Final Independent External Peer Review of the Dallas Floodway Feasibility Report and Environmental Impact Statement

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Flood Risk Management National Planning Center of Expertise
Baltimore District

Contract No. W912HQ-10-D-0002
Task Order: 0043

June 17, 2014

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Columbus, Ohio 43201

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The Dallas Floodway Feasibility Report and Environmental Impact Statement (EIS) is a multipurpose study for flood risk management (FRM), environmental management, and recreation being conducted by the U.S. Army Corps of Engineers (USACE). The non-Federal sponsor for the Dallas Floodway Feasibility Study is the City of Dallas, Texas (the City). Upon its completion, the Feasibility Report is intended to provide a full response to Section 5141 of the Water Resources Development Act (WRDA) of 2007. Under this authority, the Assistant Secretary of the Army for Civil Works (ASA (CW)) is to determine whether the Balanced Vision Plan (BVP) and Interior Drainage Plan (IDP) within the existing Dallas Floodway Project are "technically sound" and "environmentally acceptable." Should the Director's Report be approved by the Director of Civil Works on this basis, and a Record of Decision (ROD) be signed by the ASA (CW), the project could be constructed without additional authorization.

Subsequent to the enactment of WRDA 2007, USACE's Fort Worth District issued the Periodic Inspection Report No. 9 (PI No. 9), dated 2009, which documented significant deficiencies with the existing structural integrity of the Dallas Floodway Levee System. It became readily apparent that the Dallas Floodway Study was extremely complex, with various aspects of the study requiring USACE evaluation. These include the deficiencies identified in the PI No. 9, multiple local projects requiring Section 408 approval (including the Trinity Parkway), and the authority to review the City's BVP and IDP (the 5141 WRDA project). A framework to evaluate all components proposed for implementation within the study area was developed. This plan is referred to as the "Comprehensive System-wide Analysis," or Comprehensive Analysis.

In order to perform the Comprehensive Analysis, the study had to be conducted in phases. The first phase had to address deficiencies with the levee system and formulate a FRM plan utilizing National Economic Development (NED) criteria. The FRM plan would then become a component of the BVP. In the second phase, all proposed projects and features currently being planned within the Dallas Floodway System (BVP, IDP, local projects, and the Trinity Parkway) were evaluated during the Comprehensive Analysis. This analysis methodology ensures that the proposed local projects meet USACE engineering and safety standards, are compatible with the proposed Federal Project features, and would not have significant adverse effects on the functioning of the existing Dallas Floodway Levee System. The analysis also ensures that components of the BVP and IDP are technically sound and environmentally acceptable. In the final phase, features to be implemented as the Modified Dallas Floodway Project under WRDA 2007 are presented in the Feasibility Report and coordinated as the recommended plan.

Local features are projects that will not be a part of the Federal plan, but their implementation does represent a modification to the existing Federal Project. These features either have undergone or are required to undergo a Section 408 review by USACE. Additionally, the local features will be considered as

a part of the Comprehensive Analysis along with the BVP and IDP features. The local features to be evaluated in the Comprehensive Analysis are the Trinity Parkway, the Trinity River Standing Wave, the Santa Fe Trestle Trail, the Pavaho wetlands, the Dallas Horseshoe Project, Sylvan Avenue Bridge, the Jefferson Bridge, Dallas Water Utilities waterlines, the Continental Bridge, the East Bank/West Bank interceptor line, and IDP-Phase II pump stations (Charlie, Delta, Pavaho, and Trinity/Portland). These projects (excluding the Trinity Parkway and the Charlie, Delta, and Trinity/Portland pump stations) have received initial "approval" under Section 408 and are in various stages of design and construction. In addition, the City has expressed a desire to construct any BVP feature that is not selected as part of the Federal plan as a Section 408 project at 100 percent local cost.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Dallas Floodway Feasibility Report and Environmental Impact Statement (hereinafter Dallas Floodway IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate the IEPR of the Dallas Floodway. The IEPR was external to the agency and conducted following USACE and Office of Management and Budget (OMB) guidance described in USACE (2012) and OMB (2004). This final report presents the Final Panel Comments of the IEPR Panel (the Panel). Details regarding the IEPR (including the process for selecting panel members, the panel members' biographical information and expertise, and the charge submitted to the Panel to guide its review) are presented in appendices.

Based on the technical content of the Dallas Floodway IEPR review documents and the overall scope of the project, Battelle identified candidates for the Panel in the following key technical areas: civil/structural engineering, geotechnical engineering, hydrologic and hydraulic engineering, economics/Civil Works planning, and biologist/ecologist. Five panel members were selected for the IEPR. USACE was given the list of candidate panel members, but Battelle made the final selection of the Panel.

The Panel received an electronic version of the 2,692-page Dallas Floodway review documents, along with a charge that solicited comments on specific sections of the documents to be reviewed. USACE prepared the charge questions following guidance provided in USACE (2012) and OMB (2004), which were included in the draft and final Work Plans.

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

IEPR panel members reviewed the Dallas Floodway review documents individually. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of: (1) a comment statement, (2) the basis for the comment, (3) the significance of the comment (high, medium, or low), and (4) recommendations on how to resolve the comment. Overall, 16 Final Panel Comments were identified and documented. Of these, four were

identified as having high significance, seven were identified as having medium significance, and five had low significance.

Battelle received three public comments from USACE on the Dallas Floodway IEPR and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the Dallas Floodway IEPR review documents, and if adequate stakeholder involvement had occurred to identify issues of interest and to solicit feedback from interested parties.

Results of the Independent External Peer Review

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Dallas Floodway review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the report is well-written and organized, and provides an excellent presentation through the use of photographs, maps, diagrams, tables, and appendices. While the report assessed the economic, engineering, and environmental issues of the Dallas Floodway Project, the Panel identified several elements of the project that require further analysis and sections of the Feasibility Report/EIS that should be clarified or revised.

Economics/Civil Works Planning: The Feasibility Report/EIS clearly represent the result of many years of study effort and the Panel believes that USACE followed the planning process well in arriving at the Tentatively Selected Plan (TSP). The Panel's most significant finding was that dividing the study area into East and West reaches may not be appropriate for such a large, complex area, and may not facilitate a thorough levee risk analysis. This can be addressed by identifying areas of hydrologic, geotechnical, social, and environmental risk and by providing a more thorough risk analysis on the existing levee systems using a more detailed delineation of reaches by channel cross section. The Panel also acknowledged that the Feasibility Report/EIS does not discuss residual risk and project economic performance as required by USACE planning guidance documents. This matter can be resolved by providing the expected economic performance of the alternatives and the TSP, describing the critical factors contributing to residual risk, and explaining how these factors would affect the expected economic performance of the TSP. Finally, the Panel noted that emergency costs, infrastructure damage, damage to utilities, and other standard FRM benefit categories are not addressed. To resolve this issue, the inventory of infrastructure, utilities, and transportation assets in the study area needs to be defined and should include a discussion regarding how these benefit categories were considered when formulating alternative plans. In addition, USACE should also estimate the with- and without-project condition damages within these benefit categories and discuss the effect of including these categories on the project's net NED benefits and benefit-cost ratio.

Biology/Ecology: The Feasibility Report/EIS is thorough in its consideration of resources and project impacts, and uses graphics very effectively to introduce each of the resources presented in the Affected Environment and Environmental Consequences sections. It does a good job of defining the project and existing conditions in easy-to-understand terms for the public, portraying conditions graphically, and projecting without-project conditions into the future. It also explains and justifies the methodologies used to measure existing conditions and analyzing project impacts in an effective manner. The Panel's primary

concern is that the purpose and need statement and the Dallas BVP elements (which may not have been evaluated to determine if alternatives exist with less environmental impact) may not be fully compliant with the National Environmental Policy Act (NEPA). The Panel recommends that the current purpose and need statement reflect the primary goal of protecting human safety by managing flooding risks; recreation and enhancement should be listed as secondary objectives. In addition, a discussion should be included on how the proposed BVP elements were determined and how the other alternatives were suggested as part of selecting the TSP. To address this issue, USACE should identify what other alternatives within the BVP were considered for implementation and, for each resource, explain why the TSP would result in fewer impacts. USACE should also indicate how the percentage of the area proposed for developed active versus passive recreation was determined and what alternatives, impacts, and benefits were used to make that determination.

Hydraulic and Hydrologic (H&H): The Panel found that the project provides a unique opportunity to more effectively manage flood risk, recreation, and environmental rehabilitation and that the Feasibility Report/EIS provides detailed information on the project's history, existing conditions, and potential alternatives. A key H&H issue identified by the Panel was that the future without-project damages are potentially underestimated because a risk analysis was not provided for the existing levee system. To address this issue, the reaches should be delineated using appropriate economic, geotechnical, and H&H criteria; probable non-failure and failure elevations should be assigned to the levees for each cross-section; and a summary of the resulting analyses should be presented. The Panel also noted that the assumptions made on breach width and velocity threshold are not verified, nor are their risk and uncertainty considered. Documentation should be included that verifies the assumed minimum and maximum breach widths and velocity threshold for erosion at the breach and identifies the risk and uncertainty associated with levee breach width.

Civil/Structural Engineering: In general, the engineering analysis formulated to conduct the Base Condition Risk Assessment (BCRA) was complete. The evaluation of the overall project risk includes all relevant failure modes and assesses each in detail. The Panel acknowledges that the cost estimate for the river relocation element of the TSP is based upon limited engineering analysis and may be underestimated, making the final project cost estimate low. To address this issue, USACE should include the missing information or provide new narrative information to better explain how the engineering uncertainty was included for cases mentioned therein. If costs are determined to be omitted or underestimated, the project cost estimate should be revised. The Panel also noted that potential cost impacts due to schedule delays resulting from funding limitations are underestimated and may affect the total project cost. This should be addressed by revising the project cost estimate discussion of possible schedule delays to appropriately account for the real risk of project delays.

Geotechnical Engineering: The geotechnical studies are based on a strong database of geological reports, historical records, extensive field investigations, laboratory tests, and state-of-practice analyses. The Panel noted that the total project cost for the FRM plan may be low because (1) it does not include a quantity allowance for levee settlement, and (2) the limited design completed for the levee caps beneath bridges may underestimate the construction effort. USACE can resolve this issue by revising the project levee design and stability analysis as well as the project cost estimate to appropriately account the potential necessity for raising the levee crest to offset future settlement. In addition, it is recommended that the proposed levee capping features and levee settlement be better explained by revising the narratives in the main Feasibility Report, the Civil and Structural Appendix, and the Cost Appendix to include the missing information.

Finally, the Panel confirmed that no new issues or concerns were identified during the review of public comments other than those already covered in their Final Panel Comments and determined that adequate stakeholder involvement had occurred.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Dallas Floodway IEPR Panel

No.	Final Panel Comment
High – Significance	
1	Dividing the study area into East and West reaches may not be appropriate for such a large, complex area, and may not facilitate a thorough levee risk analysis.
2	The future without-project damages are potentially underestimated since a risk analysis was not provided for the existing levee system.
3	It is uncertain whether the purpose and need statement for the Environmental Impact Statement is accurate and fulfills the procedural requirements of the National Environmental Policy Act.
4	The Dallas Balanced Vision Plan elements have not been evaluated to determine if alternatives exist with less environmental impact, suggesting the Environmental Impact Statement is not fully compliant with the National Environmental Policy Act.
Medium – Significance	
5	The Feasibility Report does not discuss residual risk and project economic performance as required by USACE planning guidance documents.
6	The assumptions made on breach width and velocity threshold are not verified, nor are their risk and uncertainty considered.
7	The potential cumulative impacts of the proposed Federal Highway Administration project on air quality, noise, wetlands, and other resources are not fully considered.
8	Potential cost impacts due to schedule delays resulting from funding limitations are underestimated and may affect the total project cost.
9	Emergency costs, infrastructure damage, damage to utilities, and other standard flood risk management benefit categories are not addressed.
10	The cost estimate for the river relocation element of the Tentatively Selected Plan is based upon very limited engineering analysis and may be underestimated, making the total project cost estimate low.
11	The total project cost for the Flood Risk Management plan is low because it does not include a quantity allowance for levee settlement, and the limited design completed for the levee caps beneath bridges may underestimate the construction effort.

Table ES-1. Overview of 16 Final Panel Comments Identified by the Dallas Floodway IEPR Panel (continued)

No.	Final Panel Comment
Low – Significance	
12	The analysis of the effectiveness of cutoff walls is not sufficiently documented to support the stated need or projected costs for the areas where these structures are to be constructed.
13	An estimate of economic outputs for the recreational features is not provided.
14	The Main Report and Economics Appendix do not present values in consistent year dollars and discount rates.
15	It is difficult to assess the project's ability to address potential impacts and to determine if the plans to mitigate the impacts are appropriate because detailed information is not provided for all impacts and their proposed mitigation.
16	No rationale is given for applying unsteady Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling to cases where steady HEC-RAS modeling results did not meet the project criteria.

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LIST OF ACRONYMS

ASA (CW)	Assistant Secretary of the Army for Civil Works
ASCE	American Society of Civil Engineers
ATR	Agency Technical Review
BCRA	Base Condition Risk Assessment
BVP	Balanced Vision Plan
COI	Conflict of Interest
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EC	Engineer Circular
EFDC	Environmental Fluid Dynamics Code
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
EIS	Environmental Impact Statement
FHA	Federal Highway Administration
FRM	Flood Risk Management
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HEC-ResSim	Hydrologic Engineering Center-Reservoir Simulation
HHD	Herbert Hoover Dam
IDP	Interior Drainage Plan
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
LEED®	Leadership in Energy and Environmental Design
LIDAR	Light Detection and Ranging
MCACES	Micro-Computer Aided Cost Engineering System
NED	National Economic Development
NEPA	National Environmental Policy Act
OEO	Outside Eligible Organization
OMB	Office of Management and Budget

PDT	Project Delivery Team
ROD	Record of Decision
SAR	Safety Assurance Review
SPF	Standard Project Flood
TSP	Tentatively Selected Plan
UDV	Unit Day Value
UNF	University of Florida
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Services
TSP	Tentatively Selected Plan
WRDA	Water Resources Development Act

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1. INTRODUCTION

The Dallas Floodway Feasibility Report and Environmental Impact Statement (EIS) is a multipurpose study for flood risk management (FRM), environmental management, and recreation being conducted by the U.S. Army Corps of Engineers (USACE). The non-Federal sponsor for the Dallas Floodway Feasibility Study is the City of Dallas, Texas (the City). Upon its completion, the Feasibility Report is intended to provide a full response to Section 5141 of the Water Resources Development Act (WRDA) of 2007. Under this authority, the Assistant Secretary of the Army for Civil Works (ASA (CW)) is to determine whether the Balanced Vision Plan (BVP) and Interior Drainage Plan (IDP) within the existing Dallas Floodway Project are "technically sound" and "environmentally acceptable." Should the Director's Report be approved by the Director of Civil Works on this basis, and a Record of Decision (ROD) be signed by the ASA (CW), the project could be constructed without additional authorization.

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In order to perform the Comprehensive Analysis, the study had to be conducted in phases. The first phase had to address deficiencies with the levee system and formulate a FRM plan utilizing National Economic Development (NED) criteria. The FRM plan would then become a component of the BVP. In the second phase, all proposed projects and features currently being planned within the Dallas Floodway System (BVP, IDP, local projects, and the Trinity Parkway) were evaluated during the Comprehensive Analysis. This analysis methodology ensures that the proposed local projects meet USACE engineering and safety standards, are compatible with the proposed Federal Project features, and would not have significant adverse effects on the functioning of the existing Dallas Floodway Levee System. The analysis also ensures that components of the BVP and IDP are technically sound and environmentally acceptable. In the final phase, features to be implemented as the Modified Dallas Floodway Project under WRDA 2007 are presented in the Feasibility Report and coordinated as the recommended plan.

Local features are projects that will not be a part of the Federal plan, but their implementation does represent a modification to the existing Federal Project. These features either have undergone or are required to undergo a Section 408 review by USACE. Additionally, the local features will be considered as a part of the Comprehensive Analysis along with the BVP and IDP features. The local features to be evaluated in the Comprehensive Analysis are the Trinity Parkway, the Trinity River Standing Wave, the Santa Fe Trestle Trail, the Pavaho wetlands, the Dallas Horseshoe Project, Sylvan Avenue Bridge, the Jefferson Bridge, Dallas Water Utilities waterlines, the Continental Bridge, the East Bank/West Bank interceptor line, and IDP-Phase II pump stations (Charlie, Delta, Pavaho, and Trinity/Portland). These projects (excluding the Trinity Parkway and the Charlie, Delta, and Trinity/Portland pump stations) have received initial "approval" under Section 408 and are in various stages of design and construction. In addition, the City has expressed a desire to construct any BVP feature that is not selected as part of the Federal plan as a Section 408 project at 100 percent local cost.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Dallas Floodway Feasibility Report and Environmental Impact Statement (hereinafter Dallas Floodway IEPR) in accordance with procedures described in the Department of the Army, USACE, Engineer Circular (EC) *Civil Works Review* (EC 1165-2-214) (USACE, 2012) and the Office of Management and Budget (OMB) bulletin *Final Information Quality Bulletin for Peer Review* (OMB, 2004). Supplemental guidance on evaluation for conflicts of interest (COIs) was obtained from the *Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports* (The National Academies, 2003).

This final report presents the Final Panel Comments of the IEPR Panel (the Panel) on the existing engineering, economic, environmental, and plan formulation analyses contained in the Dallas Floodway review documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review (ATR), as described in USACE (2012).

In general, the purpose of peer review is to strengthen the quality and credibility of the USACE decision documents in support of its Civil Works program. IEPR provides an independent assessment of the engineering, economic, environmental, and plan formulation analyses of the project study. In particular, the IEPR addresses the technical soundness of the project study's assumptions, methods, analyses, and calculations and identifies the need for additional data or analyses to make a good decision regarding implementation of alternatives and recommendations.

In this case, the IEPR of the Dallas Floodway Project was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-214). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. Table 1 presents the major milestones and deliverables of the Dallas Floodway IEPR. Due dates for milestones and deliverables were originally based on the award/effective date of July 25, 2013, but the IEPR was placed on hold by USACE to accommodate the public comment period. Note that the work items listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the PDF printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on July 14, 2014. The actual date for contract end will depend on the date that all activities for this IEPR are conducted.

Table 1. Major Milestones and Deliverables of the Dallas Floodway IEPR

Task	Action	Due Date
1	Award/Effective Date	7/25/2013
	Review documents available	8/20/2013
2	Battelle submits list of selected panel members	8/15/2013
	USACE confirms the panel members have no COI	8/16/2013
3	Battelle convenes kick-off meeting with USACE	8/13/2013
	Battelle convenes kick-off meeting with USACE and panel members	8/29/2013
4	Panel members complete their individual reviews	9/18/2013
	Panel members provide draft Final Panel Comments to Battelle	10/1/2013
	USACE submits public comments to Battelle	5/16/2014
	Battelle submits public comments to Panel	6/4/2014
	Panel members provide response to public comments	6/6/2014
5	Battelle submits Final IEPR Report to USACE	6/17/2014
6[a]	Battelle convenes Comment-Response Teleconference with panel members and USACE	7/1/2014
	Battelle submits pdf printout of DrChecks project file to USACE	7/14/2014
	Senior Leadership Meeting[b]	9/8/2014
	Contract End/Delivery Date	10/1/2014

[a]*Task 6 occurs after the submission of this report.*

[b]*The Senior Leadership Meeting was listed in the Performance Work Statement under Task 3 but was relocated in this schedule to reflect the chronological order of activities.*

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: civil engineering, hydrologic and hydraulic engineering, geotechnical engineering, economics/Civil Works planner, and biologist/ecologist. The Panel reviewed the Dallas Floodway IEPR document and produced 16 Final Panel Comments in response to 74 charge questions provided by USACE for the review. This charge included two questions added by Battelle that sought summary information from the IEPR Panel. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

1. Comment Statement (succinct summary statement of concern)
2. Basis for Comment (details regarding the concern)
3. Significance (high, medium, or low; in accordance with specific criteria for determining level of significance). Due to the review being put on hold and the report being generated at a later date,

the Final Panel Comments were generated prior to the levels of significance criteria being expanded from three to five (per coordination with USACE Headquarters).

4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-214, Appendix D), and completeness prior to determining that they were final and suitable for inclusion in the Final IEPR Report. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Panel's findings are summarized in Section 4.1; the Final Panel Comments are presented in full in Section 4.2.

4. RESULTS OF THE IEPR

This section presents the results of the IEPR. A summary of the Panel's findings and the full text of the Final Panel Comments are provided.

4.1 Summary of Final Panel Comments

The panel members agreed on their "assessment of the adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (USACE, 2012; p. D-4) in the Dallas Floodway IEPR review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

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Economics/Civil Works Planning: The Feasibility Report/EIS clearly represent the result of many years of study effort and the Panel believes that USACE followed the planning process well in arriving at the Tentatively Selected Plan (TSP). The Panel's most significant finding was that dividing the study area into East and West reaches may not be appropriate for such a large, complex area, and may not facilitate a thorough levee risk analysis. This can be addressed by identifying areas of hydrologic, geotechnical, social, and environmental risk and by providing a more thorough risk analysis on the existing levee systems using a more detailed delineation of reaches by channel cross section. The Panel also acknowledged that the Feasibility Report/EIS does not discuss residual risk and project economic performance as required by USACE planning guidance documents. This matter can be resolved by providing the expected economic performance of the alternatives and the TSP, describing the critical factors contributing to residual risk, and explaining how these factors would affect the expected economic performance of the TSP. Finally, the Panel noted that emergency costs, infrastructure damage, damage to utilities, and other standard FRM benefit categories are not addressed. To resolve this issue, the inventory of infrastructure, utilities, and transportation assets in the study area needs to be defined and should include a discussion regarding how these benefit categories were considered when formulating alternative plans. In addition, USACE should also estimate the with- and without-project condition damages within these benefit categories and discuss the effect of including these categories on the project's net NED benefits and benefit-cost ratio.

Biology/Ecology: The Feasibility Report/EIS is thorough in its consideration of resources and project impacts, and uses graphics very effectively to introduce each of the resources presented in the Affected Environment and Environmental Consequences sections. It does a good job of defining the project and existing conditions in easy-to-understand terms for the public, portraying conditions graphically, and projecting without-project conditions into the future. It also explains and justifies the methodologies used to measure existing conditions and analyzing project impacts in an effective manner. The Panel's primary concern is that the purpose and need statement and the Dallas BVP elements (which may not have been evaluated to determine if alternatives exist with less environmental impact) may not be fully compliant with the National Environmental Policy Act (NEPA). The Panel recommends that the current purpose and need statement reflect the primary goal of protecting human safety by managing flooding risks; recreation and enhancement should be listed as secondary objectives. In addition, a discussion should be included on how the proposed BVP elements were determined and how the other alternatives were suggested as part of selecting the TSP. To address this issue, USACE should identify what other alternatives within the BVP were considered for implementation and, for each resource, explain why the TSP would result in fewer impacts. USACE should also indicate how the percentage of the area proposed for developed active versus passive recreation was determined and what alternatives, impacts, and benefits were used to make that determination.

Hydraulic and Hydrologic (H&H): The Panel found that the project provides a unique opportunity to more effectively manage flood risk, recreation, and environmental rehabilitation and that the Feasibility Report/EIS provides detailed information on the project's history, existing conditions, and potential alternatives. A key H&H issue identified by the Panel was that the future without-project damages are potentially underestimated because a risk analysis was not provided for the existing levee system. To address this issue, the reaches should be delineated using appropriate economic, geotechnical, and H&H criteria; probable non-failure and failure elevations should be assigned to the levees for each cross-section; and a summary of the resulting analyses should be presented. The Panel also noted that the assumptions made on breach width and velocity threshold are not verified, nor are their risk and uncertainty considered. Documentation should be included that verifies the assumed minimum and maximum breach widths and velocity threshold for erosion at the breach and identifies the risk and uncertainty associated with levee breach width.

Civil/Structural Engineering: In general, the engineering analysis formulated to conduct the Base Condition Risk Assessment (BCRA) was complete. The evaluation of the overall project risk includes all relevant failure modes and assesses each in detail. The Panel acknowledges that the cost estimate for the river relocation element of the TSP is based upon limited engineering analysis and may be underestimated, making the final project cost estimate low. To address this issue, USACE should include the missing information or provide new narrative information to better explain how the engineering uncertainty was included for cases mentioned therein. If costs are determined to be omitted or underestimated, the project cost estimate should be revised. The Panel also noted that potential cost impacts due to schedule delays resulting from funding limitations are underestimated and may affect the total project cost. This should be addressed by revising the project cost estimate discussion of possible schedule delays to appropriately account for the real risk of project delays.

Geotechnical Engineering: The geotechnical studies are based on a strong database of geological reports, historical records, extensive field investigations, laboratory tests, and state-of-practice analyses. The Panel noted that the total project cost for the FRM plan may be low because (1) it does not include a quantity allowance for levee settlement, and (2) the limited design completed for the levee caps beneath

bridges may underestimate the construction effort. USACE can resolve this issue by revising the project levee design and stability analysis as well as the project cost estimate to appropriately account the potential necessity for raising the levee crest to offset future settlement. In addition, it is recommended that the proposed levee capping features and levee settlement be better explained by revising the narratives in the main Feasibility Report, the Civil and Structural Appendix, and the Cost Appendix to include the missing information.

Finally, the Panel confirmed that no new issues or concerns were identified during the review of public comments other than those already covered in their Final Panel Comments and determined that adequate stakeholder involvement had occurred.

4.2 Final Panel Comments

This section presents the full text of the Final Panel Comments prepared by the IEPR panel members.

Final Panel Comment 1

Dividing the study area into East and West reaches may not be appropriate for such a large, complex area, and may not facilitate a thorough levee risk analysis.

Basis for Comment

The Dallas Floodway study area is large and complex, with a high magnitude of future without-project condition damages. The levee systems' height and geotechnical characteristics vary widely as one progresses through the floodplain. Land use characteristics also vary and there is potential for economic justice issues to arise.

According to standard USACE practice (USACE, 2000; USACE, 1988), reaches are the primary geographic unit for planning in FRM studies. Plans are formulated with components that cover a series of reaches. The engineering, economic, and environmental impacts and benefits attributable to a project are calculated and displayed for each reach. Consequently, it is important that reach selection be a joint effort by the project planner, hydrologic and hydraulic engineers, geotechnical engineers, and the economists. If environmental or social justice impacts are possible or likely to occur, the National Environmental Policy Act (NEPA) team member should also be included.

Reaches should be delineated by the study team with careful attention to economic, hydrologic, social, geographic, geotechnical, political, or other issues that separate one segment of a watershed from another.

Different reaches will have different hydrologic/hydraulic and geotechnical characteristics, both of which factor into the levee risk analysis through the establishment of the probable non-failure and failure points for the levee sections tied to each reach and the probabilities assigned to those elevations. The differing socio-economic characteristics of the areas protected by the levees affect how the consequences of failure are measured.

With such widely varying conditions in the floodplain, having only two reaches does not facilitate identification of key damage centers, areas of high geotechnical risk, or areas of potential social and/or environmental effects on the future without-project condition. Accordingly, this affects the ability to determine whether the impacts and residual risk associated with the Tentatively Selected Plan (TSP) are technically and environmentally acceptable.

Significance – High

Detailed delineation of reaches could affect the selection or justification of the TSP. Areas of existing and post-implementation risk are not identified and affect confidence in the ability of the TSP to achieve the planning objectives.

Recommendations for Resolution

1. Provide a detailed delineation of the reaches by channel cross section.
2. Identify damage centers and areas of hydrologic and geotechnical risk.
3. Identify any areas of potential social or environmental concern or risk.
4. Provide a more thorough risk analysis on the existing levee systems using the revised reaches.

Literature Cited:

USACE (2000). Planning - Planning Guidance Notebook. Engineer Regulation (ER) 1105-2-100. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. April. Appendix E.

USACE (1988). National Economic Development Procedures - Urban Flood Damage. Institute for Water Resources (IWR) Report 88-R-2. U.S. Army Corps of Engineers, Washington, D.C. March.

Final Panel Comment 2

The future without-project damages are potentially underestimated since a risk analysis was not provided for the existing levee system.

Basis for Comment

The existing levee systems were not investigated using a systematic approach to determine degrees of reliability, as required by USACE policy (USACE, 2000).The study assumes that the existing levees will not fail unless overtopped, which is not consistent with this policy: "Investigations for flood damage prevention involving the evaluation of the physical effectiveness of existing levees and the related effect on the economic analysis shall use a systematic approach to resolving indeterminate, or arguable, degrees of reliability. Reasonable technical investigations shall be pursued to establish the minimum and, to the extent possible, the maximum estimated levels of physical effectiveness. Necessary information and summary of analyses shall be included in report presentations of plan formulation and shall be documented in appropriate supporting materials." Overtopping is not the only failure mode that could occur in the study area. However, other potential failure modes are not addressed following the guidance in USACE (2000).

The existing levees associated with the Dallas Floodway were found to be deficient as late as 2007. Depending on the level of their unreliability, the future without-project condition damages are likely underestimated. Incorporating the risk of failure and estimates of the consequences for flood events that do not overtop the levees would produce a higher estimate of future without-project damages. Accordingly, the benefits attributable to management plans that address the deficiencies are also likely underestimated.

Significance – High

The plan benefits could be significantly underestimated across the range of alternatives. This could affect the benefits expected to accrue and potentially change the justification and selection of a TSP.

Recommendations for Resolution

5. Delineate the reaches using appropriate economic, geotechnical, and hydrologic/hydraulic criteria, using channel cross-sections.
6. Assign probable non-failure and failure elevations to the levees for each cross- section in a manner compliant with USACE (2000), pp. 105-107.
7. Estimate consequences of failure.
8. Provide a summary of the analyses conducted as recommended in Recommendations 1-3 in the Main Report and Economic, Geotechnical, and Hydrology and Hydraulics Appendices.

Literature Cited:

USACE (2000). Planning - Planning Guidance Notebook. Engineer Regulation (ER) 1105-2-100. Department of the Army, U.S. Army Corps of Engineers. April. Appendix E

Final Panel Comment 3

It is uncertain whether the purpose and need statement for the Environmental Impact Statement is accurate and fulfills the procedural requirements of the National Environmental Policy Act.

Basis for Comment

The purpose and need statement of the Environmental Impact Statement (EIS) describes three goals that are to be balanced: reduce flood risk, provide public recreation, and restore habitat. Presenting these elements as "equal" is unconvincing, as the public need for recreation and habitat enhancement is clearly less urgent than managing safety concerns arising from flooding risks. The Panel believes that it makes more sense for the EIS to identify flood control as the primary purpose of the project, dictated by compelling need, and publication recreation and habitat restoration as desirable project objectives, but with less urgent need or consequence. This would allow selection of a preferred alternative that best meets the overall Water Resources Development Act (WRDA) project objectives (including the Balanced Vision Plan [BVP] elements). At present, the alternatives analysis allows only the currently proposed plan to be the preferred alternative. While habitat restoration and providing recreational opportunities do fall within the Civil Works program and are clearly part of the Congressionally authorized project, the primary driver of this project is to reduce flood risk. Therefore the format of the EIS should follow flood control as the primary project purpose, as demonstrated by a compelling need, with remaining planning elements (restoration, enhancement) considered as project objectives that would be desirable to attain, but for which the need is not as great or as consequential. This would not constrain the alternatives analysis as it presently does, by allowing only the currently proposed plan as the preferred alternative, and would still allow selection of a preferred alternative that best meets the overall WRDA project objectives (including the BVP elements).

If management of flood risks is the primary project purpose, then the alternatives analysis presented is sufficient to meet National Environmental Policy Act (NEPA) requirements since the Feasibility Report clearly evaluates several flood control alternatives from a variety of perspectives before arriving at the Tentatively Selected Plan (TSP). If the project purpose remains as stated to specifically balance the needs of all three major project elements (flood control, habitat enhancement, recreation) then by its nature the alternatives analysis is artificially constrained to the one alternative that best balances these three elements. A similar analysis for the BVP elements would have to be provided to justify the selection of those elements under the TSP. As presented, the EIS does not allow sufficient consideration of other alternatives (e.g., reduced recreation, increased habitat enhancement, or reduced enhancement, increased recreation) because alternatives to the specific BVP elements are not presented.

Significance – High

A redefinition of the project purpose and need is required as a basis for a NEPA-compliant assessment of alternatives.

Recommendations for Resolution

1. Replace the current Purpose and Need statement with one that has a primary goal of protecting human safety by management of flooding risks, and lists recreation and enhancement as secondary objectives.
2. In the EIS, discuss how the proposed BVP elements were determined, and how the other alternatives were suggested as part of selecting the Preferred Alternative.

Final Panel Comment 4

The Dallas Balanced Vision Plan elements have not been evaluated to determine if alternatives exist with less environmental impact, suggesting the Environmental Impact Statement is not fully compliant with the National Environmental Policy Act.

Basis for Comment

The feasibility report provides a thorough discussion of the different alternatives for ensuring that flood risks are managed. The Environmental Impact Statement (EIS), however, does not present an equivalent discussion of how the Balanced Vision Plan (BVP) elements were evaluated with respect to alternatives, including environmental impacts. Rather, the BVP elements have been added to the EIS as part of the preferred alternative without explanation of how they were determined.

Under 40 CFR Parts 1500 - 1508 (1987), Section 1502.14 requires the EIS to examine all reasonable alternatives to the proposal. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable." Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant. Clearly, this Congressionally authorized project includes the BVP elements within the Tentatively Selected Plan (TSP), but in the view of the Panel, this does not preclude or alleviate the need for the EIS document to describe the alternatives to the different BVP elements considered during the planning process and their environmental impacts.

There are several cases where BVP elements could be further evaluated in the EIS to determine if alternatives exist with less environmental impact, instead it appears as if the plan was incorporated into the TSP as proposed by the City. The Executive Summary (ES-4) of the EIS states: “This EIS serves two purposes: 1) it analyzes the USACE’s Recommended Plan as identified in the Feasibility Report (USACE 2013) and 2) it serves as the reference NEPA document for one over-arching future permit (i.e., 33 U.S. Code Section 408, or “Section 408” permit) for everything the City of Dallas proposes to construct within the Dallas Floodway (i.e., the BVP Study features as proposed and analyzed in this EIS), minus the Trinity Parkway. The potential Trinity Parkway project would require its own Section 408 permit.”

One option would be to include the BVP as an appendix to the EIS, as some agencies do for EISs based on proposed plans. This would seem an appropriate solution (CEQ, 1981; Comment 21).

Significance – High

Alternatives to the BVP elements such as recreational facilities, roadways, and other projects cannot be evaluated for environmental impacts on the basis of the information provided in the EIS.

Recommendations for Resolution

1. Include the BVP on a compact disk in the Appendix to the EIS, since it is the planning document that much of the EIS addresses.
2. Indicate in Chapter 4 for each resource impacted what other alternatives within the BVP have been considered for implementation and why the preferred alternative would result in fewer impacts.
3. Indicate in Section 4.7 of the EIS how the percentage of the area proposed for developed recreation (e.g., ball fields) versus passive recreation (hiking, nature trails) was arrived at and what

alternatives/impacts/benefits were used to make that determination.

4. Indicate in Section 2.2.5 what amount of the 14 miles of roads required for construction would require paving, versus remaining impervious gravel surfaces or trails; the alternatives considered to siting roadways relative to traffic and environmental concerns; and the effectiveness of habitat enhancement measures and required access for recreation
5. Indicate in Chapter 4 under specific resource sections the impacts on stormwater, flooding, air quality, and socioeconomics from the various configurations considered in placement of the amphitheater, access roads, and percent developed versus passive recreation.

Literature Cited:

40 CFR Parts 1500 – 1508. Protection of Environment. Council on Environmental Quality. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 1987.

CEQ (1981). Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. Council on Environmental Quality, Executive Office of the President. March 23.

Final Panel Comment 5

The Feasibility Report does not discuss residual risk and project economic performance as required by USACE planning guidance documents.

Basis for Comment

According to USACE guidance (USACE, 2000, 2006), the expected economic performance of the alternatives and the Tentatively Selected Plan (TSP) must be carefully analyzed and displayed along with the residual risk of the with-project condition.

The Economics Appendix displays residual Expected Annual Damages for each of the alternative plans. However, the Appendix does not analyze or discuss residual risk or the factors contributing to residual risk and how residual risk affects the expected performance of the TSP.

The Economics Appendix does not address how well the TSP is expected to perform economically in order to determine whether residual risk is reasonable and whether the economic outputs of the project have a reasonably high probability of being achieved.

Significance – Medium

Display and analysis of expected project performance is a policy requirement and an important technical aspect affecting the completeness and understanding of the selection of the TSP.

Recommendations for Resolution

1. Display the expected economic performance of the alternatives and the TSP.
2. Describe the critical factors contributing to residual risk.
3. Discuss how these factors affect the expected economic performance of the TSP.

Literature Cited:

USACE (2000). Planning - Planning Guidance Notebook. Engineer Regulation (ER) 1105-2-100. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 22 April. Appendix E.

USACE (2006). Planning – Risk Analysis for Flood Damage Reduction Studies. Engineer Regulation (ER) 1105-2-101. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. 3 January.

Final Panel Comment 6

The assumptions made on breach width and velocity threshold are not verified, nor are their risk and uncertainty considered.

Basis for Comment

According to the Feasibility Report Appendix A (Section 4.4.5, Figures 4-4 and 4-5), sensitivity tests on levee breach development indicate that the potential average interior flood elevation behind the East and West Levees is more than 10 feet for various combinations of assumed breach width and breach formation time. Based on these results, the expected soil conditions of the levees, and engineering judgment, the study assumes minimum and maximum breach widths of 130 feet and 400 feet and an 8 feet-per-second flow velocity threshold for erosion when modeling the levee breach. The assumed breach width and flow velocity threshold for erosion have an "overwhelming effect on interior flooding depth, as well as the resulting estimates of economic damage and life loss" (Feasibility Report Appendix A, Section 4.4.1).

The Panel cannot confirm if the assumptions on breach width and velocity threshold for erosion are appropriate because it could not find detailed documentation on the bases for these assumptions in the review documents. In addition, the Feasibility Report Appendix A does not analyze the risk and uncertainty associated with levee breach width development.

Significance – Medium

Detailed information on the assumptions on breach width and velocity threshold for erosion would improve the understanding of the risk and uncertainty associated with breach development.

Recommendations for Resolution

1. Provide documentation to verify the assumed minimum and maximum breach widths.
2. Provide documentation to verify the assumed velocity threshold for erosion at the breach.
3. Consider the risk and uncertainty associated with levee breach width development.

Final Panel Comment 7

The potential cumulative impacts of the proposed Federal Highway Administration project on air quality, noise, wetlands, and other resources are not fully considered.

Basis for Comment

In general, the Environmental Impact Statement (EIS) and Feasibility Report does an excellent job of detailing the many proposed projects and initiatives within the study area that are currently being built, scheduled to be built, or are being considered for future construction. However, the issue of how to address the cumulative impacts of both the Tentatively Selected Plan (TSP) and the proposed Federal Highway Administration (FHA) project that would run through the same project area is problematic. If the TSP and FHA projects each evaluate their own impacts independently, there are potential environmental issues such as air, noise, and wetlands that will not be adequately addressed. Examples of potential cumulative impacts that have not been fully considered include the following:

- Air quality. The discussion in the EIS considers construction impacts from the FRM portion of the project. It does not consider additional vehicular use associated with increased visitor use to the center of the city in the event that recreational fields are developed or parklands are further developed to encourage use. The assumption that mobile air sources would remain the same since traffic would merely be redistributed is not justified in the EIS. Construction of an amphitheater, plans for fireworks displays, and similar public events would bring with them the potential to cause cumulative impacts when a new FHA highway project is also constructed within the same area. For example, there could be increased vehicle queuing at entrance and exit ramps and impacts on local traffic patterns.

- Noise. Similar cumulative impacts could result from the combined noise from concerts and other events held within the project area and highway noise from the FHA project.

- Wetlands. Implementation of the FHA project could produce cumulative impacts on wetlands or the habitat portion of the proposed project. For example, the construction of overhead ramps could create shadowing effects, stormwater runoff from the roadway into adjacent habitat (e.g., road salt, sediment) could produce habitat fragmentation, and the enhancement plan designed to benefit wildlife could cause general disturbance impacts. These could include issues such as shadowing of habitat from overhead highway entrance/exit ramps, fragmentation from placement of pylons, etc.

These kinds of impacts cannot be solely addressed by the EIS for the FHA portion of the project. Rather, the two projects should be considered concurrently. Since USACE evaluated the impact of potential highway configurations on the flood project design, it should also consider other environmental impacts such as air and noise. The EIS addresses the impact of Alternative 2 in the event that the highway is present (e.g., implications of designing around it, rather than combined impacts on traffic) (Sections 4.5, 4.12, 4.14, and 4.15), and the impact of construction on air quality (Section 4.14.3). Although Section 4.12.3 does indicate significant adverse cumulative impacts on traffic, it does not address local traffic.

Significance – Medium

Cumulative impacts should be evaluated more comprehensively, but they seldom provide the sole basis for determining whether a project has significant impacts.

Recommendations for Resolution

1. Include additional discussion of potential cumulative highway impacts on the implementation of the TSP.

Final Panel Comment 8

Potential cost impacts due to schedule delays resulting from funding limitations are underestimated and may affect the total project cost.

Basis for Comment

The Cost Risk Study and Risk Register presented in Appendix J note that a key risk to cost escalation is schedule risk. For the Balanced Vision Plan (BVP), the schedule delay at 80% confidence interval is estimated to be 40 months. However, this assumption does not match what is discussed in the Main Feasibility Report, which indicates that the project could take 10 to 20 years (e.g., 120 to 240 months) due to Federal funding limitations. The resulting delays could increase the total project cost as interest rises during delayed construction. Extended delays may also mean higher material and commodity costs as these fluctuate over time (currently they are generally constrained due to the economic climate).

Significance – Medium

The contradiction regarding the duration of schedule delays affects the completeness of the report; if the delays are underestimated, the final project cost will increase.

Recommendations for Resolution

1. Revise the project cost estimate to appropriately account for the real risk of project delays.
2. Revise the discussion of possible schedule delays in the Cost Appendix and Main Feasibility Report and resolve the current contradictions.

Final Panel Comment 9

Emergency costs, infrastructure damage, damage to utilities, and other standard flood risk management benefit categories are not addressed.

Basis for Comment

Emergency costs are one of the three primary benefit categories traditionally attributable to flood risk management (FRM) and can be a significant proportion of total expected annual damages. Physical losses or damages can include damages to structures and their contents, inventory, vehicles, roads and bridges, infrastructure, utilities, and other economically important assets subjected to flood risk.

The Feasibility Report/EIS only provide estimates for with- and without-project condition damages to the structure inventory and personally owned vehicles. The documents do not address the economic value of incurring elevated emergency response and recovery costs or the costs of elevated public health and safety activities following significant flood events. The economic value of risk to public infrastructure, utilities, transportation assets, or any other assets with important economic or social value is also not discussed.

In order to understand that the actual benefits of the Tentatively Selected Plan (TSP) are presented in the Economic Appendix, a more thorough analysis of the full range of benefit categories is needed. These important benefit categories should be included in the analysis to provide a complete picture of the TSP's benefits. This allows for a more complete understanding that the TSP's net benefits and benefit-cost ratio reflect the actual expectations of the TSP's performance.

Significance – Medium

Including only a subset of the physical damages reduced by the TSP affects the completeness and understanding of the report, and it affects the Panel's ability to determine if the actual benefits of the TSP are significantly higher than presented.

Recommendations for Resolution

1. Describe the inventory of infrastructure, utilities, and transportation assets in the study area.
2. Estimate the emergency costs of one or more significant flood events.
3. Discuss how these benefit categories were considered when formulating alternative plans.
4. Estimate the with- and without-project condition damages within these benefit categories.
5. Display and discuss the effect of including these categories on the project's net National Economic Development (NED) benefits and benefit-cost ratio.

Final Panel Comment 10

The cost estimate for the river relocation element of the Tentatively Selected Plan is based upon very limited engineering analysis and may be underestimated, making the total project cost estimate low.

Basis for Comment

Only general descriptions and limited data are presented in the Main Feasibility Report and engineering appendices regarding the river relocation portion of the Balanced Vision Plan (BVP). The final river relocation plan in the Tentatively Selected Plan (TSP) appears uncertain, with key engineering details lacking. This is especially true regarding key assumptions necessary to determine the cost of the river relocation plan. Many of the assumptions are not discussed in any of the various reports. In some cases, the technical basis for a particular assumption is not provided. For example, the depth to the water table within the flood plain is estimated at 10 feet, yet no basis for this assumption is given. A higher water table may preclude "excavation in the dry," leading to further construction complications and potential increased costs.

The engineering analysis of required utility relocations is very limited and uncertain. There are numerous utilities located within the flood plain that could be affected by the relocation plan. These utilities may have to be relocated or hardened to protect them from erosion. Although the locations are generally known, the exact depth and condition of each utility is unknown. Regarding the river relocation plan, the Panel cannot ascertain what relocation costs are included in the project cost estimate that may be associated with these utilities or what action (e.g. relocation or hardening) is required for each. In addition, since utility relocations are the responsibility of the utility owner or local non-Federal sponsor for USACE projects, schedule delays may be expected due to the extensive coordination usually required to complete relocation efforts, perhaps further increasing the BVP cost.

Significance – Medium

The missing information and incomplete discussion of the river relocation plan affect the completeness of the report and understanding of the total project cost.

Recommendations for Resolution

1. Revise the narratives in the Main Feasibility Report, Civil and Structural Appendix, and Cost Appendix to include the missing information or provide new narrative information to better explain how the engineering uncertainty was included for cases mentioned herein.
2. If costs are determined to be omitted or underestimated, revise the project cost estimate.

Final Panel Comment 11

The total project cost for the Flood Risk Management plan is low because it does not include a quantity allowance for levee settlement, and the limited design completed for the levee caps beneath bridges may underestimate the construction effort.

Basis for Comment

A number of important cost considerations are not included in the draft project cost estimate. Earthwork quantities are low since no allowance for levee settlement is included in the quantity estimates for the project. The design for the levee cap beneath bridges is uncertain and requires further clarification to ensure that the actual construction effort is not underestimated. The following summarizes the Panel's observation regarding the low costs of the Flood Risk Management (FRM) plan:

The current levee cross-section undulates along the levee profile. The Panel assumes that one reason for this condition is settlement of the clay material used to construct the levees. If the FRM plan is implemented, it would be reasonable to expect that further settlement may occur over time once the levees are modified. Currently, there is no provision in the engineering design to account for this settlement over the 50-year design life of the project. Other similar USACE projects have accounted for levee settlement in their design, stability analysis, and cost estimates. One approach that has been used is to "over build" or super elevate portions of the levee to ensure that the levee crest elevation does not sink below its design value over 50 years. The engineering appendices clearly indicate that settlement was not accounted for in the current recommended design. It is also not accounted for in the project cost estimate, meaning that the current estimate is low.

Further, taking settlement into account for the current design may mean that some levee sections need further stability analysis to ensure adequate factors of safety. For levee sections currently having marginal safety factors against sliding (Geotechnical Appendix, Section 10), an expanded levee section with flatter slopes will likely be required to support an increased levee height. The costs associated with such an expansion have not been included in the cost estimates.

The design of the levee caps beneath the many bridges in the study area is highly uncertain. The selected engineering design for these areas is supported by no detail and noted to be "unconventional" in the Civil and Structural Appendix (p. D82). Although the overall cost of these items may be small compared to the total project cost, the engineering analysis completed in support of the project cost estimate is not commensurate with other parts of the project where a higher level of detailed engineering has been completed. Therefore, the Panel assumes that the cost for this element is low.

Significance – Medium

The cost estimate omissions affect the adequacy of the total project cost for the FRM plan.

Recommendations for Resolution

1. Revise the project levee design to account for levee settlement.
2. Revise levee stability analysis as necessary (based upon the new levee design) to account for super elevated or "over built" levees.
3. Revise the project cost estimate to appropriately account for levee settlement.

4. Revise the narratives in the Main Feasibility Report, Civil and Structural Appendix, and Cost Appendix to include the missing information or provide new narrative information to better explain the proposed levee capping features and levee settlement.

Final Panel Comment 12

The analysis of the effectiveness of cutoff walls is not sufficiently documented to support the stated need or projected costs for the areas where these structures are to be constructed.

Basis for Comment

A cutoff wall is the only measure that was given consideration in the final report (Main Report Section 3.4.5.2) for reducing the risk of internal erosion and heave. However, other seepage control measures are possible, including seepage berms, a floodside clay cap, and relief wells. The seepage berm and clay cap options are analyzed in Appendix C of the Base Condition Risk Assessment (BCRA) report, but the process for eliminating them from further consideration is not described. In addition, the effectiveness of a cutoff wall in mitigating certain Balanced Vision Plan (BVP) features such as lake excavation and river relocations (Main Report Section 3.5.4.2) is not supported by seepage analyses or other supporting information. Documentation of the process for selecting cutoff walls as the primary seepage control alternative and studies supporting the effectiveness of cutoff walls in mitigating the impacts of various BVP measures could improve the understanding of the report. This documentation will support the decision for the selection of cutoff walls as the primary means of reducing the risk of piping and heave.

Significance – Low

Documentation is needed to support the selection of the cutoff walls as the primary means of controlling seepage and reducing internal erosion.

Recommendations for Resolution

1. Add a paragraph that describes the process for selecting cutoff walls as the primary means of controlling seepage and reducing the risk of internal erosion. Include a discussion of the other measures that were considered in lieu of cutoff walls.
2. Provide supporting evidence that cutoff walls are needed and will mitigate the effects of BVP measures that will increase the risk of internal erosion.

Final Panel Comment 13

An estimate of economic outputs for the recreational features is not provided.

Basis for Comment

Recreation is an important project objective for the non-Federal sponsor and for gaining public acceptance of the Tentatively Selected Plan (TSP). Including an analysis of the economic value of recreation has the potential for increasing the net National Economic Development (NED) benefits attributable to the project while demonstrating that the proposed recreational features provide economic as well as social benefits.

However, the Economic Appendix does not describe how or whether recreation was valued in the study. Since the project is formulated for flood risk management (FRM) and recreation is an incidental output of lower priority, a detailed analysis is not necessary. A Unit Day Value (UDV) analysis, using readily available non-Federal data on recreation demand and visitation, would effectively illustrate the recreational value of the resource to the community and to the Nation.

Significance – Low

Including the economic values for the recreational features will not affect the selection of the TSP, but these values do affect the overall completeness and technical accuracy of the benefit estimates.

Recommendations for Resolution

1. Collect recreational demand and visitation data.
2. Extrapolate future recreation demand using existing population forecasts.
3. Compute the UDV of the recreational resource to be provided.
4. Display the benefits for inclusion in the NED benefit analysis.

Final Panel Comment 14

The Main Report and Economics Appendix do not present values in consistent year dollars and discount rates.

Basis for Comment

The Main Report and Economics Appendix each present values in different year dollars and development: 2010 values and development, 2012 prices and discount rate, and 2013 dollars and discount rate.

This makes it difficult for the Panel to understand and compare the costs and benefits derived at different stages of the study's history and determine the accuracy and readability of the review documents.

Significance – Low

The inconsistent year dollars and discount rates affect the technical aspects of how the cost and benefit figures are represented.

Recommendations for Resolution

1. Present all figures using FY2013 dollars and the current Federal Discount Rate of 3.75%.

Final Panel Comment 15

It is difficult to assess the project's ability to address potential impacts and to determine if the plans to mitigate the impacts are appropriate because detailed information is not provided for all impacts and their proposed mitigation.

Basis for Comment

Mitigation measures for many of the proposed project impacts (e.g., biological resources including wetlands, cultural resources) are proposed, but specific plans have not yet been provided. The effectiveness of mitigation measures in compensating for impacts cannot be evaluated until the plans are developed. For example, item M-3 (p. 7-10) states: "The USACE and City of Dallas shall develop and implement a Wetland and Waters 1 Mitigation and Monitoring Plan. This plan would specify that unavoidable permanent impacts to sensitive habitats (i.e., aquatic riverine and emergent wetlands) would be minimized and mitigated through restoration and/or replacement. The successful implementation of the Wetland and Waters Mitigation Plan would ensure that no net loss of aquatic resources and no cumulative loss of sensitive aquatic habitat result from implementation of the Preferred Alternative."

The cultural resources survey should be added as an Appendix to the EIS. Table 3.6-2 lists several potential resources, but they are not described in detail nor is there text to indicate how potential impacts would be mitigated. Item M-7 (p. 7-10) states: "Mitigation of impacts to cultural resources shall be required. The USACE would determine any necessary level of mitigation for any structure subject to significant adverse impacts. The City of Dallas would comply with all the relevant and applicable laws and regulations. Mitigation requirements determined in the course of consultation will be added to this list as they become available."

Significance – Low

Although the major project plans and impacts have been adequately addressed, specific mitigation plans are necessary for the completeness of the assessment.

Recommendations for Resolution

1. Add the cultural resources survey (primary report) as an appendix to the EIS.
2. Develop the Wetland and Waters Mitigation Plan and add as an appendix to the EIS prior to release of the draft to the public.
3. Prepare a cultural resources mitigation plan and add as an appendix to the EIS prior to release of the draft to the public.

Final Panel Comment 16

No rationale is given for applying unsteady Hydrologic Engineering Center-River Analysis System (HEC-RAS) modeling to cases where steady HEC-RAS modeling results did not meet the project criteria.

Basis for Comment

The Feasibility Report Appendix A (p. A-98) provides the USACE Record of Decision (ROD) (April 1988) that specifies the criteria the USACE would use to evaluate Section 404 permit applications in the Trinity River Corridor:

1. "Hydraulic Impacts - No rise in the 100-year or Standard Project Flood (SPF) elevation for the proposed condition will be allowed."
2. "The maximum allowable loss in storage capacity for the 100-year and SPF discharges will be 0% and 5% respectively."
3. "Alterations in the floodplain may not create or increase an erosive water velocity on or off-site."

In addition, the 1988 ROD also states that the cumulative impacts of other projects in the vicinity will be considered and are presented in the 1988 ROD as: "Cumulative Impacts - The upstream, adjacent, and downstream effects of the applicant's proposal will be considered. The proposal will be reviewed on the assumption that adjacent projects will be allowed to have an equitable chance to be built, such that the cumulative impacts of both will not exceed the common criteria."

The analysis of the with-project Balanced Vision Plan (BVP) with the Trinity Parkway alternative in the Feasibility Report Appendix A (Section 6.7.3 and Table 6-6) indicates this alternative does not meet the 1988 ROD criteria 1 and 2 above when steady HEC-RAS modeling is used. Unsteady HEC-RAS modeling (with adjusted model parameters) was then applied to check if the alternative can meet the 1988 ROD criteria. Unsteady modeling results also show the alternative does not meet the 1988 ROD criteria. The reason for resorting to unsteady modeling is not clearly stated.

Significance – Low

The results of the analysis do not change with either steady or unsteady modeling. However, an explanation for the application of the unsteady modeling will improve the documentation.

Recommendations for Resolution

1. Provide documentation that steady modeling is all that is needed to evaluate project performance against the Record of Decision criteria.
2. Explain the use of unsteady HEC-RAS modeling to check if an alternative meets project criteria.

5. REFERENCES

40 CFR Parts 1500 – 1508. Protection of Environment. Council on Environmental Quality. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 1987.

CEQ (1981). Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. Council on Environmental Quality, Executive Office of the President. March 23.

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APPENDIX A

IEPR Process for the Dallas Floodway Project

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A.1 Planning and Conduct of the Independent External Peer Review (IEPR)

Table A-1 presents the schedule followed in executing the Dallas Floodway Feasibility Report and Environmental Impact Statement (EIS) Independent External Peer Review (hereinafter: Dallas Floodway IEPR). Due dates for milestones and deliverables are based on the award/effective date of July 25, 2013. The review documents were provided by U.S. Army Corps of Engineers (USACE) on August 20, 2013. Note that the work items listed under Task 6 occur after the submission of this report. Battelle will enter the 16 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a PDF printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

Table A-1. Dallas Floodway Complete IEPR Schedule

Task	Action	Due Date
1	Award/Effective Date	7/25/2013
	Contract Modification 1 Award	3/26/2014
	Contract Modification 2 Award	6/6/2014
	Review documents available	8/20/2013
	*Battelle submits draft Work Plan	8/29/2013
	USACE provides comments on draft Work Plan	9/6/2013
	*Battelle submits final Work Plan	9/11/2013
2	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	8/1/2013
	USACE provides comments on COI questionnaire	8/5/2013
	*Battelle submits list of selected panel members	8/15/2013
	USACE confirms the panel members have no COI	8/16/2013
	Battelle completes subcontracts for panel members	8/27/2013
3	Battelle convenes kick-off meeting with USACE	8/13/2013
	Battelle sends review documents to panel members	8/27/2013
	Battelle convenes kick-off meeting with panel members	8/29/2013
	Battelle convenes kick-off meeting with USACE and panel members	8/29/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	9/13/2013
	Panel prepares and reviews slides for the Senior Leader Meeting	9/1/2014
	Senior Leader Meeting participation	9/8/2014

Task	Action	Due Date
4	Panel members complete their individual reviews	9/18/2013
	Battelle provides panel members with talking points for Panel Review Teleconference	9/23/2013
	Battelle convenes Panel Review Teleconference	9/24/2013
	Battelle provides FPC templates and instructions to panel members	9/25/2013
	Panel members provide draft FPCs to Battelle	10/1/2013
	Battelle provides feedback to panel members on draft FPCs; panel members revise FPCs	9/26-10/3/2013
	Battelle finalizes Final Panel Comments	10/10/2013
	Project on hold awaiting receipt of Public Comments from USACE	10/11/2013-6/2/2014
	Battelle receives Public Comments from USACE	5/16/2014
	Battelle provides Public Comments to Panel for Review	6/4/2014
	Panel submits draft response to public comments	6/6/2014
5	Battelle provides Final IEPR Report to panel members for review	6/12/2014
	Panel members provide comments on Final IEPR Report	6/13/2014
	***Battelle submits Final IEPR Report to USACE**	**6/17/2014**
6	Battelle inputs FPCs to DrChecks and provides FPC response template to USACE	6/17/2014
	Battelle convenes teleconference with USACE to review the Post-FPC Response Process	6/17/2014
	Battelle convenes teleconference with Panel to review the Post-FPC Response Process	6/19/2014
	USACE provides draft PDT Evaluator Responses to Battelle	6/23/2014
	Battelle provides the panel members the draft PDT Evaluator Responses	6/24/2014
	Panel members provide Battelle with draft BackCheck Responses	6/27/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	6/30/2014
	Battelle convenes Comment-Response Teleconference with panel members and USACE	7/1/2014
	USACE inputs final PDT Evaluator Responses to DrChecks	7/7/2014
	Battelle provides final PDT Evaluator Responses to panel members	7/8/2014
	Panel members provide Battelle with final BackCheck Responses	7/10/2014
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	7/11/2014
	***Battelle submits pdf printout of DrChecks project file**	**7/14/2014**

*Deliverable

At the beginning of the Period of Performance for the Dallas Floodway IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., clarify expertise areas needed for panel members). Any revisions to the schedule were submitted as part of the final Work Plan. In addition, 70 charge questions were provided by USACE and included in the draft and final Work Plans. Battelle added 2 questions that seek summary information from the IEPR Panel. The final charge also included general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and within two days of their subcontracts being finalized, all members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge as well as the Dallas Floodway review documents and reference materials listed below. The documents and files in bold font were provided for review; the other documents were provided for reference or supplemental information only.

- **Feasibility Report (110 pages)**
- **Appendix A: Hydrology and Hydraulics (168 pages)**
- **Appendix B: Geotechnical (102 pages)**
- **Appendix C: Base Condition Risk Assessment (Parts I, II, and III) (405 pages)**
- **Appendix D: Civil and Structural (240 pages)**
- **Appendix E: Economics (37 pages)**
- **Appendix F: Environmental Resources (134 pages)**
- **Appendix G: USFWS Planning Aid Report (265 pages)**
- **Appendix H: Recreation (40 pages)**
- **Appendix I: Real Estate Plan (24 pages)**
- **Appendix J: Detailed Cost Estimate and Cost Analysis (156 pages)**
- **Appendix K: Correspondence (42 pages)**
- **Appendix L: Public and Agency Coordination (31 pages)**
- **Appendix M: Figures (10 pages)**
- **Environmental Impact Statement (540 pages)**
- **Appendix A: Notice of Intent and Agency Correspondence (42 pages)**
- **Appendix B: Environmental Impact Assessment Criteria (13 pages)**
- **Appendix C: Figures of Proposed BVP Flood Risk Management Elements (16 pages)**
- **Appendix D: Figures of Proposed BVP Study Ecosystem and Recreation Features (Alternative 2) (35 pages)**
- **Appendix E: Figures of Proposed BVP Study Ecosystem and Recreation Features (Alternative 3) (35 pages)**
- **Appendix F: Differences in BYP Study Ecosystem and Recreation Features between Alternatives 2 and 3 (6 pages)**

- **Appendix G: Figures of Proposed IDP Improvements (9 pages)**
- **Appendix H: Socioeconomics and Environmental Justice Background and Data (22 pages)**
- **Appendix I: Planting Tables and Texas Parks and Wildlife Department Aquatic Resource Relocation Plan Guidance (120 pages)**
- **Appendix J: Air Quality (86 pages)**
- Risk Management Documentation and Risk Register
- USACE guidance Civil Works Review, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

About halfway through the review of the Dallas Floodway review documents, a teleconference was held with USACE, the Panel, and Battelle so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 11 panel member questions to USACE. USACE was able to provide responses to all of the questions during the teleconference or later that day via email.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response table provided by Battelle. At the end of the review period, the Panel produced individual comments in response to the charge questions/discussion points. Battelle reviewed the comments to identify overall recurring themes, areas of potential conflict, and other overall impressions. At the end of the review, Battelle summarized the individual comments in a preliminary list of 22 overall comments and discussion points. Each panel member's individual comments were shared with the full Panel in a merged individual comments table.

A.3 IEPR Panel Teleconference

Battelle facilitated a four -hour teleconference with the Panel so that the panel members could exchange technical information. The main goal of the teleconference was to identify which issues should be carried forward as Final Panel Comments in the Final IEPR Report and decide which panel member would serve as the lead author for the development of each Final Panel Comment. This information exchange ensured that the Final IEPR Report would accurately represent the Panel's assessment of the project, including any conflicting opinions. The Panel engaged in a thorough discussion of the overall positive and negative comments, added any missing issues of significant importance to the findings, and merged any related individual comments. At the conclusion of the teleconference, Battelle reviewed each Final Panel Comment with the Panel, including the associated level of significance, and confirmed the lead author for each comment.

The Panel also discussed responses to six specific charge questions where there appeared to be disagreement among panel members. The conflicting comments were resolved based on the professional judgment of the Panel, and all sets of comments were determined not to be conflicting. Each comment was either incorporated into a Final Panel Comment, determined to be consistent with other Final Panel Comments already developed, or determined to be a non-significant issue.

At the end of these discussions, the Panel identified 16 comments and discussion points that should be brought forward as Final Panel Comments.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle prepared a summary memorandum for the Panel documenting each Final Panel Comment (organized by level of significance). The memorandum provided the following detailed guidance on the approach and format to be used to develop the Final Panel Comments for the Dallas Floodway IEPR:

- Lead Responsibility: For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed the merged individual comments table, a summary detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.

- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:

    1. Comment Statement (succinct summary statement of concern)

    2. Basis for Comment (details regarding the concern)

    3. Significance (high, medium, and low; see description below). Due to the review being put on hold and the report being generated at a later date, the Final Panel Comments were generated prior to the levels of significance criteria being expanded from three to five (in coordination with USACE Headquarters).
    4. Recommendation(s) for Resolution (see description below).

- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:

    1. **High:** Describes a fundamental problem with the project that could affect the recommendation, success, or justification of the project. Comments rated as high indicate that the Panel analyzed or assessed the methods, models, and/or analyses and determined that there is a “showstopper” issue.

    2. **Medium:** Affects the completeness of the report in describing the project, but will not affect the recommendation or justification of the project. Comments rated as medium indicate that the Panel does not have sufficient information to analyze or assess the methods, models, or analyses.

    3. **Low:** Affects the understanding or accuracy of the project as described in the report, but will not affect the recommendation or justification of the project. Comments rated as low indicate

that the Panel identified information (tables, figures, equations, discussions) that was mislabeled or incorrect or data or report sections that were not clearly described or presented.

- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 16 Final Panel Comments were prepared and assembled. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comments. The Final Panel Comments are presented in the main report.

A.5 Conduct of the Public Comment Review

Battelle received a PDF file containing three pages of public comments on the Dallas Floodway IEPR from USACE on May 16, 2014. Battelle sent the public comments to the panel members on June 4, 2014, along with two charge questions:

1. **Does information or do concerns raised in the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

2. **Has adequate stakeholder involvement occurred to identify issues of interest and to solicit feedback from interested parties?**

The panel members were charged with responding to the two charge questions above.

The Panel produced individual comments in response to the two charge questions. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. Upon review, Battelle determined and the Panel confirmed that no new issues or concerns were identified other than those already covered in their Final Panel Comments. The Panel also determined that adequate stakeholder involvement had occurred.

APPENDIX B

Identification and Selection of Panel Members
for the Dallas Floodway Project

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B.1 Panel Identification

The candidates for the Independent External Peer Review of the Dallas Floodway Feasibility Report and Environmental Impact Statement (hereinafter: Dallas Floodway IEPR) Panel were evaluated based on their technical expertise in the following key areas: civil/structural engineering, geotechnical engineering, hydrologic and hydraulic engineering, economics/Civil Works planning, and biologist/ecologist. These areas correspond to the technical content of the Dallas Floodway IEPR review documents and overall scope of the Dallas Floodway Project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected five experts for the final Panel.

The five selected reviewers constituted the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

The candidates were screened for the following potential exclusion criteria or COIs.[1] These COI questions serve as a means of disclosure and to better characterize a candidate's employment history and background. Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous U.S. Army Corps of Engineers (USACE) technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

- Previous and/or current involvement by you or your firm[2] in the Dallas Floodway Feasibility Report and Environmental Impact Statement (EIS), Dallas, Texas (hereinafter: Dallas Floodway FR/EIS).
- Previous and/or current involvement by you or your firm[2] in flood risk management studies or projects in the Dallas, Texas area.
- Previous and/or current involvement by you or your firm[2] in the Dallas Floodway FR/EIS-related projects.

[1] Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. See OMB (2004, p. 18), "….when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

[2] Includes any joint ventures in which firm is involved and if firm serves as a prime or as a subcontractor to a prime.

- Previous and/or current involvement by you or your firm[2] in the conceptual or actual design, construction, or O&M of any Dallas Floodway FR/EIS-related projects.
- Current employment by the U.S. Army Corps of Engineers (USACE).
- Previous and/or current involvement with paid or unpaid expert testimony related to Dallas Floodway FR/EIS.
- Previous and/or current employment or affiliation with the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups:] the City of Dallas, TX; Texas Parks and Wildlife Department; Texas Commission on Environmental Quality; Federal Aviation Administration; U.S. Environmental Protection Agency; or the U.S. Fish and Wildlife Service (for pay or pro bono).
- Past, current or future interests or involvements (financial or otherwise) by you, your spouse or children related to the greater Dallas area.
- Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Fort Worth District.
- Previous or current involvement with the development or testing of models that will be used for or in support of the Dallas Floodway FR/EIS.
- Current firm[2] involvement with other USACE projects, specifically those projects/contracts that are with the Fort Worth District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Fort Worth District. Please explain.
- Any previous employment by the USACE as a direct employee, notably if employment was with the Fort Worth District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Any previous employment by the USACE as a contractor (either as an individual or through your firm[2]) within the last 10 years, notably if those projects/contracts are with the Fort Worth District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood risk management, and include the client/agency and duration of review (approximate dates).
- Pending, current or future financial interests in Dallas Floodway FR/EIS-related contracts/awards from USACE.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years came from USACE contracts.
- A significant portion (i.e., greater than 50%) of personal or firm[2] revenues within the last 3 years from contracts with the non-federal sponsor (City of Dallas, TX).
- Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Dallas Floodway FR/EIS.

- Participation in relevant prior Federal studies relevant to this project and/or the Dallas Floodway FR/EIS.
- Previous and/or current participation in prior non-Federal studies relevant to this project and/or the Dallas Floodway FR/EIS
- Is there any past, present or future activity, relationship or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe:

Other considerations:

- Participation in previous USACE technical review panels
- Other technical review panel experience.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Two of the final reviewers are affiliated with universities, two is affiliated with a consulting company, and the other is an independent consultant. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

An overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria is presented in Table B-1. More detailed biographical information regarding each panel member and his area of technical expertise is presented in Section B.3.

Table B-1. Dallas Floodway IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Brown	Aubeny	Kabiling	Luckie	Bovitz
Civil/Structural Engineering					
Minimum 10 years of experience in civil or construction engineering	X				
Experience in performing cost engineering/construction management of all phases of flood risk management (FRM) projects	X				
Experience with levee design	X				
Experience with floodwall design	X				
Experience with box culvert design	X				
Experience with drainage structure design	X				
Experience with utility relocations	X				
Experience with bridge pier modifications	X				
Capable of addressing the USACE Safety Assurance Review (SAR)	X				
Registered Professional Engineer	X				
Geotechnical Engineering					
Minimum 10 years of experience in geotechnical engineering		X			
Experience in performing geotechnical evaluation and geo-civil design for FRM projects		X			
Five years of experience working for or with USACE on FRM projects		X			
Experience in fluvial processes and geomorphology		X			
Expertise in geotechnical risk analysis, specifically the application of probabilistic methods to geotechnical aspects of levees		X			
Experience in site investigation planning and implementation including modification of stream channels for FRM that minimizes environmental impacts		X			
Familiar with geotechnical practices used in Texas		X			
Familiar with geotechnical practices used in Texas		X			
Capable of addressing the USACE SAR aspects of all projects		X			
Active participation in related professional societies		X			
Registered Professional Engineer		X			
M.S. degree or higher in engineering		X			

Table B-1. Dallas Floodway IEPR Panel: Technical Criteria and Areas of Expertise (continued)

Technical Criterion	Brown	Aubeny	Kabiling	Luckie	Bovitz
Hydrologic and Hydraulic Engineering					
Minimum 10 years of experience in hydraulic engineering with an emphasis on large public works projects			X		
Extensive background in hydraulic theory and practice			X		
Experience in the application of risk and uncertainty in defining project performance and assurance			X		
Familiar with standard USACE hydrologic and hydraulic computer models including: Hydrologic Engineering Center-1 (HEC-1), HEC-Hydrologic Modeling System (HEC-HMS), HEC-River Analysis System (HEC-RAS) (both steady and unsteady flow analysis), and HEC-Flood Damage Reduction Analysis (HEC-FDA)			X		
Active participation in related professional societies			X		
Registered Professional Engineer			X		
M.S. degree or higher in engineering			X		
Economics/Civil Works Planning					
Minimum 10 years of experience in public works planning				X	
Very familiar with USACE plan formulation process, procedures, and standards				X	
Familiar with USACE structural FRM projects				X	
Minimum of 5 years of experience directly dealing with the USACE six-step planning process, governed by Engineer Regulation (ER) 1105-2-100				X	
Familiar with the USACE FRM analysis and benefit calculations, including use of the USACE HEC-FDA computer program				X	
Five years of experience directly working for or with USACE				X	
Biologist/Ecologist					
Minimum 10 years demonstrated experience in evaluation and conducting National Environmental Policy Act (NEPA) impact assessments, including cumulative effects analyses, for complex multi-objective public works projects with competing tradeoffs					X
Experience determining the scope and appropriate methodologies for impact assessment and analyses for a diversity of projects and programs with varied environmental impacts and high public and interagency interests					X
M.S. degree or higher in an appropriate field of study					X

B.3 Panel Member Qualifications

Christopher Brown, P.E., Ph.D.

Role: Civil/structural engineering
Affiliation: University of North Florida

Dr. Brown is an assistant professor at the University of North Florida (UNF) teaching civil engineering, fluid mechanics, hydraulics, senior design, foundation engineering, and engineering geology. He earned his Ph.D. in civil engineering in 2005 from the University of Florida and is a licensed, practicing professional engineer in Florida and Pennsylvania focusing on water resources and geotechnical engineering. Dr. Brown has extensive experience in performing coast engineering and construction management for all phases of flood risk management (FRM) related projects. Dr. Brown has conducted cost-estimating projects using spreadsheets, Micro-Computer Aided Cost Engineering System (MCACES), @Risk, and Crystal Ball and is familiar with unit cost development, risk assessment, production/productivity, and change orders. While at the USACE Philadelphia District Construction Division, he worked on a large floodwall project in New Jersey. He has also testified in court on construction management deficiencies regarding dewatering and differing site conditions.

Dr. Brown has more than 20 years of experience working on public works projects for the USACE (1991-2006) and as a private consultant for various complex civil engineering projects. He was consistently recognized for his excellent technical skills, including award of “engineer of the year” twice over 15 years. He is experienced in structural engineering and construction methods. He has participated in levee design projects in New Jersey, Pennsylvania, Delaware, Georgia, Florida, and Puerto Rico and reviewed levee designs on IEPR teams in St. Louis, New Orleans, and Walla Walla USACE Districts. He was a member of the USACE Levee Assessment team in 2005-2006. He conducted floodwall design for the Molly Anns Brook flood mitigation project, which included a U-wall, L-wall, and T-wall and was a member of the IEPR team for New Orleans District responsible for review of the Levee System Rehab Design Manual. The New Orleans system includes a variety of floodwalls and hybrid levee-floodwall designs. He has developed box culvert designs for multiple projects for USACE and private industry, including land development of a 200-acre parcel in Georgia where he designed runoff and stormwater collection systems including culverts, weirs, and low-flow pipe.

Dr. Brown also evaluated siphon-type box culvert designs for the Everglades Restoration water preserve areas in south Florida. Dr. Brown has designed or evaluated a variety of drainage structures, including weirs, pipes, tunnels, culverts, ogee weirs, spillways, manholes, and storm sewer; he has designed these structures, modeled them, and testified in court regarding drainage structure failures. He has worked on multiple flood mitigation projects, including both relocation of structures (e.g., buildings, box culverts, and weirs) and basic utilities. For the Everglades Restoration project and the 8.5 Square Mile Area project in Florida, Dr. Brown oversaw development of design alternatives for flood mitigation in the Homestead, Florida, area, including relocation of water lines, electric, roads, and homes. The Molly Ann Brooks flood mitigation project included utility relocations, utility hardening, and underpinning of an existing building close to the main flood channel. While working for a private contractor, Dr. Brown developed mitigation alternatives for the Iluka Mining water impoundments, including relocation and replacement of outflow structures. This project also included evaluation of lining of existing conduits using “Insitu form” technique. Dr. Brown has worked on full bridge replacements as part of Molly Anns Brook project and Tamiami Trail Everglades Bridge. He has worked on bridge replacements and new bridge projects to minimize the hydraulic profile of the piers in the waterway. Dr. Brown is fully capable of addressing

relevant Safety Assurance Review (SAR) issues and has fulfilled this requirement for at least three other IEPR projects, including work on the largest lock and dam project in the United States.

Dr. Brown teaches the senior capstone civil engineering course at UNF, which includes lectures regarding project scheduling, cost estimating, contracts, claims, and construction management. Dr. Brown has testified in court as an expert witness in cases involving differing site conditions, construction delays, dewatering, and hazardous waste contamination. Dr. Brown also has extensive experience conducting independent peer reviews, including evaluation of projects in St. Louis, Rock Island, New Orleans, Omaha, Louisville, and Walla Walla USACE Districts.

Charles Aubeny, P.E., Ph.D.

Role: Geotechnical engineering
Affiliation: Texas A&M University

Dr. Aubeny is a professor at Texas A&M University in the Civil Engineering Department of the Construction, Geotechnical & Structures Division with 29 years of geotechnical engineering experience. He earned his Ph.D. in civil engineering from Massachusetts Institute of Technology, specializing in in situ testing in geotechnical engineering. He is a registered professional engineer in Texas, California, and Colorado. Dr. Aubeny has specialized in geotechnical engineering since 1983. His experience includes 8 years with the U.S. Bureau of Reclamation (1978-1986) in embankment dam design, 6 years with RFA/GEI consultants (1992-1999) as project manager on dam and levee projects, and 13 years at Texas A&M University engaged in teaching, research, and external consulting on geotechnical topics.

Dr. Aubeny has demonstrated experience in performing geotechnical evaluation and geo-civil design for FRM projects. This includes performing work relevant to levee and earth dam design and construction; supervising and/or performing analyses for seepage, slope stability, settlement, liquefaction, and wave runup; developing and evaluating various foundation design alternatives; designing and executing instrumentation systems for monitoring; supervising cost comparisons for various design alternatives; and evaluating the safety of existing dams and levees. He has participated as an IEPR panel member on other USACE projects relating to FRM, and has worked on levee and dam projects as a consultant, which involved interactions with multiple regulatory agencies, including USACE, on issues such as site investigations, soil material parameter selection, levee upgrade measures, and design criteria.

Dr. Aubeny has geotechnical engineering expertise in fluvial processes and geomorphology based on 15 years of work on levees and dams in fluvial environments. In this position, he collaborates with engineering geologists on issues relating to defining and understanding the fluvial processes underlying the site stratigraphy. The nature of the collaborations involved formulating a geologic model for developing a site investigation program, interpreting boring data for the purpose of defining geologic units, identifying potential engineering problems from the perspective of geo-logic origin of the soils, and inspecting soils exposed during construction to confirm that actual geologic conditions are consistent with design assumptions.

Dr. Aubeny has experience in geotechnical risk and analysis. He is the principal investigator on a project with the Texas Department of Transportation on the performance of mechanically stabilized earth fill walls, one component of which involves Monte Carlo simulations to assess risk of sliding and overturning failure. Additionally, he is serving as a panel member for the Kansas Citys, Missouri, and Kansas Flood Risk Management Project, which utilizes probabilistic methods to evaluate geotechnical risk, specifically the Taylor Series Approximation of FOSM method.

During his employment at RFA/GEI consultants, Dr. Aubeny gained experience in site investigation planning and implementation, including modification of stream channels for FRM purposes and minimizing environmental impacts. His work focused on upgrades and modifications to levee systems to reduce flood risk. His consulting activities spanned the spectrum of planning and implementation activities, from initial planning studies and site investigations to conceptual design, final design, construction inspection, and monitoring of levee performance during operation.

Dr. Aubeny has been a licensed professional engineer in Texas since 1999 and is familiar with the geotechnical practices used in the state. He is serving as expert witness on an issue relating to the strength characteristics of high plasticity clays and shales associated with Dallas North Turnpike retaining walls. Additionally, he is the principal investigator on two research projects related to geotechnical practices in Texas: one investigating design procedures for mechanically stabilized earth fill walls and one investigating live load effects from railroads on retaining walls and shoring. He is also serving as a consultant on a project regarding sinkhole formation and slope stabilization at Lafayette Lift Station on Brazos River.

Dr. Aubeny is able to address relevant SAR issues and has fulfilled this requirement by serving as a panel member for the IEPR of the Santa Maria Levee slope protection upgrade involving soil–cement slope protection and sheetpile wall installation. An extension of this project for the Bradley Canyon levee upgrades is now in progress. He is a member of the American Society of Civil Engineers (ASCE), the ASCE committee on Embankments, Dams and Slopes, and has served as editorial board member for ASCE Journal of Geotechnical and Geoenvironmental Engineering and for the American Society for Testing and Materials Geotechnical Testing Journal.

Michael Kabiling, P.E., Ph.D.

Role: Hydrologic and hydraulic engineering
Affiliation: Taylor Engineering, Inc.

Dr. Kabiling is a senior engineer with Taylor Engineering Inc. in Jacksonville, Florida, an engineering consulting firm that specializes in hydrology, hydraulic, and coastal engineering. Dr. Kabiling has more than 20 years of work experience in water resources; hydrologic, hydraulic, and coastal engineering; and numerical modeling. He has a Ph.D. in hydraulic and coastal engineering and is a professional engineer in Florida, Georgia, and South Carolina. At Taylor Engineering, Dr. Kabiling has served as project manager and lead engineer in large, complex public works projects with high public and interagency interests.

As part of the Jacksonville Harbor Deepening Project Impact Assessment, he supervised Environmental Fluid Dynamics Code (EFDC) model validation, model application for various harbor dredging scenarios, and provided quality assurance/quality control reviews of the EFDC modeling for the project (2009 – 2014). The EFDC modeling of the St. Johns River provided the means to evaluate the effects on river hydraulics, salinity, ecology, and water quality of the channel deepening, channel widening at select locations, and construction of new turning basins; and the cumulative impacts of other projects, including the Mayport Deepening Project for the U.S. Navy and freshwater withdrawals in the St. Johns River. He worked on the Pasig River Rehabilitation Project, Manila, Philippines (1995–2001), where he supervised the implementation of the field monitoring programs, and conducted regular periodic numerical modeling of the water levels, river flow, and water quality of the Pasig, San Juan, Marikina rivers and the Mangahan and Napindan channels. He also prepared regular technical reports on the assessment of the water quality in these rivers, probable scenarios due to various river rehabilitation programs, water quality

prognoses, and pollution load assessments. Dr. Kabiling conducted user's training courses to teach the operation and application of hydrological, hydrodynamic, advection-dispersion, and water quality numerical models like the Danish Hydraulic Institute's MIKE modeling system.

Another example of Dr. Kabiling's hydraulic engineering project experience is the Ft. Pierce Inlet Sand Bypassing Feasibility Study, Florida (2003, 2008 – ongoing). In addition to project management responsibilities, Dr. Kabiling was responsible for designing the field measurement program, supervising and performing data evaluation and numerical modeling, supervising estimation of potential shoaling rates at proposed deposition basins, preparing technical reports, and recommending future tasks for engineering design and permitting of the deposition basins. The study evaluated the construction of a deposition basin within the inlet to supplement the sand bypassing volume requirements across the inlet. The study also assessed existing conditions, applied three different methodologies to estimate shoaling rates, and developed two conceptual designs for a sediment deposition basin. Numerical modeling and field measurements of bathymetry, tides, currents, sediment concentrations, sediment characteristics, and waves were also performed, which provided the means to validate assumptions applied in the evaluations.

Dr. Kabiling has completed several flooding and hydraulics studies in his more than 20 years of experience. The following projects illustrate his extensive background in hydraulic theory and practice. The USACE Rio de la Plata Two-Dimensional Flood Analysis, Dorado, Puerto Rico (2008) project consisted of improving the river channel and construction of levees along Rio de la Plata to reduce flooding in the northern portion of the basin. To provide inputs to future studies that measure the economic benefit of the proposed project, the Puerto Rico Infrastructure Financing Authority authorized this study to analyze two-dimensional flood propagation along the Rio de la Plata River and its floodplains. As team leader, Dr. Kabiling led the collection, review, and application of readily available existing data from various sources to develop a two-dimensional hydrodynamic model for the northern Rio de la Plata drainage basin. As modeler, he conducted MIKE21 two-dimensional hydrodynamic routing of flood and estimated existing (without-project) and with-project flood elevations, depth of inundations, and flow velocities. In comparison with previous one-dimensional model results, the two-dimensional flood study provided a more realistic and detailed estimate of the extent of existing and post-project flooding, flood inundation depth, and changes between pre- and post-project flood water surface elevations at select locations. Another example of his project experience is the South Florida Water Management District G160 Hydraulic Modeling Project, Palm Beach County, Florida (2003 – 2004). This project included the evaluation of various hydrologic and hydraulic modeling systems for application to flood and hydroperiod modeling and developed a hydrologic model to generate basin hydrographs. Dr. Kabiling also supervised the application of the unsteady Hydrologic Engineering Center-River Analysis System (HEC-RAS) hydraulic model to assess the impacts for the G160 water control structure, an essential component of the Comprehensive Everglades Restoration Plan. Another example of his project experience is the South Carolina Department of Transportation, US-17 Bridge Replacement over Combahee and Ashepoo Rivers, Colleton County, South Carolina (2005 – 2010). In addition to project management responsibilities, he was responsible for estimating 10-, 25-, 50-, 100-, and 500-year surge elevations for the multi-inlet system of Port Royal Sound and St. Helena Sound. As hydrologist, he calculated upstream flows for different flood frequencies; as a hydrodynamic modeler, he set up and applied the RMA2 model to estimate stage and currents under the bridge replacement. Dr. Kabiling was the water resources engineer for the Wolf-Pennywash Creek Reservoir Water Supply Permitting Project, Florida (2010 – 2011). He reviewed previous water supply studies and data, conducted field reconnaissance to inspect existing reservoir levees and dam structures, and evaluated different reservoir

development schemes. He also used available flow data over a 60-year period to set up and apply the HEC-Reservoir Simulation (HEC-ResSim) reservoir operation simulation model to estimate the water supply yields from different water sources, reservoir impoundment schemes, and reservoir operations. The HEC-ResSim model provided the design parameters for reservoir sizing, spillway location and geometry, and emergency overflow structures. The model also provided an operational protocol consistent with water supply yield needs and environmental requirements, including wetland development and minimum flow requirements.

Dr. Kabiling has extensive experience in the application of risk and certainty in defining project performance and assurance. Dr. Kabiling worked directly on the USACE, Herbert Hoover Dam (HHD) Breach Dam-Break Analysis. The Hoover Dike system consists of approximately 143 miles of levee surrounding Lake Okeechobee. Based on the latest and most detailed light detection and ranging (LIDAR) topographic data around Lake Okeechobee, the project analyzed, documented, and illustrated the expected impact to the public from flood inundation resulting from an uncontrolled breach of any of the reaches of the HHD. In addition to project management responsibilities, he led review, analysis, and selection of suitable dam breach and flood routing models for levee or dam breach analysis. As modeler, he set up and applied unsteady 1-D HEC-RAS and MIKE11, 2-D MIKE21, and combined 1-D and 2-D MIKE-FLOOD hydrodynamic and dam break models to simulate several HHD dam failure inundation scenarios. The results of the flood model provided the input data to map the flood inundation for the various breach scenarios evaluated in the study and to life loss evaluations. Other relevant experience includes the Northeast Florida/Georgia and East Central Florida Coastal Storm Surge Study (2011–ongoing). As Steering Committee member, he reviewed task procedures, results, and reports necessary to complete a Federal Emergency Management Agency Region IV storm surge study along Georgia, northeast Florida, and East Central Florida. Dr. Kabiling provides technical guidance to task leaders in developing and implementing modeling systems to evaluate storm surge, including risk, uncertainty, and influence of wave-induced water and current effects. Dr. Kabiling also worked as an external expert on the Surge and Seiche Hazard Analysis Safety Review of the Salem-Hope Creek Early Site Permit Application, Salem County, New Jersey (2011 – ongoing). For this study, he provided a U.S. Nuclear Regulatory Commission required external review of the hydrologic and hydraulic study for the early site permit application for a new nuclear electric generating plant. His data review included hydrology, hydrodynamic modeling, and surge elevation estimations.

Dr. Kabiling is familiar with standard USACE hydrologic and hydraulic computer models. His project experience demonstrates his expertise in USACE computer models. Dr. Kabiling is familiar with and understands the hydrologic and hydraulic input requirements and assumptions for HEC-1, HEC-Hydrologic Modeling System (HEC-HMS), HEC-River Analysis System (HEC-RAS), and HEC-Flood Damage Reduction Analysis (HEC-FDA). Dr. Kabiling's work with the South Carolina Department of Transportation, Fantasy Harbour Bridge Hydraulic Study, Horry County, South Carolina, project (2003) included hydrodynamic model set up of a one-dimensional unsteady hydrodynamic HEC-RAS model to evaluate maximum flow velocities, water surface stage, and scour around Fantasy Harbor Bridge. The bridge is subject to extreme surge and upstream flood conditions. He evaluated the complex hydraulic conditions in the two-inlet Atlantic Intracoastal Waterway-Waccamaw River system to estimate the probable extreme surge events based on the storm landfall location. The work included estimating the upstream inflow hydrograph using HEC-HMS, and he performed scour analysis to estimate probable scour during floods. The Agno Flood Control Project (Sediment Balance Study, Tarlac, Philippines) (2000) included the review of previous hydraulic reports and updated data. This effort included model setup of a hydrological HEC-1/HEC-HMS and hydraulic steady HEC-RAS numerical models to estimate

design storm discharges and estimated sediment transport and morphological changes. For the South Carolina Department of Transportation, US-17 Bridge Replacement over Rantowles Creek and Wallace Rivers Hydraulic Study, Charleston County, South Carolina (2003), Dr. Kabiling performed hydrodynamic modeling to convert the existing UNET model to HEC-RAS setup and extended the model to include river reaches upstream of Rantowles Creek and Wallace River. He calibrated the model to perform surge analysis through the Stono and North Edisto Rivers.

Dr. Kabiling is an active member of numerous professional societies, including ASCE, the Association of State Floodplain Managers, the National Society of Professional Engineers, and the Florida Engineering Society.

David Luckie

Role: Economics and Civil Works planning
Affiliation: Independent Consultant

Mr. Luckie is an independent consultant with more than 25 years of professional experience working for or with numerous USACE Districts across the country. He earned his B.S. in economics and finance from the University of South Alabama in 1986. His professional expertise includes public works planning, water resource planning, economic analysis, and review of USACE planning documents. Relevant project experience ranges from major dam rehabilitation studies to complex, multipurpose projects, including flood control, hydropower, water supply, recreation and water quality.

Mr. Luckie has extensive experience in the USACE plan formulation process, procedures, and standards. He has led or participated in numerous multidisciplinary planning teams, preparing or reviewing numerous Civil Works planning reports. He has additional broad experience in reviewing plan documents for compliance with policy, guidance, and technical procedures. Mr. Luckie has almost 25 years of direct experience in structural FRM studies, ranging from small Continuing Authorities Program Studies to large complex General Investigation studies. He recently completed the Upper White Oak Bayou General Reevaluation Report in Harris County, Texas. Mr. Luckie is familiar with the USACE FRM analysis and benefit calculations, including use of the USACE HEC-FDA computer program. He has extensive experience in preparing or reviewing planning studies utilizing flood risk reduction, risk analysis, and risk-based benefit-cost analysis. These projects range from large multipurpose reservoirs to riverine channel improvement projects. Recently, he provided the economic analyses and plan formulation services for the Village Creek Watershed Study (Birmingham, Alabama). This study included extensive use of HEC-FDA; careful coordination with the study team's hydrology and hydraulic engineers; and flood risk reduction, recreation, and ecosystem restoration outputs.

Mr. Luckie was employed as a regional economist for nearly 17 years with USACE Mobile District, Planning and Environmental Division. He is very familiar with the USACE six-step planning process governed by Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook. This experience includes close coordination with multidisciplinary teams to identify, formulate, and evaluate alternatives and identify cost-effective solutions to water resource problems throughout the Southeast and across the United States using the six-step planning process. Mr. Luckie has experience with the National Economic Development (NED) analysis procedures, particularly as they relate to FRM, social well-being, and regional economic development. He has performed or reviewed numerous planning reports utilizing NED evaluation procedures. In 2003, Mr. Luckie was part of an Institute for Water Resources (IWR) working group that revised and updated the NED Procedures Manual for Urban Flood Risk Reduction.

Paul Bovitz, PWS, LSRP, CEM, LEED AP

Role: Biology and ecology
Affiliation: WorleyParsons, Inc.

Mr. Bovitz is an environmental scientist and project manager with WorleyParsons, Inc. located in Hillsborough, New Jersey. He has more than 30 years of technical experience in ecological assessment and natural resources management in public, private, and academic sectors, engaging in both theoretical and applied aspects of ecological research and encompassing a variety of geographic regions, habitats, and taxa. He earned an M.S. in ecology from Rutgers University in 1992. He has managed and participated as principal investigator in a variety of projects and programs with varied environmental impacts, including environmental assessments under the National Environmental Policy Act (NEPA), water quality and storm water studies, wetlands delineation, assessment, mitigation and permitting, and essential fish habitat investigation.

Mr. Bovitz has demonstrated experience in the evaluation and conduct of NEPA impact assessments, including cumulative effects analyses, for complex multi-objective public works projects with competing tradeoffs. His experience consists of ecological assessments, feasibility studies, dredged material management plans, environmental assessments (EAs) and EISs. He has broad technical experience in ecology and natural resources as well as other environmental issues (e.g., water quality; sediment quality; hazardous, toxic and radioactive waste issues; flooding; and cultural resources).

Mr. Bovitz's experience encompasses determining the scope and appropriate methodologies for impact assessment and analyses for a diversity of projects and programs with varied environmental impacts and high public and interagency interests. Mr. Bovitz has worked on several high-profile projects in the Northeast. He served as the project manager for the EA for placement of two 2-megawatt wind turbines in Cape May, New Jersey. As part of this project, he assessed environmental impacts, including potential impacts on birds and bats within a major migratory corridor of national significance. He worked with the client in evaluating alternatives and selecting the preferred design, and with reviewing agencies to develop mitigation strategies for projected impacts. The EA was well received by the public and reviewing agencies, and the project is progressing to the construction stage. Mr. Bovitz also served as the project manager for the preparation of draft and final EISs, evaluating impacts of a proposed 206-acre wetland fill project in the Hackensack Meadowlands District as part of the Meadowlands Mills Development project for USACE, New York District. As part of this project, he assessed critical technical issues for the project, including the following: the accuracy of the Indicator Value Assessment method as a means of functional assessment of wetlands on the site; the contamination present within site wetlands, the potential success of the applicant's mitigation plan in offsetting potential development impacts; and the evaluation of wildlife habitat, including threatened and endangered species, avian studies, water quality, flood storage and hydrologic and hydraulic modeling, management of contaminated sediment, and other wetland values under existing and proposed alternative conditions.

He is a certified Professional Wetland Scientist, a Licensed Site Remediation Professional in New Jersey, a Certified Energy Manager, and a Leadership in Energy and Environmental Design (LEED®) Accredited Professional. He is a member of the New Jersey Department of Environmental Protection Science Advisory Board, Ecological Sciences Committee, and the New Jersey Department of Environmental Protection, Comparative Ecological Risk Project, Technical Committee.

APPENDIX C

Final Charge to the IEPR Panel as Submitted to USACE on September 11, 2013 for the Dallas Floodway Project

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Charge Questions and Guidance to the Panel Members for the IEPR of the Dallas Floodway Feasibility Report and Environmental Impact Statement

BACKGROUND

The Dallas Floodway Feasibility Report and Environmental Impact Statement (EIS) is a multipurpose study for flood risk management (FRM), environmental management, and recreation being conducted by the U.S. Army Corps of Engineers (USACE). The non-Federal sponsor for the Dallas Floodway Feasibility Study is the City of Dallas, Texas (the City). Upon its completion, the Feasibility Report is intended to provide a full response to Section 5141 of the Water Resources Development Act (WRDA) of 2007. Under this authority, the Assistant Secretary of the Army for Civil Works (ASA (CW)) is to determine whether the Balanced Vision Plan (BVP) and Interior Drainage Plan (IDP) within the existing Dallas Floodway Project are "technically sound" and "environmentally acceptable." Should the Director's Report be approved by the Director of Civil Works on this basis, and a Record of Decision (ROD) be signed by the ASA (CW), the project could be constructed without additional authorization.

Subsequent to the enactment of WRDA 2007, USACE's Fort Worth District issued the Periodic Inspection Report No. 9 (PI No. 9), dated 2009, which documented significant deficiencies with the existing structural integrity of the Dallas Floodway Levee System. It became readily apparent that the Dallas Floodway Study was extremely complex, with various aspects of the study requiring USACE evaluation. These include the deficiencies identified in the PI No. 9, multiple local projects requiring Section 408 approval (including the Trinity Parkway), and the authority to review the City's BVP and IDP (the 5141 WRDA project). A framework to evaluate all components proposed for implementation within the study area was developed. This plan is referred to as the "Comprehensive System-wide Analysis," or Comprehensive Analysis.

In order to perform the Comprehensive Analysis, the study had to be conducted in phases. The first phase had to address deficiencies with the levee system and formulate a FRM plan utilizing National Economic Development (NED) criteria. The FRM plan would then become a component of the BVP. In the second phase, all proposed projects and features currently being planned within the Dallas Floodway System (BVP, IDP, local projects, and the Trinity Parkway) were evaluated during the Comprehensive Analysis. This analysis methodology ensures that the proposed local projects meet USACE engineering and safety standards, are compatible with the proposed Federal Project features, and would not have significant adverse effects on the functioning of the existing Dallas Floodway Levee System. The analysis also ensures that components of the BVP and IDP are technically sound and environmentally acceptable. In the final phase, features to be implemented as the Modified Dallas Floodway Project under WRDA 2007 are presented in the Feasibility Report and coordinated as the recommended plan.

Local features are projects that will not be a part of the Federal plan, but their implementation does represent a modification to the existing Federal Project. These features either have undergone or are required to undergo a Section 408 review by USACE. Additionally, the local features will be considered as a part of the Comprehensive Analysis along with the BVP and IDP features. The local features to be evaluated in the Comprehensive Analysis are the Trinity Parkway, the Trinity River Standing Wave, the

Santa Fe Trestle Trail, the Pavaho wetlands, the Dallas Horseshoe Project, Sylvan Avenue Bridge, the Jefferson Bridge, Dallas Water Utilities waterlines, the Continental Bridge, the East Bank/West Bank interceptor line, and IDP-Phase II pump stations (Charlie, Delta, Pavaho, and Trinity/Portland). These projects (excluding the Trinity Parkway and the Charlie, Delta, and Trinity/Portland pump stations) have received initial "approval" under Section 408 and are in various stages of design and construction. In addition, the City has expressed a desire to construct any BVP feature that is not selected as part of the Federal plan as a Section 408 project at 100 percent local cost. This Performance Work Statement (PWS) is focused on IEPR for the Feasibility Report and EIS.

Projects that are not part of the WRDA project features and require Section 408 approval are part of a separate review process and are not subject to review with the Dallas Floodway Feasibility Report and EIS. The feasibility study analyzes the Section 408 projects from a "system" perspective in the Comprehensive Analysis to ensure that that they are technically sound and environmentally acceptable and function in combination with the BVP and IDP features.

Information for the 408 project will be provided at the level of detail utilized for the purpose of the Comprehensive Analysis.

The Dallas Floodway Feasibility Report and EIS has been conducted to meet the USACE modernized planning initiative, which is to complete investigations leading to a decision in less time by utilizing a risk-informed evaluation with less detailed information.

This new process has not been business as usual and has required heavy involvement as well as input and decisions from the Vertical Team at multiple points throughout the study. Instead of following the traditional USACE planning milestones, the study has been divided into phases each with key milestones and associated In-Progress Reviews (IPR). A risk register and other risk management documentation will accompany the feasibility study decision document.

Although one of the objectives of IEPR is to evaluate whether sufficient information was available or technical analyses were completed, the IEPR must be completed within the context of the risk-informed decision-making process.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Dallas Floodway Feasibility Study and Environmental Impact Statement (EIS) (hereinafter: Dallas Floodway IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Civil Works Review* (EC 1165-2-214, dated December 15, 2012), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

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 purpose of the IEPR is to assess the "adequacy and acceptability of the economic, engineering, and environmental methods, models, and analyses used" (EC 1165-2-214; p. D-4) for the Dallas Floodway documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will

be conducted by subject matter experts (i.e., IEPR panel members) with extensive experience in civil/structural engineering, geotechnical engineering, hydrology and hydraulics, economics/Civil Works planning, and biological/ecological issues relevant to the project. They will also have experience applying their subject matter expertise to FRM.

The Panel will be "charged" with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-214, Appendix D, review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review.

Documents for Review

The following documents are to be reviewed by designated discipline:

Review Documents	
Title	**Number of Pages**
Feasibility Report	**110**
Appendix A: Hydrology and Hydraulics	168
Appendix B: Geotechnical	102
Appendix C: Base Condition Risk Assessment (Parts I, II, and III)	405
Appendix D: Civil and Structural	240
Appendix E: Economics	37
Appendix F: Environmental Resources	134
Appendix G: USFWS Planning Aid Report	265
Appendix H: Recreation	40
Appendix I: Real Estate Plan	24
Appendix J: Detailed Cost Estimate and Cost Analysis	156
Appendix K: Correspondence	42

Review Documents	
Title	**Number of Pages**
Appendix L: Public and Agency Coordination	31
Appendix M: Figures	10
Feasibility Report Subtotal	**1768**
Environmental Impact Statement	**540**
Appendix A: Notice of Intent and Agency Correspondence	42
Appendix B: Environmental Impact Assessment Criteria	13
Appendix C: Figures of Proposed BVP Flood Risk Management Elements	16
Appendix D: Figures of Proposed BVP Study Ecosystem and Recreation Features (Alternative 2)	35
Appendix E: Figures of Proposed BVP Study Ecosystem and Recreation Features (Alternative 3)	35
Appendix F: Differences in BYP Study Ecosystem and Recreation Features between Alternatives 2 and 3	6
Appendix G: Figures of Proposed IDP Improvements	9
Appendix H: Socioeconomics and Environmental Justice Background and Data	22
Appendix I: Planting Tables and Texas Parks and Wildlife Department Aquatic Resource Relocation Plan Guidance	120
Appendix J: Air Quality	86
EIS Subtotal	**924**
Total Pages	**2,692**

Supporting Information

- Risk Management Documentation and Risk Register

Documents for Reference

- USACE guidance *Civil Works Review*, (EC 1165-2-214) dated 15 December 2012
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* released December 16, 2004.

SCHEDULE

This final schedule is based on the August 20, 2013 receipt of the final review documents.

Task	Action	Due Date
1	Award/Effective Date	7/25/2013
	Battelle Awarded Contract Modification 1	3/26/2014
	Battelle Awarded Contract Modification 2	6/6/2014
	Review documents available	8/20/2013
	*Battelle submits draft Work Plan	8/29/2013
2	USACE provides comments on draft Work Plan	9/6/2013
	*Battelle submits final Work Plan	9/11/2013
	Battelle requests input from USACE on the conflict of interest (COI) questionnaire	8/1/2013
	USACE provides comments on COI questionnaire	8/5/2013
	*Battelle submits list of selected panel members	8/15/2013
3	USACE confirms the panel members have no COI	8/16/2013
	Battelle completes subcontracts for panel members	8/27/2013
	Battelle convenes kick-off meeting with USACE	8/13/2013
	Battelle sends review documents to panel members	8/27/2013
	Battelle convenes kick-off meeting with panel members	8/29/2013
	Battelle convenes kick-off meeting with USACE and panel members	8/29/2013
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	9/13/2013
4	Panel prepares and reviews slides for the Senior Leader Meeting	9/1/2014
	Senior Leader Meeting participation	9/8/2014
	Panel members complete their individual reviews	9/18/2013
	Battelle provides panel members with talking points for Panel Review Teleconference	9/23/2013
	Battelle convenes Panel Review Teleconference	9/24/2013
	Battelle provides Final Panel Comment templates and instructions to panel members	9/25/2013
	Panel members provide draft Final Panel Comments to Battelle	10/1/2013
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	9/26-10/3/2013
	Panel finalizes Final Panel Comments	10/10/2013

Task	Action	Due Date
Public Comments	Project on hold; USACE to provide Public Comments	10/11/2013-6/2/2014
	Battelle receives Public Comments from USACE	5/16/2014
	Battelle provides Public Comments to Panel for Review	6/4/2014
	Public Comment Period Extended	6/16/2014
	Panel submits draft response to public comments	6/6/2014
5	Battelle provides Final IEPR Report to panel members for review	6/13/2014
	Panel members provide comments on Final IEPR Report	6/16/2014
	***Battelle submits Final IEPR Report to USACE**	**6/19/2014**
6[a]	Battelle inputs Final Panel Comments to DrChecks and provides Final Panel Comment response template to USACE	6/23/2014
	Battelle convenes teleconference with USACE to review the Post-Final Panel Comment Response Process	6/23/2014
	Battelle convenes teleconference with Panel to review the Post-Final Panel Comment Response Process (if necessary)	6/23/2014
	USACE provides draft PDT Evaluator Responses to Battelle	7/3/2014
	Battelle provides the panel members the draft PDT Evaluator Responses	7/7/2014
	Panel members provide Battelle with draft BackCheck Responses	7/9/2014
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	7/10/2014
	Battelle convenes Comment-Response Teleconference with panel members and USACE	7/11/2014
	USACE inputs final PDT Evaluator Responses to DrChecks	7/17/2014
	Battelle provides final PDT Evaluator Responses to panel members	7/21/2014
	Panel members provide Battelle with final BackCheck Responses	7/23/2014
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	7/24/2014
	*Battelle submits pdf printout of DrChecks project file	7/25/2014

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the Dallas Floodway documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, properly documented, satisfies established quality requirements, and yields scientifically credible

conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or Appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the Dallas Floodway documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Even though there are some sections with no questions associated with them, that does not mean that you cannot comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note the following guidance. Note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-214; Appendix D).

1. Your response to the charge questions should not be limited to a "yes" or "no." Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision-making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Project Manager (Patricia Strayer, strayerp@battelle.org)[2] or Program Manager (Karen Johnson-Young (johnson-youngk@battelle.org) for requests or additional information.

[2] USACE was notified on May 6, 2014 that Patricia Strayer, the original IEPR project manager, would be replaced by Richard Uhler.

3. In case of media contact, notify the Battelle Program Manager, Karen Johnson-Young (johnson-youngk@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report, but will remain anonymous.

Please submit your comments in electronic form to Project Manager, strayerp@battelle.org, no later than September 18, 2013, 10 pm ET.

IEPR of the Dallas Floodway Feasibility Report and Environmental Impact Statement

CHARGE QUESTIONS AND RELEVANT SECTIONS AS SUPPLIED BY USACE

General Questions

1. Within the context of risk-informed decision-making, to what extent has it been shown that the project is technically sound?

2. Are the assumptions that underlie the engineering, and environmental analyses sound?

3. Within the context of risk-informed decision-making, are the engineering, and environmental methods, models and analyses used adequate and acceptable?

4. Were all models used in the analyses used in an appropriate manner with assumptions appropriately documented and explained?

5. Were risk and uncertainty sufficiently considered?

6. Was the process used to select the recommended alternative rational and was the process implemented in a reasonable manner given the project constraints?

7. Does the environmental assessment satisfy the requirements of NEPA? Were adequate considerations given to significant resources by the project?

8. Assess the recommended alternatives from the perspective of systems. It should also include systemic aspects being considered from a temporal perspective, including the potential effects of climate change.

Safety Assurance Review Questions

9. Within the context of risk-informed decision-making, were the methods used to evaluate the condition of the structure adequate and appropriate given the circumstances?

10. Have the appropriate alternatives been considered and adequately described for this project and do they appear reasonable?

11. Within the context of risk-informed decision-making, do the project features adequately address redundancy, resiliency, or robustness with an emphasis on interfaces between structures, materials, members, and project phases?

12. Are the quality and quantity of the surveys, investigations, and engineering sufficient to assess expected risk reduction?

13. Have the hazards that affect the structures been adequately documented and described?

14. Are the models used to assess hazards appropriate?

15. Are the assumptions made for the impacts appropriately documented and explained in the report documentation and/or risk register?

16. Is there sufficient information presented to identify, explain, and comment on the assumptions that underlie the engineering analyses? Has the risk register adequately documented assumptions and corresponding risks associated with limited detailed information associated with the various engineering analyses?

17. Are there any additional analyses or information available or readily obtainable that would affect decisions regarding the structures?

18. Does the physical data and observed data provide adequate information to characterize the structures and their performance? If not, is the risk register documented accordingly?

19. Have all characteristics, conditions, and scenarios leading to potential failure, along with the potential impacts and consequences, been clearly identified and described? Have all pertinent factors, including but not necessarily limited to population-at-risk been considered?

20. Does the analysis adequately address the uncertainty given the consequences associated with the potential loss of life for this type of project?

21. From a public safety perspective, is the proposed alternative reasonably appropriate or are there other alternatives that should be considered?

22. Has anything significant been overlooked in the development of the assessment of the project or the alternatives?

23. Do the alternatives and their associated costs appear reasonable? Do the benefits and consequences appear reasonable?

Specific Questions

Objectives

24. Is the purpose of the project adequately defined? If not, why?

25. Has the project need been clearly described?

26. Have the public concerns been identified and adequately described?

27. Are the specific objectives adequately described?

28. In your opinion, are there any other issues, resources, or concerns that have not been identified and/or addressed?

Alternatives

29. Has the criteria to eliminate plans from further study been clearly described?

30. Is each of the different alternative plans clearly described?

31. Within the context of risk-informed decision-making, were the assumptions made for use in developing the future with-project conditions for each alternative reasonable? Were adequate

scenarios considered? Were the assumptions reasonably consistent across the range of alternatives and/or adequately justified where different?

32. Are the changes between the without- and with-project conditions adequately described for each alternative?

33. Have comparative impacts been clearly and adequately described?

34. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated cost of those efforts reasonable for each alternative?

35. Please comment on the likelihood of the recommended alternative will achieve the expected outputs.

36. Are residual risks adequately described and is there a sufficient plan for communicating the residual risk to affected populations?

37. Within the context of risk-informed decision-making have the impacts to the existing infrastructure, including the existing flood risk management project, utilities, and transportation infrastructure, been adequately addressed?

Affected Environment

38. Is the description of wetland resources in the project area complete and accurate?

39. Is the description of aquatic resources in the project area complete and accurate?

40. Is the description of threatened and endangered species resources in the study area complete and accurate?

41. Is the description of the historical and existing recreational resources in the study area complete and accurate?

42. Is the description of the cultural resources in the study area complete and accurate?

43. Is the description of the historical and existing socioeconomic resources in the study area complete and accurate? Were specific socioeconomic issues not addressed?

Environmental Consequences

44. Have impacts to significant resources been adequately and clearly described?

45. To what extent have the potential impacts of the alternatives on significant resources been addressed and supported?

46. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and supported?

47. Have impacts from borrow areas been adequately and clearly described?

Cumulative Impacts

48. Are cumulative impacts adequately described and discussed? If not, please explain.

Mitigation

49. Are mitigation measures adequately described and discussed? If not, please explain.

Traffic

50. Were mitigation measures proposed during construction adequately described and discussed? If not, please explain why.

Hydrology and Hydraulics

51. Was the hydrology discussion sufficient to feasibility scope to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with- and without-proposed actions) are likely to affect hydrologic conditions?

Geotechnical Engineering

52. Is the description of the geomorphic and physiographic setting of the proposed project area accurate and comprehensive?

53. Were the geotechnical analyses adequate and appropriate for the current level of design as presented in the report documentation?

Design

54. Have the design and engineering considerations presented been clearly outlined and will they achieve the project objectives?

55. Are any additional design assumptions necessary to validate the preliminary design of the primary project components?

56. Are the assumptions used to determine the cost of operations and maintenance for the proposed project adequately documented and explained?

Real Estate Plan

57. Comment on the extent to which assumptions and data sources used in the economics analyses are clearly identified and the assumptions are justified and reasonable.

58. Does the Real Estate Plan adequately address all real estate interests (public and private)?

Relocations

59. Have potential relocations as a result of the project been adequately addressed?

Hazardous, Toxic, and Radioactive Waste

60. Comment on the extent to which impacts of the alternatives may have on hazardous, toxic, and radioactive waste issues?

Cost Estimates and Economics

61. Were the benefit categories used in the economic analysis adequate to calculate a benefit-to-cost ratio for each of the project alternatives?

62. Was the methodology used to determine the characteristics and corresponding value of the structure inventory for the study area adequate?

63. Were the methods used to develop the content-to-structure value rations appropriate and were the generated results applicable to the study area?

64. Were the methods to develop the depth-damage relationships appropriate and were the generated results applicable to the study area?

65. Has the economic analyses addressed the issue of repetitive flood damages and the subsequent extent of rebuild/repair by property owners as it relates to annual damage estimation?

66. Were risk and uncertainty sufficiently considered in relation to the future development process?

67. To what extent have significant project construction costs been adequately identified and described?

68. Are the costs adequately justified?

Public Involvement and Correspondence

69. Based on your experience with similar projects, has adequate public, stakeholder, and agency involvement occurred to determine all issues of interest and to ensure that the issues have been adequately addressed to the satisfaction of those interested parties? Should additional public outreach and coordination activities be conducted?

Overview Questions

70. What is the most important concern you have with the document or its appendices that was not covered in your answers to the questions above?

71. Please identify the most critical concerns (up to 5) you have with the project and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

72. Please provide positive feedback on the project and/or review documents.

Public Comment Questions (provided to the Panel separately for their review of the public comments)

73. Does information or do concerns raised in the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

74. Has adequate stakeholder involvement occurred to identify issues of interest and to solicit feedback from interested parties

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