the Brazoria region in the south (Figure 1). The Sabine region includes the Sabine Lake system and Gulf of Mexico shoreline from Sabine Pass to High Island and the Sabine-Neches Waterway, serving the Ports of Beaumont, Port Arthur, and Orange. The Brazoria region includes the Brazos River system and the Gulf of Mexico shoreline in Brazoria County and the Freeport Harbor Channel serving Port Freeport. These regions include heavily industrialize areas and nationally important navigation channels.

As part of the study of the Sabine and Brazoria subregions, the Galveston District has published the report entitled *Sabine Pass to Galveston Bay, Texas, Coastal Storm Risk Management and Ecosystem Restoration Draft Integrated Feasibility Report – Environmental Impact Statement* (Sabine Pass DIFR-EIS). The study has identified and screened alternatives to address coastal storm risk management and ecosystem restoration in the subregions and presents a Tentatively Selected Plan (TSP).

3 Independent External Peer Review Process

This section summarizes the process for conducting the IEPR. Figure 2 below shows the overall process.

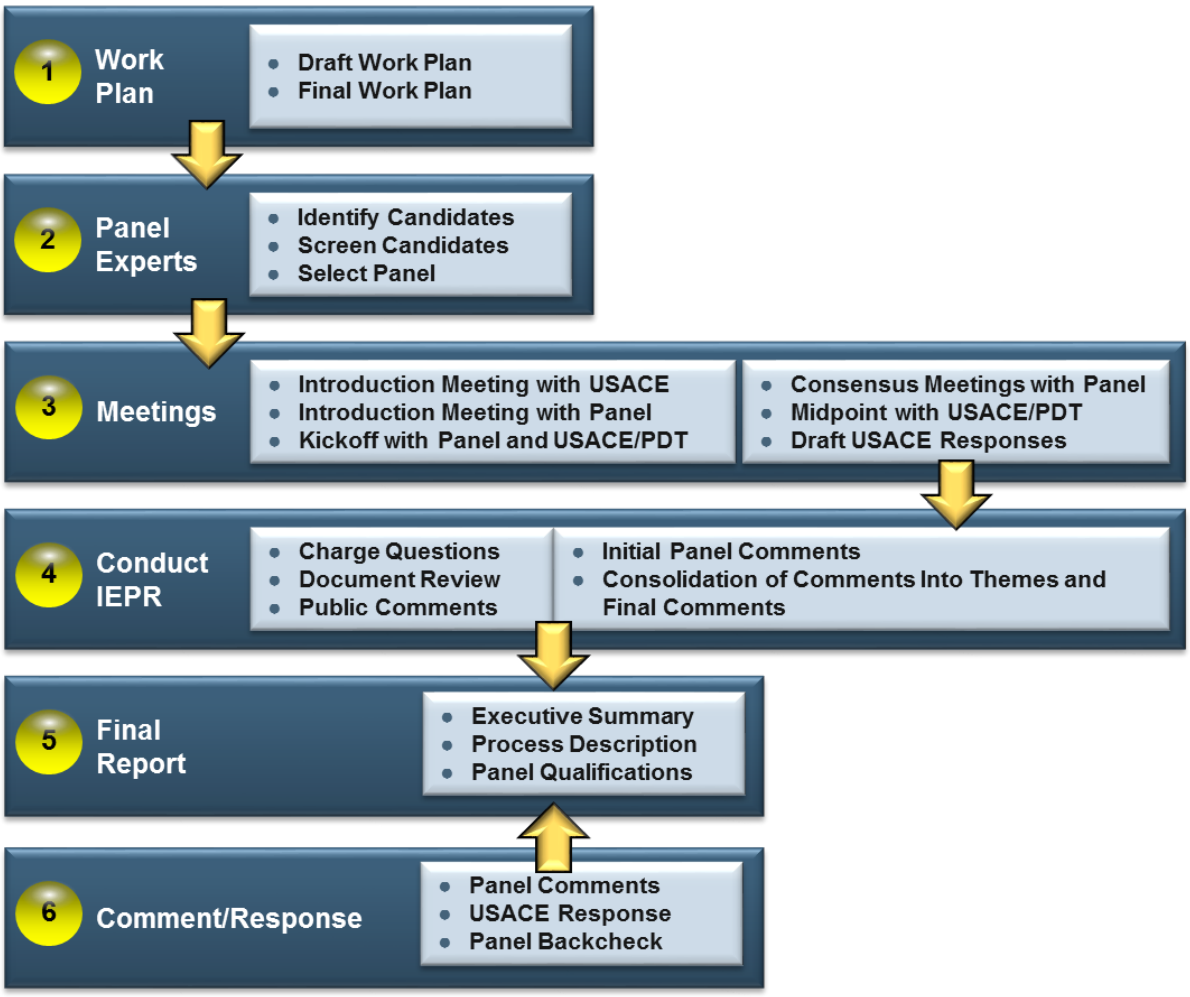

Figure 2. Summary of the Independent External Peer Review (IEPR) Process

3.1 Project Management

To manage this effort and meet the project schedule, APMI prepared a draft and final Work Plan to define and manage the process for conducting the IEPR. The work plan included the process for screening and selecting independent reviewers, communicating and meeting with the USACE project team, maintaining the project schedule and quality control, compiling and disseminating the independent reviewers' comments, and project management and administration. The work plan included the schedule for conducting the IEPR review.

APMI developed a schedule that would meet USACE's goal of completing the IEPR as efficiently as possible in accordance with the Performance Work Statement (PWS). The schedule of activities was agreed upon by APMI and USACE. Table 1 below shows the major milestones and deliverables for the IEPR.

Table 1. Major Milestones and Deliverables for the IEPR

Activity	Date
Notice to Proceed	28 August 2015
Initial Protocol Meeting (PCX and APMI)	09 September 2015
Introductory Meeting (Panel and APMI)	24 September 2015
Kickoff meeting (Panel, APMI, LMI, PCX, PDT)	28 September 2015
In-Progress Review Meetings (Panel and APMI)	Multiple
Mid-point Review Meeting *	28 October 2015
IEPR panel receives public comments on DIFR-EIS submitted to USACE	28 October 2015
Consensus Meeting (APMI and Panel)	13 November 2015
Final IEPR panel report submitted to USACE	20 November 2015

*Purpose is for panel members to ask USACE clarifying questions and get additional information needed to complete review and finalize comments.

APMI provided USACE with project status reports on a bi-monthly basis to communicate the current status of the project. The project status reports included details of each task and noted any schedule changes.

3.2 Selection of the Panel

Reaching out to its various pools of experts, APMI identified experts who met and exceeded the technical expertise and requirements of this IEPR. APMI provided potential candidates with a scope of work, which included the required expertise and project schedule, and conducted informal and formal discussions to identify any technical expertise concerns or potential conflict of interest issues. Consistent with the guidelines of the US Office of Management and Budget's (OMB's) Final Information Quality Bulletin for Peer Review (M-05-03), issued December 16, 2004, the following were considered in the screening of the candidates:

- *Expertise*: Ensuring the selected reviewer has the knowledge, experience, and skills necessary to perform the review.

- *Independence*: The reviewer was not involved with the projects in the Sabine Pass DIFR EIS or in producing the documents to be reviewed.
- *Conflict of interest*: Identification of any financial or other interest that conflicts with the service of an individual on the review panel because it could impair the individual's objectivity or could create an unfair competitive advantage for a person or organization.
- *Availability:* Candidates' availability to meet the project schedule.

After screening candidates to exclude those with inadequate expertise or potential COI issues in accordance with the requirements and guidelines of the National Academy of Sciences (NAS) and OMB M-05-03, several candidates were selected for further screening and evaluation to ensure they met or exceeded the requirements of this task. The list was then narrowed down to identify the most qualified candidates that would be available to serve on the IEPR panel. APMI provided the list of selected panelists along with their detailed résumés to the USACE to determine if any had a potential COI based on USACE knowledge of the individual's past involvement with the project. USACE acknowledged the proposed panel members' experience relative to the requirements of the IEPR and that there were no perceived COI issues. Information on the panel members is provided in Section 4.

3.3 Preparation and Charge for the Panel

The USACE provided to APMI the documents to be reviewed by the IEPR panel and also provided additional supporting documents as background material for panel reference. APMI provided these documents to the panel.

The final charge questions were provided to the panel members. These charge questions, which were developed and approved by USACE, established the general boundaries for the IEPR. The charge questions are shown in Appendix C.

APMI and the panel had an introductory meeting via teleconference during which APMI outlined the steps of the IEPR process, identified the overall schedule and deadlines, and instructed the IEPR panel members on how to access the documentation and to undertake the review.

Subsequent to a cursory review of the documents by the panel but prior to the actual detailed IEPR, a kickoff meeting was held via teleconference with the Product Delivery Team (PDT) to familiarize the IEPR panel members with the technical aspects of the project. As part of this meeting, the PDT provided a detailed project briefing, reviewed project features and requirements, and provided the opportunity to exchange technical information among the panel and USACE technical staff.

Following the kickoff meeting, the panel began a detailed review of the documents provided. APMI provided them with instructions and guidance for preparing their comments to ensure proper coverage of all important issues and consistency in the development of the IEPR comments. APMI remained as the conduit for information exchange between the panel and USACE throughout the project in order to ensure a truly independent review.

3.4 Performing the Independent External Peer Review

After the panel was oriented with the general scope and background information of the project, the panel initiated a detailed review of the required documents, using the supporting documentation to help

with the review. The IEPR involved conducting an independent technical peer review to analyze the adequacy and acceptability of environmental and engineering methods, models, data, and analyses presented in the documents. The review was limited to a technical review and did not involve policy issues. The IEPR panel members used the charge questions as guidance for identifying relevant information and developing their comments and recommendations.

APMI coordinated a teleconference with the panel members and the USACE at the approximate midpoint of the review process so that the panel members could ask clarifying questions of the USACE and request any additional information related to panel concerns. Subsequently, USACE provided additional information to APMI for dissemination to the panel.

APMI communicated to the panel all relevant project information, instructions, and required actions and deadlines. Any identified information or documents that the panel required to support its review were noted. APMI used internal tools to track comments, issues, and information requests by the panel members during the evaluation process. APMI facilitated information exchange and discussions between the panel and USACE in order to meet the needs of the panel as well as project objectives.

3.5 Finalization of the Panel Comments

After completing the review, the IEPR panel members submitted their draft final comments to APMI. APMI collated the panel comments and ensured they were complete and responsive to the charge. APMI ensured that the panel focused on performing a technical review of the documents and did not comment on policy-related issues.

APMI convened a panel consensus meeting via teleconference with the panel members to discuss the panel's comments. This meeting provided a forum for reviewers to reach consensus on the comments, identify any overlapping comments, and resolve any contradictions. Further refinement and consolidation of the comments occurred via email exchange following the meeting. The panel discussion resulted in the final IEPR comments that were submitted to USACE. The final IEPR comments are presented in Appendix A.

Each IEPR panel member comment consisted of four parts:

1) Clear statement of the concern ("Comment")
2) Basis for the concern ("Basis for Comment")
3) Significance of the concern (the importance of the concern with regard to project implementability) ("Significance")
4) Recommended actions necessary to resolve the concern to include a description of any additional research that would appreciably influence the conclusions ("Recommendation[s] for Resolution").

Comments were rated as "high," "medium/high," "medium," "medium/low," or "low" to indicate the general significance the comment has to project implementability. APMI identified overall themes that were presented by multiple peer reviewers or repeated by one reviewer, comments that indicated conflicting peer review opinions, and other noteworthy comments.

Minor editorial changes were not included in the final set of comments unless they affected the understanding of the technical content.

3.6 USACE Responses to the Panel Comments

Following the submittal of this IEPR report, APMI will hold a teleconference with USACE to discuss the process for clarifying the final IEPR comments, delivering the final PDT evaluator responses, and providing the concluding backcheck comments by the Panel. APMI will conduct a teleconference with USACE and the IEPR panel to seek any needed clarification on the IEPR comments as well as discuss the USACE draft evaluator responses provided to APMI and the panel prior to the meeting.

Following the teleconference, USACE will submit the final USACE evaluator responses to the IEPR comments. In response to the IEPR panel recommendation for resolution, USACE will include a statement to "adopt" or "not adopt" for each recommendation, along with a response describing where documentation will or will not be expanded, revised, or changed. After the submittal of the final evaluator responses, APMI will meet with the panel to discuss the responses and the approach for preparing the panel's concluding backcheck comments. The backcheck comments will provide panel concurrence or non-concurrence with the USACE responses and indicate whether the responses adequately address the panel's identified concerns.

After APMI inputs the panel backcheck comments to each USACE evaluator response, APMI will provide USACE with a Portable Document Format (PDF) of the final IEPR comments, the final USACE evaluator responses to those comments, and the panel's concluding backcheck comments.

4 Panel Organization

APMI assembled a panel of experts that met the qualifications set forth by the USACE in the PWS for the task, which was to conduct the IEPR and provide independent comments. APMI supported and assisted the panel in carrying out its review and served as the intermediary for communications between the panel and USACE during the IEPR process.

Figure 3. Organization of the Independent External Peer Review Project

below shows how the IEPR project was organized among the panel members, APMI support, and the various USACE organizations.

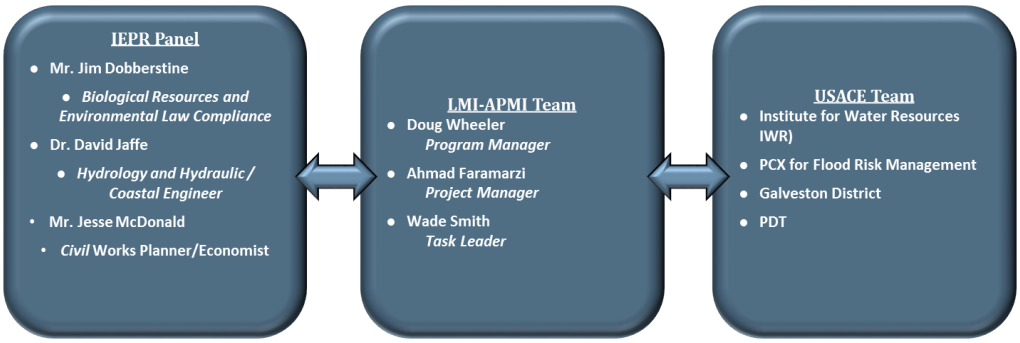

Figure 3. Organization of the Independent External Peer Review Project

4.1 Independent External Peer Review Panel Members

APMI selected three panel members who were qualified in the required areas of expertise called for by the USACE:

- Civil works planner/economics
- Biological resources and environmental law compliance
- Hydrology and hydraulics/coastal engineer

The panel members met and exceeded the minimum requirements for each of the specified areas of expertise. The panel represented a balanced mix of individuals from academia and individual consultants as well as those with direct past experience with USACE. Table 2 on page 18 shows the panel members and their areas of expertise for the IEPR review.

Table 2. Panel Members and Their Area of Expertise

Subject Matter Expertise	Requirements	Mr. Jesse McDonald	Dr. David Jaffe	Mr. James Dobberstine
Summary	Highest Degree	MS	Ph.D.	MS
	Years of Experience	45	15	22
	Experience with USACE (Direct, Indirect, None)	Dir.	Indir.	Indir.
Civil Works Planner/ Economist	Have a minimum of 15-years demonstrated experience in public works planning with Master's degree in a relevant field.	✓		
	Have a minimum of 5-years' experience directly dealing with the USACE six-step planning process, policies, methodologies and procedures as governed by ER 1105-2-100, Planning Guidance Notebook.	✓		
	Familiar with USACE plan formulation process, procedures and standards as it relates to hurricane and coastal storm damage risk reduction.	✓		
	Familiar with USACE coastal storm risk management projects and a minimum of 10-years' experience in coastal economics evaluation and coastal flood risk evaluation.	✓		
	Experience related to regional and traditional Corps national economic development (NED).	✓		
	Minimum of 5-years' experience working with Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA).	✓		
	Capability to evaluate traditional National Economic Development plan benefits associated with hurricane and coastal storm risk management projects.	✓		
Biological Resources and Environmental Law Compliance	Have a minimum of 15 years of experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance.			✓
	Have experience in describing and evaluating complex relationships and dynamics of coastal ecosystems.			✓
	Have experience assessing the consequences of altering environmental conditions, particularly projects in urbanized coastal areas.			✓

Subject Matter Expertise	Requirements	Mr. Jesse McDonald	Dr. David Jaffe	Mr. James Dobberstine
	Familiar with the habitat, and fish and wildlife species that may be affected by the project alternatives in this study area.			✓
	Familiar and have experience with United States Fish and Wildlife Service Habitat Evaluation Procedure (HEP) (USFWS, 1980), Endangered Species Act (ESA), essential fish habitat (EFH), and the Marine Mammals Protection Act (MMPA).			✓
Hydrology and Hydraulic/Coastal Engineer	Registered professional engineer with a minimum of 10 years' experience in coastal and hydraulic engineering with emphasis on large public works projects, or a professor from academia with extensive background in coastal processes and hydraulic theory and practice.		✓	
	Have extensive experience in estuarine systems and be familiar with USACE applications of standard USACE coastal, hydrologic and hydraulic computer models such as Coastal Modeling System Wave (CMS) and Steady State Spectral WAVE (STWAVE).		✓	
	Familiar with the USACE application of risk and uncertainty analyses in coastal storm risk management projects, particularly projects in urbanized coastal areas.		✓	
	Be capable of addressing the USACE Safety Assurance Review (SAR)* aspects of projects. *Since project designs are initiated in the decision document phase, SAR is incorporated into this IEPR. The initial evaluation of SAR as part of Type I IEPR includes at a minimum addressing the following questions (EC 1165-2-214, Appendix D, Para. 2.c (3)), among others: a. *In accordance with ER 1110-2-1150, is the quality and quantity of the surveys, investigations, and engineering sufficient for a concept design?* *b. Are the models used to assess hazards appropriate?* *c. Are the assumptions made for the hazards appropriate?* *d. Does the analysis adequately address the uncertainty given the consequences associated with the potential for loss of life for this type of project?*		✓	

Summaries of the panel member's qualifications are presented below.

Mr. Jesse McDonald

Role: Civil works planner/economics
Affiliation: Consultant, Starkville, MS

Mr. McDonald holds bachelor's and master's degrees in agricultural economics from Mississippi State University and a master's degree in urban and water resource planning from Georgia Tech. He spent 31

years with the USACE conducting, reviewing, supervising, and managing economic and financial analyses on an assortment of water resource development projects. During this time, he had extensive experience in the economic analyses of agricultural and urban flood control, shallow- and deep-draft navigation, and agricultural water supply projects. His broad experience and training in a wide array of water resource development projects provide him with the ability to link hydrology and economics and to quickly identify any possible weaknesses in the analyses. Mr. McDonald retired in January 2000, and since then has been involved as a consultant in the economic analyses of numerous water resource projects to include cost allocation, financial analyses, and the analysis of environmental preservation/restoration projects.

Prof. James Dobberstine

Role: Biological resources and environmental law compliance
Affiliation: Lee College, Baytown, Texas

Mr. Dobberstine is an environmental scientist focusing on wetlands and other sensitive habitats. He is experienced with the complex regulatory framework affecting projects that potentially impact natural habitats. He has experience working with ecologic models as they relate to adaptive management and resource use planning. He is currently engaged in grant-funded ecosystem studies examining the effect of restoration technique on aquatic ecosystem function, to be used toward adaptive management of ongoing ecosystem restoration. He has experience assessing aquatic habitats using the Sediment Triad/Maximum Likelihood Estimation (MLE) method (toxicology, chemistry, biologic community), and a background with a wide range of aquatic and riparian habitats and biologic communities. Mr. Dobberstine also has extensive experience with habitat conservation and restoration, including project development, implementation, monitoring, and adaptive management.

Mr. Dobberstine is frequently called on to serve as an advisor on projects and panels, currently serving on the Monitoring and Research Subcommittee of the Galveston Bay Council (Galveston Bay Estuary Program), on the Harris County Flood Control District (HCFCD) Memorial Park Demonstration Project Vegetation Advisory Workgroup, on the Boards of Directors of the Texas Association of Environmental Professionals (President 2010–present) and the South Central Regional Chapter of Society for Environmental Toxicology and Chemistry (as President 2013–2015), and as an Advisory Board Member of the Galveston Bay Foundation.

Dr. David Jaffe

Role: Hydrology and hydraulics/coastal engineer
Affiliation: AECOM Technology Corp., Los Angeles, CA

Dr. David Jaffe has worked for more than 15 years at the intersection of water resource development, water infrastructure design, and water policy in coastal and riverine environments. This work has included analysis, design, and related regulatory elements. Dr. Jaffe has focused his technical expertise on the translation of engineering science into actionable environmental benefit including protection, restoration, and remediation. His areas of technical focus reside in hydrology, hydraulics and sediment transport. Dr. Jaffe utilizes a broad scope of numerical and analytical methods, including a wide range of numerical models, and is an expert in applying existing, off-the-shelf tools to provide in-depth and forward-looking

analysis and insight to complex hydraulic problems. He has extensive experience in using numerical models for coastal and riverine analysis, both commercial and proprietary. Dr. Jaffe's modeling experience includes significant use of modeling packages from federal agencies, HEC in particular.

Dr. Jaffe has maintained his academic and research ties and currently serves as a lecturer in civil engineering design. Additionally, his current area of research focuses on using sediment transport, through modeling and measurement, as a proxy for several facets of environmental analysis and design. Dr. Jaffe's background in physical marine science, riverine hydraulics, and numerical modeling provides a broad foundation for developing solutions in a diverse pallet of aquatic habitats, including those at the intersections of littoral and riverine systems. Dr. Jaffe also manages projects and programs that deal with environmental policy and systemic risk. These projects and programs include large or regional government projects and small, locally driven initiatives covering a broad spectrum of agencies and interests. Dr. Jaffe has served as a project manager for federal and state projects, in particular those of FEMA, NMFS, USACE, USEPA and USBR.

4.2 IEPR Process Management Team

The APMI project management team members were the following;

Mr. Douglas Wheeler (LMI)

As the Program Manager, Mr. Wheeler was responsible for the overall implementation of the IEPR process in compliance with contractual requirements as well as overall quality of the review. Mr. Wheeler has more than 20 years of experience in strategic process engineering and financial analysis for various government agencies. He holds an MBA and a BS in mechanical engineering from Columbia University and an MSE in industrial engineering from Arizona State University.

Ahmad Faramarzi (APMI)

Ahmad Faramarzi, PE, PMP. As the Project Manager, Mr. Faramarzi was responsible for the execution of this IEPR. He assigned and supervised project personnel and communicated policies, procedures, and goals to the IEPR Team. Mr. Faramarzi maintained regular contact with the USACE and was responsible for the overall project planning, performance, quality and personnel assignment to this task. Mr. Faramarzi is a registered PE and a certified PMP with 35 years of experience providing managerial and technical expertise to government agencies. He holds an Applied Scientist Degree from The George Washington University in Aerospace and Mechanical engineering (fluid mechanics), an MS in Fluids Engineering, and a BS in Nuclear Engineering. He is on the Board of Directors of the Washington DC Section of the American Society for Mechanical Engineers (ASME) and is an active member of the Fluid Dynamics branch.

Wade H. B. Smith, Ph.D. (APMI)

As the Task Leader and Principal Investigator, Dr. Smith was responsible for guiding and supporting the IEPR panel members as they carried out their review. He coordinated any communications of panel members with the USACE. He was responsible for coordinating with panel members in the preparation of the IEPR report that transmitted their comments to the USACE. He has over 30 years of experience with environmental regulations, including the NEPA process, and with analyzing the environmental impacts of

a wide variety of types of federal projects. Dr. Smith is an ecologist and environmental scientist who received his Ph.D. in environmental engineering sciences from the University of Florida.

5 Summary of the Independent External Peer Review Comments

The following paragraphs provide a general assessment of the panel's comments as well as specific assessment of the Sabine Pass Project in the areas of engineering, environmental and economics as discussed in EC-1165-2-214. Appendix A includes detailed panel comments.

The IEPR panel recognizes the significant amount of USACE effort, analysis, and documentation that has gone into preparing the Sabine Pass DIFR-EIS. The panel acknowledges the USACE for its systematic approach to conducting the overall Coastal Texas Protection and Restoration Study with the many scientific, technical, and engineering analyses and studies that are required to develop an effective plan to mitigate the effects of coastal storms, restore important coastal aquatic ecosystems, and protect this nationally important and complex region.

The panel believes that there are several ways that the Sabine Pass DIFR-EIS can be improved by clarifying some of the documentation and by describing some issues in greater depth. Also, the panel believes that the understanding and clarity of the document can be helped greatly by pulling together material about some specific subjects in one place rather than presenting the material scattered in a number of different places throughout the document.

The panel believes that there are several specific areas that require additional analysis and documentation to confirm or support the conclusions presented in the DIFR-EIS. These analyses should be conducted before confirming the Tentatively Selected Plan (TSP) to be sure that the additional data and information do not reveal unacceptable risk or unintended or unacceptable consequences that could require changing the plans.

There were a total of 19 final comments. Of these, 8 are identified as having high significance, 2 as Medium/High significance, 5 as Medium significance, 1 as Medium/Low significance, and 3 of Low significance. The following paragraphs provide a summary of these panel comments in the specific areas of engineering, environment, and economics areas.

Engineering

The study area and related level of engineering effort is extensive. The panel recommends some changes to the documentation for clarity. Most significantly, several specific subjects need to be discussed in greater depth, particularly where the specific engineering subjects concern major design considerations or the ability of the reader to follow the analysis and reasoning in the documentation. These include the following: unintended consequences, joint probabilities, and the overall report organization. In the case of unintended consequences, the discussion appears to be quite limited compared to the range of outcomes in a program of the scope addressed in the documentation. Moreover, while joint probabilities are clearly addressed the text is limited in scope and uses variables that are not well defined. The most significant finding in the review of the engineering elements of the documentation is the weakness of organization of the text. This was brought up several times in public comments, as well, most notably by the US Environmental Protection Agency. Specifically, the engineering documentation needs to be revised in such a way that subject matter can be located in a single location in the documentation and with references to or from relevant related sections. Other significant comments include the absence of a discussion of sediment transport impacts, a clear discussion of modeling and analytical sensitivity analysis, and a substan-

tive discussion of secondary influences of local water surface elevation. Once these deficiencies are addressed the panel believes that the documentation will be stronger, both in presentation of the relevant information and support of the findings of the extensive analysis.

Environment

The DIFR-EIS includes appropriate methods for analyzing project impacts. However, the panel recommends changes to the document for clarity and to address issues pertinent to meaningful analysis. Key project impacts and important specifics regarding mitigation and monitoring plans critical to the justification and implementation of the project are not included or adequately discussed. This includes specific issues with regard to hazardous, toxic, and radioactive waste risk assessment that are not sufficiently addressed in the materials provided for review**.** Additionally, the DIFR-EIS lacks substantive details in regard to elements of the impact assessment and subsequent mitigation and monitoring plans. The panel recognizes that more detailed information to support the assessment of environmental impacts and mitigation approaches, specifically including more detailed analysis of mitigation and monitoring, will be added to the Final Integrated Feasibility Report – Environmental Impact Statement.

Economics

Overall, the economic analysis of the Sabine Pass project seemed adequate. However, one area of concern is the accuracy of the ground elevation data that was the basis for the first floor elevation of all structures and the elevation at which automobiles were located. With the subsidence that is occurring in much of the Gulf Coast Region, it is questionable whether the use of NAVD88 topographic data provides accurate ground elevations. If these data are not accurate, benefit estimates could be significantly misrepresented. This issue is of high significance. Other areas of lower significance are the lack of identification of the risk measures included in HEC-FDA runs and the need for additional discussion in the DIFR-EIS on the guidance on selecting the NED Plan. Also, consideration might want to be given to recommending a plan with a higher level of performance than the NED Plan.

Appendix A Final Panel Comments

This Appendix provides the comments of the IEPR panel members on the Sabine Pass DIFR-EIS. The comments cover a range of issues that pertain to the technical aspects of the documents reviewed.

Each comment consists of four parts that include the following:

1) Clear statement of the concern
2) Basis for the concern
3) Significance of the concern
4) Recommended actions necessary to resolve the concern.

Comments are rated to indicate the general significance the comment has to the project implementability. The significance ratings are defined as follows:

- **High** = Comment describes a fundamental problem with the project that could affect the recommendation or justification of the project.
- **Medium/High** = Comment affects the completeness or overall understanding of the recommendation or justification of the project. Resolution of the issue determines if it is fundamental problem with the project or not.
- **Medium** = Comment affects the completeness or overall understanding of the recommendation or justification of the project.
- **Medium/Low** = Comment affects the technical quality and understanding of the project based on the presentation of information related to the recommendation or justification of the project. However, the panel does not have sufficient information to determine the effect on project implementability.
- **Low** = Comment affects the technical quality and understanding of the project based on the presentation of information related to the recommendation or justification of the project, but there is limited concern regarding project implementability.

The comments are arranged in order of significance. Of the final 19 comments, 8 were identified as having high significance, 2 as Medium/High significance, 5 as Medium significance, 1 as Medium/Low, and 3 of Low significance.

A.1 Final Independent External Peer Review Panel Comments

Table 3 below provides a summary list of all IEPR comments organized by their significance from high to low. The summary tabular list is followed by Table 4 providing a detailed discussion of each comment, its basis, its significance, and proposed recommendation for resolution, as appropriate.

Table 3. Summary of Final Panel Comments

No.	Summarized Final Panel Comment
Significance – High	
1.	The accuracy of the ground elevation data used in the study should be discussed in the report.
2.	Please provide additional details in the text about unintended consequences.
3.	Additional discussion is needed in the text about joint probabilities.
4.	Model sensitivity analysis discussion is insufficient and should be revised.
5.	DIFR-EIS main report Section 5.5.6.2: Sediment and soil analysis (HTRW) should be conducted for Adams and Cow bayous where the gate structures are to be installed prior to any disturbance of sediments to assess and manage potential sediment and water contaminants.
6.	The rationale for the risk ranking noted in the DIFR-EIS and Appendix N needs revision to provide further explanation.
7.	The DIFR-EIS appears to be very preliminary in regard to environmental impact determination and measures to avoid, minimize, and mitigate for those impacts.
8.	There are systemic problems with organization in the report that must be addressed to increase understanding of the analysis procedures.
Significance – Medium/High	
9.	DIFR-EIS main report and App. N: Terminology regarding HTRW risk assessment applies the terms “major” and “recent” to facilities in the study area and HTRW releases, respectively. However, these terms are not clearly defined in the document as it applies to HTRW.
10.	Appendix H: There appears to be inconsistencies in the 404(b)(1) evaluation short form that require additional explanation.
Significance – Medium	
11.	Secondary considerations for the determination of local water surface elevation requires additional discussion in text.
12.	A discussion of sediment transport impacts is missing from the text.
13.	Consider recommending a plan with higher performance than the NED.

No.	Summarized Final Panel Comment
14.	DIFR-EIS main report Section 7.2 and Section 7.6.1.1: Steps for pre- and post-project monitoring do not appear to be included in the DIFR-EIS, but should be recommended to ensure impacts to hydrology and fishery passages are as anticipated via modeling.
15.	It is not clear from the DIFR-EIS what effect the costs for pipeline relocation might have on the alternatives selection.
Significance – Medium/Low	
16.	Appendix O: There are a number of issues related to base assumptions in the WVA model that should be addressed more substantively in the DIFR-EIS.
Significance – Low	
17.	The statement on the economic basis for selecting the TSP is not complete.
18.	The discussion of risk and uncertainty in Appendix C – Economics Analysis does not define the risk data entered in HEC_FDA for various parameters such as structure elevation, structure value, etc.
19.	Please revise figures.

Table 4. Final Panel Comments

Comment #1
The accuracy of the ground elevation data used in the study should be discussed in the report.
Basis for Comment
Paragraph 2.2.1, page 14, Appendix C states “Ground elevations were derived from data processed using U.S. Geological Survey Digital Elevation Model (DEM) 0.05m elevation data for the appropriate Gulf Coast Counties.” The accuracy of such models is dependent on the quality of the topographic data on which they are based. Other data for this project seems to indicate that NAVD88 was the topographic data on which this study is based. With the subsidence that is occurring in much of the Gulf Coast Region, are these data sufficient to provide acceptable accuracy in determining ground elevations? Since ground elevations are the basis for all structure first floor elevations, the accuracy of damage estimates could be questioned.
Significance
High
Recommendation for Resolution
Provide a discussion of the accuracy of ground elevations as determined using NAVD88. Some spot-checking of elevations through the use of GPS elevation systems could be useful in getting a valid estimate of the elevations used in the study.

Comment #2
Please provide additional details in the text about unintended consequences.
Basis for Comment
The documentation discusses what existing and proposed infrastructure may inhibit erosion and/or aid in recovery. It is less clear how down-stream or upland impacts were considered and may be resolved. For example, Appx. 2.11 discusses impacts to "surge water surface elevations, run-up, and waves" from a proposed condition, although which one is undefined within the section. (It is assumed that the section refers to the TSP, however.) Other unintended consequences, significant to the project outcome and success, are missing from this discussion, including sediment movement, and flood fighting activities that may encourage subsidence and/or reductions in floodplain storage.
Significance
High
Recommendation for Resolution
The limited selection of unintended consequences and negative impacts should be discussed and justified. The project condition should be stated for clarity. It is strongly recommended that additional tables and/or figures be incorporated that illustrate the locations of impacts and their extents, particularly where "the TSP removed a large part of the original levee system causing adjacent impacts due to lack of economic justification. This drastically reduced induced impacts along the Neches River from 1-foot levels to an insignificant impact on the order of 0.5 foot."
Comment #3
Additional discussion is needed in the text about joint probabilities.
Basis for Comment
Coastal design is problematic since the joint probabilities of multiple factors of risk need to be addressed simultaneously. For example, during hurricanes wind, surge, overland flood flow, wave run-up and other factors can combine to exceed the design water surface elevation at a given location, particularly on the eastern edge of the storm where heavy wind, waves and rain may precede the eye by many hours. This delay allows for significant changes in tidal range and storm runoff to occur during the period in which the storm's impacts are observed. It is presently unclear how these joint probabilities were addressed, particularly in light of sea level rise and considering USACE documents that provide guidance on addressing these concerns (i.e., North Atlantic Coast Comprehensive Study [NACCS] Resilient Adaption to Increasing Risk, Appx. A, etc.) Appx. D specifically addresses some joint probabilities (storm surge vs. riverine discharge; wave height vs. generalized water surface elevation), although these appear to be limited in scope (i.e., overland flood flow, wind do not appear to be considered) and not clearly defined (i.e., it is not clear what combination of parameters, if any, are included in water surface elevation).
Significance
High
Recommendation for Resolution
Please address how joint probabilities were considered in the study. Specifically, if only a limited subset of probabilities (i.e., only two or three parameters) was considered please present a justification for this approach – why not include more? Please also address if a sensitivity analysis was completed to determine if additional parameters (here, more than two) were considered. If significant changes to the model results (i.e., StormSim) were observed during the sensitivity analysis, please justify this approach. Please describe the parameters that are included in the "water levels" in Appx. D 2.7.1.1.

Comment #4

Model sensitivity analysis discussion is insufficient and should be revised.

Basis for Comment

Typically, in many of the data sets used in numerical /analytical modeling, no verification or calibration of the data is possible. Sensitivity analyses related to data values and the selection of modeling analytic parameters are frequently applied in similar circumstances. It is unclear if and the extent to which sensitivity analysis was applied in the absence of analytical verification or calibration.

Significance

High

Recommendation for Resolution

Please discuss if and how sensitivity analyses were applied to modeling in the absence of verification or calibration runs.

Comment #5

DIFR-EIS main report Section 5.5.6.2: Sediment and soil analysis (HTRW) should be conducted for Adams and Cow bayous where the gate structures are to be installed prior to any disturbance of sediments to assess and manage potential sediment and water contaminants.

Basis for Comment

The potential for sediment contaminants (based on the industrialized nature of the area) may warrant sediment analysis for persistent pollutants in the sediments. The DIFR-EIS does note that fill material used for construction will be tested for contaminants and that BMPs would be used to minimize turbidity and related water quality impacts, which is good. It is advisable to conduct soil/sediment analysis in areas that would require significant disturbance, especially in aquatic environments such as where the surge protection gates are to be installed to assess and avoid potential HTRW impacts.

The project study area lies adjacent to or intersects with numerous HTRW producing sites. Many or the contaminants common to these areas include persistent organic pollutants (POPs; i.e., PCBs, PAHs, etc.) and heavy metals (i.e., mercury, nickel, cadmium, etc.) that can remain in sediments in their active form for decades. When disturbed and exposed to the water column, these contaminants when present in the sediments can be bioaccumulated and biomagnified in aquatic organisms, potentially impacting human populations through consumption or repeated environmental exposure.

The Sabine River, including Adams bayou and Little Cypress bayou (Segment ID 0501 and 0501b) is listed on the Texas 303d list for PCBs in edible tissue and toxicity in the water, indicating likelihood of potential contaminants in that system. The Neches River (Segment ID 0601 and 0602) is also listed for PCBs and mercury in edible tissue. Typically, contaminants of this variety in aquatic environments sequester to sediments, where they can find their way into the aquatic food web through bioaccumulation and biomagnification. Additionally, air deposition to water and sediment is a concern in heavily loaded environments. The study area is located in a highly industrialized area that produces a number air toxics, including VOCs (i.e., PAHs, others) and heavy metals (i.e., nickel, cadmium, others), with potential to sequester to water, soils, and sediment.

Significance

High

Recommendation for Resolution

The FIFR-EIS should be revised to indicate that appropriate on-site sediment analysis for HTRW will be conducted to assess and manage risk prior to implementation of any construction activity.

Comment #6

The rationale for the risk ranking noted in the DIFR-EIS and Appendix N needs revision to provide further explanation.

Basis for Comment

The proposed TSP alignment appears to intersect and/or run immediately adjacent to locations where industrial facilities are in operation and numerous HTRW issues are noted, but are subsequently identified as posing low risk.

For example, in table 4-1 for the Jefferson County-Port Arthur construction corridor, the Oil Tanking Port Neches, LLC, the Motiva Terminal, the Port Neches Terminal, and the Flint Hills Resources Terminal are noted under Contaminants of Concern for "*Oil and petroleum products storage and shipping*", and subsequently noted under the Risk Analysis as "*Low Risk, CWA violations in 2013, significant CAA violation.*" Similarly, in the Freeport study area there are several HTRW sites that intersect the proposed alignment (i.e., Nalco, Brazos Nav, Valasco East) and areas where the alignment intersects properties where HTRW are produced, stored, etc. The DOW property, for instance, is noted in table 5-1 under Contaminants of Concern for "*Organic and industrial chemicals and waste… Numerous past RCRA and CWA/NPDES violations with significant penalties, currently in violation of RCRA permit…*" However, the Risk Analysis in the adjacent column inexplicably states, "*Low Risk, site generates and stores large quantities of hazardous material*". Similar notes are made throughout the TSP study areas, identifying past NPDES, CWA, RCRA, and CAA violations in addition to persistent hazardous chemicals associated with the site(s). Only one site across the entire study area, Star Lake Canal (currently on the National Priorities List), is noted as high risk.

The logic to these findings is not intuitive as it is presented in the DIFR-EIS and Appendix N, and may underrepresent the actual risk present. The current approach to HTRW seems to fail to consider the potential for accumulation of contaminants from multiple sources over decades of industrial activity in the region. Many contaminants associated with the manufacturing activities noted in the DIFR-EIS can be persistent in the environment, and have serious chronic exposure concerns. Waterways associated with the study area are included on the Texas 303d list, including the Sabine River and associate waterways (Segment ID 0501 and 0501b) for PCBs in edible tissue and toxicity in the water, and the Neches River (Segment ID 0601 and 0602) for PCBs and mercury in edible tissue. Also, air deposition to water and soil/sediment is frequently a concern in heavily loaded environments. The study area is in an industrial area that produces a number of air toxics, including VOCs (i.e., PAHs, others) and heavy metals (i.e., nickel, cadmium, others) that can sequester to water, soils, and sediments. The repetitive note regarding CAA violations should be a red flag for air deposition in the area.

These factors would seem to indicate a likelihood of HTRW risk associated with construction and associated disturbance of soil and sediment within the study area. Actual accumulated onsite values may not yet be determined through field sample analysis, but potential for this risk is reasonably foreseeable and should be more thoroughly considered in the document. The text in Appendix N notes that, *"… HTRW facilities indicated should be more thoroughly investigated with visual inspections and interviews with facility managers to confirm the potential HTRW risks along the alignment corridor prior to construction or more detailed design."* However, based on the limited information presented in the DIFR-EIS, noted contaminant issues in the region, and the significant level of industrial activity present in the area extending back several decades, it seems logical to anticipate that there would be more than one location along the TSP that could have a substantive risk for HTRW concerns (and thus a higher ranking than indicated in the table).

The risk analysis statements may be based on the relatively low amount of disturbance proposed across much of the TSP (or other reasons), but the materials should provide a far more thorough explanation. As noted elsewhere, the potential for persistent hazardous pollutants to have been released in the environment within or near the study area indicates that timeframes considered regarding risk associated with past incidents are important and should be specified in the document and commensurate with the known environmental lifespan of the potential pollutant(s). The environmental lifespan of many persistent chemicals can be quite long (decades), and accumulation in environmental media (i.e., sediments) and foodwebs can occur under certain circumstances. The rationale for the risk ranking needs additional explanation and revision to either better justify the low rankings assigned to facilities where past violations are noted or hazardous materials are produced/stored/transported, or revisions to reassign different risk rankings for the facilities within the proposed construction corridors.

Additionally, the maps (Figures 3-2, 3-3, 4-3, 4-4, 4-5, 5-2, 5-3, and 5-4) and their corresponding tables (Tables 3-1, 4-1, and 5-1) need to be easier to reference to one another. Both would benefit if the sites noted on the maps were assigned site reference numbers on the maps and in the tables, and a more detailed explanation for individual risk rankings (rationale) were included in the tables than currently presented. This might be accomplished by additional columns in the tables identifying 1) site numbers referenced to specific sites/facilities on the maps (also numbered), and 2) a detailed rationale for the risk ranking.

Significance

High

Recommendation for Resolution

- Revise the FIFR-EIS main report and relevant appendices to better describe the rationale for how HTRW risk was determined, and the individual rankings for each facility noted in tables 3-1, 4-1, and 5-1 of Appendix N.
- Revise the referenced tables to better identify the sites along the TSP by site number (referenced to the associated maps) and better explain the rational for the risk ranking for each site within the tables.

Comment #7

The DIFR-EIS appears to be very preliminary in regard to environmental impact determination and measures to avoid, minimize, and mitigate for those impacts.

Basis for Comment

For example:
Main report:
Section 6.1.3.2 notes, "*WVA modeling will be conducted to quantify benefits (AAHUs) of mitigation measures. Selection of potential mitigation sites and modeling of benefits will be conducted in coordination with resource agencies. Feasibility-level costs of selected mitigation measures will be developed, and the costs and benefits will be used to identify a best buy mitigation plan using Cost Effectiveness-Incremental Cost Analysis that will fully compensate for all impacts. Mitigation banks will be investigated to determine if sufficient and appropriate mitigation is available; none are known at this time. If mitigation banks are not available to compensate for all or a portion of project impacts, areas in the floodplains of the Neches and Sabine Rivers within and adjacent to the study area will be reviewed to*

identify potential in-kind mitigation sites." Substantial scoping and coordination with agencies appears to have already occurred in the preparation of the DIFR-EIS. It seems curious that the USACE continues to consider the use of mitigation banks after stating that none are known at the time the DIFR-EIS was developed. Are appropriate banks currently under development or reasonably foreseeable that might apply by the time the project is implemented? If not, it seems reasonable, especially with the level of coordination that has occurred to date, that more detailed mitigation and monitoring plans would be present in the DIFR-EIS for review. Certainly, these plans should be developed to a much greater level in preparation of the FIFR-EIS, as noted in Appendix O. The mitigation and monitoring plans described in the DIFR-EIS and appendices are far too underdeveloped to allow for meaningful evaluation or cost determination. This is very important to determine that appropriate mitigation opportunities are practicable to fully offset unavoidable project impacts in compliance with CWA requirements and applicable USACE regulations.

Further, Section 6.1.3.2. (and Section 8.2. of Appendix O) also notes, "*During final feasibility planning, an appendix to the FIFR-EIS will be prepared that presents sensitivity analyses of the WVA marsh models using a sensitivity spreadsheet prepared by the ERDC Environmental Lab. These sensitivity analyses will provide additional information to assist in the investigation of several unresolved issues related to the suitability graphs for Variables 1, 2, and 3 and the aggregation methods used to combine the marsh habitat units and open water habitat units for each sub-model. These analyses will be coordinated with the ECO-PCX and reported in a separate appendix to the FIFR-EIS.*" It is not clear why the sensitivity analysis was not completed prior to release of the DIFR-EIS, as much of the environmental impact analysis and mitigation development depends on the WVA model outputs. Is there some information that will be made available through the processes associated with the release/review of the DIFR-EIS that will allow for these analyses to be completed?

Section 7.2.1.1 states: "*Impacts from overland flows are expected to be minimal because these flows are minor and temporary*." As a result of the coastal topography and soil characteristics, overland (sheet) flow is a significant method of water conveyance during rain events. This can be substantial in both volume and time period for even typical storm events during the rainy season and tropical downpours. It is not clear from the report whether sufficient analysis has been completed to determine whether the TSP or other alternatives might increase overland runoff impoundment behind the levee(s), which might subsequently pose a hazard to both local communities and ecologic resources.
Section 7.6.2 indicates, "*Direct and indirect impacts associated with construction of the Orange-Jefferson CSRM Plan would result in the loss of about 275.9 acres of estuarine emergent marsh over the period of analysis. Marsh acres include water within the marsh and small drainages; some SAV in the estuarine marsh areas would also be lost. These acres would be replaced by in-kind mitigation in the amount determined using the WVA model and the CE/ICA incremental analysis; all impacts would be fully compensated with the restoration of estuarine emergent marsh and shallow water."* No detailed plans or sites are identified, and the amounts are subject to pending sensitivity analysis of the WVA model. It seems reasonable that more detailed mitigation plans would be present in the DIFR-EIS for review. The mitigation and monitoring plans described in the DIFR-EIS are far too underdeveloped to allow for meaningful evaluation. These plans should be developed to a much greater level of detail in preparation of the FIFR-EIS to determine that appropriate mitigation is practicable to fully offset unavoidable project impacts.

Section 7.6.2 and Appendix M: "*Construction of the Cow and Adams Bayous surge gates would result in the loss of approximately 11 acres of estuarine soft bottom EFH. This is the area estimated for the footings of the gate structures. The structures themselves would provide artificial hardbottom habitat in the*

same area, increasing the diversity of EFH bottom types in the area. The net long-term loss to EFH bottom habitat from the Cow and Adams gate structures would therefore be negligible." It is not clear from information included in the DIFR-EIS that an increase in diversity would result from the creation of a "hardbottom habitat". Further, it is not clear whether this is a habitat type that is natural for the ecosystem referenced. Creation of hard bottom habitat in an area where that habitat type does not naturally occur may not provide beneficial compensation for net-loss of habitat functional values in a soft bottom environment. Thus, impacts associated with loss of estuarine soft bottom EFH should be compensated for in a manner appropriate for the ecologic system being impacted by this action.

Appendix M: There are aspects of the TCMP Consistency Determination which appear difficult to verify at this stage:

1. Full avoidance, minimization, and mitigation of impacts are still under consideration;
    - - The accuracy of the AAHU calculations are subject to sensitivity analysis that are still forthcoming
    - - The DIFR-EIS only identifies very broad mitigation measures, but does not specify detailed plans or targets
2. The plan should identify functional values, not "no net less of wetlands" (p4)
    - - 7e: this project would negatively affect EFH for managed species as a result of hydrologic changes associated with the installation of the surge gate structures at Adams and Cow bayous and should be specified in the document. "No effect" is only true provided the WVA model accurately predicts the impacts, and that those impacts are fully mitigated, which might be affected by the time lag for the biologic community within any created or restored aquatic ecosystem to achieve peak functional values.

Appendix O: Section 8.1 states, "*Preliminary mitigation cost estimates were developed based on these conceptual plans for use in the incremental analysis of levee reaches. Mitigation costs are small in relation to overall project construction costs, and therefore a final mitigation plan and more developed mitigation cost estimates are not needed to support plan selection.*" Further, Section 8.2 states "*Conceptual mitigation measures used to estimate mitigation costs for use in alternative comparisons included coastal marsh restoration, the acquisition and long-term conservation of bottomland hardwoods and/or swamps, and possible improvements to the forested wetland areas targeted for conservation*." Referring back to the main report, Section 5.4.2 states, "*Fish and wildlife mitigation costs were included in the economic evaluation. The approved WVA was used to quantify habitat impacts for a conservatively wide footprint of the alignment's construction right-of-way. Estimated mitigation costs (first costs and monitoring/adaptive management costs) were developed based upon conceptual mitigation plans. The same mitigation cost was applied to all height alternatives in each segment, as the impacts and mitigation would be similar for all heights and the cost variation among them would be small. When compared to other cost elements, estimated fish and wildlife mitigations costs were not large enough to affect plan selection."* It is not clear from the information presented in the DIFR-EIS how these mitigation cost estimates could have been carried out to any reasonable range of certainty based on the few details provided. Subsequently, it also is not clear whether or not these costs could potentially become a substantive factor in the alternative analysis and plan selection.

Significance

High

Recommendation for Resolution

Revisions to better specify environmental impacts and mitigation and monitoring plans should be included in the Final IFR-EIS.

Comment #8
There are systemic problems with organization in the report that must be addressed to increase understanding of the analysis procedures.
Basis for Comment
There are many project analysis topics in the text that are difficult to find. Some of the difficulty arises from organization of the text being weak in several locations, while some difficulty also arises from a paucity of the discussion of a particular topic. This is very problematic since there is a limited time for the technical reviewer, government agencies and the public to offer comments on the content of the documentation. The lack of organization of several topics hinders the ability to review, understand and comment on the effort. While it is recognized that an enormous amount of work went into developing the content of the documentation, the navigation of that volume of that effort has not been supported by the layout. For example, joint probabilities are addressed in Appx D 2.15.3 and 2.7.1. Nowhere in the table of contents or in the summary of contents of the appendix is there a discussion of where joint probabilities are addressed specifically. Rather, text concerning joint probabilities is included in discussions of river discharge and storm patterns with no guidance as to where to locate this important topic. Likewise, efforts to address avoidance, minimization, and mitigation of adverse impacts are covered in two sections of the main report and five sections of two appendices. There is absent any textual or tabular reference indicating where this information can be found. There are similar concerns with discussions of adjacent impacts, and hydraulic/hydrologic analysis. Somewhat better but still lacking clarity are the discussions of sea level rise and climate change which are spread out over four sections of the main report and at least five sections of two different appendices. While it is recognized that covering these topics in multiple relevant sections is appropriate from the perspective of fostering a complete discussion of a particular analysis or alternative element, the lack of a single location within the larger study discussing or indicating where primary topics of the analysis are located greatly weakens the readability of the overall study and fails to highlight much of the great effort that was undertaken in the development of the documentation. This is most evident in cases where only a few sentences are included in the documentation covering a broadly important topic, such as hydrology, specifically as it applies to rainfall and overland flow impoundment within the area behind the proposed levee. The DIFR-EIS (Section 7.2.1.1) states: "*Impacts from overland flows are expected to be minimal because these flows are minor and temporary*." It is not clear from the report whether sufficient analysis has been completed to determine whether the TSP or other alternatives might increase overland runoff impoundment behind the levee(s), which might subsequently pose a hazard to both local communities and ecologic resources. Nor does the text refer the reader to where they might find additional information on the subject in the DIFR-EIS or supporting documents. Supporting documentation was found in Appendix D, Section 2 (H&H), but here again, the discussion is diffuse and difficult to follow, eventually (and vaguely) referring the reader to “Section 5 of the H&H section of engineering appendix” for information on the interior drainage analysis performed.
Significance
High

Recommendation for Resolution

The organization of the text needs to be revised so all readers can quickly and easily identify locations of the primary topics of analysis. This can be accomplished in an executive summary, table, or discussion of primary analytic topics, or similar approaches.

Comment #9

DIFR-EIS main report and App. N: Terminology regarding HTRW risk assessment applies the terms "major" and "recent" to facilities in the study area and HTRW releases, respectively. However, these terms are not clearly defined in the document as it applies to HTRW.

Basis for Comment

It is not clear from the materials what timeframes were investigated to make determinations regarding HTRW. Also, it is not clear from the document what classifies a facility as "*major*", relative to other facilities/activities in the area. The area has been heavily industrialized for several decades. The study area includes a large number of facilities that produce, store, or transport HTRW. The TSP would both intersect and/or run adjacent to many of these facilities throughout the proposed project area. In order to fully communicate the risk assessment decision rationale in the DIFR-EIS, it is important to clearly define the terms according to the process used.

Regarding the term "major", it could be determined based on physical footprint, length of intersection of the property with the TSP, or similar properties. For example, "*A major HTRW facility would be a large chemical production or storage facility with a mappable footprint, as opposed to a minor or small facility indicated by a point on the map.*" Alternative or supplemental definitions might include production or storage capacities, etc.

Regarding the term "recent", as many of the identified HTRW in the study area are considered persistent pollutants in the environment (i.e., PCBs, PAHs, heavy metals, etc.), timeframes considered regarding HTRW releases or applicable regulatory violations (i.e., RCRA, etc.) becomes very important in understanding the risk assessment rationale and subsequent decision process validity. Said timeframes should be appropriate for the known environmental lifespans of the pollutants likely or known to be present. As many contaminants can have very long lifespans in covered sediments and soils, these timeframes may reasonably be several decades in some circumstances.

Clearly defining these terms in the document is important for clarity regarding the risk assessment of HTRW associated with the proposed alternatives in order to make a meaningful analysis of the anticipated impacts and alternatives.

Significance

Medium/High

Recommendation for Resolution

Define the terms "major" and "recent" in the FIFR-EIS for clarity of content and rationale for risk analysis.

Comment #10

Appendix H: There appears to be inconsistencies in the 404(b)(1) evaluation short form that require additional explanation.

Basis for Comment

- Section 1c of the short form indicates that there would not be significant degradation to waters of the US, but then section 2c1 and 2c2 indicate significant negative impacts.
- Section 6b, 6e, 6g, and 6h do not appear to align with the determination of circulation impacts to marsh (and secondary fisheries impacts) as a result of the placement of the surge gates at Adams and Cow bayou noted elsewhere throughout the DIFR-EIS.

Significance

Medium/High

Recommendation for Resolution

Review the 404(b)(1) documentation and revise as necessary for the FIFR-EIS.

Comment #11

Secondary considerations for the determination of local water surface elevation requires additional discussion in text.

Basis for Comment

Several factors play a secondary role in water surface elevation, and are important locally to design both at the time of construction and during the design life of any facilities. Isostasy, local or regional subsidence, and the presence of embayments may all modify the behavior of waves, surges and tidal nonlinearly. How are these local factors addressed in the study and how do they impact design decisions related to flood control and environmental impacts?

Significance

Medium

Recommendation for Resolution

Please address how these local factors are addressed in the study and how do they impact design decisions related to flood control and environmental impacts.

Comment #12

A discussion of sediment transport impacts is missing from the text.

Basis for Comment

The TSP and other alternatives have the potential to alter limnological, riverine, and sub/supra-littoral sediment movement and storage. Any alterations will have consequences on the flood control and ecological goals and benefits of the project. For example, increased sedimentation may negatively impact habitat or decrease flood control conveyance. This possibility does not appear to be addressed in the development of the TSP.

Significance

Medium

Recommendation for Resolution

Please address how the project impacts sediment transport and storage and how the consequences of these impacts are addressed and/or mitigated in the development of the TSP. If sediment transport impacts were not addressed intentionally please provide a justification.

Comment #13

Consider recommending a plan with higher performance than the NED.

Basis for Comment

As stated on page 7-42, Appendix B, it may make sense to recommend a plan that provides a higher level of performance because it fulfills other, non-economic objectives of the study, including considerations of life/safety, critical infrastructure, and RSLC. Also, Objective 2 is: *Reduce risk to human life from storm surge impacts for the Sabine and Brazoria region for the 50-year period of analysis*. The report also emphasizes the importance of protecting critical infrastructure and the risk and uncertainty caused by RSLC.

Significance

Medium

Recommendation for Resolution

Emphasize need for consideration of factors in addition to NED in selection of the Recommended Plan.

Comment #14

DIFR-EIS main report Section 7.2 and Section 7.6.1.1: Steps for pre- and post-project monitoring do not appear to be included in the DIFR-EIS, but should be recommended to ensure impacts to hydrology and fishery passage are as anticipated via modeling.

Basis for Comment

Pre/post project monitoring would aid in adaptive management efforts specific to the project and in general regarding the model(s) as they might apply to this and other future projects. This is especially important, given the special, one-time nature of the application of the WVA model, but should be included as a matter of course for projects of this magnitude to support continued model development and project efficacy.

Significance

Medium

Recommendation for Resolution

Revise the Final IFR-EIS to include monitoring as noted.

Comment #15

It is not clear from the DIFR-EIS what effect the costs for pipeline relocation might have on the alternatives selection.

Basis for Comment

Appendix E (Real Estate), Section 11 notes: *"It is known that there will be multiple pipelines that will be impacted by this project. However, relocation and modification costs were purposely not included because the relocations and modifications that will be necessary largely depend on how the feature designs evolve prior to ADM, and what the actual field conditions are when more thoroughly investigated."*

It is not clear whether the omission of costs for pipeline relocation might change the cost/benefits analysis for the project. Nor is it clear from the documentation what "*feature designs*" might evolve that would substantively alter these estimates. The alignment and general features of the TSP and retained alternatives are fairly well identified and, barring a major public or resource agency objection, appear unlikely to change substantively based on the alternatives analysis. Thus, it seems like those costs could be reasonably estimated at this stage for each alternative within a reasonable range of error.

Significance

Medium

Recommendation for Resolution

Estimate costs for pipeline relocation in the alternatives analysis of the FIFR-EIS.

Comment #16

Appendix O: There are a number of issues related to base assumptions in the WVA model that should be addressed more substantively in the DIFR-EIS:

Basis for Comment

1. 6.1.1 (p26): "*In this model, an area that is 100 percent shallow water is assumed to have minimal habitat suitability (SI = 0.1). For all marsh types, optimal vegetative coverage is assumed to be 100 percent (SI = 1.0). This assumption diverges from the general biological understanding that optimum cover falls in the 60 to 80 percent range.*" The explanation, "*Selection of 100 percent marsh cover as the optimal habitat condition is based upon several factors. Loss of emergent coastal marsh is a serious existing condition in the study area, and it is assumed that this loss will continue due to RSLR*." 100% vegetative cover is retained in the model as optimal; why not target 60-80% as noted in the supporting documentation? The included materials do not provide sufficient rationale for this assumption. Needs additional explanation on basis for the assumption.
2. Section 6.3.6. (p41-42): the model assumes ranges of uncertainty for V6 Surrounding Land Use. The ranges are from 20% (no change predicted) to 30% range (where change is predicted). How/why were these ranges of uncertainty selected? Needs additional explanation on basis for assumption.
3. Section 7.2.2.2 (p66): The document notes, "*WVA modeling of the FWOP condition assumed that the conversion from one wetland type to another occurred at the midpoint of the period of analysis (TY31). The existing wetland was assumed to persist through TY30…*" The basis for these starting assumptions is not clear. Needs additional explanation on basis for assumption.

Based on information indicating that the model will undergo sensitivity analysis, it is anticipated that this analysis should reveal whether these assumed numbers individually (or collectively) change the outcome of the modeled conditions. However, the panel recommends that a more substantive description of the pending sensitivity analysis be included in the appendices, and that the rational for the starting assumptions be more clearly stated in the documentation related to the WVA model.

Significance

Medium/Low

Recommendation for Resolution

Revise documentation in Appendix O as noted for the FIFR-EIS.

Comment #17

The statement on the economic basis for selecting the TSP is not complete.

Basis for Comment

Paragraph 5.4.4, page 5-22, EIS states, *The current TSP is the NED plan for each project area and only considers economics as the decision criteria*. The following statement should be added, ER 1105-2-100 states "Where two cost-effective plans produce no significantly different levels of net benefits, the less costly plan is the NED plan, even though the level of outputs may be less." This also applies to Paragraph 7.1.17, Page 7-41, Appendix B. The EIS should be a stand-alone document. Without this statement, the reader may be confused as to why the plan with the highest net benefit is not always the NED plan and therefore not the Tentatively Selected Plan (TSP).

Significance

Low

Recommendation for Resolution

Add the recommended statement.

Comment #18
The discussion of risk and uncertainty in Appendix C – Economics Analysis does not define the risk data entered in HEC_FDA for various parameters such as structure elevation, structure value, etc.
Basis for Comment
Corps guidance on risk requires that reasonable data on how risk and uncertainty is addressed in a report.
Significance
Low
Recommendation for Resolution:
Include a discussion of the risk and uncertainty factors addressed in Appendix C – Economic Analysis. Include a table showing the risk data input into HEC-FDA and discuss how the data were calculated.

Comment #19
Please revise figures.
Basis for Comment
Typical section S-03: scour protection (please see DIFR EIS App A Pt 1), illustrates the proposed flood wall as being a vertical slab of undefined material with undefined toe-down depth and without toe, key or heel. While it is understood that the final design will vary greatly depending on many factors, including local soil conditions and design scour depths, the figure is unclear as to the types of scour protection walls to be implemented – the figure suggests a buttress type. Some additional design information is included in the Design Assumptions text, below the figure, but that information has not been translated into the figure. Moreover, this figure is particularly confusing in its lack of detail compared to Typical Section S-04: Orange County floodwall, later in the document or Figure 7-1 in Appendix D. Typical section S-14: levee armor (please see DIFR EIS App A Pt 2), illustrates the proposed levee armor as being a riprap blanket without top or toe protection and without underlayment or gravel layer. While it is understood that the final design will vary greatly depending on many factors, including local wind, wave, and soil conditions, the figure is unclear as to the extent of scour protection top and toe to be implemented. Some additional design information is included in the Design Assumptions text, below the figure, but that information is vague and missing top and toe details.
Significance
Low
Recommendation for Resolution
Please revise the relevant figure generally to illustrate the varied scour protection depth and type or types of scour protection considered as part of the design. Please revise the relevant figure generally to illustrate the varied scour protection top and toe or types of scour protection considered as part of the design.

Appendix B Charge to Reviewers

The general charge produced by the USACE to support the Independent External Peer Review is reproduced below. APMI provided this charge to the IEPR panel to guide its review.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the charge. The panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the charge.

The panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The panel should not make recommendations on USACE policy or whether a particular alternative should be implemented or present findings that become "directives" in that they call for modifications or additional studies or suggest new conclusions and recommendations. This includes opinions from named USACE personnel or others outside of USACE. In such circumstances the panel may have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the panel's intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment.

Table 5 on page 42 lists the documents to be reviewed by the IEPR panel.

The following are the broad evaluation charge questions considered for this IEPR:

1. Is the need for and intent of the decision document clearly stated?
2. Does the decision document adequately address the stated need and intent relative to scientific and technical information?

Given the need for and intent of the decision document, assess the adequacy and acceptability of the following:

3. Project evaluation data used in the study analyses,
4. Economic, environmental, and engineering assumptions that underlie the study analyses,
5. Economic, environmental, and engineering methodologies, analyses, and projections,
6. Applications of models used in the evaluation of existing and future without-project conditions and of economic or environmental impacts of alternatives. This includes inputs and outputs,
7. Methods for integrating risk and uncertainty,
8. Formulation of alternative plans and the range of alternative plans considered,
9. Quality and quantity of the surveys, investigations, and engineering sufficient for conceptual design of alternative plans, and
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable, and
12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

    For the tentatively selected plan, assess whether:

13. The models used to assess life safety hazards are appropriate,
14. The assumptions made for the life safety hazards are appropriate,
15. The quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards, and
16. The analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.

Table 5. List of Documents Reviewed and Documents for Reference that Supported the Review

Documents for Review	Number of Pages
Sabine Pass to Galveston Bay, Texas Coastal Storm Risk Management and Ecosystem Restoration – Draft Integrated Feasibility Report – Environmental Impact Statement	55
Draft Appendix A – Measure Information Sheets	210
Draft Appendix B – Plan Formulation Appendix	117
Draft Appendix C – Economic Analysis	73
Draft Appendix D – Engineering Design, Cost Estimates and cost Risk Analysis	209
Draft Appendix E – Real Estate Plan	28
Draft Appendix F – Public Coordination: 1) Scoping, 2) Comments on Draft IFR-EA (placeholder)	65
Draft Appendix G – Agency and Tribal Coordination	68
Draft Appendix H – Clean Water Act Section 404(b)(1) Evaluation	6
Draft Appendix I – Clean Air Act Emissions Modeling	13
Draft Appendix J – Endangered Species Act – Biological Assessment	79
Draft Appendix K – Fish and Wildlife Coordination Act – Draft Coordination Action Report	0
Draft Appendix L – National Historic Preservation Act Coordination – Programmatic Agreement	10
Draft Appendix M – Coastal Zone Management Act – Consistency Determination	13
Draft Appendix N – Hazardous, Toxic and Radioactive Waste Assessment	33
Draft Appendix O – Wetlands Value Assessment Ecological Modeling Report	123
Draft Appendix P – Mitigation Plan and Incremental Analysis and Monitoring Plan (placeholder)	0
Draft Appendix Q – Wetlands Value Assessment Sensitivity Analysis (placeholder)	0
Draft Appendix R – Demographic Analysis Appendix	25
Draft Appendix S – List of Preparers	1
Draft Appendix T – Distribution List	11
Total	**1,139**
Documents for Reference and Support	
Report Synopsis for Sabine Pass to Galveston Bay, Texas Coastal Storm Risk Management and Ecosystem Restoration - Feasibility Study, September 11, 2015	55
Joint Probability Analysis of Coastal Storm Hazards, 31 October 2014	18
ADCIRC Based Storm Surge Analysis of Sea Level Rise in the Galveston Bay and Jefferson County Area in Texas, November 28, 2011	85

Appendix C Organizational Conflict of Interest Forms

C.1 LMI COI Disclosure

Conflicts of Interest Questionnaire
[Independent External Peer Review]
[Sabine Pass IEPR]

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: Logistics Management Institute
REPRESENTATIVE'S NAME: Susan D. Ford
TELEPHONE: 703-917-7524
ADDRESS: 7940 Jones Branch Drive, Tysons, VA 22102
EMAIL ADDRESS: susan.ford@lmi.org

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.) No Yes (if yes, briefly describe):NO

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? No Yes (if yes, briefly describe):NO

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? No Yes (if no, briefly describe the difficulty in identifying outside reviewers):YES

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? No Yes (if yes, briefly describe):NO

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information. N/A

YOUR SIGNATURE 8/5/15 DATE

C.2 APMI COI Disclosure

Conflicts of Interest Questionnaire

Independent External Peer Review

(Sabine Pass IEPR)

The purpose of this document is to help the U.S. Army Corps of Engineers identify potential organizational conflicts of interest on a task order basis as early in the acquisition process as possible. Complete the questionnaire with background information and fully disclose relevant potential conflicts of interest. Substantial details are not necessary; USACE will examine additional information if appropriate. Affirmative answers will not disqualify your firm from this or future procurements.

NAME OF FIRM: Analysis Planning and Management Institute, Inc. (APM Institute)
REPRESENTATIVE'S NAME: Ahmad Faramarzi
TELEPHONE: 703-304-8072
ADDRESS: 21087 Zachary Taylor Highway; Culpeper, VA 22701-7832

EMAIL ADDRESS: ahmad.faramarzi@apm-inst.org

I. INDEPENDENCE FROM WORK PRODUCT. Has your firm been involved in any aspect of the preparation of the subject study report and associated analyses (field studies, report writing, supporting research etc.)? (No) Yes (if yes, briefly describe):

II. INTEREST IN STUDY AREA OR OUTCOME. Does your firm have any interests or holdings in the study area, or any stake in the outcome or recommendations of the study, or any affiliation with the local sponsor? (No) Yes (if yes, briefly describe):

III. REVIEWERS. Do you anticipate that all expert reviewers on this task order will be selected from outside your firm? No (Yes) (if no, briefly describe the difficulty in identifying outside reviewers):

IV. AFFILIATION WITH PARTIES THAT MAY BE INVOLVED WITH PROJECT IMPLEMENTATION. Do you anticipate that your firm will have any association with parties that may be involved with or benefit from future activities associated with this study, such as project construction? (No) Yes (if yes, briefly describe):

V. ADDITIONAL INFORMATION. Report relevant aspects of your firm's background or present circumstances not addressed above that might reasonably be construed by others as affecting your firm's judgment. Please include any information that may reasonably: impair your firm's objectivity; skew the competition in favor of your firm; or allow your firm unequal access to nonpublic information.

None

Ahmad Faramarzi
YOUR SIGNATURE

August 2, 2015
DATE

Appendix D Review Panel Members' Resumes

APMI selected three panel members who were qualified in the required areas of expertise called for by the USACE:

- Civil works planner/economics
- Biological resources and environmental law compliance
- Hydrology and hydraulics/coastal engineer

The panel members met and exceeded the minimum requirements for each of the specified areas of expertise. The panel represented a balanced mix of individuals from academia, a commercial firm, and an independent consultant.

D.1 Mr. James Dobberstine

Qualifications Summary

20+ years' experience as a biologist and environmental scientist, including:

Extensive management and leadership experience with habitat restoration, monitoring, and protection.

Ongoing research experience with many aspects of aquatic and riparian habitats, including water and sediment characterization (toxicity, biotic community, chemistry), and the effects of adjacent land use on in-stream conditions.

Experience with NEPA impact and cumulative affects assessments on projects with high public and inter-agency interest within sensitive aquatic habitats, including wetlands and riparian systems.

Extensive experience developing and evaluating USACE permits applications and related documents. Experienced with the complex regulatory framework affecting projects that potentially affect aquatic habitat (NEPA, ESA, CWA, etc.). Familiar with USACE Planning Process, including applicable guidance and regulations.

Habitat restoration featuring beneficial uses of dredge material to restore estuarine marsh and sea grass beds, coupled to coastal marsh preservation. Also habitat restoration in mixed urban/industrial riparian areas where there were potential toxicant/exposure concerns contrasted with significant cultural and environmental benefits including community education and recreation opportunities, and ecosystem enhancement.

Extensive habitat monitoring experience for adaptive management of aquatic habitat restoration in estuarine and riparian systems. Experience includes development and implementation of an EPA approved QAPP for data quality.

Prior IEPR experience with the Noblis Center for Sustainability (Energy and Environment Mission), serving on the Independent External Peer Reviews of the:

USACE Engineering, Economic, and Environmental Evaluation of the Geotechnical, Hydrological, Hydraulic, and Economic Aspects of the Dam Safety Modification Study Report for Rough River Dam, Kentucky.

USACE Limited Reevaluation Report for Design Deficiency Corrections Prairie du Pont and Fish Lake Flood Risk Reduction Project, St. Clair and Monroe Counties, Illinois.

USACE Missouri River Recovery Program (MRRP) National Environmental Policy Act Project.

USACE IEPR for the Alabama-Coosa-Tallapoosa River Basin Water Control Manual Update and Environmental Impact Statement Project

USACE Lower Snake River Programmatic Sedimentation Plan and Draft Environmental Impact Statement Project

Active with numerous Environmental Professional Associations and Advisory Councils, including:

EPA/TCEQ Galveston Bay Estuary Program: current member of the Monitoring and Research Subcommittee of the Galveston Bay Council.

Board member of the Texas Association of Environmental Professionals (TAEP; a chapter of the National Association of Environmental Professionals): President of the Board (2010- present) and Education Director (2008- present).

Board Member of the South Central Regional Chapter of the Society of Environmental Toxicology and Chemistry (SETAC) since 2010: Vice-President (2012-13), President (2013- present).

Advisory Board Member of the Galveston Bay Foundation: Advisor to the Land Committee (Conservation Holdings) and the Permit Review Committee (2009- present).

Memorial Park Demonstration Project Vegetation Advisory Workgroup (2015)

Member of the Moody Gardens Animal Care and Use Committee, advising on actions including support/funding of conservation efforts and research (2015).

Education

M.S., Environmental Science, University of Houston Clear Lake (2007)

M.S., Environmental Management, University of Houston Clear Lake (2005)

B.A., Life Sciences, Concordia University Portland (1993)

Certifications

Certificate: 40 hour USACE Wetland Delineation Course. Texas A&M, Texas Sea Grant, and the Texas Coastal Watershed Program, 2007.

Certificate: Constructed Wetlands for Water Quality Improvement. ENTRIX (Cardno), Clemson University, and University of Houston Clear Lake, 2004.

Certificate: Management Development at the American Zoo and Aquarium Association School for Zoo and Aquarium Personnel conducted by North Carolina State University, 1999.

Continuing Education

GIS Techniques in Environmental Assessment. SETAC short course conducted by the University of North Texas, 2011.

Probabilistic Ecological Risk Assessment. SETAC short course conducted by Texas Tech University, 2010.

Application of Adaptive Management to Address Climate Change Related Challenges. Restore America's Estuaries (RAE) Special Program conducted by the NOAA Coastal Service Center and the PBS&J Ecosystem Restoration Division, 2010.

Benthic Mapping Techniques aboard the Alletta Morris. Benthic mapping techniques including side scan sonar, underwater video, sediment profile cameras, and soil cores. RAE Special Program conducted by the EPA, USDA-NRCS, and the University of Rhode Island, 2008.

Sampling Benthic Sediments: Methods, Analyses, and Judgments. SETAC short course conducted by the University of North Texas Institute of Applied Sciences, 2006.

Conserving Land with Conservation Easements short course, a program of the National Land Trust Alliance's Land Conservation Leadership Program, 2006.

Summary of Professional Experience

Academia

Lee College, Environmental Science and Biology—Faculty

2007-present

Primary Responsibilities

Division Chair-Mathematics, Engineering, and Sciences (MES) at Lee College (August 2013- present)

- Overseeing all operational aspects of the MES Division, including oversight of three departments (Mathematics, Biological Sciences, and Physical Sciences), 13 laboratories, approximately 30 faculty and staff, and a $170,000 annual facilities budget (excluding faculty and staff salaries).
- Responsible for ongoing development of the division, including expansion plans for new laboratory facilities, personnel hiring and evaluation, budgeting and expenditures, program development, course scheduling, and teaching and laboratory facilities. Reports to the Dean of Academic Studies.

Environmental Science Faculty (2007-present)

- Responsible for course and degree plan development, laboratory facilities, classroom instruction, and undergraduate research in the environmental sciences.
- Ongoing research in ecotoxicology and ecosystem function in aquatic estuarine communities, the results of which have been featured through organizations including Restore America's Estuaries (RAE), the Galveston Bay Estuary Program, and the Texas Association of Environmental Professionals (TAEP). Current and recent grant-funded projects include:
  - "*Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System*" multi-phase study examining biotic and abiotic elements of estuarine ecosystems (funded through NOAA/TCMP and TCEQ/EPA grants),
  - "*Living Shorelines: Small-scale Restoration Efforts and Their Ecologic Impacts on Local Communities*" ongoing study examining ecologic community development and restoration efficacy at a small scale (funded in-part through U.S. Dept. of Education grant), and
  - "*Project TES: Teaching Environmental Sciences*", providing funding for equipment (including GC Mass Spectrometer and FTIR Spectrometer) and materials aimed at developing curricula and skills for students interested in teaching in the environmental sciences (funded through U.S. Dept. of Education grant).

Served on numerous hiring committees, including as:

- Chair, Faculty Screening (Hiring) Committee for Environmental Science/Biology (2012).
- Member, Screening (Hiring) Committees for the HSI STEM Grant Data Analyst position (2012), Honors Program Director (2013), Chemistry Faculty position (2013), Microbiology Faculty position (2013), and Public Relations Manager position (2013).

Voting member of the Institutional Review Board and Honors Program Council.

Member of the Integrated Learning Center (ILC) Task Force (2014), President's Task Force on Division Realignment (2012-13), Presidents Task Force on Faculty Compensation (2014).

Professional Activities

2015: Memorial Park Demonstration Project Vegetation Advisory Workgroup (2015), a multi-stakeholder effort led by the Harris County Flood Control District to stabilize the shoreline of Buffalo Bayou in urban Houston while enhancing riparian habitat.

2012-present: Member of the Stephen F. Austin State University Arthur Temple College of Forestry and Agriculture (ATCOFA) College-level Advisory Council, providing advice and guidance relating to teaching, research, outreach, and matters related to the College's Strategic Plan.

2013-present: Member of the Moody Gardens Animal Care and Use Committee, advising on actions affecting the facilities' biologic collection, and support/funding of conservation efforts and research.

2013: Session Chair at the TAEP Environmental Challenges and Innovations Conference (ECIC) session titled "Wetlands and Water Bodies", and presenter on wetland restoration and mitigation titled "Assessing the Success of Coastal Marsh Plant Communities at Five Restored Sites in the Galveston Bay System".

2010: Session Chair at the Restore America's Estuaries Conference (Galveston, TX) session titled "Opportunities, Challenges, and Lessons Learned with the Use of Dredged Materials".

2009: Peer reviewer for the TCEQ Galveston Bay Estuary Program's "State of the Bay: A Characterization of the Galveston Bay Ecosystem. Third Edition". Reviewed and provided subject matter and editorial comments on Chapter 8: The Bay's Living Resources.

2009: Session Chair at the Galveston Bay Estuary Program's Ninth Biennial State of the Bay Symposium (Galveston, TX) session titled "The Science of Estuarine Wetlands".

2007-2008: Member of the Technical Advisory Committee of the Chambers County (TX) Greenprint Project of the Trust for Public Land (www.tpl.org/chambers-county-greenprint).

2007-present: Member on the Professional Development Committee (a subcommittee of the Lee College Faculty Assembly).

2007- 2008: Faculty Learning Community III member/participant (with stipend), working to develop improved teaching methods for critical thinking (Lee College).

External Advisor for the University of Houston Environmental Management Program Curriculum Review, April 2007.

Editor and contributor to Laboratory and Field Exercises in Environmental Science (Lehmberg, 2010-12).

Grant Funding Acquired

2013 Lee College HSI Stem Faculty Mini-grants (2). $9K (Spring 2013) and $6000 (Fall 2013) to fund research stipends for students investigating ecosystem function of aquatic habitat restoration in coordination with the "Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System" project.

2012 Lee College HSI Stem Faculty Mini-grant. $9K to fund student research investigating aquatic habitat restoration on private land in cooperation with the Galveston Bay Foundation. The results were presented at the 2012 Restore America's Estuaries Conference, Tampa, FL, under a presentation titled "Living Shorelines: Small-scale Restoration Efforts and Their Ecologic Impacts on Local Communities". Three students also won a scholarship for an updated version of this presentation at the Our Gulf Coast Communities: Past, Present, and Future Symposium, May 2013.

2011 NOAA/Texas General Land Office (GLO) Coastal Management Program (CMP) grant awarded in partnership with Lee College and the University of Houston Clear Lake. $79K to fund Phase II of a research

project titled "Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System." Phase II project commenced November 2012 and closed June 2014. Phase I was completed by the same team in 2007-08. The research was framed along the recommendations from "Science-based Restoration Monitoring of Coastal Habitats (NOAA Coastal Ocean Program, Decision Analysis Series No. 23, Volumes 1 and 2). Funding partners for the overall project included NOAA, the Texas General Land Office Texas (GLO) Coastal Management Program (CMP), and the Galveston Bay Estuary Program (GBEP). Data was collected according to the Quality Assurance Program Plan (QAPP) prepared by Jim Dobberstine and Cynthia Howard to meet EPA and TCEQ requirements for scientific data and will be available through the National Biological Information Infrastructure (NBII) Database through our partnership with the Houston Advanced Research Center (HARC: http://maps.harc.edu/Marshes/). Data collected is anticipated to aid habitat restoration managers with the design and implementation of future projects in the lower Galveston Bay watershed.

2011 US Department of Education Hispanic Serving Institution (HSI) STEM grant awarded to Lee College, including the $162K subcomponent "Project TES: Teacher Education Science", providing funding for equipment (including GC Mass Spectrometer and FTIR Spectrometer) and materials aimed at developing curricula and skills for students interested in teaching in the sciences.

Project Management, Research, and Field Experience

Independent Consultant—Environmental Science and Management

2010-present

Providing consulting services to clientele in SE Texas on projects requiring habitat assessment, regulatory permitting, and habitat restoration, mitigation, and monitoring services.

Center for Sustainability: Noblis, Inc.—Subcontractor

2011-13

NEPA and ecologist panel member for the following Independent External Panel Reviews (IEPRs):

USACE Engineering, Economic, and Environmental Evaluation of the Geotechnical, Hydrological, Hydraulic, and Economic Aspects of the Dam Safety Modification Study Report for Rough River Dam, Kentucky (www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/peer/RoughRiverDam_IEPR_18Aug2011.pdf)

USACE Limited Reevaluation Report for Design Deficiency Corrections Prairie du Pont and Fish Lake Flood Risk Reduction Project, St. Clair and Monroe Counties, Illinois (www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/peer/PrairieduPont_FishLake_IEPR.pdf)

USACE Missouri River Recovery Program (MRRP) National Environmental Policy Act Project

USACE Alabama-Coosa-Tallapoosa River Basin Water Control Manual Update and Environmental Impact Statement Project (www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/peer/ACT_RiverBasinIEPR.pdf)

USACE Lower Snake River Programmatic Sedimentation Plan and Draft Environmental Impact Statement Project (www.usace.army.mil/Portals/2/docs/civilworks/Project%20Planning/peer/LowerSnakeRiver_IEPR_24May2013.pdf)

The Galveston Bay Foundation—Environmental Scientist

2000-07

Primary Responsibilities

Land Programs Manager, working as an environmental scientist and regulatory specialist, focusing on wetlands and other aquatic habitats.

Project manager for a number of successful programs linking science to policy, including:

The Galveston Bay Foundation's *Wetland Permit Review Program* working proactively with citizens, local business, and federal, state and regional policy makers to affect positive change to both individual actions and the underlying policies affecting the Galveston Bay watershed. Coordinated with federal, state, and local agencies to review project proposals within the lower Galveston Bay watershed, providing comments on impacts, alternatives analysis, mitigation requirements, and project design, aimed at reducing any given project's adverse impacts to Galveston Bay. Also conducted rulemaking reviews and comment development, and worked to establish clear links between the relevant science and policy affecting aquatic habitat management within the bay system.

Living Shorelines Program, funded through grants from the USFWS Coastal Program and Texas GLO Coastal Impact Assistance Program (CIAP), assisting local landowners with permitting, fundraising, and project implementation for shoreline restoration and alternative shoreline stabilization on private lands within the bay system to correct habitat losses due to erosion and subsidence.

Worked in the area of habitat conservation, overseeing the Foundation's *Land Conservation Program* managing more than 2,500 acres of protected coastal habitat (terrestrial and aquatic). Included development and implementation of conservation easements, fee-simple acquisition. Led development of habitat assessments, baseline biologic inventories, and project cost models, and assisted with the negotiation and development of easement contracts for numerous conservation easements including Sunset Cove (Galveston Island), Moore Island (west Galveston Bay), and Crystal Dunes (Bolivar). The management focus of these holdings is to protect and enhance important, complex habitats for biologic communities at all trophic levels, including threatened and endangered species.

Collaborative habitat restoration experience at all phases, including project development, permit acquisition, fundraising/grant development, and project implementation on multi-stakeholder projects including federal and non-federal partners. Experienced team member on numerous multi-stakeholder aquatic habitat restoration projects aiding in project design, funding development, safety and toxicity issues, and habitat quality/needs. Project teams frequently included federal (USFWS, NOAA, USACE) and non-federal (TPWD, TGLO, NGO's, others) partners. Projects included numerous aquatic habitat (stream/river, estuarine wetland) restoration projects, stream bank erosion protection, and stream/estuarine aquatic habitat assessments, including lifecycle and habitat needs. Extensive experience developing and evaluating U.S. Army Corps of Engineers permits applications and related documents for the Galveston Bay Foundation. Experienced with the complex regulatory framework affecting projects that potentially impact coastal habitat (NEPA, ESA, CWA, etc.). Examples of projects contributed to include:

Emergent estuarine marsh and seagrass habitat beneficially using dredge material from onsite in Snake Island Cove (west Galveston Bay), coupled to preservation (conservation easement) of associated coastal high marsh and prairie (buffer) habitat at Sunset Cove on Galveston Island, including work on project scoping, design, funding development (grant writing), and permit

development. Also included developing the conservation easement baseline assessment and management plan, and collaboration on easement contract development.

Collaboration on estuarine low marsh restoration design and permit development in Pierce Marsh (west Galveston Bay) for TXDOT mitigation of off-site impacts (this site is now one of several included in ongoing monitoring as part of the "*Science-based Monitoring*…" grant-funded research project being conducted by UHCL and Lee College, and was the site from which we gathered pre-construction data for that effort).

Emergent estuarine and palustrine marsh restoration project design, site assessment, funding development, permit development, and project implementation within multiple riparian corridors of lower Galveston Bay for numerous small-scale living shorelines projects.

Project design, permit development, and project implementation of estuarine marsh and correction of erosional losses of shoreline in high wave energy areas for Sullivan property on East Bay (now one of several sites being monitored under the "*Living Shorelines*…" research project being conducted by Lee College).

Review and consultation on sediment contaminant sampling plan and data analysis pertaining to a subsided marsh restoration within mixed urban/industrial area in the San Jacinto River where potential toxicant/exposure concerns contrasted with significant cultural and environmental benefits including community education and recreation opportunities, and ecosystem enhancement.

Project manager for a number of federal grant funded habitat research and educational projects, including fund raising, project design and implementation, reporting, and public outreach. Example projects include:

Phase I, "Science Based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System", a joint project in partnership with the University of Houston Clear Lake. This research focused on the functional aspects (biotic community, sediment, and water quality) of multiple wetland habitat restoration sites, generating data regarding the vegetation and faunal uses of created marshes relative to natural ones, and the relative ecologic function of each restoration design to determine whether certain designs result in more functional biologic communities over time. Part of an ongoing study (described above in Phase II).

"Discover Galveston Bay Interpretive Sign Project": Two-tier grant funded project placing educational signs on the natural history specific to 40 locations around the Galveston Bay watershed in cooperation with multiple private and public agency partners. Funded by NOAA and the Texas CMP.

Professional Activities

GBF representative on citizen advisory panels (CAPs) facilitating communication between local petrochemical industry and neighboring communities, including the Bay Area Citizens Advisory Panel (BayCAP) and the Seashore Area Citizens Advisory Panel (SeaCAP).

2005: Public Participation and Education Plenary Session moderator at the GBEP "State of the Bay" Symposium, January 25th, Houston TX.

Active member of the Monitoring and Research, Water and Sediment Quality, and Public Participation and Education Subcommittees of the Galveston Bay Council (Galveston Bay Estuary Program).

Active with the Texas Land Trust Council, Land Trust Alliance, and Restore America's Estuaries.

Active with the Texas Association of Environmental Professionals and South Central Chapter of the Society for Environmental Toxicology and Chemistry.

Grant Funding Acquired

2007 NOAA/Texas GLO Coastal Impact Assistance Program (CIAP) grant award to the Galveston Bay Foundation. $71K to fund the GBF Living Shorelines Program.

2007 Galveston Bay Estuary Program grant awarded to the University of Houston Clear Lake in partnership with the Galveston Bay Foundation. $10K to supplement the NOAA/Texas GLO Coastal Management Program (CMP) grant for "Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System."

2006 US Fish and Wildlife Service Coastal Program grant to the Galveston Bay Foundation. $30K to fund the Living Shorelines Program.

2006 Fish America Foundation/NOAA Restoration Center grant to the Galveston Bay Foundation. $50K to fund a portion of the coastal habitat restoration at Snake Island Cove.

2006 NOAA/Texas GLO CMP grant awarded to the University of Houston Clear Lake in partnership with the Galveston Bay Foundation. $42K to fund a portion of a research project titled "Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System." Project complete summer 2008.

2006 NOAA/Texas GLO CMP grant awarded to the Galveston Bay Foundation. $33K to fund the Drive and Discover Galveston Bay Interpretive Sign Project (Phase 2).

The Houston Advanced Research Center (HARC)—Contract Consultant

2004-06

Assisted information management, technical communications, and stakeholder facilitation related to the Galveston Bay Freshwater Inflows Group, a program of the TCEQ Galveston Bay Estuary Program. Required extensive knowledge of stream and estuarine ecology, water quality, and research methods.

The University of Houston Clear Lake (UHCL)—Graduate Research Assistant

2003-05

Research assistant to Dr. Cindy Howard, working on estuarine habitat assessments (water, sediment, benthic community), sediment toxicity (internship completed with the PBS&J Environmental Toxicology Laboratory, Houston under Dr. Jim Horne), and sediment contaminants (heavy metals, organics). Culminated in Master's Thesis titled "*Sediment Triad Approach to Finding a Suitable Reference Bayou for Patrick Bayou and Similar Sites Located on the Houston Ship Channel*". The data compiled under this effort is currently being used in association with analysis for the Patrick Bayou EPA Superfund project.

Public zoo and aquarium field—Senior Biologist, Aquatic Habitat Specialist

1993-2000

Extensive experience working with aquatic habitats, water quality, and organisms including fish, birds, and marine mammals. Includes facilities, staff, and budget management experience, in addition to propagation, husbandry, and habitat experience with numerous threatened and endangered Texas animal species including birds (Brown Pelicans), fish (various), reptiles (Kemp's Ridley sea turtles, others), marine mammals, and others.

Publications and Presentations

2016: Invited to present an oral platform titled, "Comparing Salt-Marsh Ecosystem Responses to Different Restoration Techniques" at the Galveston Bay Estuary Program's 10th State of the Bay Symposium: 20 Years of Successfully Preserving Galveston Bay. Coauthor/speaker: C. Howard.

2014: Final report: Science-based Monitoring of Created Wetlands and Restored Habitat within the Galveston Bay System (Phase 2). Prepared for the Coastal Management Program (CMP) of the Texas General Land Office and the National Oceanic and Atmospheric Administration (NOAA). Contract No. 13-039-000-6906. J. Dobberstine and C. Howard.

2014: Senior-author of a research poster (additional data), "Living Shorelines: Small Scale Restoration Efforts and Their Ecological Impacts on Local Communities" (Z. Martin, A. Ficklin, R. Cummings, T. Provost, L. Wilde, T. Hall, J. Dobberstine) presented at the Restore America's Estuaries/Coastal Society Joint Symposium in Washington, D.C.

2014: Platform presentation, "Assessing the Success of Coastal Marsh Plant Communities at Five Restored Sites in the Galveston Bay System" (Z. Martin, A. Ficklin, M. Warwick, T. Hall, J. Dobberstine, and C. Howard), presented at the Restore America's Estuaries/Coastal Society Joint Symposium (Washington, DC).

2013: Platform presentation "Assessing the Success of Coastal Marsh Plant Communities at Five Restored Sites in the Galveston Bay System" (J. Dobberstine and C. Howard), presented at the 2013 TAEP Environmental Challenges and Innovations Conference (Houston, TX).

2012: Senior author of research poster, "Living Shorelines: Small Scale Restoration Efforts and Their Ecological Impacts on Local Communities" (R. Gammon, Z. Martin, A. Ficklin, R. Cummings, L. Eagle, B. Freeman, L. Wilde, T. Hall, J. Dobberstine), presented at the 6th National Restore America's Estuaries Conference (Tampa, Fl.).

2011: Platform presentation "Functional Assessment of Coastal Marsh Communities at Four Restored Sites in the Galveston Bay System". Co-presenter: Cynthia L. Howard, University of Houston Clear Lake. Presented at the 2011 Native Plant Society of Texas Annual Symposium (Houston, TX).

2010-12: Editor and section contributor to Laboratory and Field Exercises in Environmental Science (Lehmberg, 2010; ISBN978-0-578-05921-1).

2009: Platform presentation titled "Comparing salt marsh ecosystem responses to different restoration techniques". Presented at the 2009 Texas Coastal Conference hosted by the Texas General Land Office (Galveston, TX).

2008: Final Report: Galveston Bay Wetland Restoration Assessment. Contract No. 582-7-84936. Prepared for the Galveston Bay Estuary Program of the Texas Commission on Environmental Quality. C. Howard and J. Dobberstine.

2008: Platform presentation at the 4th National Restore America's Estuaries Conference (Providence, RI) on ongoing research titled "Comparing salt marsh ecosystem responses to different restoration techniques".

2008: Final report: Science-based Monitoring of Created and Restored Habitat within the Galveston Bay System. Prepared for the Coastal Management Program of the Texas General Land Office and the National Oceanic and Atmospheric Administration. Contract No. 07-005-11. J. Dobberstine and C. Howard.

2007: Quality Assurance Project Plan (QAPP) for the Galveston Bay Wetland Restoration Assessment. Contract No. 582-7-84936. Prepared for the Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency. J. Dobberstine and C. Howard.

2007: Coauthor of a research poster presented at the Eighth Biennial State of the Bay Symposium (Galveston, TX) titled "Identifying suitable reference sites for impacted sites along the Houston Ship Channel" (J. Dobberstine, J. Horne, L. Brzuzy, C. Howard). Full paper in the conference proceedings, viewable at http://gbic.tamug.edu/gbeppubs/sobviii/sobviii_rpr.htm#Dobberstine. This work was also presented as a platform at the 2006 Society of Environmental Toxicology and Chemistry National Conference (Montreal, Canada) and at the American Association for the Advancement of Science (AAAS) Southwestern and Rocky Mountain Division Annual Meeting (Clear Lake, TX), April 2007, where it was awarded "Honorable Mention" for outstanding student paper presentation.

2007: "Sediment Triad Approach to Finding a Suitable Reference Bayou for Patrick Bayou and Similar Sites Located on the Houston Ship Channel". Master's Thesis, UHCL. The data compiled under this effort is currently being used in association with analysis for the Patrick Bayou EPA Superfund project. Available online through Google Books.

2007: Presenter at the Texas Association of Environmental Professionals Environmental Challenges and Innovations Conference; presented a platform titled "Public Comments and the role of an NGO in the NEPA process; an overview of the Galveston Bay Foundation's volunteer Permit Review Committee." Also presented at the Society for Wetland Scientists annual conference in June 2007 (Sacramento, Ca).

2007: Coauthor of two research posters, "Functional Assessment of Plant Communities at Four Restored Sites in a Lower Galveston Bay Estuarine Marsh Complex" (L. Ray, J. Dobberstine, J.C. Whitney, C. Howard) and "Comparison of Benthic Macroinvertebrate Communities among Native, Restored, and Impacted Salt Marshes in the Galveston Bay System" (K. Farmer, J. Dobberstine, C. Howard), presented at the Society of Environmental Toxicology and Chemistry National Conference (Milwaukee, WI).

2006: Final Report: Landowner Initiative Program (later renamed the Living Shorelines Program). USFWS Agreement No. 1448-20181-02-G917. Prepared for the U.S. Fish and Wildlife Service Texas Coastal Program. J. Dobberstine.

2006: Round Table presenter and panelist at the Texas A&M University Chapter of Sigma Xi's Spring Symposium (College Station, TX) on "Sea-level rise, hurricanes, and the future of our coasts".

2006: Platform presentation titled "Successes and Challenges: An overview of community-based coastal marsh restoration in Galveston Bay" at the 3rd National Restore America's Estuaries National Conference (New Orleans, LA).

2005: Coauthor of a platform presentation, "PAHs Environmental Overview: Occurrence in Houston Area Sediments" (I. Rhodes, J. Dobberstine, L. Brzuzy), presented at the SETAC SC Regional Meeting (Marble Falls, TX).

1996: Coauthored paper titled "Hand-rearing Scarlet Ibis (Eudocimus ruber) at Moody Gardens" (P. Sharkey, J. Dobberstine). Published in the Animal Keepers' Forum, October 1996. Awarded Certificate of Excellence in Journalism at the American Association of Zookeepers National Conference in October 1997.

1993: Coauthored a research paper concerning behavioral enrichment for captive Spectacled (Tremarctos ornatus) and American Black (Ursus americanus) bears, titled "Food-scattering Enrichment for Zoo Bears: Does It Really Work?" (J. Dobberstine, D. Shepherdson). Published in the Shape of Enrichment, February 1994. Presented the same research in poster format at the First Conference on Environmental Enrichment, Portland Oregon.

Professional Associations

Texas Association of Environmental Professionals (TAEP): Board member since 2008.

President (2010-present)

Board Member and Education Director (2008- present; oversees the association's Chuck Glore Memorial Scholarship program, which awards $1,000 scholarships to environmental science and engineering students at several southeast Texas universities)

http://taep.org/

South Central Regional Chapter of the Society of Environmental Toxicology and Chemistry (SETAC):

President (2013-present)

Vice-President (2012-13)

Board Member (2010 to present)

http://www.setac.org/socentral/

The Galveston Bay Foundation:

Advisory Board member (2012-present)

Delegate Trustee representing TAEP (2009-2012)

Advisor for the Land Committee working with conservation land holdings

Advisor for the Wetland Permit Review Committee reviewing regulatory notices and advising on actions

http://www.galvbay.org/

Galveston Bay Council (Galveston Bay Estuary Program):

Vice-Chair of the Public Participation and Education Subcommittee (2003-2006)

Member of the Monitoring and Research Subcommittee (2007-present)

http://www.gbep.state.tx.us/subcommittees/#MR

Member of the National Association of Environmental Professionals

Member of the Texas Community College Teachers Association

Awards

2009 Phi Theta Kappa "Certificate of Appreciation" in recognition of valuable faculty contributions to the 2009 student inductees

2007 "Honorable Mention" for outstanding student paper presentation. "Identifying suitable reference sites for impacted sites along the Houston Ship Channel" at the American Association for the Advancement of Science (AAAS) Southwestern and Rocky Mountain Division Annual Meeting (Clear Lake, TX)

2004 Student Scholarship to attend the SETAC 4th World Congress, Portland, OR, to present a research poster titled "Is there a Suitable Reference Site for Impacted Sites along the Houston Ship Channel?"

Brown and Root Halliburton Environmental Management Student Scholarship 2002 through 2005

Jones Endowment School of Business and Public Administration Student Scholarship 2003/2004

Rhome and Haas Environmental Science Student Scholarship 2004/2005

2002 student scholarship to attend the State of the Bay Symposium, TCEQ Galveston Bay Estuary Program

Awarded Certificate of Excellence in Journalism at the American Association of Zookeepers National Conference in October 1997 for paper titled "Hand-rearing Scarlet Ibis (Eudocimus ruber) at Moody Gardens" (P. Sharkey, J. Dobberstine) published in the Animal Keepers' Forum, October 1996.

D.2 David A. Jaffe, PhD, PE, D.WRE

Project Manager & Water Resources, AECOM Technology Corp., Los Angeles, CA

Education

- University of California, Irvine, PhD, Civil & Environmental Engineering, 2002. Regent's Dissertation Fellow, 2001–2002
- University of California, Irvine, MS, Civil & Environmental Engineering, 2002
- University of Southern Mississippi/Stennis Space Center, MS, Physical Marine Science, 1998
- Johns Hopkins University
BA, Earth & Planetary Science, 1994

Certifications

- Registered Civil Engineer, California (68321)
- Registered Civil Engineer, Arizona (44318)
- Disaster Service Worker, California (SAP62634)
- Diplomate, American Academy of Water Resource Engineers (563), 2010
- Qualified SWPPP Developer (QSD), California (C68321), 2014
- **Professional Affiliations**
- American Society of Civil Engineers
- **TEACHING AF FI L IATIONS**
- University of California, Irvine, CEE 181 Senior Design, 2012-2015

Years of Experience

- 15 years total

David Jaffe has worked for more than 15 years at the intersection of water resource development, water infrastructure design, and water policy in coastal and riverine environments. This work has included analysis, design and related regulatory elements. Dr. Jaffe has focused his technical expertise on the translation of engineering science into actionable environmental benefit including protection, restoration and remediation. His areas of technical focus reside in hydrology, hydraulics and sediment transport. David utilizes a broad scope of numerical and analytical methods, including a wide range of numerical models, and is an expert in applying existing, off-the-shelf tools to provide in-depth and forward-looking analysis and insight to complex hydraulic problems.

Dr. Jaffe has maintained his academic and research ties and currently serves as a lecturer in civil engineering design. Additionally, his current area of research focuses on using sediment transport, through modeling and measurement, as a proxy for several facets of environmental analysis and design. David's background in physical marine science, riverine hydraulics and numerical modeling provides a broad foundation for developing solutions in a diverse pallet of aquatic habitats, including those at the intersections of littoral and riverine systems. Dr. Jaffe also manages projects and programs that deal with environmental policy and systematic risk. These project and programs include large or regional government projects and small, locally driven initiatives covering a broad spectrum of agencies and interests. Dr. Jaffe has served as a project manager for federal and state projects, in particular those of FEMA, NMFS, USACOE, USEPA and USBOR.

David has extensive experience in using numerical models for coastal and riverine analysis, both commercial and proprietary. Dr. Jaffe modeling experience includes significant use of modeling packages from federal agencies, HEC in particular.

Select Experience

University of California, Irvine stream restoration and erosion control, Irvine, CA

Dr. Jaffe is currently a lecturer in the Civil Engineering Department for the Senior Design course (CEE 181) at UCI. The project associated with the lecture is the design of a stream restoration on UCI's campus between Science Library and the athletic center. The most recent class developed the 90% restoration design under Dr. Jaffe's direction, with the guidance of Campus Planning, and under the auspices of the Department. The project seeks to improve the overall quality of the stream corridor, restore the stream channel to a more natural state, manage in-stream erosion, improve water quality in the stream discharged to the downstream receiving water - Newport Back Bay, a 303(d) listed water body – and to serve as an amenity to the campus. To date the project has included HEC-RAS numeral modeling, contributing hydrology, stream bed sediment transport analysis, erosion control planning and design, plant palette development and plant removal efficiency research, contributing runoff constituent estimation, water quality sampling plan design, preliminary grading, cost estimating, and a review of applicable permits and process related to the project build-out.

Haystack Landing Bridge Hydraulics and Scour Analysis, Petaluma River, Sonoma County, CA

The intent of the analysis was to evaluate the impacts from changes to local scour resulting from proposed bridge improvements. A HEC-RAS model was employed for analysis of stream hydraulics. Sediment and hydrologic data was taken from previous efforts, and additional analysis was required to determine down-stream boundary conditions for tidally controlled water surface elevation. The study followed HEC-18 criteria in that general, long-term and local bed adjustment was considered. Bridge hydraulics and related scour were modeled in HEC-RAS. The study found the pier and abutment scour dominated bed impacts. Long-term bed adjustment was found not to be significant factor in impacts since the stream is in an aggrading condition, with regular dredging to control stream bed shape and elevation. Dr. Jaffe led the bridge hydraulics and bridge scour effort as part of the bridge replacement effort.

Buckeye Creek Watershed LOMR Restudy, Douglas County, NV.

- Dr. Jaffe led the technical review of the numerical modeling and alluvial fan analysis of the project. Douglas County, Nevada retained an outside consultant to perform a restudy of the Airport Wash, Johnson Lane Wash, Buckbrush Wash and Sunrise Pass Wash watersheds and Phase II of the Buckeye/Martin Slough watershed located in western Douglas County, Nevada. The purpose of the restudy was to submit a FEMA Physical Map Revision (PMR) and substantially revise portions of the effective 2010 Flood Insurance Study (FIS) and corresponding Digital Flood Insurance Rate Maps (DFIRMs). The restudy sought establish updated FIS peak flow rates and hydrographs at specific locations and provide corresponding floodplain mapping revisions to portions of the 2010 Effective Flood Insurance Rate Maps (FIRMs) for Douglas County. The modeling review consisted of multiple FLO-2D models and the methods used by the outside consultants for hydraulically connecting the different models through differing boundary conditions. Other areas of specialty review included the use or absence of culverts, model stability (CFL condition), and boundary condition applications. The supporting LOMR documentation was also reviewed.

Illinois Tollways Stream Crossing Design Guidelines Development, Chicago, IL

Dr. Jaffe led the development of and authored the document for the design guidance of stream crossings for Illinois Tollway Authority. The document includes a design matrix for alternatives analysis to aid stream crossing designers develop and utilize best practices for bridges, culverts and other crossings so that the completed project will minimize impacts to sediment transport and fish passage. The document is also developed to aid designers in complying with ACOE Chicago District regulatory requirements for stream crossing design by providing best practices design guidelines.

Guadalupe River Climate Change Impacts Pilot Study, Public Agency, Santa Clara County, California.

Dr. Jaffe developed protocols for and led the pilot study that examined the hydraulic climate change impacts to infrastructure along the south bank of Guadalupe River in San Jose based on a 50-year (2012-2062) time horizon. The study compared the existing and future conditions levee deficiency and resulting existing and future conditions flood plain using one- and two-dimensional hydraulic modeling, as well as GIS-based tool sets. Sea level rise was a primary consideration. The impacts to existing bridge soffits in the existing and future conditions were also examined. A preliminary economic impacts analysis was conducted using parcel assessment maps and GIS tools based on 2012 dollars. The conclusion of the study outlined future analytic pathways for analysis of climate change impacts to infrastructure and habitat in riverine systems, including sediment transport and bulking, and watershed burn and sediment yield.

Caltrans Dist. 3 & 7 Linear Filtration BMP Pilot Study

The purpose of the Linear Filtration Pilot Study is to investigate the effectiveness and feasibility of using linear filtration systems to treat runoff from Caltrans highways. Seven types of linear filtration BMPs were proposed for evaluation in the pilot study, the goal of which is to develop BMPs that meet several pre-defined criteria. Dr. Jaffe functioned as AECOM's deputy project manager and technical lead in the development of sizing calculations and the Basis of Design Report for the implementation of Caltrans' Districts 3 & 7 BMP pilot study. Much of David's work focused on referencing existing design standards to the current project, including Caltrans' PPDG and HDM. Dr. Jaffe also worked to develop additional potential outlet drainage options for the pilot study in an effort to minimize excavation into contaminated soils, as well as the preparation and review of final design plans.

Twitchell Island Levee Improvement Project Water Quality Impacts Analysis, Public Agency, San Joaquin River, California.

Like much of the Delta, Twitchell Island was originally swamp and overflowed lands. The banks of the San Joaquin River and the sloughs adjacent to Twitchell Island were the natural high ground due to sedimentation of the materials carried by the high flows. Developers, using these natural areas of high ground as a foundation, began constructing "shoestring" levees in the early 1850s using material adjacent to the waterway banks. Once the levees were in place, the protected lands were drained and cleared to make way for agriculture. Farming has been the primary activity on Twitchell Island since reclamation began and has contributed to the gradual degradation of peat soils. As a result, the land has subsided and elevations on the island have fallen to nearly 20 feet below sea level, requiring protection by nearly 12 miles of constructed levees. The dominant cause of land subsidence in the Delta is decomposition of organic carbon in the peat soils. In 1991 the State of California purchased the majority of the property within the

island. The state's interest in the island is to ensure that the levees would be improved to protect against flooding of the island. Flooding in the western Delta could severely degrade water quality within the Delta and impact the operations of the state and federal water projects as higher salinity water is pulled upstream while water flows into the flooded area. Dr. Jaffe's role in the project was to examine the impacts to water quality as part of the proposed improvements on the island, including levee and habitat improvements for all of the design alternatives presented in the environmental documentation. The review included construction materials, sequencing, design elements, and water quality protection measures.

Grand River Watershed Management Plan & NPS Conceptual Model, Public Agency, Ontario, Canada.

The purpose of the project was to characterize the sources and impacts of urban non-point source pollution to guide the development of best practices that will reduce deleterious impacts of these pollutants on Grand River and Lake Erie, Ontario, Canada. The findings and recommendations of the study component of the project were used to inform the update to the Grand River Watershed Water Management Plan. The project included review of background data, the development of a conceptual understanding of key urban contaminants and their impacts, the identification and evaluation of best practices, public outreach, the preparation of a best practices guide, and the development of recommendations for monitoring programs and methods to characterize TSS and phosphorus transport and targets. A non-point source conceptual model was developed to track the source and fate of pollutants, including TSS and phosphorus, including illicit discharges, temperature, and water quantity. Other modeling and management considerations included point- and non-point sources, the age of urban development within the watershed, the temporal loading and lifetime of pollutants, agricultural contributions, and an understanding of the regulatory setting. Dr. Jaffe served as a project expert in the areas of water resources policy development and BMP efficiency assessment.

Santa Ana River Parkway EIR, hydraulic water quality impacts, habitat impacts and sediment transport technical analysis, County of Orange, Orange County California.

The intent of the project is to evaluate of the quasi-two-dimensional hydraulics, water quality (as turbidity), bed scour and habitat impacts resulting from the build-out of the proposed Santa Ana River Parkway project improvements downstream of Prado Dam, Orange County, California. The project includes three bridge crossings of the River that may alter the local hydraulics and sediment transport, resulting in an impact to habitat within the River corridor. Dr. Jaffe led the quasi-two-dimensional hydraulics analysis (HEC-RAS), sediment transport analysis (HEC-6T), and habitat impacts analysis (hydraulic model output analysis with GIS tools). Analysis included comparing the existing and post project hydraulics and sediment transport with geo-referenced habitat data sets to determine both the extent of impacts and the types of habitat most severely impacted by the proposed project. The work was completed to support the Environmental Impact Report for the project and included the main EIR as well as the technical appendices. Approximate contract value $300,000.

Santa Clara River Freeman Diversion improvements sediment transport analysis, United Water District, Ventura, California.

HEC-6T numerical modeling, based on recently update FEMA HEC-RAS numerical models, was employed to determine the magnitude and extent of impacts that large bed load particles would have on improvements to the Freeman Diversion in Santa Clara River. Specifically, improvements to the diversion

are intended to improve sensitive and endangered fish species migration within the River. Several design, operation, and long-term maintenance elements of these improvements are dependent on the size range and relative frequency of the largest particles transported as bed load during 100-year and other large flow events. The study, led by Dr. Jaffe, estimated the largest size of particulate impacting the structure during the FEMA 100-year discharge and the relative frequency of these large particles in the bed load. Approximate contract value $60,000.

Central Valley Flood Elevation and Delineation Program Task Order 31, California Department of Water Resources, Public Agency, Sacramento, California.

Dr. Jaffe was responsible, in part, for finalization of the pre-delineation hydraulic models, coordinated the levee breach plans, determined the levee breach hydrographs, assisted in development of the draft 200-year floodplain maps for urban areas, and provided both technical and procedural recommendations for the subsequent task order. The work was focused on the Feather River West model domain in the Lower Sacramento River basin and incorporated the breach hydrographs calculated from the unsteady HEC-RAS river models into the overland flow FLO-2D models. Approximate contract value: $100,000.

Central Valley Flood Elevation and Delineation Program Task Order 32, California Department of Water Resources. Public Agency, Sacramento, California.

Dr. Jaffe was responsible, in part, for the finalization of the HEC-RAS and FLO-2D hydraulic models, reviewed and incorporated hydrology from the CVHS, coordinated the levee breach plans, determined the levee breach hydrographs, and assisted in the development of the draft 200-year floodplain maps for urban areas. Primary responsibilities were focused upon the Natomas urban area. Approximate contract value: $100,000.

Rio Grande/San Acacia IEPR Phase 1 & 2, Public Agency, San Acacia, New Mexico.

Dr. Jaffe served on the Independent Expert Review Panel for Phase 1 & 2 of the Rio Grande Floodway General Reevaluation for the San Acacia to Bosque del Apache Unit. ACOE, Albuquerque District prepared a GRR/SEIS to determine whether the authorized project, flood risk management for the unit of the Rio Grande Floodway, was still implementable and still NED Plan under the 1947 authorization by Congress. David, as part of the expert review panel considered changes to the river alignment by BOR, revised hydrologic data, updated levee design criteria, probabilistic determination of flood risk, and other hydrologic and hydraulic factors within the project design. He also held regular meeting with ACOE staff and project managers and developed with the review panel recommendations to improve the GRR/SEIS documentation. Approximate contract value: $35,000.

Missouri River Ecosystem Restoration Plan IEPR Phase 1, Public Agency, Washington, D.C.

Dr. Jaffe served on the Independent Expert Review Panel for Phase 1 of the Missouri River Focal Natural Resources Provisional Baseline Assessment. Congress authorized the Missouri River Ecosystem Restoration Plan (MRERP) process through the Water Resources Development Act (WRDA) of 2007. The general deteriorated condition and health of the Missouri River led to the passage of Section 5018 of the WRDA of 2007. Section 5018 authorized a study (Missouri River Ecosystem Restoration Plan, or MRERP) of the Missouri River and its tributaries to determine actions required to: mitigate losses of aquatic and terrestrial habitat; recover federally listed species; and restore the ecosystem to prevent further declines

among other native species. The MRERP/Environmental Impact Statement planning process is being conducted by the U.S. Army Corps of Engineers (USACE) in partnership with the U.S. Fish and Wildlife Service (USFWS). The USACE and USFWS have engaged more than 30 cooperating agencies, 29 Tribes, a 70-member stakeholder committee (the Missouri River Recovery Implementation Committee), and the public in the planning process. David provided hydrologic, hydrologic, geomorphic and sediment transport review of the draft document and study protocols as part of the oversight mandated by congress. Approximate contract value: $25,000.

Mississippi River Prairie Du Pont Flood Risk Reduction IEPR, Public Agency, St. Louis, Missouri.

Dr. Jaffe served on the Independent Expert Review Panel for the Mississippi River Limited Reevaluation Report for Design Deficiency Correction: Prairie Du Ponte, St. Clair and Monroe Counties, Illinois. This Limited Reevaluation Report (LRR) describes the basis for recommending implementation of a design deficiency correction project for the Prairie du Pont and Fish Lake levee system. During the flood of 1993, Prairie du Pont and Fish Lake levee system's flood of record, portions of the levee experienced unexpected underseepage problems that had to be controlled through emergency action. The seepage problems were related to deficiencies in the geotechnical underseepage design for the levee system. Dr. Jaffe provided review of the levee design and flood control measures as part of the flood reduction efforts. Approximate contract value: $15,000.

San Jacinto River Tributary Clean Water Act Permitting, Private Land Owner, San Jacinto, California.

Led Clean Water Act permitting efforts for a large, unnamed ephemeral drainage, crossing several property boundaries and a tributary to San Jacinto River. Particular effort was taken to resolve issues related to the (then) recent Solid Waste Agency of Northern Cook County (SWANCC) Supreme Court decision, particularly related to connectivity. Approximate contract value: $75,000.

San Jacinto River ACOE Levee Design, Public Agency, Riverside County, California.

Led modeling and design support team to develop improvements to the existing ACOE levee with the City of San Jacinto. Led sediment data collection efforts and hydrology determination, including design storm and long-term hydrographs, numerical modeling, gas pipeline protection measures, levee top- and toe-elevation determination, bridge design criteria and downstream habitat impacts analysis. Project included historical and gravel mining operations analysis. Coordinated with local Indian tribe to address local tribal concerns. The primary design concern was to restore River habitat and functions while minimizing impacts to downstream special habitat areas. Approximate contract value: $300,000.

Oxnard Floodplain Flooding Analysis, Public Agency, Oxnard California.

Dr. Jaffe lead two-dimensional numerical modeling of the Oxnard Floodplain, including drainage channels, was conducted to determine the extent of flooding below Highway 101 and upstream of the Pacific Ocean for the 100-year floodplain. The study examined the three sub-watersheds developed by the Ventura County Watershed Protection District including Hueneme Drain, "J" Street Drain, and Rice/Industrial Drain, separately. The goals of the study were 1) to estimate the locations and extents of flooding on the Oxnard floodplain, including acreage of inundation and 2) determine the discharges at the floodplain outflow. A FLO-2D numerical model was developed for each of the three sub-watersheds, the boundaries of

which closely follow those used in Ventura County's VCRat model. The model grid was assembled using FLO-2D's GDS software and established by importing DTM data provided by Ventura County into the GDS. Model parameters were then imported into the GDS. Following collection and importation, data was area averaged on a grid cell by grid cell basis. Hydrology for all simulations is the County's design 100-year, 24-hour rainfall, Zone B, and was provided by the County's hydrology branch. Modeling suggested that existing topographic conditions determined where flooding occurred adjacent to existing channels. Improvements were recommended based on the location of the topographic controls.

Morro Bay WWTP Expansion Effluent Disposal Feasibility, Public Agency, Morro Bay, California.

Led effluent disposal-related siting and constraints analysis and effluent disposal alternatives analysis for a proposed plant expansion and relocation project. The project aimed to incorporate stormwater master planning in coordination with WWTP effluent discharge design for the City of Morro Bay. In support of these activities, conducted planning-level hydrologic and hydraulic analysis of creeks and estuaries to prevent flooding from WWTP discharges into local drainages. Examined peak design storm discharges coinciding with peak effluent discharges for multiple scenarios, calculated maximum water surface elevation changes that may result from full WWTP build-out, and estimated increased erosion and sediment transport resulting from treatment plant effluent discharges and sediment delivery impacts to natural water bodies. The design alternatives analysis completed by Dr. Jaffe made design recommendations based on hydrologic and hydraulic analysis. Approximate contract value: $30,000.

Malibu Creek and Lagoon Bank Restoration, Private Land Owner, Malibu, California.

Led Clean Water Act, Department of Fish and Game, FEMA, and California Coastal Commission permitting for the restoration and remediation of 500 linear feet of bank protection in lower Malibu Creek. Also led alternatives and design efforts for the restoration and remediation effort, including the selection of environmentally sensitive methods of mitigation and bank protection in environmentally sensitive habitat. Approximate contract value: $150,000.

Mississippi River Restoration Diversion, Public Agency, Pointe á la Hache, Louisiana.

Led hydraulic and sediment transport efforts to determine the diversion rate and impacts to hydraulics and sediment transport as part of a wetland restoration effort. Analysis of water surface elevation variation within Lower Mississippi River was conducted to determine the placement and maximum diversion rate into the wetland mitigation area. Associated Clean Water Act permitting factors were considered in the analysis and design.

Expert Witness, Public Agency, San Diego County, California.

Dr. Jaffe served as an expert to the defendant, a municipality, for a suit concerning the adequacy of design of portions of the city's stormwater conveyance system. Specifically, the suit alleged that the design of some streets, storm drain inlets, and related storm drains were inadequate and failed to meet local or regional design standards. David provided research and technical expertise, including a review of plans, design documents, standards, and additional mathematical and technical analysis, as well as testimony under oath to support the position of the city. With the assistance provided by Dr. Jaffe to the client the city was able to prevail at trial. Approximate contract value: $60,000.

Select Publications

Jaffe, D.A. 2015. “Design Guidance for Environmentally Sensitive Stream Crossing Design.” Illinois State Tollway Authority. In prep.

Jaffe, D.A. 2008. “Examination of an Arithmetic Approach for the Coupling of Two-Dimensional Hydraulic Surface Water Models.” FMA News (December) 18(4): 13–18.

Jaffe, D.A. 2007. “The Use of Historic Topography for the Characterization of Time Dependent Geomorphic Change and Sediment Delivery.” ASCE COPRI Coastal Sediments Conference Proceedings, edited by Kraus and Dean-Rosati. New Orleans, Louisiana: Vol. 2, 861–887.

Jaffe, D.A. 2007. “The Use of Geospatial Hydraulic Analysis for the Characterization of Habitat Impacts on Wide, Braided Rivers.” ASCE EWRI WEWRC Conference Proceedings, edited by K.C. Kabbes. Tampa, Florida.

Sanders, B.F., J.C. Pau, and D.A. Jaffe. 2006. “Passive and Active Control of Diversions to an Off- Line Reservoir for Flood Stage Reduction.” Advances in Water Resources 29(6):861–871.

Sanders, B.F., D.A. Jaffe, and A.K. Chu. 2003. “Discretization of Integral Equations Describing Flow in Non-Prismatic Channels with Uneven Beds.” Journal of Hydraulic Engrg. 129(3):235–244.

Jaffe, D.A. 2002. “Levee Breaches for Flood Reduction.” PhD dissertation; University of California, Irvine.

Jaffe, D.A., and B.F. Sanders. 2001. “Engineered Levee Breaches for Flood Mitigation.” Journal of Hydraulic Engrg. 127(6):471–479.

Burnett, B.H., V. Kamenkovich, D.A. Jaffe, A.L. Gordon, and G.L. Mellor. 2000. “Dynamical Balance in the Indonesian Seas Circulation.” Geophysical Research Letters 27(17):2705–2708.

Sanders, B.F., and D.A. Jaffe. 1999. “Mitigation of Extreme Flooding Events by Tactical Depression Wave Control.” ASCE International Water Resources Engineering Presentation Summaries. Edited by R. Walton and R. Nice. Seattle, Washington.

Jaffe, D.A. 1998. “Determination of the Pathway of Waters through the Indonesian Seas.” Master’s thesis; University of Southern Mississippi.

Select Conference Abstracts & Seminars

Jaffe, D. A. 2014. “A comprehensive approach to assessing economic, infrastructure and habitat impacts from climate change on riverine hydraulics.” Headwaters to Oceans (H2O) Conference, San Diego, California.

Jaffe, D. A. 2013. “A new approach to application of sediment transport for jurisdictional assessment in the arid southwest.” ASCE's Distinguished Speakers Webinar Series. December.

Jaffe, D. A. 2013. “Habitat impacts analysis using quasi-two-dimensional hydraulics and sediment transport numerical modeling. Headwaters to Oceans (H2O) Conference, San Diego, California.

Jaffe, D.A. 2011. “Channel Forming Discharge and Historical Sediment Transport Analysis in Arid Southwestern Streams: Implications for Jurisdiction.” Floodplain Management Association Annual Conference. San Diego, California.

Jaffe, D.A. 2009. “A Comparison of Long-Term Sediment Transport Numerical Model Results Using Historical and Statistical Hydrograph Data in the Arid Southwestern United States.” California Shore and Beach Preservation Association (CSBPA) Headwaters to Ocean (H2O) Conference. Long Beach, California.

Jaffe, D.A., and B. Jones. 2008. “Application of Multiple-Scale, Two-Dimensional Coupled Hydraulic Modeling for Estimation Flood Extents in the California Bay-Delta Area.” Floodplain Management Association Annual Conference. San Diego, California.

Jaffe, D.A., and R.J. Rovansek. 2004. “Creating 2-D Velocity Distributions from a 1-D Hydraulic Model: Applications for Impact Analysis.” Fourth Annual CalCoast H20 Conference. Long Beach, California.

Jaffe, D.A. 2003. “Ten Coastal Environmental Concepts to Teach Your Children.” Groundswell Society SAIC 4. San Diego, California.

Jaffe, D.A. 1999. “Effects of Engineered Structures on Coastal Erosion: A Review.” Surfrider Foundation Summit. San Diego, California.

D.3 Jesse McDonald

Professional Experience

Economist/Water Resource Planner-Consultant (Self Employed)

May 2013 to Present

Serving as an economic consultant studying the economic feasibility of construction of a flood damage reduction project on the Pearl River below Ross Barnett Reservoir in the Jackson Mississippi Metropolitan Area. Has complete responsibility for quantification of all benefits from the construction of such a project to include reduction in flood damages to structures, streets, roads, and highways, and other infrastructure as is applicable. Damages include rerouting costs of traffic because of road closures, relocation of hospital patients, and damage to a sewage treatment plant. Recreation benefits from possible inclusion of recreation features are also being evaluated. All other possible economic impacts such as intensification and location benefits are being studied. Also responsible for development of land use and other socio-economic data required for completion of the EIS. Study is scheduled for completion by end of 2014. Draft Feasibility Study/EIS are under review with Corps of Engineers.

Economist/Water Resource Planner-Consultant (Self Employed)

May 2013 to October 2013

Served as a member of the Independent External Peer Review Team for the Alabama-Coosa-Tallapoosa River Basin Water Control Manual Update and Environmental Impact Statement. Was the Panel member responsible for IEPR of socio-economic impacts of existing operating plan and alternative operating schemes considered in subject study. EIS considered impacts on flood risk management, navigation, recreation, water supply, and on fisheries and the benthic community. IPER was completed in September 2013.

Economist/Water Resource Planner-Consultant (Self Employed)

May 2011 to February 2013

Served as an economic consultant studying the Caño Martín Peña Ecosystem Restoration Project in San Juan, Puerto Rico. Responsible for the Cost Effectiveness/Incremental Cost Analysis of numerous alternatives for restoring natural ecosystem of the area and for providing information for use in selecting a preferred alternative that provides the optimal combination of restoration and park facilities. IWR Planning Suite was used to analyze all alternatives and to identify those alternatives that were cost effective

and those that were also “Best Buys.” Responsible for preparing sections of the report dealing with economic costs and with plan analysis.

Economist/Water Resource Planner-Consultant (Self Employed)

July 2011 to December 2011

Served as an economic consultant to the U.S. Army Engineer District, Vicksburg, developing a “White Paper” detailing the hypoxia problem in the Gulf of Mexico, relating the scope of this problem to the amount of nitrogen and phosphorous entering the Gulf from the Mississippi and Atchafalaya Rivers, and describing the relationship between sedimentation and movement of nitrogen and phosphorous. Various “best management practices” for removing nitrogen and phosphorous from surface water and other possible metrics for quantifying benefits of sediment retention structures were researched and analyzed. Based on the analysis of these metrics, a method of quantifying benefits to these structures from removal of nitrogen and phosphorous was recommended.

Economist/Water Resource Planner-Consultant (Self Employed)

June 2010 to Present

Served as an economic consultant to the U.S. Army Engineer Division, Mississippi Valley. Proved technical guidance and performed certain analyses regarding socioeconomic planning for various civil works projects. The tasks varied and were identified by MVD Planning Community of Practice staff on a monthly basis. Advised the MVD Planning Staff on resolution of all socio-economic problems and issues arising during the duration of this contract. Responsible for preparing Documentation and Certification Report for the Agricultural Flood Risk Management (AGFRM) model which has just completed revision and will be used in the Districts in the Mississippi Valley Division and in the Sacramento District.

Economist/Water Resource Planner-Consultant (Self Employed)

January 2010 to August 2010

Served as an economic consultant to the U.S. Army Engineering District, Seattle, studying the Seahurst Park, North Seawall Project. Responsible for the Cost Effectiveness/Incremental Cost Analysis of numerous alternatives for restoring natural marine nearshore processes and for providing information for use in selecting a preferred alternative that provides the optimal combination of shoreline habitat restoration, park facilities, and support for ongoing educational programs. IWR Planning Suite was used to analyze all alternatives and to identify those alternatives that were cost effective and those that were also “Best Buys.” Responsible for preparing sections of the report dealing with economic costs and with plan analysis.

Economist/Water Resource Planner-Consultant (Self Employed)

October 2008 to September 2010

Served as an economic consultant to the Lake Ponchatrain Levee District studying the Bayou Manchac, Louisiana, Area. Responsible for data collection and economic analysis of all alternatives for flood control

in the project area. . Flood damages for existing conditions and all alternatives were calculated using HEC-FDA and the Marshall and Swift real estate valuation software package. Hydrologic and plan formulation efforts were reviewed for reasonableness and compatibility with the existing and projected economic development of the area.

Economist/Water Resource Planner-Consultant (Self Employed)

May 2008 to August 2009

Served as an economic consultant to the U.S. Army Engineering District, Vicksburg providing quality control to a revision of the Computerized Agricultural Crop Flood Damage Assessment System being conducted by Mississippi State University. These revisions included changing the programming language from Fortran to a Windows based environment using Microsoft Visual SoftPro. Improvements were made to the manner in which the computer program handled various inputs and outputs. A stand alone risk analysis program was developed using the Crystal Ball to provide risk analysis for the crop program. Revisions include the ability to read budget data directly from several Budget Generators used by various Land Grant Universities or to input budget data in Spreadsheet format.

Economist/Water Resource Planner-Consultant (Self Employed)

October 2007 to March 2008

Served as an economic consultant to the U.S. Army Engineering District, Sacramento studying the Lower Walnut Creek, California, area. Participated in gathering and organizing data and information based on Contra Costa County Assessor Parcel Rolls and other sources to produce a complete and accurate inventory of all structures/properties and infrastructure that are located within the 500-year floodplain in the study area. Used the Marshall and Swift real estate valuation software package to compare property valuations with the Assessor Parcel Rolls. Interviewed special facilities such as airports, refineries, sewage treatment plants, etc. to determine damage potential from potential floods.

Economist/Water Resource Planner-Consultant (Self Employed)

October 2007 to June 2009

Served as an economic consultant to the U.S. Army Engineer Division, Mississippi Valley. Proved technical guidance and performed certain analyses regarding socioeconomic planning for various civil works projects. The tasks varied and were identified by MVD Planning Community of Practice staff on a monthly basis. Advised the MVD Planning Staff on resolution of all socio-economic problems and issues arising during the duration of this contract. Participated in technical meetings and issue resolution conferences as determined by MVD staff.

Economist/Water Resource Planner-Consultant (Self Employed)

March 2006 to July 2007

Served as an economic consultant to the U.S. Army Engineer Division, Mississippi Valley. Responsible for providing technical guidance and performing certain analyses regarding socioeconomic planning for

various civil works projects. The tasks varied and were identified by MVD Planning Community of Practice staff on a monthly basis. Advised the MVD Planning Staff on resolution of all socio-economic problems and issues arising during the duration of this contract. Participate in technical meetings and issue resolution conferences as determined by MVD staff.

Economist/Water Resource Planner-Consultant (Self Employed)

April 2006 to January 2007

Worked with two other consulting firms in support of the Louisiana Department of Natural Resources' (LDNR) development of a Comprehensive Master Plan for Hurricane Protection and Coastal Restoration. JAYMAC was responsible for development of all economic data in support of all alternatives developed as a part of the comprehensive plan. Data included estimates in the areas of damage reduction, reduced emergency costs, impacts on transportation, impacts on area tax base, business losses, etc. Damages were based on information from FEMA's HAZUS-MH Flood Model, Marshall and Swift real estate valuation system, Manheim Used Vehicle Index, agricultural budgets, etc.

Economist/Water Resource Planner-Consultant (Self Employed)

March 2006 to August 2006

Responsible for providing technical support to Vicksburg District economists in the development of revised methodologies and assumptions regarding planting dates, yields, cultural practices, etc. for the Yazoo Backwater Pump Project reanalysis. Responsible for assisting District personnel in developing detailed documentation of all benefit methodologies and in preparing the "Revised Economic Appendix." Will participate in meetings in Washington D.C. with District personnel to meet with EPA, HQUSACE, and other Federal agencies concerning Yazoo Backwater Pumps. Assisted the District in including risk and uncertainty into the economic analysis using Palisades @RISK software.

Economist/Water Resource Planner-Consultant (Self Employed)

July 2004 to March 2006

One of a team of five consulting firms selected by the Louisiana DNR to prepare a feasibility analysis and 30% design for freshwater diversion alternatives from the Mississippi River to Bayou Lafourche. Had complete responsibility for the quantification of benefits, incremental analysis of alternatives using quantifiable and non-quantifiable benefits (using IWR Plan), cost allocation, and financial analysis for all alternatives. The final report was completed in March 2006.

Economist/Water Resource Planner-Consultant (Self Employed)

July 2005 to February 2006

Performed an independent review of the Economic Appendix of the Reformulation Report for the Yazoo Backwater Pump Project. Reviewed and prepared responses to EPA comments on the Yazoo Backwater Pump Report. Reviewed and prepared a position paper on the technical accuracy and relevancy to application in the Yazoo Backwater of the report "An Approach for Evaluating Nonstructural Actions With

Application to the Yazoo River (Mississippi) Backwater Area" by Leonard Shabman and Laura Zepp of VPI. Provided oversight to agricultural economists and agronomists from the Mississippi Agricultural and Forestry Experiment Station in Starkville and Stoneville during the development of data on soybean, corn, and cotton production in the Yazoo Backwater Project area.

Economist/Water Resource Planner-Consultant (Self Employed)

June 2003 to January 2004

Provided hydrologic engineering, plan formulation, and economic analyses of a Section 205, Small Flood Control Project in Lilbourn, Missouri. Collected data on the flood plain and conducted the economic analysis of all proposed alternatives. Flood damages for existing conditions and all alternatives were calculated using HEC-FDA and the Marshall and Swift real estate valuation software package. Reviewed the hydrologic and plan formulation efforts for reasonableness and compatibility with the existing and projected economic development of the area. (Worked with another consultant as part of a project for the Memphis District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

September 2002 to January 2004

Louisiana Coastal Area Ecosystem Restoration Feasibility Study –As a part of Phase II of the LCA Study, further developed and described the economic linkages between saltwater marshland and flood control, navigation, national security, recreation, etc. for the New Orleans District, USACE. Quantified economic impacts of coastal erosion on various economic sectors (navigation, agricultural, etc.) of Louisiana and the Nation. Developed information on the importance of the Mississippi River and Tributaries Project to the Nation. . (Worked with another consultant for the New Orleans District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

May 2002 to September 2003

Involved in the collection of data and development of depth-damage and structure to content relationships for the Donaldsonville to the Gulf study in south Louisiana. (Worked with another consultant for the New Orleans District, U.S. Army Corps of Engineers.)

Involved in the collection of data and preparation of a Reconnaissance Study for Mustang Bayou in the vicinity of Alvin, Texas. This report was prepared in accordance with Section 905(b), WRDA 1986. (Worked with another consultant for the Galveston District, U.S. Army Corps of Engineers.)

Involved in the collection of data concerning waterborne movements on Chocolate Bayou, Texas, and preparation of an economic analysis of maintenance dredging on the waterway. Transportation rates for barge, truck, and rail were developed using the REEBIE transportation cost models (now Global Insight Transportation Models). This analysis was part of the Dredged Material Management Plan for Chocolate Bayou. (Worked with another consultant for the Galveston District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

June 2001 to May 2002

Conducted literature review and made recommendations concerning the economic evaluation of saltwater marshland in south Louisiana as part of Phase I of the Louisiana Coastal Area Ecosystem Restoration Feasibility Study. Reviewed current and past efforts in economic evaluation of ecosystem restoration/preservation and preparation of a report describing these efforts. Developed and described the economic linkages between saltwater marshland and flood control, navigation, national security, recreation, etc. (Worked with another consultant as part of a project for the New Orleans District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

June 2001 to April 2002

Collected data and provided information for briefs in a lawsuit involving insurance claims concerning increased corn prices caused by the Great Mid-Western Flood of 1993. (Worked with a law firm from Washington, DC.)

Economist/Water Resource Planner-Consultant (Self Employed)

June 2001 to March 2002

Conducted the agricultural flood control portion of an economic analysis of proposed flood control and water supply alternatives in the area of West Palm Beach, Florida. Assisted in urban flood control, water supply, recreation, etc. (Worked with another consultant as part of a project for the Jacksonville District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

June 2001 to December 2001

Worked with another consulting firm in conducting a preliminary analysis of the economic, environmental, and engineering feasibility of deepening the Ports of Iberia and Morgan City, Louisiana, and preparing preliminary Plans of Study for an analysis of each port under the authority of Section 203 of WRDA 1986. (Terminated in favor of a cost-shared feasibility study with the New Orleans District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

June 2001 to August 2001

Provided hydrologic engineering, plan formulation, and economic analyses of a Section 205, Small Flood Control Project in Forrest City, Arkansas. Collected data on the flood plain and conducted the economic analysis of all proposed alternatives. Flood damages for existing conditions and all alternatives were calculated using HEC-FDA and the Marshall and Swift real estate valuation software package. Reviewed

the hydrologic and plan formulation efforts for reasonableness and compatibility with the existing and projected economic development of the area. (Worked with another consultant as part of a project for the Memphis District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

April 2001 to July 2001

Involved in hydrologic engineering, plan formulation, and economic analyses of two Section 205, Small Flood Control Projects in the urban area of Memphis/Shelby County, Tennessee. Collected data on the flood plains and conducted the economic analysis of all proposed alternatives. Flood damages for existing conditions and all alternatives were calculated using HEC-FDA and the Marshall and Swift real estate valuation software package. Reviewed the hydrologic and plan formulation efforts for reasonableness and compatibility with the existing and projected economic development of the area. (Worked with another consultant as part of a project for the Memphis District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

March 2001 to May 2001

Developed a paper on Corps' involvement in riverfront development. Conducted telephone interviews and literature research to determine which completed and ongoing Corps projects included riverfront development. Identified and described strengths and weaknesses of existing authorities under which the Corps could possibly conduct riverfront development studies. Supplied knowledge of current Corps activities, Corps personnel, and sources of information available on the Internet. (Worked with another consultant for the New Orleans District, U.S. Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

August 2000 to January 2001

Conducted a Natural Resource Study for a feasibility study for extending navigation on the Red River from Shreveport, Louisiana, to Index, Arkansas. Collected and analyzed data on the future viability of the forest and forest product industry in the study area. Conducted analysis of the economic viability of transporting products associated with this industry on the proposed waterway. (Worked with another consultant for the Vicksburg District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

July 2000 to August 2000

Performed Technical Review of the economic analysis portion of a Flood Control Study of Morganza to the Gulf, Louisiana. (Provided for the New Orleans District, U.S. Army Corps of Engineers.)

Economist/Water Resource Planner-Consultant (Self Employed)

February 2000 to July 2000

Conducted a study on the economic feasibility of deepening the Port at Panama City, Florida. Conducted interviews with shippers, shipping agents, port officials, and others to determine current and potential future commodity movements through the port and determined the level of benefits from various depths at the port. (Worked with another consultant for the Mobile District, U.S. Army Corps of Engineers.)

Supervisory Regional Economist—GM-14

November 1990 to January 2000

Economic and Social Analysis Division
Mississippi Valley Division
U.S. Army Corps of Engineers
Vicksburg, MS

Supervised all economic and social aspects of the Mississippi River Commission (MRC)/Mississippi Valley Division (MVD) water resource planning functions, including MVD employees. Coordinated and provided technical assistance for all navigation planning, evaluation, and systems analysis in MVD, including the Upper Mississippi River and Illinois Waterway Navigation Study, Inner Harbor Canal Lock, and Bayou Sorrell Lock. Served on the Inland Navigation System Prioritization Committee. Developed a prioritized list of needed improvements on the inland navigation system. Served as the Division's point of contact with the Inland Waterway Users Board (IWUB) with responsibility for coordination and regional interface with other Corps divisions, the navigation industry, Headquarters USACE, and the Water Resource Support Center. Provided command and control and technical assistance to the six districts within MVD. Made numerous technical presentations to IWUB, Transportation Research Board, Society of American Military Engineers, and other organizations. Served as a member of the Task Force reengineering the Lock Performance Monitoring System. Served as project manager of studies involving 1993 Mid-West Flood and Mississippi River Impacts of Missouri River Reservoir Operations (including the impacts on inland navigation). Ensured all economic and financial analyses and socio-economic studies were in conformance with all Corps policy and legal requirements.

Regional Economist—GS-13

February 1979 to November 1990

Economic and Social Analysis Branch, Lower Mississippi Valley Division
Vicksburg, MS.

Formulated and evaluated water resource studies, including development, application, and review models and procedures for economic and social evaluation. Engaged in coordination and technical assistance for all inland navigation planning and evaluation in the Lower Mississippi Valley Division (LMVD). Served on the Inland Navigation System Prioritization Task Force. Assisted districts with evaluation of urban and agricultural flood control projects and preparation of socio-economic portions of EISs and other

pertinent documents. Served as project manager for report on Impacts of 1988 Drought including the impacts on inland and deep draft navigation. Served as Assistant Chief of Branch.

Regional Economist—GS-12

November 1973 to February 1979

Economic and Social Analysis Branch, Vicksburg District
Vicksburg, MS

Conducted urban studies and comprehensive river basin studies. Served as project manager of the public involvement program for the Pine Bluff, Arkansas, Urban Study and the Mississippi River Backwater Pump Study. Conducted evaluations for flood control, water supply, recreation, and small harbor projects. Prepared socio-economic portions of EISs and other pertinent studies. Served as Assistant Chief of Branch.

Regional Economist—GS-11

September 1970 to November 1973

Economics Section, Vicksburg District
Vicksburg, MS

Planned and conducted economic base studies and economic evaluations of existing and proposed civil works projects. Assembled and analyzed data based on econometric, statistical, and base data. Prepared reports of findings, including interpretation of data and formulation of conclusions in reports such as the Lower Mississippi River Comprehensive Study. Prepared socio-economic portions for various studies.

Economist—GS-9

August 1969 to September 1970

Economics Section, Vicksburg District
Vicksburg, MS

Compiled, interpreted, and analyzed economic benefits derived from proposed construction projects and survey investigations. Prepared economic base studies, to include socio-economic characteristics of the study area. Developed waterborne and overland transportation rates and schedules and calculated cost of transportation under “with and without” project conditions for projects such as Vicksburg Harbor.

Graduate Research Assistant

June 1968 to August 1969

Department of Agricultural Economics, Mississippi State University
Mississippi State, MS

Assisted department professors in gathering data, performing statistical analyses, and conducting other areas of research while attending graduate school.

Military Experience

Served in the U.S. Army Reserve from June 1968 to July 1998, retiring as a Lieutenant Colonel from the 412th Engineer Command, Vicksburg, Mississippi. Graduate of the Military Intelligence Officer Basic Course, the Engineer Officer Advanced Course, and Command General Staff College. Served in positions in logistics, operations, intelligence, and comptroller. Involved in numerous war planning exercises in Europe and Korea. As Acting Comptroller, managed the Command's multi-million dollar budget with an execution rate of 99 percent. Medals include the Meritorious Service Medal with two oak leaf clusters and the Army Commendation Medal with three oak leaf clusters.

Education

Graduate, Corps of Engineers Leadership Development Program, 1993

Graduate, U.S. Army Command General Staff College, 1989

Graduate, U.S. Army Officers Advanced Engineer School, 1978

Graduate, U.S. Army Officers Basic Intelligence School, 1975

Georgia Institute of Technology, Atlanta, Georgia

Major: Water Resource and Urban Planning
Degree: Master of Science (August 1973)

Mississippi State University, Mississippi State, Mississippi

Major: Agricultural Economics
Degree: Master of Science (January 1970)
Major: Agricultural Economics
Degree: Bachelor of Science (August 1967)

List of Acronyms

APMI	Analysis Planning and Management Institute
ASME	American Society for Mechanical Engineers
COI	Conflict of interest
DIFR-EIS	Draft Integrated Feasibility Report-Environmental Impact Statement
EC	Engineering Circular
EFH	Essential Fish Habitat
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIFR-EIS	Final Integrated Feasibility Report-Environmental Impact Statement
GPS	Global Positioning System
HEC	Hydrologic Engineering Center
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEP	Habitat Evaluation Procedure
HTRW	Hazardous, toxic, and radioactive waste
IEPR	Independent external peer review
LMI	Logistics Management Institute
MMPA	Marine Mammal Protection Act
NACCS	North Atlantic Coast Comprehensive Study
NAVD88	North American Vertical Datum of 1988
NED	National economic development
NEPA	National Environmental Policy Act
OMB	United States Office of Management and Budget
OMRR&R	Operation, maintenance, repair, replacement and rehabilitation
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
TCMP	Texas Coastal Management Program
USACE	United States Army Corps of Engineers
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
VOC	Volatile organic compound
WVA	Wetland value assessment