

Final Independent External Peer Review Report Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Inland Navigation Planning Center of Expertise
Baltimore District

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The Gulf Intracoastal Water Way (GIWW) is a man-made, shallow-draft waterway that was completed in 1945. Its span is 1,100 miles long and connects ports along the Gulf of Mexico from St. Marks, Florida, to Brownsville, Texas. The portion of the GIWW in Texas is authorized to a 125-foot width with a channel depth of 12 feet running for 406 miles along the coast. It is the third busiest inland waterway in the United States (as of 2015), with the Texas portion handling 75 percent of its traffic. It continues to rank in the top 10 in the nation in total waterborne tonnage moved in the United States (approximately 73 million short tons of cargo annually), with the majority of its cargo consisting of petroleum- and chemical-based products. The Colorado River Locks in Matagorda, Texas, are operated by the U.S. Army Corps of Engineers (USACE) and are the only ones on the Texas portion of the GIWW.

The study area encompasses two locations on the GIWW along the Texas Coast. The Brazos River Floodgates are located about 7 miles southwest of Freeport, Texas, at the intersection of the Brazos River and the GIWW in Brazoria County. The Colorado River Locks are located near Matagorda, Texas, at the intersection of the Colorado River and the GIWW in Matagorda County.

The Galveston District initiated a reconnaissance study to assess the feasibility of modifying the configurations of the crossings to reduce traffic accidents and delays where the GIWW intersects the Colorado and Brazos Rivers. The resulting Section 905(b) analysis produced a finding of Federal interest in continuing to the feasibility phase of the study. The purpose of the feasibility phase is to re-evaluate the proposed alternatives from the reconnaissance to determine the feasibility of undertaking modifications to the Brazos and Colorado River GIWW crossings, as well as identify changes to the floodgate and lock structures at each location where such changes are economically and environmentally justified. The goal is to reduce navigation impacts and costly waterborne traffic delays that are a result of aging infrastructure and inadequate channel dimensions for modern vessels.

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 Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study (hereinafter: BRFG-CRL IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2012). Battelle has experience in establishing and administering peer review panels for USACE and was engaged to coordinate this IEPR. 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 decision documents and the overall scope of the project, Battelle identified potential candidates for the Panel in the following key technical areas: Civil Works planning/economics, biological resources and environmental law compliance, hydrology and hydraulic engineering, structural/civil engineering, and port operations. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the five-person Panel from this list.

The Panel received electronic versions of the decision documents (1,001 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2012) and OMB (2004), USACE prepared the charge questions, 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 at 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.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE. Each Final Panel Comment was documented using a four-part format consisting of (1) a comment statement; (2) the basis for the comment; (3) the significance of the comment (high, medium/high, medium, medium/low, or low); and (4) recommendations on how to resolve the comment. Overall, seven Final Panel Comments were identified and documented. Of these, four had medium significance, one had medium/low significance, and two had low significance.

Battelle received public comments from USACE on the BRFG-CRL project documents (one transcript from a public meeting, 46 individual comments, totaling approximately 229 pages of comments) and provided them to the IEPR panel members. The panel members were charged with determining if any information or concerns presented in the public comments raised any additional discipline-specific technical concerns with regard to the BRFG-CRL review documents. After completing its review, the Panel identified new issues and subsequently generated a Final Panel Comment that summarized the concerns.

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 BRFG-CRL 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 paragraphs summarize the Panel's findings.

Based on the Panel's review, the report is well-written, detailed, and provides documentation on engineering, environmental, economic, and plan formulation issues. The report provides a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the report that should be clarified or revised.

Environmental: The Panel noted that the environmental documentation is well defined, and the PDT examined cumulative effects very thoroughly. The Panel found no significant issues with the analyses, provided. One of the Panel's concern was that the estimates of impacts on wetlands and other aquatic resources presented in the DFR are based on National Wetlands Inventory (NWI) maps. While this resource is adequate for comparative purposes to assist in determining the relative impacts associated with each measure described in the array of alternatives, the maps are known to be inaccurate. The actual sizes and types of wetlands and other aquatic resources that may be affected by the TSP are unknown and therefore the associated mitigation requirements and costs cannot be fully evaluated. The Panel suggests that the PDT add the NWI maps used to estimate wetlands locations and sizes to the list of references in the main body of the DFR and Appendix D and conduct a formal wetland delineation of the study area.

During review of the public comments, the Panel noted that there were numerous local organizations that identified several environmental issues that could be caused by the TSP, including induced flooding, increased siltation, and changes in salinity, that the Panel believes should be further investigated and addressed. The public concerns were raised based on observations and independent studies that questioned the USACE study methodologies and results relating to the environmental effects of the TSP on the San Bernard River. While the Draft Feasibility Report (DFR) addresses, on a minimal level, the likelihood of environmental consequences to the mouth of the San Bernard River associated with implementation of the TSP, these effects are not fully documented, and no mitigation has been proposed. The Panel recommends that the PDT perform more detailed analyses of the potential for increased siltation and induced flooding resulting from implementation of the TSP and develop a more detailed discussion of cumulative environmental effects on the existing environment from concurrent implementation of the TSP and the re-opening of the mouth of the San Bernard River.

Engineering: The Panel appreciated the full range of topics addressed in the study, particularly the comprehensive list of alternatives under consideration. However, the Panel points out that details on the hydrologic watershed models are not provided in the DFR, making it unclear how the watershed runoff and tidal flows will be used to improve waterway navigation. Additionally, no data on direct model calibration are provided. Therefore, the Panel is unable to determine the accuracy of the model results. The Panel recommends that more details be presented on how the rainfall-runoff values were estimated using the Texas Rainfall Runoff (TxRR) model, diversions, and returns, as well as additional details on the accuracy of the model calibrations on the model domain development and calibration of the Adaptive Hydraulics (ADH) model. The Panel also noted that the modeling of Hurricane Harvey likely played a major role in the outcome of the model results because it was one of the strongest storm events recorded to date for the area. The Panel suggests that more information is necessary on the model calibration of Hurricane Harvey, including the frequency of hurricanes and what was done once the model calibration was completed.

The Panel found that the hydraulic and hydrologic conditions of the waterway are not clearly addressed in the report. The GIWW is a relatively complex and unusual navigation system that relies on both tidal and riverine waters. Why the shallow-draft waterway was built, and what improvements were achieved through that route versus a regular coastal shipping line were not discussed. In addition, the Panel

recommends that a description of the inland navigation traffic flow patterns as well as a flow chart showing where water is coming in and out along the waterway, and how river flows, locks, and gate operations are scheduled be added to the report as these are critical to understanding the activities in the project area. A clear understanding of the hydraulic/hydrologic issues in the past and present as well as the flow of traffic and water is critical to understanding the effectiveness of the TSP in addressing these issues.

Economics/Plan Formulation: The Panel found that while the economic and Civil Works planning aspects of the report are very detailed and presented clearly throughout the document, there is a lack of detail on the components of existing structures. Additionally, the costs of alternatives presented in Appendix A are inconsistent with those presented in the DFR. Variations in the costs of alternatives presented in the DFR and its appendices create uncertainties in the accuracy of the costs of alternatives presented, which could affect their relative rankings and perhaps their individual economic feasibility. The Panel suggests that the PDT review the costs presented in DFR Table 3.11 to ensure they are consistent with those presented in Appendix A.

Table ES-1. Overview of Final Panel Comments Identified by the BRFG-CRL IEPR Panel

No.	Final Panel Comment
Significance – Medium	
1	During review of the public comments the Panel noted that comments from several local organizations described environmental consequences and cumulative effects resulting from implementation of the TSP, including inducted flooding, increased siltation, and changes in salinity that are not fully addressed.
2	Details on the hydrologic watershed models are not provided, therefore it is unclear how the watershed runoff and tidal flows interact and how the TSP will be used to improve waterway navigation.
3	Details on the modeling of Hurricane Harvey and further weather conditions are not provided in the DFR, therefore it is unclear whether future predictions are accurate.
4	It is unclear what the actual costs are for each alternative, which may affect both the ranking of the alternatives and their feasibility.
Significance – Medium/Low	
5	It is unclear how the Brazos waterway system works and how the associated challenges will be addressed.
Significance – Low	
6	Future use of new technology in Brazos waterway operations and navigation does not appear to have been addressed.
7	Wetland sizes and locations and associated mitigation costs may be over- or under-estimated due to reliance on National Wetlands Inventory maps in lieu of a formal wetland delineation.

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LIST OF ACRONYMS

ADH	Adaptive Hydraulic (Model)
ADM	Agency Decision Milestone
BRFG	Brazos River Floodgate
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
COI	Conflict of Interest
CRL	Colorado River Lock
DFR	Draft Feasibility Report
DMMP	Dredged Material Management Plan
DrChecks	Design Review and Checking System
EC	Engineer Circular
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FWOP	Future Without-Project
GIWW	Gulf Intracoastal Water Way
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
NEPA	National Environmental Policy Act
NWI	National Wetlands Inventory
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PDT	Project Delivery Team
PED	Planning, Engineering, and Design
SLM	Senior Leader Meeting
USACE	United States Army Corps of Engineers
TSP	Tentatively Selected Plan
TWDB	Texas Water Development Board
TxRR	Texas Rainfall Runoff (Model)

1. INTRODUCTION

The Gulf Intracoastal Water Way (GIWW) is a man-made, shallow-draft waterway that was completed in 1945. Its span is 1,100 miles long and connects ports along the Gulf of Mexico from St. Marks, Florida, to Brownsville, Texas. The portion of the GIWW in Texas is authorized to a 125-foot width with a channel depth of 12 feet running for 406 miles along the coast. It is the third busiest inland waterway in the United States (as of 2015), with the Texas portion handling 75 percent of its traffic. It continues to rank in the top 10 in the nation in total waterborne tonnage moved in the United States (approximately 73 million short tons of cargo annually), with the majority of its cargo consisting of petroleum- and chemical-based products. The Colorado River Locks in Matagorda, Texas, are operated by the U.S. Army Corps of Engineers (USACE) and are the only ones on the Texas portion of the GIWW.

The study area encompasses two locations on the GIWW along the Texas Coast. The Brazos River Floodgates are located about 7 miles southwest of Freeport, Texas, at the intersection of the Brazos River and the GIWW in Brazoria County. The Colorado River Locks are located near Matagorda, Texas, at the intersection of the Colorado River and the GIWW in Matagorda County.

The Galveston District initiated a reconnaissance study to assess the feasibility of modifying the configurations of the crossings to reduce traffic accidents and delays where the GIWW intersects the Colorado and Brazos Rivers. The resulting Section 905(b) analysis produced a finding of Federal interest in continuing to the feasibility phase of the study. The purpose of the feasibility phase is to re-evaluate the proposed alternatives from the reconnaissance to determine the feasibility of undertaking modifications to the Brazos and Colorado River GIWW crossings, as well as identify changes to the floodgate and lock structures at each location where such changes are economically and environmentally justified. The goal is to reduce navigation impacts and costly waterborne traffic delays that are a result of aging infrastructure and inadequate channel dimensions for modern vessels.

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 GIWW Brazos River Floodgate and Colorado River Lock Feasibility Study (hereinafter: BRFG-CRL 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), *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 BRFG-CRL IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. 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; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the BRFG-CRL IEPR.

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, 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 BRFG-CRL review documents 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. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected five panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planning/economics, biological resources and environmental law compliance, hydrology and hydraulic engineering, structural/civil engineering, and port operations. The Panel reviewed the BRFG-CRL documents and produced seven Final Panel Comments in response to 14 charge questions provided by USACE for the review. This charge included two overview questions and one public comment question added by Battelle. 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/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
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 BRFG-CRL IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the report is well-written, detailed, and provides documentation on engineering, environmental, economic, and plan formulation issues. The report provides a balanced assessment of the economic, engineering, and environmental issues of the overall project; however, the Panel identified several elements of the report that should be clarified or revised.

Environmental: The Panel noted that the environmental documentation is well defined, and the PDT examined cumulative effects very thoroughly. The Panel found no significant issues with the analyses, provided. One of the Panel's concern was that the estimates of impacts on wetlands and other aquatic resources presented in the DFR are based on National Wetlands Inventory (NWI) maps. While this resource is adequate for comparative purposes to assist in determining the relative impacts associated with each measure described in the array of alternatives, the maps are known to be inaccurate. The actual sizes and types of wetlands and other aquatic resources that may be affected by the TSP are unknown and therefore the associated mitigation requirements and costs cannot be fully evaluated. The Panel suggests that the PDT add the NWI maps used to estimate wetlands locations and sizes to the list of references in the main body of the DFR and Appendix D and conduct a formal wetland delineation of the study area.

During review of the public comments, the Panel noted that there were numerous local organizations that identified several environmental issues that could be caused by the TSP, including induced flooding, increased siltation, and changes in salinity, that the Panel believes should be further investigated and addressed. The public concerns were raised based on observations and independent studies that questioned the USACE study methodologies and results relating to the environmental effects of the TSP on the San Bernard River. While the Draft Feasibility Report (DFR) addresses, on a minimal level, the likelihood of environmental consequences to the mouth of the San Bernard River associated with implementation of the TSP, these effects are not fully documented, and no mitigation has been proposed. The Panel recommends that the PDT perform more detailed analyses of the potential for increased siltation and induced flooding resulting from implementation of the TSP and develop a more detailed discussion of cumulative environmental effects on the existing environment from concurrent implementation of the TSP and the re-opening of the mouth of the San Bernard River.

Engineering: The Panel appreciated the full range of topics addressed in the study, particularly the comprehensive list of alternatives under consideration. However, the Panel points out that details on the hydrologic watershed models are not provided in the DFR, making it unclear how the watershed runoff and tidal flows will be used to improve waterway navigation. Additionally, no data on direct model calibration are provided. Therefore, the Panel is unable to determine the accuracy of the model results. The Panel recommends that more details be presented on how the rainfall-runoff values were estimated using the Texas Rainfall Runoff (TxRR) model, diversions, and returns, as well as additional details on

the accuracy of the model calibrations on the model domain development and calibration of the Adaptive Hydraulics (ADH) model. The Panel also noted that the modeling of Hurricane Harvey likely played a major role in the outcome of the model results because it was one of the strongest storm events recorded to date for the area. The Panel suggests that more information is necessary on the model calibration of Hurricane Harvey, including the frequency of hurricanes and what was done once the model calibration was completed.

The Panel found that the hydraulic and hydrologic conditions of the waterway are not clearly addressed in the report. The GIWW is a relatively complex and unusual navigation system that relies on both tidal and riverine waters. Why the shallow-draft waterway was built, and what improvements were achieved through that route versus a regular coastal shipping line were not discussed. In addition, the Panel recommends that a description of the inland navigation traffic flow patterns as well as a flow chart showing where water is coming in and out along the waterway, and how river flows, locks, and gate operations are scheduled be added to the report as these are critical to understanding the activities in the project area. A clear understanding of the hydraulic/hydrologic issues in the past and present as well as the flow of traffic and water is critical to understanding the effectiveness of the TSP in addressing these issues.

Economics/Plan Formulation: The Panel found that while the economic and Civil Works planning aspects of the report are very detailed and presented clearly throughout the document, there is a lack of detail on the components of existing structures. Additionally, the costs of alternatives presented in Appendix A are inconsistent with those presented in the DFR. Variations in the costs of alternatives presented in the DFR and its appendices create uncertainties in the accuracy of the costs of alternatives presented, which could affect their relative rankings and perhaps their individual economic feasibility. The Panel suggests that the PDT review the costs presented in DFR Table 3.11 to ensure they are consistent with those presented in Appendix A.

[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

During review of the public comments the Panel noted that comments from several local organizations described environmental consequences and cumulative effects resulting from implementation of the TSP, including inducted flooding, increased siltation, and changes in salinity, that are not fully addressed.

Basis for Comment

The Panel's review of public comments revealed significant technical concerns with study methodologies and results relating to environmental effects of the TSP on the San Bernard River. Significant issues were raised by stakeholders such as local landowners, barge pilots, local industries (in particular Dow Chemical), port agencies (the Port of Freeport), and Brazoria County.

Expected environmental consequences, based on observations and studies by the commenters, include increased siltation at the mouth of the San Bernard River, induced regional flooding resulting from the removal of the west gate, and a substantial change in salinity at the river mouth. Brazoria County is currently seeking RESTORE Act funding to re-open the mouth of the San Bernard, and substantial funds have been expended supporting that effort.

The Port of Freeport and Dow Chemical expect a greater level of siltation in channels serving their facilities, resulting in a shorter dredging cycle than they currently experience, with associated greater expense. In the case of Brazoria County, the concern is that the mouth of the San Bernard will not be successfully re-opened in a sustainable way as a result of implementation of the TSP.

Safe navigation under certain tide, current, and weather conditions was questioned. The adequacy of the relocation channels was also questioned by the Brazos Pilots. They indicated removal of the flood gates would increase currents and impact safe navigation.

While the DFR addresses, on a minimal level, that there are environmental consequences to the mouth of the San Bernard River associated with implementation of the TSP, those effects are not fully documented, and no mitigation has been proposed. During the mid-review teleconference, the PDT indicated navigation issues will be addressed in the PED through development of navigation modeling such as SHIPSIM (SHIPSIM, page 26, Section 5.8 Key/Risk/Uncertainties Engineering Model Assumptions) and that the issue of additional maintenance dredging will be addressed by preparing a Dredged Material Management Plan (DMMP) during PED. However, this is not clear in the DFR.

Significance – Medium

Addressing environmental concerns raised throughout the public comments would strengthen the document and ensure compliance with the National Environmental Policy Act (NEPA); more detailed study results with respect to the San Bernard River could affect selection of the TSP.

Recommendation for Resolution

1. Group the public comments by topic and develop a response to each issue raised.
2. Consider performing more detailed analyses with respect to the potential for increased siltation and induced flooding resulting from implementation of the TSP.

Final Panel Comment 1

3. Describe more fully the expected effects of the TSP on plans to re-open the mouth of the San Bernard River.
4. Develop a more detailed discussion of cumulative environmental effects on the existing environment from concurrent implementation of the TSP and the re-opening of the mouth of the San Bernard River.
5. Amend the DFR to include information on the issues raised and results of any additional analyses performed.
6. Include a description of additional studies to be conducted during PED to address navigation and additional maintenance issues, including SHIPSIM and a DMMP.

Final Panel Comment 2

Details on the hydrologic watershed models are not provided, therefore it is unclear how the watershed runoff and tidal flows interact and how the TSP will be used to improve waterway navigation.

Basis for Comment

The study of the Gulf Intracoastal Waterway (GIWW) Waterway involves both tidal and riverine waters. At least two mathematical models (TxRR and ADH) were used to cover the riverine and tidal flow components and to make predictions on the potential impacts of proposed changes to flow operations. Unfortunately, the DFR provides relatively sparse details on those models (including missing calibration and future projections) and limited focus on the accuracy of model calibration and prediction. The Panel has three concerns regarding the hydrologic watershed model and the interaction of watershed runoff and tidal flows.

1. The USACE response during the mid-review teleconference stated that the contractor did not set up the Texas Rainfall-Runoff (TxRR) Model and that the contractor obtained model results from the TWDB (Texas Water Development Board). The TxRR is conceptually similar to the Agricultural Research Service model, which is based on the Soil Conservation Service curve number method. It is unclear from the data presented in the report (1) whether the rainfall-runoff values were estimated using the TxRR model, and (2) if the flows associated with water rights and holders of discharge permits, as well as losses and gains from evaporation and precipitation, were included in the calculations of impacts on the bay surface area.
2. Based on the information provided in the DFR and the Engineering Appendix, USACE has not corroborated the statement that "the San Bernard river discharge at the intersection with the GIWW is heavily influenced by precipitation-induced discharge in addition to upstream riverine processes."

The Draft Engineering Appendix, Section 3.1, states that, "The combined influences of tidal circulation and river hydraulics were simulated in the project vicinity to evaluate the influence of tidal currents and the Brazos and San Bernard River discharges on flow velocities and water surface elevations at the Brazos River Floodgates. ...The modeling was conducted using an adaptive two-dimensional finite element model of flow and transport (Adaptive Hydraulics [or] ADH)."

So far, the sources cited provide no data at all on direct model calibration. Therefore, the Panel is unable to determine the accuracy of the model results and the statement noted above.

3. Additionally, based on the information provided in the DFR, it is unclear to the Panel whether:
 - seepage is a concern
 - impacts on watershed were evaluated by the Environmental team
 - additional impacts of the gates and locks, including sedimentation, were addressed in the H&H Appendices

- physical modeling was considered for this study.

These details are needed to fully understand the influences of the proposed changes, including their relative importance.

Significance – Medium

Clear understanding of the models used in the study is critical to final decision-making on the selected plan.

Recommendation for Resolution

1. Describe in more detail how rainfall-runoff values were estimated using the TxRR model, to account for diversions, returns flows associated with water rights and holders of discharge permits, and impacts of evaporation and precipitation on the bay surface area.
2. Provide details on the accuracy of the model calibration, especially in view of the special features of the Brazos runoff.
3. Provide more details on the model domain development and calibration of the ADH in the report.

Final Panel Comment 3

Details on the modeling of Hurricane Harvey and further weather conditions are not provided in the DFR, therefore it is unclear if future predictions are fully reliable.

Basis for Comment

Model calibration of Hurricane Harvey likely played a major role in the outcome of the model results because it was one of the strongest storm events recorded to date for the area. More details on the model in the DFR would minimize questions on how the models were used in the study and how reliable they are.

USACE stated during the mid-review teleconference that:

The structures being investigated as part of this study are designed for riverine flood events, not surge events. Model calibration for Harvey was based on the rainfall impacts and elevated stages in the rivers, not for a surge event. Frequency of hurricane events was not recalibrated for this study.

Additional information on how this changed the river stages used and how potential future hurricane-induced higher river stages may impact the project would help strengthen the overall understanding of the impact of the use of Hurricane Harvey data in this instance.

Significance – Medium

The reliability of Hurricane Harvey modeling has a potential impact on the final scope of the alternative solutions.

Recommendation for Resolution

1. Provide more information on the model calibration of Hurricane Harvey, including the frequency of hurricanes and what was done once the model calibration was completed.
2. Clarify whether the new predictions have any effect on prior climate change predictions.
3. Provide information on how the new river stages results were used in the study, the range of potential future hurricane-induced higher river stages, and how they would be addressed.

Final Panel Comment 4

It is unclear what the actual costs are for each alternative, which may affect both the ranking of the alternatives and their feasibility.

Basis for Comment

The costs of alternatives presented in Engineering Appendix A are inconsistent with those presented in the DFR (Table 3.11, p. 3-19). For example:

1. Alternative (Alt) 2b, the Gate Rehabilitation and Guide Wall Replacement Option, which is the cost to operate it as it currently exists (Appendix A, p. 343), estimates the cost for Alt 2b as \$62,658,993. This does not include engineering and design or construction management costs. The DFR (p. 3-19) estimates the First Construction cost for Alt 2b as \$48,409,000. There is no explanation of why these costs went down.
2. Alternative 4a, Remove Riverside Gates. The DFR (p. 3-19) estimates the First Construction cost as \$36,862,000. Engineering Appendix A (p. 377) estimates the cost for Alt 4b.1, Inland Gate Rehab and removal of Riverside Gates, as \$27,392,124, which does not include planning, engineering, and design (PED) or construction management costs. There is no explanation whether the 35 percent increase is for engineering and design and construction management.

Significance – Medium

Variations in the costs of alternatives presented in the DFR and its appendices create uncertainties in the accuracy of these costs, which could affect their relative rankings and perhaps their individual economic feasibility.

Recommendation for Resolution

1. Describe in more detail how the First Construction cost figures in DFR Table 3.11 were derived.
2. Review the costs presented in DFR Table 3.11 to ensure they are consistent with those presented in Appendix A.

Final Panel Comment 5

It is unclear how the Brazos waterway system works and how the associated challenges will be addressed.

Basis for Comment

The GIWW is a relatively complex and unusual navigation system that relies on both tidal and riverine waters. The study focuses on the intersection of the Brazos River and the GIWW in Brazoria County, but also accounts for the hydraulic and hydrologic conditions of the entire waterway when re-evaluating modifications to the Brazos and Colorado River GIWW crossings and identifying changes to the floodgate and lock structures. Additional, non-related hydraulic and hydrologic issues include costly waterborne traffic delays due to aging infrastructure and inadequate channel dimensions for modern vessels. To fully understand the challenges at hand, the reader needs detailed background information on why the shallow-draft waterway was built, and what improvements were achieved through that route versus a regular coastal shipping line.

The needed historical information is generally hard to find, including the link that was supposed to provide a history for the entire GIWW. The website link recently provided by USACE is not working. (<HTTPS://WWW.SCRIBD.COM/DOCUMENT/204085699/HISTORYGULF-INTRACOASTAL-WATERWAY>).

The Panel believes such historical background information can be found on a site maintained by the Texas Department of Transportation, which provides a comprehensive history of the GIWW. (http://www.texasgulfcoastonline.com/protals/0/pdfs/tx_gulfcoastwaterway.pdf)

Brazos River flows have a major role to play, along with the locks and flood gates. The DFR should mention that the levee system is only used during a tropical surge event, not riverine flooding, and that the roles of the levees, pump stations, and tidal gates for this system were not evaluated as part of this study as they do not affect the behavior of the rivers and the gate structures. This will prevent potential confusion.

Significance – Medium/Low

A clear understanding of the hydraulic/hydrologic issues at hand is critical to understanding past, present, and future conditions.

Recommendation for Resolution

1. Double-check the exact link of the website shown above.
2. Describe how the inland navigation traffic flows from St. Mark, FL to Brownsville, TX. Provide a flow chart showing where water is coming in and out along the waterway, and how river flows, locks, and gate operations are scheduled.
3. Describe how the needed minimum navigation waterway depth is sustained.
4. Describe the role(s) of the levees, pump stations, and tidal gates and whether these operations are needed during a flood.

Final Panel Comment 6

Future use of new technology in Brazos waterway operations and navigation does not appear to have been addressed.

Basis for Comment

Over the years, the shipping industry has gone through many challenges involving many of its competitors. Historically, the GIWW has been used at or near its capacity, which has limited larger barge or longer tows most of the time. Potential improvements, including cost recovery and use of other techniques, have also been frequently debated. For example, there may be (predictable) changes in current policies and future operating strategies of competing parties such as railroads, oil and petrochemical, and shipping companies that could affect future navigation tonnage in the GIWW.

Addressing these changes in the DFR would be beneficial because the Panel recognizes that waterway transportation system improvements included in the Future Without-Project (FWOP) condition are limited to those with approved, current studies that are likely to be constructed. Per USACE guidance, the without-project condition is the one most likely to exist in the future. However, the DFR does not mention any actions that are part of broader private and public planning to alleviate transportation issues that should be included in the FWOP. Without formalized plans with specific schedules and funding streams, any change to non-barge transportation systems would be highly speculative. Providing these additional details is needed.

Significance – Low

Review of new technology may provide some insight into whether new paths could be envisaged and pursued to improve the implementation and cost of the project.

Recommendation for Resolution

1. Indicate if there are any (predictable) changes in current policies and future operating strategies of competing parties such as railroads, oil and petrochemical, and shipping companies that could affect future navigation tonnage in the GIWW and that would be worth considering.

Final Panel Comment 7

Wetland sizes and locations and associated mitigation costs may be over- or under-estimated due to reliance on National Wetlands Inventory maps in lieu of a formal wetland delineation.

Basis for Comment

The estimates of impacts on wetlands and other aquatic resources presented in the DFR are based on National Wetlands Inventory (NWI) maps produced by the U.S. Fish and Wildlife Service. The main body of the DFR and Appendix D do not fully describe that the NWI maps were being used to identify both sizes and types of wetlands that may be affected by the TSP.

While this resource is adequate for comparative purposes to assist in determining the relative impacts associated with each measure described in the array of alternatives, the maps are known to be highly inaccurate (40 to 50 percent) and are not generally used to determine mitigation requirements or to evaluate the function and value of wetlands and other aquatic resources (Matthews et al., 2016).

A formal wetland delineation of the study area performed in accordance with the 1987 USACE Wetlands Delineation Manual and Gulf Coast regional supplement (see Literature Cited) would more accurately evaluate locations, sizes, and functions and values of the wetlands present. The PDT has indicated that a formal wetlands delineation will be performed during a later phase of the study. These details should be included in the DFR to ensure readers are aware of future steps.

Significance – Low

The actual sizes and types of wetlands and other aquatic resources that may be affected by the TSP are unknown and therefore the associated mitigation requirements and costs cannot be fully evaluated.

Recommendation for Resolution

1. Add the NWI maps used to estimate wetlands locations and sizes to the list of references in the DFR and Appendix D.
2. Make clear in the main body of the DFR and Appendix D that further refinement of wetlands locations, sizes, and types will be based on a formal wetlands delineation to be performed during a later phase of the study.
3. Clarify once an accurate wetlands delineation has been performed, whether the habitat evaluations, mitigation plan, and associated costs will be based on these results.

Literature Cited:

Matthews, J.W., D. Skultety, B. Zercher, M.P. Ward and T.J. Benson (2016). Field verification of original and updated National Wetland Inventory maps in three metropolitan areas in Illinois, USA. *Wetlands* 36:1155-1165. <https://doi.org/10.1007/s13157-016-0836-6>

U.S. Army Corps of Engineers, Environmental Laboratory, 1987. Wetlands Research Program Technical Report Y-87-1, Wetlands Delineation Manual, Final Report January 1987.

U.S. Army Corps of Engineers, Atlantic and Gulf Coast Plain Regional Supplement to the U. S. Army Corps of Engineers Wetland Delineation Manual, Version 2.0, November 2010.

5. REFERENCES

Matthews, J.W., D. Skultety, B. Zercher, M.P. Ward and T.J. Benson (2016). Field verification of original and updated National Wetland Inventory maps in three metropolitan areas in Illinois, USA. *Wetlands* 36:1155-1165. <https://doi.org/10.1007/s13157-016-0836-6>

OMB (2004). Final Information Quality Bulletin for Peer Review. Executive Office of the President, Office of Management and Budget, Washington, D.C. Memorandum M-05-03. December 16.

The National Academies (2003). Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports. The National Academies (National Academy of Science, National Academy of Engineering, Institute of Medicine, National Research Council). May 12.

USACE (2012). Water Resources Policies and Authorities: Civil Works Review. Engineer Circular (EC) 1165-2-214. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. December 15.

U.S. Army Corps of Engineers, Environmental Laboratory, 1987. Wetlands Research Program Technical Report Y-87-1, Wetlands Delineation Manual, Final Report January 1987.

U.S. Army Corps of Engineers, Atlantic and Gulf Coast Plain Regional Supplement to the U. S. Army Corps of Engineers Wetland Delineation Manual, Version 2.0, November 2010.

APPENDIX A

IEPR Process for the BRFG-CRL Project

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

Table A-1 presents the major milestones and deliverables of the BRFG-CRL IEPR. Due dates for milestones and deliverables are based on the award/effective date listed in Table A-1. The review documents were provided by U.S. Army Corps of Engineers (USACE) on February 26, 2018. Note that the actions 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 9, 2018. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the BRFG-CRL IPER

Task		Due Date
1	Award/Effective Date	9/11/2017
	Review documents available	2/26/2018
	Public comments available	4/23/2018
	Battelle submits draft Work Plan ^a	12/21/2017
	USACE provides comments on draft Work Plan	1/10/2018
	Battelle submits final Work Plan ^a	2/28/2018
2	Battelle submits list of selected panel members ^a	2/27/2018
	USACE confirms the panel members have no COI	3/2/2018
3	Battelle convenes kick-off meeting with USACE	12/8/2017
	Battelle convenes kick-off meeting with panel members	3/12/2018
	Battelle convenes kick-off meeting with USACE and panel members	3/13/2018
4	Panel members complete their individual reviews	4/11/2018
	Panel members provide draft Final Panel Comments to Battelle	4/19/2018
	Battelle sends public comments to panel members for review	4/25/2018
	Panel finalizes Final Panel Comments	5/1/2018
	Panel finalizes Final Panel Comment regarding public comments	5/4/2018
5	Battelle submits Final IEPR Report to USACE ^a	5/8/2018
6 ^b	Battelle convenes Comment Response Teleconference with panel members and USACE	6/21/2018
	Battelle submits pdf printout of DrChecks project file ^a	7/9/2018
	Agency Decision Milestone (ADM) meeting ^c	6/13/2018
	Post-ADM Senior Leader Meeting (SLM) (estimated date) ^c	3/15/2019
	Contract End/Delivery Date	5/30/2019

^a Deliverable.

^b Task 6 occurs after the submission of this report.

^c The ADM and SLM meetings were listed in the Performance Work Statement under Task 3 but were relocated in this schedule to reflect the chronological order of activities.

At the beginning of the Period of Performance for the BRFG-CRL 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., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 16 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and 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 after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle 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 review documents and reference/supplemental materials listed in Table A-2.

Table A-2. Documents to Be Reviewed and Provided as Reference/Supplemental Information

Review Documents	No. of Pages
Draft Integrated Feasibility Report and Integrated Environmental Assessment	187
Appendix A: Engineering; Appendix 1 Hydraulic Engineering	385
Appendix B: Economics	100
Appendix C: Real Estate Plan	41
Appendix D: Environmental	288
Total # of Review Pages	1,001
Supplemental Information ^a	No. of Pages
Public Comments ^b	100
Report Summary	28
Risk Register	10
Total # of Reference Pages	138

^a Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

^b USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1. Battelle will in turn submit the comments to the IEPR Panel for review.

In addition to the materials provided in Table A-2, the panel members were provided the following USACE guidance documents.

- USACE guidance, *Civil Works Review* (EC 1165-2-214), December 15, 2012
- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review*, December 16, 2004.
- USACE Climate Change Adaptation Plan (June 2014)
- ETL 1100-2-1, Procedures to Evaluate SLR Change Impacts Responses Adaptation
- ER 1100-2-8162, Incorporating SLR Change in CW Programs
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART Planning Overview
- Planning Modernization Fact Sheet.

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 39 panel member questions to USACE. USACE was able to provide responses to most questions during the teleconference and was able to provide written responses to all the questions prior to the end of the review.

A.2 Review of Individual Comments

The Panel was instructed to address the charge questions/discussion points within a charge question response form 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 into a preliminary list of overall comments and discussion points. Each panel member's individual comments were shared with the full Panel.

A.3 IEPR Panel Teleconference

Battelle facilitated a 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 should 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.

A.4 Preparation of Final Panel Comments

Following the teleconference, Battelle distributed 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 BRFG-CRL 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 a summary email 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/high, medium, medium/low, and low; see description below)
 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:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.

5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- 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, seven 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 full text of the Final Panel Comments is presented in Section 4.2 of the main report.

A.5 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received approximately 229 pages of public comments on the BRFG-CRL project (1 transcript from a public meeting, and approximately 46 individual comments) from USACE. Battelle then sent the public comments to the panel members in addition to the following charge question:

1. **Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?**

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any technical concerns that had not been previously identified during the initial IEPR. The panel members confirmed that a new Final Panel Comments would be developed to summarize the additional issues raised by the public. One panel member was identified by Battelle as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to the other panel members and Battelle. The Final Panel Comment was developed as part of a four-part structure following guidance previously described in Section A.4.

Battelle reviewed and edited the Final Panel Comment for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that the comment did not make any observations regarding either the appropriateness of the selected alternative or USACE policy. There was no direct communication between the Panel and USACE during the preparation of the Final Panel Comment.

A.6 Final IEPR Report

After concluding the review and preparation of the Final Panel Comments, Battelle prepared a final IEPR report (this document) on the overall IEPR process and the IEPR panel members' findings. Each panel member and Battelle technical and editorial reviewers reviewed the IEPR report prior to submission to USACE for acceptance.

A.7 Comment Response Process

As part of Task 6, Battelle will enter the seven 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.

APPENDIX B

Identification and Selection of IEPR Panel Members for the BRFG-CRL Project

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B.1 Panel Identification

The candidates for the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study (hereinafter: BRFG-CRL IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planning/economics, biological resources and environmental law compliance, hydrology and hydraulic engineering, structural/civil engineering, and port operations. These areas correspond to the technical content of the review documents and overall scope of the BRFG-CRL 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 remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

Candidates were screened for the following potential exclusion criteria or conflicts of interest (COIs). These COI questions were intended to serve as a means of disclosure in order to better characterize a candidate’s employment history and background. Battelle evaluated whether scientists in universities and consulting firms that are receiving USACE-funding have sufficient independence from USACE to be appropriate peer reviewers. Guidance in OMB (2004, p. 18) states,

“...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.”

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study	
1. Previous and/or current involvement by you or your firm in the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study (hereinafter: BRFG-CRL Feasibility Study) and related projects.	
2. Previous and/or current involvement by you or your firm in inland navigation projects in Texas.	
3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in BRFG-CRL Feasibility Study-related projects.	

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study

4. Current employment by the U.S. Army Corps of Engineers (USACE).	
5. Previous and/or current involvement with paid or unpaid expert testimony related to the BRFG-CRL Feasibility Study.	
6. Previous and/or current employment or affiliation (for pay or pro bono) with the Texas Department of Transportation, the non-Federal sponsor.	
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to coastal Texas.	
8. 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 Galveston District.	
9. Previous or current involvement with the development or testing of models that will be used for, or in support of the BRFG-CRL Feasibility Study, including HEC-FDA 1.4, HEC-RAS 4.1, HEC-RAS 2D modeling Version 5, TRACES MII 4.1, Coastal Modeling System (CMS), and the ADvanced CIRCulation model (ADCIRC).	
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Galveston 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 Galveston District. Please explain.	
11. Any previous employment by USACE as a direct employee, notably if employment was with the Galveston District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.	
12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the Galveston District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.	
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning inland navigation, and include the client/agency and duration of review (approximate dates).	

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study

14. Pending, current, or future financial interests in BRFG-CRL Feasibility Study-related contracts/awards from USACE.	
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.	
16. Significant portion of your personal or office's revenues within the last three years came from Texas Department of Transportation contracts.	
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the BRFG-CRL Feasibility Study.	
18. Participation in relevant prior and/or current Federal studies relevant to this project and/or the BRFG-CRL Feasibility Study.	
19. Previous and/or current participation in prior non-Federal studies relevant to this project and/or the BRFG-CRL Feasibility Study.	
20. Has your research or analysis been evaluated as part of the BRFG-CRL Feasibility Study?	
21. 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.	

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 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. The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied to whether that firm serves as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

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. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Four of the five final reviewers are independent consultants; the other panel member is affiliated with a consulting company. 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.

Table B-1. BRFG-CRL IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Civil Works Planning/Economics					
David Bastian	Independent consultant	Annapolis, MD	M.S., River Engineering	Yes	36
Biological Resources and Environmental Law Compliance					
Kay Crouch	Crouch Environmental Services, Inc.	Houston, TX	M.S., Biology and Aquatic Ecology	No	39
Hydrology and Hydraulic Engineering					
Bolvong Tanovan	Independent consultant	Beaverton, OR	Ph.D., Hydraulic Engineering	Yes	55
Structural/Civil Engineering					
Robert Fleming, Jr.	Independent consultant	Vicksburg, MS	M.S., Geotechnical Engineering	Yes	51
Port Operations					
Ronald Vann	Independent consultant	Virginia Beach, VA	B.S., Civil Engineering	Yes	52

Table B-2 presents an overview of the credentials of the final five members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. BRFG-CRL IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Bastian	Crouch	Tanovan	Fleming	Vann
Civil Works Planning/Economics					
Minimum of 15 years of demonstrated experience in economics	X				
Minimum of 10 years of experience directly related to water resource economic evaluation, a comprehensive understanding of economics in coastal and inland navigation planning studies	X				
Familiar with U.S. Army Corps of Engineers (USACE) plan formulation processes, procedures, and standards as it relates to flood risk management civil works projects	X				
Minimum of 5 years of directly dealing with the USACE six-step planning process and policies which are governed by ER 1105-2-100, Planning Guidance Notebook	X				
M.S. degree or higher in economics	W ¹				
Biological Resources and Environmental Law Compliance					
Minimum of 15 years of experience directly related to water resource environmental evaluation or review		X			
Minimum of 10 years of experience in evaluating and conducting National Environmental Policy Act (NEPA) impact assessments		X			
Extensive experience in evaluating environmental compliance documents in support of navigation projects		X			
Familiar and have experience with United States Fish and Wildlife Service Habitat Evaluation Procedure (HEP), Endangered Species Act (ESA), Clean Water Act (CWA), essential fish habitat (EFH), and Fish and Wildlife Coordination Act (FWCA)		X			
M.S. degree or higher in a related field		X			
Hydrology and Hydraulic Engineering					
Minimum of 15 years of experience in hydrologic and hydraulic reviewer and an expert in the field of hydrology and hydraulics			X		
Thorough understanding of open and inland channel dynamics, channel flows, and nonstructural solutions			X		
Thorough understanding of computer modeling techniques using Hydraulic Engineering Center (HEC) modeling computer software including HEC River Analysis System (RAS) or Hydrologic Modeling System (HMS)			X		
Registered Professional Engineer			X		
Structural/Civil Engineering					
Minimum of 10 years of experience in civil engineering and design				X	

Technical Criterion	Bastian	Crouch	Tanovan	Fleming	Vann
Demonstrated experience in the layout and design of navigation channels				X	
Experience in structural design of navigation structures including locks, flood gates, and cofferdams				X	
M.S. degree or higher in engineering				X	
Registered Professional Engineer				X	
Port Operations					
Minimum of 5 years of experience in port operations					X
Experience in inland waterway navigation					X
Experience with port regulation and requirements					X
Experience with the Gulf Intracoastal Waterway					X

W¹ – PWS stated the panel member should have an “M.S. degree or higher in economics.” Mr. David Bastian earned an M.S. in river engineering and has 36 years of experience in economics and plan formulation for Civil Works projects

B.3 Panel Member Qualifications

Detailed biographical information on each panel members’ credentials and qualifications and areas of technical expertise are summarized in the following paragraphs.

Name	David Bastian, P.E.
Role	Civil Works Planner / Economist
Affiliation	Independent consultant

Mr. Bastian is an independent consultant and P.E. for David Bastian Consulting in Annapolis, Maryland, specializing in USACE feasibility studies and their technical and policy compliance, adherence to plan formulation, and review of feasibility studies incorporating incremental cost analysis, ecosystem restoration, flood risk reduction, deep draft navigation, dredged material disposal, and hydraulic and river engineering. He earned his B.S. in civil engineering from the Georgia Institute of Technology and an M.S. in river engineering from Delft University, Holland.

Mr. Bastian has 36 years of experience with USACE and as a contractor/consultant on USACE projects involving feasibility studies and public works planning, all based on the USACE six-step planning process. As a reviewer at USACE, Headquarters, he became familiar with and has direct experience with Engineer Regulation (ER) 1105-2-100 as well as other USACE engineering regulations, manuals, and pamphlets and continues to use and stay familiar with the “planning community toolbox.” He co-authored the USACE Planner’s Workshop Manual. His project history has resulted in his review of and collaboration on more than 100 USACE reports evaluating and comparing alternative plans.

Mr. Bastian has extensive experience with the Institute for Water Resources (IWR) Planning Suite model and the strategy and principles in developing cost effectiveness and incremental cost analysis (CE/ICA). He has evaluated the appropriateness of CE/ICA as applied to dollar costs and ecosystem restoration benefits on such studies as Picayune Strand and Puget Sound. Mr. Bastian has experience in determining cost effectiveness of the restoration or creation of riverine and estuarine wetlands and oyster reefs, and the use of fish passage structures. He also has evaluated the accuracy of CE/ICA for projects such as the Brazos Island Harbor, Texas, Channel Improvement Project Draft Integrated Feasibility Report and Environmental Assessment

Mr. Bastian has 20 years of experience in coastal and riverine economics evaluation and ecosystem restoration. He has direct experience in identifying and evaluating alternative plans for coastal and riverine systems, including nine years involved in the coastal economic evaluation for coastal Louisiana restoration, the greater New Orleans Hurricane and Storm Damage Risk Reduction System (HSDRRS), and four other study areas along the Louisiana and Texas coasts. He is familiar with large, complex Civil Works projects with high public and interagency interests through his extensive involvement with the Louisiana Coastal Study area pre- and post-Hurricane Katrina. Additionally, he has spent four years working for the greater New Orleans HSDRRS, planning and constructing the 133-mile levee, floodwall, and massive pumping system.

Mr. Bastian has developed economic input databases for deep-draft navigation studies at USACE’s IWR (1980-1987) and evaluated deep-draft economic feasibility for enlarging the Panama Canal (1987-1993). He authored the deep-draft and inland navigation sections of the IWR Planning Workshop manual, participated in the IEPR of the Delaware River Deepening Feasibility Study (2003-2004), and contributed as an external peer reviewer to the Port Everglades channel relocation and enlargement (2012) economic evaluation.

Mr. Bastian has experience related to evaluating traditional National Ecosystem Restoration (NER) plan benefits associated with ecosystem projects, which includes experience or familiarity with USACE methodologies for performing CE/ICA analysis in such studies as (1) the Puget Sound Nearshore Ecosystem Restoration Feasibility Study/Environmental Impact Statement (2014), where he served on an IEPR panel to assess the NED/NER benefits and application of CE/ICA analysis to restore environmental degradation on numerous mini projects around Puget Sound, (2) the Picayune Strand project, where he was selected to participate in the IEPR to review the plan formulation and economics aspects of the Picayune Strand portion of the Everglades restoration project, and (3) the Boardman River, Michigan Ecosystem Restoration Study (2011), where he provided the Project Delivery Team with quality control and report writing services to ensure that the study results were economically and environmentally compliant with USACE policy requirements.

Mr. Bastian is familiar with USACE coastal storm damage reduction projects and has evaluated and conducted NER analysis procedures, particularly as they relate to hurricane and coastal storm damage

risk reduction, through his participation on the following related projects. He managed the hydrologic and hydraulic studies and contributed to the draft Donaldsonville to the Gulf hurricane risk reduction feasibility study report and the draft Larose to Golden Meadow hurricane risk reduction feasibility study report. He reviewed the Morganza to the Gulf hurricane risk reduction feasibility study report. He prepared and collaborated on many of the project description documents (mini-feasibility decision documents) required for the segments that make up the New Orleans HSDRRS. Additionally, he participated in and was recognized for his work on the Louisiana Coastal Protection and Restoration study, where he assisted in writing the report and managing the application of surge model studies applying, as appropriate, CE/ICA.

While employed at USACE, Mr. Bastian held positions as Deputy Chief of Staff for Support, Office Chief of Engineers; Assistant Director of Civil Works, Office Chief of Engineers; technical and policy compliance review expert, Washington Level Review Center; and navigation research, USACE IWR. He has served as a USACE Washington-level technical and policy compliance review expert and managed interdisciplinary reviews of more than 70 feasibility reports. Mr. Bastian is a member of the American Society of Civil Engineers, the American Association of Port Authorities, the Permanent International Association of Navigation Congresses, and the Western Dredging Association.

Name	Kay Crouch
Role	Biological Resources and Environmental Law Compliance
Affiliation	Crouch Environmental Services, Inc.

Ms. Crouch is board chair of Crouch Environmental Services, Inc., a company specializing in National Environmental Policy Act (NEPA) analysis, environmental site assessment, permitting, and mitigation for projects with high public and interagency interests. She earned her M.S. in biology/ecology in 1978 from Stephen F. Austin State University and has received additional academic training in the NEPA process from the Duke University Nicholas School of Environmental and Earth Sciences (2004-05). Ms. Crouch has more than 39 years of nationwide experience in conducting environmental site assessments and NEPA impact assessments for complex multi-objective public works projects with competing trade-offs. She has performed numerous environmental evaluations throughout the nation in support of Federal Energy Regulatory Commission (FERC) filings and NEPA documentation.

Ms. Crouch has experience working with NEPA impact assessment in marsh and urban areas and related ecosystem species and habitats. She has done extensive work in the coastal marsh habitats that span the Gulf Coast and has performed site selection studies and FERC NEPA analyses in the mid-Atlantic region as well. She has experience in high and low tidal marsh restoration and evaluation, as well as inland wetlands. Additionally, she has worked on projects in Louisiana involving evaluation of chenieres and inland swamps. In the mid-1990s, Crouch Environmental Services (CESI) designed and constructed the Baytown Nature Center, Texas, a large coastal marsh creation project for which the company received the 1998 Award of Excellence from the National Association of Landscape Architects. Since that time, Ms. Crouch and CESI have designed and constructed numerous tidal marshes, restored coastal prairie habitat, and revegetated forested habitats.

Ms. Crouch is familiar with USACE calculations of environmental benefits and routinely performs cumulative effects analyses on high-visibility public works projects as part of her extensive NEPA practice. This type of modeling has been required on every flood damage reduction and ecosystem restoration project she has worked on relating to USACE, including the Clear Creek Flood Damage Reduction Project and the Addicks and Barker Dams and Reservoirs system in Harris County, Texas. Other NEPA projects have consisted of flood damage reduction projects, dams, ports, parks, offshore activities, linear transportation corridors, and power plants and other types of projects involving Federal funding.

Ms. Crouch has 39 years of experience with endangered species. She has completed several projects that involve compliance with the Endangered Species Act (ESA). The evaluation of the presence or absence of listed species is required for almost every project she has been involved in. These include USACE 404 permit applications requiring field investigations for listed species in numerous states; she also has completed the Section 7 consultation process for several species.

Ms. Crouch also has demonstrated experience with cultural resource surveys. Almost every project she works on requires an investigation and evaluation of cultural resource issues. She is intimately familiar with the record search step as well as field survey techniques for cultural resources. Her experience is supervisory and relates to USACE 404 permits and NEPA documentation. She also has experience with Section 106 for the analysis of historical issues. She has demonstrated knowledge of conducting biological assessments, including wetlands delineation, compilation of Biological Assessments for Section 404 permitting, and NEPA documentation. She has dealt with numerous types of habitats in many locations nationwide.

Ms. Crouch is familiar with USACE's calculation and application of environmental impacts and benefits. She routinely performs cumulative effects analyses on high-visibility public works projects as part of her extensive NEPA practice. She is well versed in various modeling types and in the performance of incremental cost analysis for mitigation evaluation for dam repair and restoration. She has experience reviewing the application of Wetland Value Assessment (WVA) methodology and has calculated the environmental losses and benefits of USACE projects using the hydrogeomorphic (HGM) approach, habitat evaluation procedures (HEP), and WVA, as well as other models. Most recently, she performed WVA analysis for the Addicks and Barker Dams environmental assessment in Harris County, Texas, for the Galveston District. Additionally, she has experience serving as an environmental expert in previous IEPRs of USACE Louisiana Water Resources Council (LWRC) projects. Ms. Crouch is a member of the Society of Wetland Scientists.

Ms. Crouch also has extensive experience in socio-economic impact evaluation and public engagement/education. For the past 20 years, her environmental practice has included an extensive award-winning communications component. She has performed dozens of NEPA public meetings, as well as facilitated other types of public meetings, held workshops, produced and developed video presentations, designed and authored printed pieces, and performed other communications activities for a wide variety of public and private projects.

Name	Bolvong Tanovan, Ph.D., P.E.
Role	Hydrologist and Hydraulic Engineer
Affiliation	Independent consultant

Dr. Tanovan is an independent hydrology, hydraulics, and water resource management consultant, having retired in 2008 as the Chief of the Power Branch, Columbia Basin Water Management Division, USACE. He had also served as Manager of USACE's Hydropower Analysis Center of Expertise, with more than 26 years working for USACE Northwestern division in Portland, OR. He earned his M.S. and Ph.D. in hydrologic engineering from the Federal Institute of Technology in Lausanne, Switzerland in 1963 and 1975, respectively.

Dr. Tanovan has a thorough understanding of open and inland channel dynamics, channel flows, and non-structural solutions, derived from his years as supervisory hydraulic engineer at the Columbia Basin Water Management Division, Reservoir Control Center. The Columbia River System is a vast and complex combination of Federal and non-Federal facilities used for power production, irrigation, navigation, flood control, recreation, fish and wildlife habitat, and municipal and industrial needs. In addition to daily system operational reviews, he was involved in the Columbia System Operation Review (SOR), a study and environmental compliance process started that analyzed future operations of the system and river use issues. Twenty SOR study work groups dealt with subjects similar to those faced by the BRFG-CRL Feasibility Study: river operation modeling, flood control, and navigation.

Dr. Tanovan's experience with computer modeling techniques includes the use of the HEC River Analysis System (RAS) and HEC-HMS. He developed a water temperature model for the Columbia River System based on HEC-5Q (with some time-related graphic assistance from Battelle), and FISHPASS, an anadromous fish passage model to develop the most-effective fish-spill program and seasonal reservoir operations during the fish migration season. He is also familiar with models developed by the IWR's Shared Vision Planning, an integrated planning process with structured public participation and collaborative computer modeling in identifying tradeoffs and new management options, using user-friendly and understandable computer models. His USACE modeling experience also covers many of the hydrologic and hydraulic models developed by the Engineer Research and Development Center.

Name	Robert Fleming Jr., P.E.
Role	Structural/Civil Engineering
Affiliation	Independent consultant

Mr. Fleming is a geotechnical engineer specializing in project design and geotechnical and structural engineering for flood control projects. He earned his M.E. in geotechnical engineering from Texas A&M University in 1971 and is a licensed professional engineer in Mississippi. He has more than 48 years of experience in geotechnical and structural engineering, including working for the USACE Vicksburg District for 35 years. In that capacity, he was actively involved in the design, construction, and evaluation of all types of hydraulic structures. At USACE, he served 10 years as the Chief of the Geotechnical Branch, five years as the Chief of the Design Branch, and four years as the Chief of Engineering. Mr. Fleming has had overall technical responsibility for all types of flood control, navigation, environmental restoration, and recreation projects, which have included locks and dams, pumping stations, levees,

levee tie-ins to natural features, flood management channels, drainage structures, floodwalls, earth dams, channels, channel stabilizations, and earth slide remediation.

Major accomplishments while serving as the Chief of Engineering include the responsibility for the overall design, plans and specifications, and construction consultation of the Mississippi River Enlargement Program in Mississippi, Louisiana, and Arkansas. Enlargements included more than 40 miles of levee raises up to 8 feet on existing levees 25 to 35 feet in height. As the Dam Safety Officer for seven large high-hazard dams, he was responsible for ensuring the safe operation and maintenance of these structures, as well as the design and construction of numerous floodwater-retarding structures, riser pipes, low-drop grade control, and high-drop grade control structures as part of the Demonstration Erosion Control Program in North Mississippi.

As the Chief of Engineering, he signed the Construction Plans & Specifications that were advertised for bids. He also signed the Official Cost Estimates for evaluating bids submitted. As Chief of the Design Branch, he signed individual drawings in the bid package. At USACE, Mr. Fleming was responsible for design and construction of the Phase I contracts for Locks and Dams 4 and 5 on the Red River Waterway. Phase I contracts included the development of plans and specs for site preparation, initial excavation, and dewatering. The contracts were prepared to ensure that the dewatering system could be turned over to the Phase II contractor to operate. Mr. Fleming was also heavily involved in the design and construction of the Lake Chicot Pumping Plant. At the time it was the only structure built through the Mainline Mississippi River Levees. It included slurry trench construction as part of the initial excavation and remained as part of the permanent design of the structure to control underseepage. He has experience with the design and construction of detention/retention basins, utility relocations, positive closure requirements, and interior drainage requirements on the various recreation sites on the Red River Waterway and the seven high-hazard dams located within Vicksburg District, as well as the numerous floodwater-retarding and grade control structures that were part of the Demonstration Erosion Control (DEC) Project located in the hills overlooking the Mississippi Delta in Mississippi. On several flood risk management projects in Vicksburg, he routinely applied and considered non-structural flood risk management measures as part of plan development. As an engineering consultant, Mr. Fleming provided Geotechnical Engineering Services for the design and construction of repairs and modifications to the Bayou Dupree and Bayou Bienvenue Control Structures in Orleans and St Bernard Parishes, LA that was required because of overtopping and the resulting scour during Hurricane Katrina. Services provided included assisting in development of the remediation plan, performing design analysis and engineering during construction that included bi-weekly site visit.

Mr. Fleming has experience designing and implementing site investigation and laboratory testing plans; executing and interpreting data and risk analyses, including seepage, stability, and seismically induced liquefaction; and performing the majority of the individual analyses in GeoStudio software. He also has experience in geotechnical risk and fragility analysis, as demonstrated by his work on the Sardis earthquake analysis and remediation project described above.

Mr. Fleming is knowledgeable in all phases of alternatives development and evaluation and was involved in numerous USACE planning studies investigating flood control alternatives. In addition, he has served on four IEPR panels: (1) as the geotechnical, structural, and cost engineering reviewer for the Jordan Creek-Springfield, Greene County, Missouri, Feasibility Study Report and Environmental Assessment (2013), (2) as the geotechnical reviewer for the Manhattan Kansas Section 216, Feasibility Study (2014). (3) Malibu Creek Ecosystem Restoration Study, California and (4) The Middle Rio Grande Flood

Protection Project, New Mexico. He can address the USACE Safety Assurance Review (SAR) aspects of all projects due to his experience and background in the development and implementation of the Design Quality Management System and the Independent Technical Review Process for USACE, Vicksburg District. He also served as an independent consultant on the Interagency Performance and Evaluation Task Force for the New Orleans Hurricane Protection System.

Mr. Fleming actively participates in professional engineering and scientific societies. He is a fellow of the American Society of Civil Engineers and a member of the U.S. Society on Dams and the Society of American Military Engineers.

Name	Ronald Vann, P.E.
Role	Port Operations
Affiliation	Independent consultant

Mr. Vann is a licensed professional engineer (P.E.) and private consultant with 52 years of experience as a civil and environmental engineer specializing in all aspects of dredging and channel design. For more than 38 years, he worked for USACE's Mobile, Baltimore, and, most recently, Norfolk Districts, retiring from the Norfolk District in 2003. He earned his B.S. in civil engineering from Virginia Polytechnic Institute and State University (Virginia Tech) in 1965 and has earned credits toward an M.S. in oceanography from Old Dominion. He currently is a senior engineering consultant supporting private clients and government agencies, including the City of Virginia Beach; USACE Norfolk, Mobile, and Chicago Districts; Virginia Port Authority; City of Norfolk; Maryland Port Authority; Maryland Environmental Service; and USACE Waterways Experiment Station (WES).

During his career with USACE, Mr. Vann held numerous senior technical and management positions requiring expertise in the planning, design, permitting, and management of complex civil engineering and environmental projects, many involving multiple aspects of dredged material management. As Chief of Operations Branch with USACE, he was responsible for the budget, engineering, environmental analysis, and scheduling for the Norfolk District's complex Civil Works dredging and operations program. The program included 70 navigation projects, two navigation locks, the Craney Island Dredged Material Management Facility, and the Gathright Dam and Reservoir. For the Craney Island project, Mr. Vann served as senior technical and policy advisor to expand the island for additional dredged material placement and construction of a port facility for the Virginia Port Authority. For that effort, he was responsible for permitting, planning, and managing a wide range of marine infrastructure projects that included channel approaches, coordination with proposed bridge and tunnel crossings, and mitigation measures.

Mr. Vann has overseen the development and advancement of numerous innovative technologies to solve complex engineering and environmental challenges. While at USACE, he constructed USACE's first offshore sandbar with dredged material (Murden's Mound off Virginia Beach). He co-developed USACE's first automated hydrographic survey system and facilitated the transfer and adoption of this system to over 20 USACE districts. He pioneered the use of ship simulation, asymmetrical channel design, and phased element construction of navigation channels within USACE. He also was responsible for the technical investigation, permitting, and design of the first USACE and U.S. Environmental Protection Agency (EPA) ocean disposal site (the Dam Neck Site) for dredged

material. Mr. Vann also was responsible for developing over 50 long-term placement sites in the Norfolk District that incorporated beneficial and economical use of dredged material. His responsibilities included both engineering and environmental aspects of the projects. He led the coordination and evaluation of all alternatives and also led all efforts in dealing with policy and cost-sharing procedures involving local sponsors, environmental agencies, local users, and Congress.

Mr. Vann has presented technical papers at more than 100 technical conferences. He is a member of PIANC (the World Association for Waterborne Transport Infrastructure), the Western Dredging Association, the USACE Committee on Tidal Hydraulics, and three international exchange work groups. Mr. Vann also was responsible for developing the joint USACE/Old Dominion University Seminar series on dredged material management.

As Chief of Operations, Norfolk District, Mr. Vann was responsible for the Virginia portion of two shallow-draft inland Waterways: the Atlantic Intercoastal Waterway, which extends from New England to Florida, and a waterway that extended 62 miles along the Coast of Virginia known as WCV. Mr. Vann took a leadership role to establish partnerships for each Waterway that identified responsible and interested parties to charged with working together to identify needs and develop alternatives for consideration. As a member of a WES and Engineer Research and Development Center field review group, he evaluated navigation improvements necessary to a number navigation projects throughout the Corps projects. Several included the GIWW.

Mr. Vann has earned credit toward an M.S. in port management.

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APPENDIX C

Final Charge for the BRFG-CRL IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study

This is the final Charge to the Panel for the BRFG-CRL IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on February 28, 2018.

BACKGROUND

The Gulf Intracoastal Water Way (GIWW) is a man-made, shallow-draft waterway that was completed in 1945. Its span is 1,100 miles long and connects ports along the Gulf of Mexico from St. Marks, Florida, to Brownsville, Texas. The portion of the GIWW in Texas is authorized to a 125-foot width with a channel depth of 12 feet running for 406 miles along the coast. It is the third busiest inland waterway in the United States (as of 2015), with the Texas portion handling 75 percent of its traffic. It continues to rank in the top 10 in the nation in total waterborne tonnage moved in the United States (approximately 73 million short tons of cargo annually), with the majority of its cargo consisting of petroleum- and chemical-based products. The Colorado River Locks in Matagorda, Texas, are operated by the U.S. Army Corps of Engineers (USACE) and are the only ones on the Texas portion of the GIWW.

The study area encompasses two locations on the GIWW along the Texas Coast. The Brazos River Floodgates are located about 7 miles southwest of Freeport, Texas, at the intersection of the Brazos River and the GIWW in Brazoria County. The Colorado River Locks are located near Matagorda, Texas, at the intersection of the Colorado River and the GIWW in Matagorda County.

The Galveston District initiated a reconnaissance study to assess the feasibility of modifying the configurations of the crossings to reduce traffic accidents and delays where the GIWW intersects the Colorado and Brazos Rivers. The resulting Section 905(b) analysis produced a finding of Federal interest in continuing to the feasibility phase of the study. The purpose of the feasibility phase study is to re-evaluate the proposed alternatives from the reconnaissance to determine the feasibility of undertaking modifications to the Brazos and Colorado River GIWW crossings, as well as identify changes to the floodgate and lock structures at each location where such changes are economically and environmentally justified. The goal is to reduce navigation impacts and costly waterborne traffic delays that are a result of aging infrastructure and inadequate channel dimensions for modern vessels.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Gulf Intracoastal Water Way (GIWW) Brazos River Floodgate and Colorado River Lock Feasibility Study (hereinafter: BRFG-CRL IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (USACE), Water Resources Policies and Authorities' *Civil Works Review* (Engineer Circular [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 decision 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) who meet the technical criteria and areas of expertise required for and relevant to the project.

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. The review assignments per panel member may vary slightly according to discipline.

Table 1. Documents to be Reviewed by Subject Matter Experts

Review Documents	Subject Experts					
	No. of Review Pages	Civil Works Planner/Economics	Biological Resources and Environ. Law Compliance	Hydrology and Hydraulic Engineer	Civil Engineer	Port Operations Expert
Draft Integrated Feasibility Report and Integrated Environmental Assessment	187	187	187	187	187	187
Appendix A: Engineering; Appendix 1 Hydraulic Engineering	385			385	385	385
Appendix B: Economics	100	100				
Appendix C: Real Estate Plan	41	41				
Appendix D: Environmental	288		288			
Total # of Review Pages	1,001	328	475	572	572	572
Supplemental Information ^a						
Public Comments ^b	100	100	100	100	100	100
Report Summary	28	28	28	28	28	28
Risk Register	10	10	10	10	10	10
Total # of Reference Pages	138	138	138	138	138	138

^a Supporting documentation only. These documents are not for Panel review and should be used as information sources only. They are not included in the total page count.

^b Page count for public comments is approximate. USACE will submit public comments to Battelle, who will in turn submit the comments to the IEPR Panel.

Documents for Reference

- USACE guidance *Civil Works Review*, (EC 1165-2-214, December 15, 2012)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004)
- USACE Climate Change Adaptation Plan (June 2014)
- ETL 1100-2-1 – Procedures to Evaluate SLR Change Impacts Responses Adaptation
- ER 1100-2-8162 – Incorporating SLR Change in CW Programs
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART – Planning Overview
- Planning Modernization Fact Sheet.

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents and may be revised if review document availability changes. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with MS Word (Office 2003).

Table 2. Schedule of Panel Activities

Task	Action	Due Date
Attend Meetings and Begin Peer Review	Subcontractors complete mandatory Operations Security (OPSEC) training	4/7/2018
	Battelle sends review documents to panel members	3/9/2018
	Battelle convenes kick-off meeting with panel members	3/12/2018
	Battelle convenes kick-off meeting with USACE and panel members	3/13/2018
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	3/28/2018
Prepare Final Panel Comments	Panel members complete their individual reviews	4/9/2018
	Battelle provides talking points for Panel Review Teleconference to panel members	4/11/2018
	Battelle convenes Panel Review Teleconference	4/12/2018
	Battelle provides Final Panel Comment templates and instructions to panel members	4/13/2018

Table 2. Schedule of Panel Activities, continued.

Task	Action	Due Date
Prepare Final Panel Comments and Review Public Comments	Panel members provide draft Final Panel Comments to Battelle	4/19/2018
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	4/20/2018 - 4/26/2018
	Panel finalizes Final Panel Comments	4/27/2018
	Battelle receives public comments from USACE	4/4/2018
	Battelle sends public comments to Panel	4/11/2018
	Panel completes its review of public comments	4/20/2018
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	4/23/2018
	Panel drafts Final Panel Comment for public comments, if necessary	4/25/2018
	Panel finalizes Final Panel Comment regarding public comments, if necessary	4/27/2018
Review Final IEPR Report	Battelle provides Final IEPR Report to panel members for review	5/1/2018
	Panel members provide comments on Final IEPR Report	5/3/2018
	*Battelle submits Final IEPR Report to USACE	5/8/2018
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	5/14/2018
Comment-Response Process	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	5/16/2018
	Battelle convenes teleconference with USACE to review the Comment Response process	5/16/2018
	Battelle convenes teleconference with Panel to review the Comment Response process	5/16/2018
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	6/4/2018
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	6/8/2018
	USACE PCX provides draft PDT Evaluator Responses to Battelle	6/11/2018
	Battelle provides draft PDT Evaluator Responses to panel members	6/13/2018
	Panel members provide draft BackCheck Responses to Battelle	6/18/2018
Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	6/19/2018	

Table 2. Schedule of Panel Activities, continued.

Task	Action	Due Date
Comment-Response Process	Battelle convenes Comment Response Teleconference with panel members and USACE	6/20/2018
	USACE inputs final PDT Evaluator Responses to DrChecks	6/27/2018
	Battelle provides final PDT Evaluator Responses to panel members	6/29/2018
	Panel members provide final BackCheck Responses to Battelle	7/5/2018
	Battelle inputs panel members' final BackCheck Responses to DrChecks	7/5/2018
	*Battelle submits pdf printout of DrChecks project file	7/6/2018
SLM 1	Senior Leader Meeting (SLM) 1 - Agency Decision Milestone (ADM) Meeting	6/13/2018
SLM 2	Senior Leader Meeting 2 – Post-ADM	3/15/2019
	Contract End/Delivery Date	5/30/2019

* Deliverables

** Battelle will provide public comments to the Panel after they have completed their individual reviews of the project documents to ensure that the public comment review does not bias the Panel's review of the project documents.

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and 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 decision 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 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. mm

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 (Jessica Tenzar; tenzarj@battelle.org) or Program Manager (Lynn McLeod; mcleod@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod(mcleod@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 the Jessica Tenzar; tenzarj@battelle.org no later than 10 pm ET by the date listed in the schedule above.

Charge Questions and Relevant Sections as Supplied by USACE

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

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

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

Further,

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

For the tentatively selected plan, assess whether:

13. The models used to assess life safety hazards are appropriate
14. The assumptions made for the life safety hazards are appropriate
15. The quality and quantity of the surveys, investigations, and engineering are sufficient to develop a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards

16. The analysis adequately address the uncertainty and residual risk given the consequences associated with the potential for loss of life for this type of project.

Battelle Summary Charge Questions to the Panel Members¹

Summary Questions

17. Please identify the most critical concerns (up to five) 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.
18. Please provide positive feedback on the project and/or review documents.

Public Comment Questions

19. Do the public comments raise any additional discipline-specific technical concerns with regard to the overall report?

¹ Questions 17 through 19 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

APPENDIX D

Conflict of Interest Form

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Conflicts of Interest Questionnaire
Independent External Peer Review
Gulf Intracoastal Water Way
Brazos River Floodgate and Colorado River Lock Feasibility Study

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

NAME OF FIRM: **Battelle Memorial Institute Corporate Operations**
REPRESENTATIVE'S NAME: **Courtney M. Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **brooksc1@battelle.org**

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

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

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

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

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

No additional information to report.

Courtney M. Brooks

Courtney M. Brooks

August 24, 2017

Date

BATTELLE

It can be done