

Final Independent External Peer Review Report Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois

Prepared by
Battelle Memorial Institute

Prepared for
U.S. Army Corps of Engineers
Ecosystem Restoration Planning Center of Expertise
Mississippi Valley Division

Contract No. W912HQ-15-D-0001
Task Order: W912HQ17F1064

January 16, 2018

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Dave Wethington, USACE

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It can be done

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The GLMRIS-Brandon Road Report is a feasibility study (FS) that is building on the foundation of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) Report released in January 2014. The purpose of this study is to evaluate structural and nonstructural options and technologies near the Brandon Road Lock and Dam (L&D) site, with the goal of establishing a single control point to prevent the upstream transfer of aquatic nuisance species (ANS) from the Mississippi River (MR) Basin into the Great Lakes (GL) Basin, to the maximum extent possible, while minimizing impacts on existing waterways uses and users.

As the first of possible phased actions to the GLMRIS study authority, this FS addresses the upstream transfer – from the MR Basin to the GL Basin – of ANS through the Chicago Area Waterway System (CAWS). This study will not examine: (1) downstream transfer of ANS from the GL Basin to the MR Basin, (2) transfer of ANS along the entire basin divide through an aquatic pathway, or (3) transfer of ANS via non-aquatic pathways, though the report does recognize that non-aquatic pathways do exist.

The GLMRIS Report identified several alternatives to address the problem of interbasin transfer of ANS, but full implementation of several of the alternatives would require a substantial investment of time and money. Given the potential urgency of the threat and in response to a growing consensus, the Secretary of the Army (Secretary) has determined that a formal evaluation of potential control options and technologies to be applied near the Brandon Road L&D is an appropriate next step. The Brandon Road L&D provides singular advantages for further study. The approach channel and lock provide a unique opportunity to control upstream ANS transfer in a relatively small section of the river due to the fact that the majority of the waterway flows over a high-head dam, and the only potential upstream passage is through a lock. These conditions provide the opportunity to optimize the operational characteristics of the ANS controls, maximize the efficiency of applied technologies, and minimize the associated costs for implementation and operation. Establishing a control point near Brandon Road L&D for upstream transfer of MR ANS does not adversely impact flood risk or water quality of the CAWS and provides for additional defense-in-depth for particular species of concern (Asian carp)¹ when combined with the current electric barrier dispersal system located in Romeoville, IL.

¹ While Asian carp (AC) include Silver, Bighead, and Grass carp, the focus of preventing AC expansion into the Great Lakes is on Silver and Bighead carp. Grass carp are already present as a reproducing population in Lake Erie and without the negative impact of Silver or Bighead carp.

As a partial answer to the problem of ANS transfer between the GL and MR Basins through aquatic pathways, this FS leaves open the decision of whether and to what extent one of the more complete alternatives identified in the GLMRIS Report should be recommended for implementation. As such, this FS evaluates alternatives for addressing the problem of upstream transfer of ANS from the MR Basin to the GL Basin through aquatic pathways, while deferring consideration of alternatives that would address transfer of GL ANS to the MR Basin. Further, study of transfer of MR species of concern to the GL Basin through other, lower-risk pathways continues through cooperation with state and local resource agencies.

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 IEPR of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois (hereinafter: GLMRIS Brandon Road). 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: environmental, economic, civil engineering, and risk methods and expert elicitation. 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 four-person Panel from this list.

The Panel received electronic versions of the decision documents (1,642 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, 13 Final Panel Comments were identified and documented. Of these, two were identified as having

medium/high significance, four had a medium significance, five had medium/low significance, and two had low significance.

Battelle received public comments from USACE on the GLMRIS Brandon Road project (verbal transcripts and comments from three public meetings, a video of a fourth public meeting held in New Orleans, and a summary file with 1,357 individual comments, totaling approximately 830 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 GLMRIS Brandon Road review documents. After completing its review, the Panel noted that some of the issues raised in the public comments augmented several of their IEPR Final Panel Comments. These Final Panel Comments were updated to include this detail.

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 GLMRIS Brandon Road review documents. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel’s findings.

Based on the Panel’s review, the overall report is detailed and provides supporting documentation on most engineering, environmental, economic, and plan formulation issues. The report provides a fairly 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.

Plan Formulation and Risk Assessment: The Panel agrees that the presentation of the risk assessment and its underlying expert elicitation process emphasizes the limitations and uncertainties associated with the overall assessment. The expert elicitation only provides estimates of relative risk of ANS establishment and relative risk reductions possibly afforded by the proposed management alternatives. The Panel notes that evaluating the proposed management alternatives and identifying a TSP based on relative risk reduction results in an unknown absolute effectiveness in controlling ANS establishment and propagation in the Great Lakes. The Panel recommends that USACE continue the elicitation by asking the same experts to directly estimate the probabilities of colonization and spread for each of the management alternatives. Additionally, the Panel believes that the simple average composite expert scores might inaccurately characterize the relative risk reductions afforded by the proposed alternatives and bias the identification of the TSP. It is suggested that each proposed planning alternative be analyzed separately by using the results of each individual expert, and then these individual expert results be compared to those obtained from the composite expert assessment to gain some additional insights on the implications of using the simple average composite value.

The Panel observed that the main report and supporting appendices indicate that the absolute effectiveness of the proposed control technologies (i.e., water jets, underwater noise, and electric barriers) have been minimally quantified and remain incompletely understood in their ability to regulate the movements of ANS. The Panel recommends that additional studies be performed to quantify the effectiveness of electric barriers, underwater noise, and water jets in blocking the movements of the invading species of Asian carp at different life stages.

Finally, the Panel noted that further analysis of the costs of Adaptive Management (AM) is needed to examine the implications of cost constraints on the implementation of the proposed AM plan. The Panel suggests that contingency budget plans be developed to address possible exceedances of the 10 percent constraint.

Economics: The Panel's primary concern is that the report does not clearly address why the measured outputs of the proposed project are worth the costs of obtaining those outputs. The output in this case is measured as reductions in the probability of dangerous propagation of ANS in the Great Lakes. The report addresses the significance of resources being protected as well as other decisional factors, but does not address whether the incremental outputs of probability reduction are worth the additional costs. The Panel recommends that USACE explain in greater detail why the small increase in risk reduction justifies the relatively high cost of the TSP over the Non-Structural Alternative (NSA). Additionally, the Panel agrees that the decision documents do not clearly explain how the adverse National Economic Development (NED) impacts due to "going out of business" are derived. The main report does not address the business losses for the Lock Closure Alternative, nor does it appear to be addressed in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) decision-making analysis. The Panel suggests a clear and concise description of the derivation of the "going out of business" losses associated with the alternative plans be added to the report and the associated NED costs be described in the main report as well. The final economic concern is that although the NED costs are presented in the Economic Appendix, they are not explicitly discussed in the main report, nor is the magnitude of the business closure losses relative to the project implementation costs addressed. The Panel recommends for clarity that the magnitude of the NED transportation costs be discussed in direct and clear terms in the main report.

Engineering: The Panel found that the engineering used to develop conceptual designs and project formulation alternatives meets accepted standard engineering practice for this level of feasibility study. However, it did observe that the development of a construction schedule for features that may be added to the project in the future needs added documentation for clarity. The Panel suggests that the process, including assumptions and reasoning used to select the construction schedule for future lock features, should be clearly documented in the Engineering Appendix. Additionally, the Panel noted that the physical modeling analysis recommends redoing the culvert valves and adding tiebacks at the downstream lock gates. These recommendations are not reported in the Engineering Appendix. For understanding and clarity, the Panel suggests documenting the assumptions and reasoning used in alternative analysis of the construction schedule for features that may be added to the project in future. Finally, the Panel acknowledged that the aquatic pathways are identified based on the 1% Federal Emergency Management Agency (FEMA) floodplain. Using the 0.5% or 0.2% FEMA floodplains to identify aquatic pathways could help identify additional pathways and provide an added basis for risk analysis of carp passage. The Panel recommends all aquatic pathway investigations be documented in the integrated Feasibility Study/Environmental Impact Statement (FS/EIS), along with any future plans if investigations have not been completed.

Environmental: The Panel observed that the documentation was extensive and contained a high level of detail, resulting in a concerted effort to be complete and accurate. However, the Panel did note two environmental concerns. First, the Panel believes it would benefit the report to have an outline of all consequences, both negative and positive, of Asian Carp invading the Great Lakes, as outlined in the Zhang et al. (2016) report. Second, the Panel is concerned whether fish entrainment has been fully evaluated. A new study shows that fish can pass through the Chicago and Sanitary Ship Channel

(CSSC) electric barrier via barge entrainment. This raises the possibility that fish could also pass in the same way through the proposed Brandon Road electric barrier. The Panel believes the main report needs to study the issue of entrainment; as it stands, it is an unaddressed threat.

Public Comments: Based on the Panel's review, the majority of the public comments fell into the category of general support of or opposition to the TSP as proposed, while others commented on more aggressive implementation of the TSP, offering modifications or new options for enhancing the TSP. The Panel assumes USACE is reviewing and assimilating the public comments related to this topic. The Panel also observed that commenters from the Great Lakes region tend to support any possible solution that would prevent Asian Carp, with some insisting on a total separation, whereas those who stand to be adversely affected by the temporal closure of the locks and/or the operation of the TSP favor the continuation of non-structural actions only.

Several public comments were similar in nature to ones identified by the Panel and discussed in Final Panel Comments previously developed by the Panel. Four Final Panel Comments were updated to incorporate public comments related to an issue highlighted by the Panel. These Final Panel Comments focused on the relevance of the composite expert results in characterizing risk assessment for the Brandon Roads project (Final Panel Comment 3); the uncertainties associated with the modeling scenarios in Zhang et al. (2016) and the underscored need for a more comprehensive economic analysis of Asian carp impacts (Final Panel Comment 5); the demonstrated vulnerability of the CSSC barrier and implications for the proposed Brandon Road electric barrier (Final Panel Comment 6); and additional analysis of floodplains or flood years in relation to the proposed plan (Final Panel Comment 13).

The Panel also reviewed three public comment transcripts and watched the recording of the New Orleans Public Meeting. It noted that most comments were similar to the written public comments reviewed. However, it was apparent those with navigation interests who opposed the TSP and favored the NSA were a strong presence at the meeting. Additionally, USACE discussed a 40-day closure for construction, and about a 2.5-hour delay per lockage during operations. They did not describe the monetary consequences of these impacts, which are related to Final Panel Comments 10 and 11.

Table ES-1. Overview of 13 Final Panel Comments Identified by the GLMRIS Brandon Road IEPR Panel

No.	Final Panel Comment
Significance – Medium/High	
1	The CE/ICA does not address whether the additional costs of the TSP are justified.
2	Without any quantitative relation to absolute risks and risk reductions, the overall risk assessment model provides information of unknown quality and reliability for evaluating proposed alternatives and selecting a preferred alternative.
Significance – Medium	
3	The risk assessment for the Brandon Roads project is based on the use of a simple composite expert scoring approach, which could potentially bias the results of risk assessment and selection of a preferred alternative.

No.	Final Panel Comment
4	The derivation of the adverse NED impacts of the plant closures that make up a large proportion of the NED costs is not sufficiently detailed to support the economic analysis.
5	Documentation regarding Asian carp in the Great Lakes is insufficient to support the consequence projections presented in the draft integrated FS/EIS.
6	It is not clear whether fish entrainment has been fully evaluated in the draft integrated FS/EIS.
Significance – Medium/Low	
7	The modeling assumption about the predation of Asian carp on indigenous fish larvae qualitatively affects the model results and inferences of positive or negative impacts on Great Lakes fisheries.
8	The anticipated effectiveness of the technologies available for controlling ANS establishment is based on limited data and experience.
9	The report does not clearly present the adverse impacts on transportation of goods and material, which are the major portion of NED costs.
10	The lack of contingency in the construction schedule could have an adverse impact on the transportation costs.
11	It is unclear whether the downstream culvert valves and lock gate tiebacks will be implemented and if the cost and closure times are included in the TSP.
Significance – Low	
12	The projected cost constraint on the administration of the Adaptive Management Plan could impact the effectiveness of adaptive management and overall project success.
13	Additional flood levels, such as the FEMA 0.5% or 0.2% floodplains, have not been evaluated, and additional aquatic pathways may not have been identified.

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LIST OF ACRONYMS

ADM	Agency Decision Milestone
AM	Adaptive Management
ANS	Aquatic Nuisance Species
ATR	Agency Technical Review
CAWS	Chicago Area Waterway System
CE/ICA	Cost Effectiveness/Incremental Cost Analysis
CSSC	Chicago and Sanitary Ship Canal
COI	Conflict of Interest
DrChecks	Design Review and Checking System
EC	Engineer Circular
EIS	Environmental Impact Statement
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FS	Feasibility Study
GL	Great Lakes
GLMRIS	Great Lakes and Mississippi River Interbasin Study
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
L&D	Lock and Dam
MR	Mississippi River
NED	National Economic Development
NEPA	National Environmental Policy Act
NSA	Non-Structural Alternative
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PDT	Project Delivery Team
TAEB	Technical Alternative Electric Barrier
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1. INTRODUCTION

The GLMRIS-Brandon Road Report is a feasibility study (FS) that is building on the foundation of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) Report released in January 2014. The purpose of this study is to evaluate structural and nonstructural options and technologies near the Brandon Road Lock and Dam (L&D) site, with the goal of establishing a single control point to prevent the upstream transfer of aquatic nuisance species (ANS) from the Mississippi River (MR) Basin into the Great Lakes (GL) Basin, to the maximum extent possible, while minimizing impacts on existing waterways uses and users.

As the first of possible phased actions to the GLMRIS study authority, this FS addresses the upstream transfer – from the MR Basin to the GL Basin – of ANS through the Chicago Area Waterway System (CAWS). This study will not examine: (1) downstream transfer of ANS from the GL Basin to the MR Basin, (2) transfer of ANS along the entire basin divide through an aquatic pathway, or (3) transfer of ANS via non-aquatic pathways, though the report does recognize that non-aquatic pathways do exist.

The GLMRIS Report identified several alternatives to address the problem of interbasin transfer of ANS, but full implementation of several of the alternatives would require a substantial investment of time and money. Given the potential urgency of the threat and in response to a growing consensus, the Secretary of the Army (Secretary) has determined that a formal evaluation of potential control options and technologies to be applied near the Brandon Road L&D is an appropriate next step. The Brandon Road L&D provides singular advantages for further study. The approach channel and lock provide a unique opportunity to control upstream ANS transfer in a relatively small section of the river due to the fact that the majority of the waterway flows over a high-head dam, and the only potential upstream passage is through a lock. These conditions provide the opportunity to optimize the operational characteristics of the ANS controls, maximize the efficiency of applied technologies, and minimize the associated costs for implementation and operation. Establishing a control point near Brandon Road L&D for upstream transfer of MR ANS does not adversely impact flood risk or water quality of the CAWS and provides for additional defense-in-depth for particular species of concern (Asian carp) when combined with the current electric barrier dispersal system located in Romeoville, IL.

As a partial answer to the problem of ANS transfer between the GL and MR Basins through aquatic pathways, this FS leaves open the decision of whether and to what extent one of the more complete alternatives identified in the GLMRIS Report should be recommended for implementation. As such, this FS evaluates alternatives for addressing the problem of upstream transfer of ANS from the MR Basin to the GL Basin through aquatic pathways, while deferring consideration of alternatives that would address transfer of GL ANS to the MR Basin. Further, study of transfer of MR species of concern to the GL Basin through other, lower-risk pathways continues through cooperation with state and local resource agencies.

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 Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois (hereinafter: GLMRIS Brandon Road) 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 GLMRIS Brandon Road 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 conflict of interest form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the GLMRIS Brandon Road 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 (ATR), as described in USACE (2012).

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

In this case, the IEPR of the GLMRIS Brandon Road 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, and are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: environmental, economic, civil engineering, and risk methods and expert elicitation. The Panel reviewed the GLMRIS Brandon Road documents and produced 13 Final Panel Comments in response to 39 charge questions provided by USACE for the review. This charge included one overview question 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 GLMRIS Brandon Road IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the overall report is detailed and provides supporting documentation on most engineering, environmental, economic, and plan formulation issues. The report provides a fairly 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.

Plan Formulation and Risk Assessment: The Panel agrees that the presentation of the risk assessment and its underlying expert elicitation process emphasizes the limitations and uncertainties associated with the overall assessment. The expert elicitation only provides estimates of relative risk of ANS establishment and relative risk reductions possibly afforded by the proposed management alternatives. The Panel notes that evaluating the proposed management alternatives and identifying a TSP based on relative risk reduction results in an unknown absolute effectiveness in controlling ANS establishment and propagation in the Great Lakes. The Panel recommends that USACE continue the elicitation by asking the same experts to directly estimate the probabilities of colonization and spread for each of the management alternatives. Additionally, the Panel believes that the simple average composite expert scores might inaccurately characterize the relative risk reductions afforded by the proposed alternatives and bias the identification of the TSP. It is suggested that each proposed planning alternative be analyzed separately by using the results of each individual expert, and then these individual expert results be compared to those obtained from the composite expert assessment to gain some additional insights on the implications of using the simple average composite value.

The Panel observed that the main report and supporting appendices indicate that the absolute effectiveness of the proposed control technologies (i.e., water jets, underwater noise, and electric barriers) have been minimally quantified and remain incompletely understood in their ability to regulate the movements of ANS. The Panel recommends that additional studies be performed to quantify the effectiveness of electric barriers, underwater noise, and water jets in blocking the movements of the invading species of Asian carp at different life stages.

Finally, the Panel noted that further analysis of the costs of Adaptive Management (AM) is needed to examine the implications of cost constraints on the implementation of the proposed AM plan. The Panel suggests that contingency budget plans be developed to address possible exceedances of the 10 percent constraint.

Economics: The Panel's primary concern is that the report does not clearly address why the measured outputs of the proposed project are worth the costs of obtaining those outputs. The output in this case is measured as reductions in the probability of dangerous propagation of ANS in the Great Lakes. The report addresses the significance of resources being protected as well as other decisional factors, but does not address whether the incremental outputs of probability reduction are worth the additional costs. The Panel recommends that USACE explain in greater detail why the small increase in risk reduction justifies the relatively high cost of the TSP over the Non-Structural Alternative (NSA). Additionally, the Panel agrees that the decision documents do not clearly explain how the adverse National Economic Development (NED) impacts due to "going out of business" are derived. The main report does not address the business losses for the Lock Closure Alternative, nor does it appear to be addressed in the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) decision-making analysis. The Panel suggests a clear and concise description of the derivation of the "going out of business" losses associated with the alternative plans be added to the report and the associated NED costs be described in the main report as well. The final economic concern is that although the NED costs are presented in the Economic Appendix, they are not explicitly discussed in the main report, nor is the magnitude of the business closure losses relative to the project implementation costs addressed. The Panel recommends for clarity that the magnitude of the NED transportation costs be discussed in direct and clear terms in the main report.

Engineering: The Panel found that the engineering used to develop conceptual designs and project formulation alternatives meets accepted standard engineering practice for this level of feasibility study. However, it did observe that the development of a construction schedule for features that may be added to the project in the future needs added documentation for clarity. The Panel suggests that the process, including assumptions and reasoning used to select the construction schedule for future lock features, should be clearly documented in the Engineering Appendix. Additionally, the Panel noted that the physical modeling analysis recommends redoing the culvert valves and adding tiebacks at the downstream lock gates. These recommendations are not reported in the Engineering Appendix. For understanding and clarity, the Panel suggests documenting the assumptions and reasoning used in alternative analysis of the construction schedule for features that may be added to the project in future. Finally, the Panel acknowledged that the aquatic pathways are identified based on the 1% Federal Emergency Management Agency (FEMA) floodplain. Using the 0.5% or 0.2% FEMA floodplains to identify aquatic pathways could help identify additional pathways and provide an added basis for risk analysis of carp passage. The Panel recommends all aquatic pathway investigations be documented in the integrated Feasibility Study/Environmental Impact Statement (FS/EIS), along with any future plans if investigations have not been completed.

Environmental: The Panel observed that the documentation was extensive and contained a high level of detail, resulting in a concerted effort to be complete and accurate. However, the Panel did note two environmental concerns. First, the Panel believes it would benefit the report to have an outline of all consequences, both negative and positive, of Asian Carp invading the Great Lakes, as outlined in the Zhang et al. (2016) report. Second, the Panel is concerned whether fish entrainment has been fully evaluated. A new study shows that fish can pass through the Chicago and Sanitary Ship Channel

(CSSC) electric barrier via barge entrainment. This raises the possibility that fish could also pass in the same way through the proposed Brandon Road electric barrier. The Panel believes the main report needs to study the issue of entrainment; as it stands, it is an unaddressed threat.

Public Comments: Based on the Panel's review, the majority of the public comments fell into the category of general support of or opposition to the TSP as proposed, while others commented on more aggressive implementation of the TSP, offering modifications or new options for enhancing the TSP. The Panel assumes USACE is reviewing and assimilating the public comments related to this topic. The Panel also observed that commenters from the Great Lakes region tend to support any possible solution that would prevent Asian Carp, with some insisting on a total separation, whereas those who stand to be adversely affected by the temporal closure of the locks and/or the operation of the TSP favor the continuation of non-structural actions only.

Several public comments were similar in nature to ones identified by the Panel and discussed in Final Panel Comments previously developed by the Panel. Four Final Panel Comments were updated to incorporate public comments related to an issue highlighted by the Panel. These Final Panel Comments focused on the relevance of the composite expert results in characterizing risk assessment for the Brandon Roads project (Final Panel Comment 3); the uncertainties associated with the modeling scenarios in Zhang et al. (2016) and the underscored need for a more comprehensive economic analysis of Asian carp impacts (Final Panel Comment 5); the demonstrated vulnerability of the CSSC barrier and implications for the proposed Brandon Road electric barrier (Final Panel Comment 6); and additional analysis of floodplains or flood years in relation to the proposed plan (Final Panel Comment 13).

The Panel also reviewed three public comment transcripts and watched the recording of the New Orleans Public Meeting. It noted that most comments were similar to the written public comments reviewed. However, it was apparent those with navigation interests who opposed the TSP and favored the NSA were a strong presence at the meeting. Additionally, USACE discussed a 40-day closure for construction, and about a 2.5-hour delay per lockage during operations. They did not describe the monetary consequences of these impacts, which are related to Final Panel Comments 10 and 11.

[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

The CE/ICA does not address whether the additional costs of the TSP are justified.

Basis for Comment

The report does not clearly address why the measured outputs of the proposed project are worth the costs of obtaining those outputs. USACE guidance in ER 1105-2-100 (USACE, 2000; p. E-163) states that “Selecting the NER plan requires careful consideration of the plan that meets planning objectives and constraints and reasonably maximizes environmental benefits while passing tests of cost effectiveness and incremental cost analyses, significance of outputs, acceptability, completeness, efficiency, and effectiveness.”

The decisional analysis of the Cost Effectiveness/Incremental Cost Analysis (CE/ICA) does not explicitly address the outputs of the project. The output in this case is measured as reductions in the probability of dangerous propagation of Aquatic Nuisance Species (ANS) in the Great Lakes. The report addresses the significance of resources being protected as well as other decisional factors, but does not address whether the incremental outputs of probability reduction are worth the additional costs. Information and analyses should be made available to ascertain that the benefits are worth the costs.

Table 8-6 in the main report provides a summary of the ICA for the Asian carp species. This table shows that the incremental costs of the Non-Structural Alternative (NSA) are \$1,300,000 per unit of output, with output measure as reduction in probability of no establishment from 71 percent chance to 80 percent chance (a reduction of 9 percent in probability of establishment of ANS and increase in outputs). The Tentatively Selected Plan (TSP) has an incremental cost of \$6.6 million per unit of output for an additional 7 percent decrease in probability, but the report does not provide a justification for why it is deemed worth the additional \$6 million in project costs for the additional outputs.

Furthermore, plan TAEB (Technical Alternative Electric Barrier) has an additional 2 percent reduction in probability for an additional \$4.4 million in annual costs (an incremental cost of \$2.2 million per unit of output). Given the willingness to pay \$6.6 million of additional costs per unit of output, the Panel is unclear why it would not be worth considering the lower \$2.2 million incremental cost. The TAEB also has lower overall average cost per unity output than the TSP.

Significance – Medium/High

The report does not address the significant costs for the additional outputs associated with the TSP and why they are worth incurring to obtain the additional uncertain outputs.

Recommendation for Resolution

1. Explain why the additional costs of the TSP for further reductions in the probability of ANS propagation in the Great Lakes are necessary compared to the NSA and other plans.
2. Explain why a more expensive plan (i.e., TAEB) is not worth the additional costs when it has lower incremental and lower average costs per unit of output than the TSP.

Literature Cited:

USACE (2000). Planning: Planning Guidance Notebook. Engineer Regulation (ER) 1105-2-100. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. April 22, Page E-163.

Final Panel Comment 2

Without any quantitative relation to absolute risks and risk reductions, the overall risk assessment model provides information of unknown quality and reliability for evaluating proposed alternatives and selecting a preferred alternative.

Basis for Comment

The presentation of the risk assessment and its underlying expert elicitation process emphasizes the limitations and uncertainties associated with the overall assessment. The expert elicitation only provides estimates of relative risk of ANS establishment and relative risk reductions possibly afforded by the proposed management alternatives.

The report states that the absolute risk of Asian carp establishment in the Great Lakes and risk reductions afforded by the proposed management alternatives might never be known. The report emphasizes the value of the risk assessment mainly in terms of a consensus among the experts concerning the relative effectiveness of proposed alternative ANS control technologies and management alternatives. However, it is really the risk of ANS establishment in absolute terms that remains paramount.

The decision-making process as described in the documents appears sensible in the context of relative risk. However, without reliable quantitative estimates of the absolute effectiveness of the available control technologies, management decisions (i.e., the TSP) based on relative risk might nonetheless result in Asian carp establishment in Lake Michigan and eventual propagation throughout the Great Lakes.

Alternatively, the proposed alternative judged least effective in controlling Asian carp in relative terms might prove sufficiently effective to reduce the absolute risk of carp establishment to near zero – with considerable cost savings compared to the TSP. The current risk assessment, by its own admission, provides minimal insight concerning which absolute future might occur.

Significance – Medium/High

Evaluating the proposed management alternatives and identifying a TSP based on relative risk reduction results in unknown absolute effectiveness in controlling ANS establishment and propagation in the Great Lakes.

Recommendation for Resolution

1. Continue the elicitation by asking the same experts to directly estimate the probabilities of colonization and spread for each of the management alternatives. Their estimates could then be cross-checked with the results of the initial elicitation used to compute the probabilities to perhaps calibrate the relative risks or check for internal consistency and coherence.

Final Panel Comment 3

The risk assessment for the Brandon Roads project is based on the use of a simple composite expert scoring approach, which could potentially bias the results of risk assessment and selection of a preferred alternative.

Basis for Comment

The expert elicitation and risk assessment processes are described in the main document and presented in detail in Appendix C. The processes appear commensurate with state-of-the-practice methods and approaches for performing a risk assessment based on expert elicitation.

At the same time, the documents underscore the difference of opinion among experts in relation to estimating quantitative risk for the proposed alternatives. The distribution among experts is nearly bimodal. The resulting construction of a “composite expert” by simply averaging across the experts tends to mask these differing opinions. Using the composite expert to evaluate the proposed ANS control alternatives makes sense from the mechanics of risk-based decision making. The bimodal opinions would not well-inform the decision-making process. So the question remains: how relevant is the use of the composite expert results in characterizing risks assessment for the Brandon Roads project? Concerns regarding the disparate opinions of the experts and the use of a simple composite expert in evaluating the proposed ANS control alternatives were similarly expressed in public comment 51041 provided by the Michigan Environmental Council.

Significance – Medium

The simple average composite expert scores might inaccurately characterize the relative risk reductions afforded by the proposed alternatives and bias the identification of the TSP.

Recommendation for Resolution

1. Analyze each proposed planning alternative separately by using the results of each individual expert. Then compare these individual expert results to those obtained from the composite expert assessment to gain some additional insights on the implications of using the simple average composite expert.

Final Panel Comment 4

The derivation of the adverse NED impacts of the plant closures that make up a large proportion of the NED costs is not sufficiently detailed to support the economic analysis.

Basis for Comment

The Economic Appendix (Appendix D) shows that for the structural alternatives, economic losses due to business closures form the majority of the total adverse navigation impacts and a significant proportion of NED costs. Economic losses amount to \$21.4 million of the \$26.2 million increased transportation costs for the TSP. The remainder are traffic delays and re-routings to less efficient modes of transportation. For the TSP, this amounts to \$4.8 million.

An unknown number of businesses report through surveys that they would go out of business if the lock were closed for more than 30 days. The assumed closure period for initial construction is 40 days, which, as recognized in a separate Final Panel Comment, should account for additional time-related uncertainty due to unknowns. A longer construction period could result in more entities going out of business. Any sensitivity analysis of the construction period should take into account the impacts on business closures.

The decision documents do not clearly explain how the adverse National Economic Development (NED) impacts due to “going out of business” are derived. Statements such as, “These shippers...will bear the full reduction in transportation savings” (p. D-79), do not clearly explain how such NED losses are measured. Nor do they explain why the commodities could not be shipped by other business establishments, even if at higher transportation cost.

The main report does not address the business losses for the Lock Closure Alternative, and it does not appear to be addressed in the CE/ICA decision-making analysis.

Significance – Medium

Since business losses amount to a very significant portion of total NED costs, it is of utmost importance that they be clearly explained and presented in the main report.

Recommendation for Resolution

1. Provide a clear and concise description of the derivation of the “going out of business” losses associated with the alternative plans.
2. Provide example calculations of the business losses, separate from the report if necessary.
3. Describe such NED costs in the main report.
4. Address the “going out of business” losses in the CE/ICA decision-making discussions in the Economic Appendix.

Final Panel Comment 5

Documentation regarding Asian carp in the Great Lakes is insufficient to support the consequence projections presented in the draft integrated FS/EIS.

Basis for Comment

The potential consequences of Asian carp establishment in the Great Lakes are limited to the Western Basin of Lake Erie and are based mostly on the Zhang et al. (2016) food web impacts study cited in Executive Summary, Section 6.1.1. While the Panel recognizes that this study employed the best science available, the forecast of the consequences of establishing bighead and silver carp is wide ranging, from having a negative impact on the native fish assemblages to having beneficial effects in the form of a new commercial fishery.

The Panel is not questioning the conclusions of the study or the summary of the results in the main report, but given the current socioeconomic values in the Great Lakes, it must assume that an Asian carp invasion in any part of the Great Lakes would elicit a negative reaction. This assumption was only reinforced by the many public comments advocating for a more substantiated process that would prevent Asian carp from reaching the Great Lakes because of their potential adverse impact. In particular, the Michigan Environmental Council (comment 51041) questioned the uncertainties associated with the modeling scenarios in Zhang et al. (2016) and underscored the need for a more comprehensive economic analysis of Asian carp impacts, including analysis of impacts on recreational boating.

It is the Panel's strong belief that attempts to state any beneficial impact of Asian carp establishment will be met with serious skepticism. However, for completeness, it would benefit the report to have an outline of all consequences, both negative and positive, as outlined in the Zhang et al. (2016) report.

Significance – Medium

A more concise and clear summary of the potential negative and positive consequences of Asian carp in the Great Lakes would benefit both public and professional understanding.

Recommendation for Resolution

1. Balance the conclusions of the Zhang et al. (2016) study with the current local perceptions of potential Asian carp establishment. These clarifications should be tempered by an understanding of the current unacceptability of having Asian carp established in the Western Basin of Lake Erie or anywhere else in the Great Lakes.

Literature Cited:

Zhang, H., E.S. Rutherford, D.M. Mason, J.T. Breck, M.E. Wittmann, R.M. Cooke, D.M. Lodge, J.D. Rothlisberger, X. Zhu, and T.B. Johnson .2016. Forecasting the Impacts of Silver and Bighead Carp on the Lake Erie Food Web, *Trans Am. Fish. Soc.* 145 (1): 136-162.

Final Panel Comment 6

It is not clear whether fish entrainment has been fully evaluated in the draft integrated FS/EIS.

Basis for Comment

The barge entrainment study conducted at the Chicago and Sanitary Ship Canal (CSSC) electric barrier will soon be published in the *Journal of Great Lakes Research* (Davis et al., 2017; currently in press). It was not referenced in the main report or appendices, but may impact the project assessment.

The study shows that fish can pass through the CSSC electric barrier via barge entrainment. This raises the possibility that fish could also pass through the proposed Brandon Road electric barrier via barge entrainment. In addition, two public comments (50810 and 51272) raised concerns about the occurrence of a single silver carp 9 miles above the CSSC electric barrier and the demonstrated vulnerability of that barrier. This extends to the proposed Brandon Road barrier and is potentially compounded by the intermittent operation.

However, the Panel recognizes that the physical dynamics and circumstances are somewhat different at the proposed Brandon Road lock chamber barrier, but believes that the main report needs to address the issue of entrainment. As it stands, it is an unaddressed threat.

Significance – Medium

The potential for an increased risk of fish passage through the electric barrier could hamper project success and potentially undermine the credibility of the TSP.

Recommendation for Resolution

1. Revise the main report to include a summary of the findings of the CSSC barge entrainment study.
2. Assess how potential barge entrainment can be effectively mitigated by the TSP at Brandon Road.

Literature Cited:

Davis, J.J., J.Z. LeRoy, M.R. Shanks, P.R. Jackson, F.L. Engel, E.A. Murphy, C.L. Baxter, J.C. Trovillion, M.K. McInerney, and N.A. Barkowski (in press). Effects of tow transit on the efficacy of the Chicago Sanitary and Ship Canal Electric Dispersal Barrier System. *J. Great Lakes Res.* (2017), <http://dx.doi.org/10.1016/j.jglr.2017.08.013>.

Final Panel Comment 7

The modeling assumption about the predation of Asian carp on indigenous fish larvae qualitatively affects the model results and inferences of positive or negative impacts on Great Lakes fisheries.

Basis for Comment

A modeling study by Zhang et al. (2016) cited in Executive Summary, Section 6.1.1 of the main report was used to assess the implications of Asian carp establishment on Lake Erie food web dynamics and potential impacts on fisheries. It is based on Ecopath/Ecosim, a generally accepted modeling platform. Importantly, a key modeling assumption regarding the predation of Asian carp on indigenous fish larvae qualitatively affects the model results and inferences regarding positive or negative impacts on Great Lakes fisheries.

If the modeling assumption is that Asian carp do not consume the larvae of native species, the model results essentially characterize Asian carp as additional biomass added to the current commercial fisheries. However, if the model defines Asian carp as predators of native fish larvae, the net results of model simulations decrease the biomass of harvested native fishes and the overall economic benefit of the commercial fisheries. Zhang et al. evaluate both assumptions in the model applications, but do not state which assumption is more realistic for Asian carp and native Great Lakes fish larvae.

Significance – Medium/Low

The consequences of an unknown assumption in the food web modeling could affect the economic evaluation of Asian carp establishment and spread in the Great Lakes.

Recommendation for Resolution

1. Thoroughly investigate all available sources of information that might inform the model whether Asian carp are likely to consume (or not) larvae of native fishes, particularly species of commercial importance or their prey fish.
2. Perform the necessary Asian carp feeding experiments to the extent possible under controlled conditions (e.g., mesocosm studies) to address the key modeling assumption.

Final Panel Comment 8

The anticipated effectiveness of the technologies available for controlling ANS establishment is based on limited data and experience.

Basis for Comment

The range of alternative plans appears to be well-justified. The No New Action and Lock Closure alternatives serve as conservative ranges for the management alternatives. The Non-Structural and three technology alternatives are similarly reasonable, given the available ANS control methods and the negative issues associated with the use of fish poisons.

However, the main report and supporting appendices indicate that the absolute effectiveness of the proposed control technologies (i.e., water jets, underwater noise, and electric barriers) have been minimally quantified and remain incompletely understood in their ability to regulate the movements of ANS. The alternative plans are presented in substantial detail. However, the sparse nature of data and experience in quantifying the anticipated effectiveness of the technologies available for ANS control increases the risk when selecting the TSP. Without a clear understanding of the effectiveness of the proposed technology, the risk and success of the TSP cannot be fully evaluated.

Significance – Medium/Low

Incomplete assessment of the control proposed technologies could affect the success of the TSP and increase the risk of Asian carp establishing in the Great Lakes.

Recommendation for Resolution

1. Perform additional studies to quantify the effectiveness of electric barriers, underwater noise, and water jets in blocking the movements of the invading species of Asian carp at different life stages.
2. Clarify the limited nature of data and experience in quantifying the anticipated technology effectiveness increases the inherent risk and success of the TSP.

Final Panel Comment 9

The report does not clearly present the adverse impacts on transportation of goods and material, which are the major portion of NED costs.

Basis for Comment

The adverse impacts on navigation transportation are appropriately measured as NED costs for purposes of the plan comparison expressed through the CE/ICA. They make up nearly 50 percent of the costs of the TSP (\$26.6 of \$56.2 million), and more than 50 percent of all other Technical Alternative Plans. These “externalized costs” are a major factor in overall project costs and in plan comparison and selection. Externalized costs in this context mean costs that are not incurred as part of the construction and operation, maintenance, repair, replacement, and rehabilitation (OMRR&R) of the project, which are costs not shared between the Federal government and the non-Federal sponsor, but rather by businesses and private interests (including producers and consumers) primarily in the Chicago area.

Most adverse NED effects on navigation are the result of business closures due to construction of project features for all plans except the Non-Structural Alternative, which has no induced transportation costs. For the TSP, NED costs due to business closures amount to \$21.4 million of the \$26.2 million in increased transportation costs. They are driven by the closure period for initial construction. The remaining costs of NED navigation effects (\$4.8 million for the TSP) are attributable to lock delays and traffic re-routings. The Panel discovered these values while studying a sensitivity analysis in the Economic Appendix (p. D-81 ff.), but these values do not appear in the main report.

It is important that decision makers at the Federal and local level and interested and affected parties have a thorough understanding of the navigation transportation costs and who bears those costs. Such costs are also important in the plan comparisons and selection of the TSP. Although the costs are presented in Table 8-8 and Figure 8-11 of the Economic Appendix, they are not explicitly discussed in the main report, nor is the magnitude of the business closure losses relative to the project implementation costs addressed.

Additionally, there is no indication that business losses are being used as a factor in the plan selection other than noting the Lock Closure Alternative would result in a total closure of navigation traffic.

Significance – Medium/Low

A clear explanation of the navigation transportation costs and who bears them is important in the plan comparisons and selection of the TSP.

Recommendation for Resolution

1. List and discuss the magnitude of the NED transportation costs in direct and clear terms in the main report.
2. Address the business closure effects in the decision-making discussions associated with the CE/ICA.
3. In order to benefit the overall study and to provide improved transparency, consider listing and discussing the NED transportation costs in presentations to the public, interested parties, and decision makers.

Final Panel Comment 10

The lack of contingency in the construction schedule could have an adverse impact on the transportation costs.

Basis for Comment

Reasonable contingencies are routinely added to the construction cost of each project feature to include cost of features not yet identified at this level of conceptual design. The construction time schedule also considers these unknowns.

For this study, the analysis of developing a construction schedule for features (those developed during physical modeling, to reduce filling time, reduce hawser forces, or improve the ratio of port area to culvert area) that may be added to the project in the future needs added documentation for clarity. Any expansion of the construction schedule may increase lock closure time and increase transportation costs, negatively affecting overall benefits and the transportation industry. The process, including assumptions and reasoning used to select the construction schedule for future lock features, should be clearly documented in the Engineering Appendix.

Significance – Medium/Low

Any increase in the construction schedule may negatively affect transportation costs, but not to the extent that formulation of the TSP would be changed.

Recommendation for Resolution

1. Document in the Engineering Appendix the process used for selecting the construction schedule for lock closure with contingencies added for unknown project features.

Final Panel Comment 11

It is unclear whether the downstream culvert valves and lock gate tiebacks will be implemented and if the cost and closure times are included in the TSP.

Basis for Comment

The report from the physical modeling recommends redoing the culvert valves and adding tiebacks at the downstream lock gates. These recommendations do not appear to be reported in the Engineering Appendix as recommendations for acceptance in the TSP. A complete analysis of incremental costs and benefits of including/excluding the valves or tiebacks in the recommended plan would strengthen the Engineering Appendix. All identified cost features should be listed in the construction cost and time estimates, exclusive of contingences.

The analysis of developing a construction schedule for features that may be added to, replaced, or eliminated in the project in the future needs to be added to the Engineering Appendix for documentation and clarity. Any expansion of the construction schedule may increase lock closure time and increase transportation costs, negatively impacting overall benefits and the transportation industry.

Significance – Medium/Low

Any increase in the construction schedule caused by future additions or changes in the lock filling and emptying systems may negatively impact project cost, closure times, and transportation costs, but not to the extent that formulation of the TSP would be changed.

Recommendation for Resolution

1. Document for understanding and clarity the assumptions and reasoning used in alternative analysis of the construction schedule for features that may be added to the project in the future, such as replacement of the culvert valves and downstream lock gate tiebacks.

Final Panel Comment 12

The projected cost constraint on the administration of the Adaptive Management Plan could impact the effectiveness of adaptive management and overall project success.

Basis for Comment

Appendix L describes in detail the proposed monitoring and adaptive management (AM) program for the GLMRIS-Brandon Roads project. The AM program and supporting monitoring appears comprehensive and consistent with standardized USACE concepts and approaches for adaptive management. The described AM plan provides a useful conceptual model for managing ANS in relation to risks and uncertainty.

A detailed description of monitoring, data analysis, data management, and data use in decision making indicates thorough consideration in plan development. However, specific action criteria have yet to be defined. One concern may be the budget constraint that monitoring and AM should not exceed 10 percent of total project costs. The scope of the described AM plan and associated monitoring might well require substantial funding, particularly for years when monitoring results require additional decision making according to prescriptions laid out in the AM plan.

Significance – Low

Further analysis of the costs of AM is needed to examine the implications of cost constraints on the implementation of the proposed AM plan.

Recommendation for Resolution

1. Develop contingency budget plans to address possible exceedances of the 10 percent constraint.

Final Panel Comment 13

Additional flood levels, such as the FEMA 0.5% or 0.2% floodplains, have not been evaluated, and additional aquatic pathways may not have been identified.

Basis for Comment

In the draft integrated FS/EIS (Section 4.3.4) and the H&H Appendix (pp. E-15, 16, 17), the aquatic pathways are identified based on the 1% FEMA floodplain. Using the 0.5% or 0.2% FEMA floodplains to identify aquatic pathways could help identify additional pathways and provide an added basis for risk analysis of carp passage. A complete analysis of risk at any floodplain level would include field evaluation of topography and pathways. Normal FEMA mapping does not have the accuracy to identify shallow swales or hydraulic pathways. Documentation of field work conducted after the draft EIS was published would add clarity to the final EIS. Additionally, one public comment (50639) raises the related issue of whether the proposed plan will withstand a 200-, 300-, or 500-year flood.

Significance – Low

Identification of additional aquatic pathways may alter the risk analysis, but should not influence the formulation or selection of the TSP.

Recommendation for Resolution

1. Document in both the H&H Appendix and the draft integrated FS/EIS all aquatic pathway investigations that took place both before and after publication of the draft EIS.
2. If the aquatic pathway investigations are not yet conducted, document any future plans to consider additional aquatic pathways.

5. REFERENCES

Davis, J.J., J.Z. LeRoy, M.R. Shanks, P.R. Jackson, F.L. Engel, E.A. Murphy, C.L. Baxter, J.C. Trovillion, M.K. McInerney, and N.A. Barkowski (in press). Effects of tow transit on the efficacy of the Chicago Sanitary and Ship Canal Electric Dispersal Barrier System. *J. Great Lakes Res.* (2017), <http://dx.doi.org/10.1016/j.jglr.2017.08.013>.

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.

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

Zhang, H., E.S. Rutherford, D.M. Mason, J.T. Breck, M.E. Wittmann, R.M. Cooke, D.M. Lodge, J.D. Rothlisberger, X. Zhu, and T.B. Johnson .2016. Forecasting the Impacts of Silver and Bighead Carp on the Lake Erie Food Web, *Trans Am. Fish. Soc.* 145 (1):

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APPENDIX A

IEPR Process for the GLMRIS Brandon Road 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 GLMRIS Brandon Road 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 September 27, 2017. 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 March 16, 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 GLMRIS Brandon Road IEPR

Task		Due Date
1	Award/Effective Date	9/18/2017
	Review documents available	9/27/2017
	Public comments available	12/4/2017 – 1/8/2018
	Battelle submits draft Work Plan ^a	10/2/2017
	USACE provides comments on draft Work Plan	10/5/2017
	Battelle submits final Work Plan ^a	10/11/2017
2	Battelle submits list of selected panel members ^a	10/9/2017
	USACE confirms the panel members have no COI	10/12/2017
3	Battelle convenes kick-off meeting with USACE	9/27/2017
	Battelle convenes kick-off meeting with panel members	10/16/2017
	Battelle convenes kick-off meeting with USACE and panel members	10/16/2017
4	Panel members complete their review of the documents	11/8/2017
	Panel members provide draft Final Panel Comments to Battelle	11/16/2017
	Panel members complete their review of the public comments	1/9/2018
	Panel drafts Final Panel Comment on public comments, if necessary	1/10/2018
	Panel finalizes Final Panel Comments	1/11/2018
5	Battelle submits Final IEPR Report to USACE ^a	1/16/2018
6 ^b	Battelle convenes Comment Response Teleconference with panel members and USACE	3/1/2018
	Battelle submits pdf printout of DrChecks project file ^a	3/16/2018
	Agency Decision Milestone (ADM) meeting (estimated date) ^c	Tentative: Q1FY2018
	Contract End/Delivery Date	8/30/2019

^a Deliverable.

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

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

At the beginning of the Period of Performance for the GLMRIS Brandon Road 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 39 charge questions provided by USACE, one overview question 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 in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated a second kick-off meeting via teleconference during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge, as well as the 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 Review Pages
Integrated Feasibility Report/EIS	488
Appendix B: Plan Formulation	224
Appendix C: Risk Assessment	256
Appendix D: Economics/Safety Analysis/Waterway Traffic Demand Projections	202
Appendix E: Hydrology and Hydraulics	188
Appendix F: General Conformity Determination	21
Appendix G: Phase I HTRW	112
Appendix H: Engineering	100
Appendix J: Real Estate	28
Appendix L: Monitoring and Adaptive Management	23
Total Number of Pages to be Reviewed	1,642
Supplemental Documents*	
Appendix A: USFWS Draft Coordination Act Report	231
Appendix I: Cost Estimate	50
Appendix K: Coordination	357
Appendix M: Distribution List	37
Public Comments**	830
Risk Register	10
Total Number of Reference Documents	1,515

* 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.

**830 pages of written public comments were received, as well as four transcripts from public meetings.

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.
- Foundations of SMART Planning
- SMART Planning Bulletin (PB 2013-03)
- SMART – Planning Overview
- USACE Planning Modernization Summary
- Engineering and Construction Bulletin (ECB) 2012-18: Engineering Within the Planning Modernization Paradigm
- 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

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 18 panel member questions to USACE. USACE was able to provide responses to all the 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 GLMRIS Brandon Road 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 member 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, 13 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 several files summarizing 1,357 public comments (550-page combined file) on the GLMRIS Brandon Road project. In addition, USACE provided three verbal transcripts from Public Meetings and a link to a video of a fourth public meeting in New Orleans along with the associated written comments from these meetings totaling about 830 pages of public comments and transcripts. Battelle sent the following charge question to the panel members along with all public comments.

- 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 new technical concerns that had not been previously identified during the review of the decision documents. The panel members confirmed that four Final Panel Comments would be updated to address the additional issues raised by both the Public and the Panel. No new Final Panel Comments were developed. Battelle reviewed and edited the four Final Panel Comments 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.

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 (this document). 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 13 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 GLMRIS
Brandon Road Project

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B.1 Panel Identification

The candidates for the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois (hereinafter: GLMRIS Brandon Road IEPR) Panel were evaluated based on their technical expertise in the following key areas: environmental, economic, civil engineering, and risk methods and expert elicitation. These areas correspond to the technical content of the review documents and overall scope of the GLMRIS Brandon Road 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 four 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 Statements for the IEPR of the GLMRIS-Brandon Road

- | | |
|---|--|
| 1. Previous and/or current involvement by you or your firm in the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois and related projects. | |
| 2. Previous and/or current involvement by you or your firm in Ecosystem Restoration Studies in the Mississippi River Basin, specifically in portions located in Illinois. | |
| 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 at or in the pool above or below Brandon Road Lock and Dam, Joliet, Illinois. | |
| 4. Current employment by the U.S. Army Corps of Engineers (USACE). | |

Panel Conflict of Interest (COI) Screening Statements for the IEPR of the GLMRIS-Brandon Road	
5. Previous and/or current involvement with paid or unpaid expert testimony related to Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois.	
6. Previous and/or current employment or affiliation with members any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups (<i>for pay or pro bono</i>): U.S. Fish Wildlife Service, U.S. Coast Guard, U.S. Geological Survey, U.S. Environmental Protection Agency	
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the Mississippi River or Great Lakes basins, specifically in the Illinois portion of the project area.	
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, ERDC, etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Rock Island and Chicago Districts.	
9. Previous or current involvement with the development or testing of models that will be used for, or in support of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois project.	
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Rock Island and Chicago Districts. 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 Rock Island and Chicago Districts. Please explain.	
11. Any previous employment by USACE as a direct employee, notably if employment was with the Rock Island and Chicago Districts. 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 Rock Island and Chicago Districts. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.	

Panel Conflict of Interest (COI) Screening Statements for the IEPR of the GLMRIS-Brandon Road

13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning the Great Lakes and Mississippi River Interbasin Study (GLMRIS) (i.e., ecosystem restoration review), and include the client/agency and duration of review (approximate dates).	
14. Pending, current, or future financial interests in Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois 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. Any publicly documented statement (including, for example, advocating for or discouraging against) related to Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois.	
17. Participation in relevant prior and/or current Federal studies relevant to this project and/or Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois.	
18. Previous and/or current participation in prior non-Federal studies relevant to this project and/or Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois.	
19. Has your research or analysis been evaluated as part of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois.	
20. 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. One of the four final reviewers is an independent consultant; the other three are 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. GLMRIS Brandon Road IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Environmental					
Chris Yoder	Midwest Biodiversity Institute	Columbus, OH	M.A., Zoology	N/A	40+
Economics					
Steven R. Cone	Independent Consultant	Montgomery, TX	B.S., Economics	N/A	40+
Civil Engineering					
Peter A. Fischer	Consulting Engineer	Woodbury, MN	M.S., Civil Engineering	P.E.*	63
Risk Methods and Expert Elicitation					
Steven Bartell	Oneida Total Integrated Enterprises (OTIE)	Greenback, TN	Ph.D., Limnology and Oceanography	N/A	39

*Retired

Table B-2 presents an overview of the credentials of the final four members of the Panel and their qualifications in relation to the technical evaluation criteria. More detailed biographical information regarding each panel member and his area of technical expertise is given in Section B.3.

Table B-2. GLMRIS Brandon Road IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Yoder	Cone	Fischer	Bartell
Environmental				
At least 15 years of experience directly related to water resource environmental evaluation or review and National Environmental Policy Act (NEPA) compliance	X			
Minimum M.S. degree or higher in a related field	X			
Extensive experience with Aquatic Nuisance Species (ANS), required	X			

Table B-2. GLMRIS Brandon Road IEPR Panel: Technical Criteria and Areas of Expertise, cont'd.

Technical Criterion	Yoder	Cone	Fischer	Bartell
Familiar with the habitat and fish and wildlife species that may be affected by the project alternatives in this study area	X			
Familiar with the life cycle and movement of various types of ANS, including Asian carp, silver carp, Northern snakehead, bighead carp, and others, as well as the wetlands and riparian habitats of Great Lakes and surrounding areas	X			
An expert in compliance with additional environmental laws, policies, and regulations, including the Fish and Wildlife Coordination Act and Endangered Species Act, and familiar with standardized ecosystem assessment methodologies	X			
Economics				
At least 15 years of demonstrated experience or combined equivalent of education and experience and recognition in applied economics related to water resource economic evaluation (multipurpose ecosystem restoration and navigation analyses) or review		X		
Minimum M.S. degree or higher in a related field		W ¹		
Experience working with risk-informed approaches to decision making, risk models, and evaluation scenarios with regard to economic impact		X		
Able to evaluate the appropriateness of cost effectiveness and incremental cost analysis (CE/ICA), as applied to dollar costs and ecosystem restoration benefits		X		
Familiar with the Corps of Engineers tool for CE/ICA called the Institute for Water Resources (IWR) Planning Suite		X		
Experience with the use of trade-off analysis to formulate, evaluate, and recommend alternatives for investment decisions		X		
At least 5 years of experience directly working for or with USACE is highly recommended		X		
Civil Engineering				
A minimum of 10 years of experience in civil engineering			X	
Minimum M.S. degree in engineering			X	
Demonstrated experience in river restoration			X	
Extensive experience in design and construction of ecosystem restoration projects and navigation features			X	
Experience in large public works projects			X	
Thorough understanding of design of culverts and channel improvements in an urban setting			X	
Registered professional engineer			X	

Table B-2. GLMRIS Brandon Road IEPR Panel: Technical Criteria and Areas of Expertise, cont'd.

Technical Criterion	Yoder	Cone	Fischer	Bartell
Risk Methods and Expert Elicitation				
At least 10 years of experience working with expert elicitation processes and their use to manage uncertainties related to environmental investment decisions				X
Possess an in-depth understanding of risk assessment and uncertainty as applied to Corps Civil Works projects and as it relates to the viability and transfer of ANS				X
Extensive experience in developing and using risk assessment models (experience with @RISK software is strongly desired) and procedures for ANS				X
Understanding of how risk analysis can be used in the formulation, evaluation, and selection of plans during feasibility studies as well as how uncertainty is documented				X
Experience in reviewing risk assessment processes and ability to analyze the validity of the TSP and provide feedback on the assessment of the probability that any particular ANS may establish in the Great Lakes Basin for different alternatives				X

W¹ - See Section 4.0 Panel Member Waiver Statements, in the Brandon Road Task 2 deliverable.

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	Chris Yoder
Role	Environmental
Affiliation	Midwest Biodiversity Institute

Mr. Yoder is the Research Director at the Midwest Biodiversity Institute (MBI), Center for Applied Bioassessment and Biocriteria, in Hilliard, Ohio. He has an M.A. in zoology from DePauw University and more than 40 years of experience in the taxonomy, distribution, and life history of Eastern and Midwestern U.S. stream and riverine fish species. He has more than 25 years of experience directly related to water resources environmental evaluation and review, as well as with the National Environmental Policy Act (NEPA) process and analysis through his most recent work at MBI and during his 25 years at the Ohio Environmental Protection Agency (EPA). In addition, he is a certified trainer for fish assemblage, habitat, and chemical sampling under the Ohio Credible Data Law (OCDL) (2009); a Tier II Certified Fisheries Scientist (1986); a Level 3 Qualified Data Collector for fish, habitat, and water sampling under the OCDL; and trained by the U.S. Fish and Wildlife Service (USFWS) in Principles of Electrofishing.

While working for the Ohio EPA (1976-2001) and the Midwest Biodiversity Institute (2001-present), Mr. Yoder gained extensive expertise related to Midwestern aquatic resources. Most of his work was conducted in the upper Ohio River, upper Mississippi River (UMR), and the Great Lakes basins. He has been conducting fish assemblage assessments of Ohio rivers and streams since 1980, has conducted nearshore and tributary fish assemblage assessments in the Great Lakes for more than 20 years, and has recent experience with assemblage assessments of large Midwestern river fish throughout the Upper Mississippi and Ohio River basins. Mr. Yoder has also been involved in studies of aquatic nuisance species, including Asian carp, other invasive species in the Midwest U.S., and invasive/introduced fish species in New England. In surveys on the Illinois River Basin, he documented the presence of Asian carp, and he is currently examining restoration options for the DuPage River-Salt Creek and Des Plaines River watersheds where Asian carp is a risk in re-establishing connectivity with the lower Des Plaines River. Having worked in multiple states and gaining technical experience at both the Ohio EPA and MBI, Mr. Yoder is familiar with the socioeconomic factors and cultural resources that may be affected by the project alternatives both locally and in the region.

Mr. Yoder is familiar with environmental impact analysis and mitigation. He started his career at Wittenberg University conducting data collection, analysis, and reporting for an environmental impact statement to evaluate the effect of a reservoir on Buck Creek, Ohio, and has continued in this field to the present at MBI, where he provides direct technical assistance to Federal, regional, state, and local government and non-government organizations with monitoring and assessment design and bioassessment and biocriteria implementation issues and topics. As manager of the Ecological Assessment Section at Ohio EPA (1990-2001), he conducted research and development on methods and procedures for incorporating ecoregions, biological, chemical, and physical data in water quality management policy and programs.

Mr. Yoder has experience with the USFWS Habitat Evaluation Procedures (HEP) (USFWS, 1980), Clean Water Act (CWA), Endangered Species Act, National Historic Preservation Act, and Ohio Qualitative Habitat Evaluation Index procedures. Mr. Yoder was the primary author of the Implementation Guidance Document, "Improving Water Quality Standards and Assessment Approaches for the Upper Mississippi River: UMR Clean Water Act Biological Assessment Implementation Guidance" (2011). This document provides methods and data for integrating biological assessment into CWA programs for the interstate and Minnesota portions of the UMR. He was also a reviewer of the Endangered Fish section of the Ohio Department of Natural Resources (DNR) Strategic Plan and served on the Ohio DNR Interagency ad hoc workgroup on endangered fish and fish population data from 1986 to 1989.

Mr. Yoder has authored more than 70 publications and more than 200 technical reports relevant to his field of expertise, and has served as a manuscript reviewer for numerous peer-reviewed journals and technical reports such as the North American Journal of Fisheries Management, Journal of Environmental Monitoring and Assessment, and the U.S. EPA Ecological Report Series. A recipient of the North American Benthological Society Environmental Stewardship Award in 2009, Mr. Yoder is a member of the American Fisheries Society, the Ohio Academy of Science, and the Society for Freshwater Science.

Name	Steven R. Cone
Role	Economist
Affiliation	Independent Consultant

An independent consultant, Mr. Cone retired from USACE in 2007. He has more than 40 years of experience in policy, planning, and economics, of which 18 years were spent at HQUSACE and five years at IWR (2007-2012). Mr. Cone's primary experience has been as a senior economist and policy advisor. He has experience working directly for and with USACE in applying Principles and Guidelines (P&G) to Civil Works project evaluations. At HQUSACE, Mr. Cone prepared and interpreted planning and policy guidance, led policy review teams for feasibility and post authorization reports, and prepared reports of the Chief of Engineers for new and modified project authorizations. Mr. Cone is a widely recognized expert in various aspects of Civil Works policy, planning and economic analysis, including navigation and ecosystem restoration.

He has more than 40 years of demonstrated experience in all aspects of water resource planning studies. He is very familiar with USACE procedures and standards for National Economic Development (NED) and National Ecosystem Restoration (NER) water resource management projects and studies. While at HQUSACE, Mr. Cone was extensively involved with IWR and other HQ elements in development of policy and guidance for the application of cost effectiveness and incremental cost analysis (CE/ICA) for environmental mitigation and ecosystem restoration.

At IWR, he served as a senior economist providing planning support for economic benefit analysis for a project to deepen the harbor at Savannah, Georgia. He was part of a team that developed new methodologies for economic benefit evaluation of containerized commodities that established the foundation for the development of the HarborSym Deepening Model and Containership Loading Tools. He reviewed model testing results and model documentation, but was not part of HarborSym development or its creation.

Mr. Cone is familiar with USACE plan formulation processes, procedures, and standards and has demonstrated experience in plan formulation and evaluation of alternative plans for flood damage reduction, water supply, hydropower, navigation, recreation, and ecosystem restoration studies and projects. He has provided guidance and review to such ecosystem restoration project studies as South/Central Florida Ecosystem Restoration, Louisiana Coastal, and the Upper Mississippi Environmental Management Plan. Mr. Cone also has experience in guidance development and review of, studies involving NED and NER trade-off analysis and risk assessment. Mr. Cone has participated in the development of policies and guidance for risk-informed approaches to decision making management and decision making, and provided instructions at courses on risk analysis, models, and evaluation scenarios involving economic and non-economic impacts of water resource decisions and projects. Mr. Cone has also performed policy and technical reviews on numerous Corps decision documents involving risk analysis.

Name	Peter Fischer, P.E. (Retired)
Role	Civil Engineering
Affiliation	SEH

Mr. Fischer is a senior water resource engineer with 63 years of experience practicing in the fields of civil and water resources engineering, with river engineering experience on navigable waterways. He was a registered P.E. in Minnesota, North Dakota, Wisconsin and Iowa and received his B.S. and M.S. degrees from the University of Minnesota-Minneapolis. For more than 31 of those years, Mr. Fischer was with the USACE St. Paul District. His assignments included engineering management, project management, technical supervision, hydraulic design, and hydrologic engineering of a wide variety of projects in ecosystem restoration, storm water management, flood control, navigation, and water resources development. His work also included field inspections and reporting of dams, embankments, levees, rivers, and channels.

Mr. Fischer has experience in design and construction of ecosystem restoration projects and navigation features on rivers. As an example, Mr. Fischer worked on studies and design for providing chutes to backwater areas for habitat restoration. He participated in the study and design of placing islands in large backwater areas to reduce scour and erosion from wind-driven waves, thus improving habitat for waterfowl. Additionally, Mr. Fischer has worked on and managed hydraulic navigation channel design for more than 10 years on projects along the Mississippi River and tributaries, and has been involved with projects that required the design of wing dams, rock dikes, and riprap bank protection where the navigation channel was eroding its banks, diversion dikes, channel closure structures, gated inlet structures, groynes, gated diversion structures, weirs, revetments, and dredging and low overflow spillways. He has worked on several studies and rehabilitation projects on the Mississippi River and its tributaries, including the Mississippi River Locks and Dams 1 to 10 Rehabilitation projects, and projects to repair erosion downstream from Mississippi River Locks and Dams. He prepared hydraulic studies for the extension of the Mississippi River Navigation channel upstream from Lock and Dam 1, concentrating on the location of dredged material disposal areas to limit channel velocities to navigable rates. Mr. Fischer has worked on small harbors of refuge projects on Lake Superior where design and layout must consider protection of existing wildlife habitat

Mr. Fischer has a thorough understanding of the physical effect of river training structures on river bathymetry, velocities, and water surfaces; river data collection; and river geomorphology. This is demonstrated by his work on navigation channels on the Mississippi, Minnesota, St. Croix, and Red River of the North. He has a thorough understanding of design culverts and channel improvements in urban settings. While working for SEH, he provided guidance and technical review for the storm water master plan for Grand Forks, North Dakota, which included large interceptor pipe, channels, culverts, and structures. He also worked on the interior drainage system for East Grand Forks, Minnesota, which included pipe outlets, storm water pipes, channels, culverts, and structures.

For the past 28 years, as a member of SEH's Water Resources Division, Mr. Fischer has been involved in the hands-on design of water resources projects. His work included preparing concept and preliminary designs, providing hydraulic and hydrologic engineering advice to project designers, providing peer and quality review of hydrology and hydraulic modeling, and design reports, and preparing and coordinating the preparation of design and environmental reports. He has recently participated in independent reviews of design and feasibility reports for levees, canals, and other water control facilities for USACE. He served

as a member of an IEPR team for two projects within the New Orleans Hurricane and Storm Damage Risk Reduction System. Mr. Fischer is an active member of the American Society of Civil Engineers; the U.S. Committee on Large Dams; and the U.S. Committee on Irrigation, Drainage and Flood Control.

Name	Steven Bartell, Ph.D.
Role	Risk Methods and Expert Elicitation
Affiliation	Oneida Total Integrated Enterprises (OTIE)

Dr. Bartell is Senior Aquatic Ecosystem Modeler at the Oneida Total Integrated Enterprises (OTIE) in Oak Ridge, Tennessee. He earned a Ph.D. in limnology and oceanography from the University of Wisconsin, Madison, in 1978. He has 20+ years of experience in expert elicitation processes and their use to manage uncertainties related to environmental investment decisions. Concurrent with his part-time technical support to OTIE, Bartell also serves as Principal and Practice Lead in Ecological Modeling with Cardno, Inc., Greenback, Tennessee. He is also an adjunct faculty member in the Department of Ecology and Evolutionary Biology at the University of Tennessee, Knoxville and serves on the advisory board of the University of Tennessee Center for Water Resources Research. Prior to a career in private consulting, Dr. Bartell was a senior environmental scientist and group leader (1980-1992) in the Environmental Sciences Division at the Oak Ridge National Laboratory.

Dr. Bartell has extensive experience and technical skills in quantitative ecosystem analysis and ecological modeling. He has applied these skills in assessing ecological risks posed by a variety of physical, chemical, and biological environmental stressors. He has also developed complex aquatic ecosystem models in support of ecosystem management and restoration, primarily for the U.S. Army Corps of Engineers. In support of the Upper Mississippi River and Illinois Waterway Navigation Feasibility Study (1994-2004), Dr. Bartell was responsible for the development of ecological models for assessing risks posed by increased commercial navigation on fish, submerged aquatic vegetation, and freshwater mussels. These ecological models were developed within a Monte Carlo methodology to facilitate probabilistic assessments and sensitivity and uncertainty analysis.

Dr. Bartell has demonstrated experience in the application and analysis of methods of expert elicitation in relation to ecological risk assessment. He has taught short courses on the use of expert elicitation and characterization of associated uncertainties as they influence the overall risk assessment process. He has hands-on experience in the use of @RISK, Crystal Ball, and other Monte Carlo frameworks for quantifying the impacts of parameter uncertainty on risk estimates. He is well-versed in the application of numerical methods for sensitivity and uncertainty analysis of models used in risk estimation.

Dr. Bartell managed and technically participated in the development, application, and analysis of a probabilistic model to characterize the risks of zebra and quagga mussel invasion and establishment throughout the St. Croix Watershed for USACE St. Paul District. He also developed a probabilistic model of the USACE ICA methodology that was used to estimate the probable outcomes of engineering planning alternatives designed to reduce risks to human safety and damage to private wetlands for the USACE Lock and Dam 3 Renovation (St. Paul District). Dr. Bartell also developed a probabilistic framework and model to assess risks of invasive species (e.g., Asian long-horned beetle) establishment throughout the United States for the US Department of Agriculture. These projects included the characterization of uncertain model parameters estimated using data and expert elicitation on the resulting risks, as well as accompanying sensitivity and uncertainty analyses that described the impacts of uncertain expert elicitation on model performance and risk estimation.

APPENDIX C

Final Charge for the GLMRIS Brandon Road IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois

This is the final Charge to the Panel for GLMRIS Brandon Road IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on October 11, 2017.

BACKGROUND

The GLMRIS-Brandon Road Report is a feasibility study (FS) that is building on the foundation of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) Report released in January 2014. The purpose of this study is to evaluate structural and nonstructural options and technologies near the Brandon Road Lock and Dam (L&D) site, with the goal of establishing a single control point to prevent the upstream transfer of aquatic nuisance species (ANS) from the Mississippi River (MR) Basin into the Great Lakes (GL) Basin, to the maximum extent possible, while minimizing impacts on existing waterways uses and users.

As the first of possible phased actions to the GLMRIS study authority, this FS addresses the upstream transfer – from the MR Basin to the GL Basin – of ANS through the Chicago Area Waterway System (CAWS). This study will not examine: (1) downstream transfer of ANS from the GL Basin to the MR Basin, (2) transfer of ANS along the entire basin divide through an aquatic pathway, or (3) transfer of ANS via non-aquatic pathways, though the report does recognize that non-aquatic pathways do exist.

The GLMRIS Report identified several alternatives to address the problem of interbasin transfer of ANS, but full implementation of several of the alternatives would require a substantial investment of time and money. Given the potential urgency of the threat and in response to a growing consensus, the Secretary of the Army (Secretary) has determined that a formal evaluation of potential control options and technologies to be applied near the Brandon Road L&D is an appropriate next step. The Brandon Road L&D provides singular advantages for further study. The approach channel and lock provide a unique opportunity to control upstream ANS transfer in a relatively small section of the river due to the fact that the majority of the waterway flows over a high-head dam, and the only potential upstream passage is through a lock. These conditions provide the opportunity to optimize the operational characteristics of the ANS controls, maximize the efficiency of applied technologies, and minimize the associated costs for implementation and operation. Establishing a control point near Brandon Road L&D for upstream transfer of MR ANS does not adversely impact flood risk or water quality of the CAWS and provides for additional defense-in-depth for particular species of concern (Asian carp) when combined with the current electric barrier dispersal system located in Romeoville, IL.

As a partial answer to the problem of ANS transfer between the GL and MR Basins through aquatic pathways, this FS leaves open the decision of whether and to what extent one of the more complete alternatives identified in the GLMRIS Report should be recommended for implementation. As such, this FS evaluates alternatives for addressing the problem of upstream transfer of ANS from the MR Basin to the GL Basin through aquatic pathways, while deferring consideration of alternatives that would address transfer of GL ANS to the MR Basin. Further, study of transfer of MR species of concern to the GL Basin through other, lower-risk pathways continues through cooperation with state and local resource agencies.

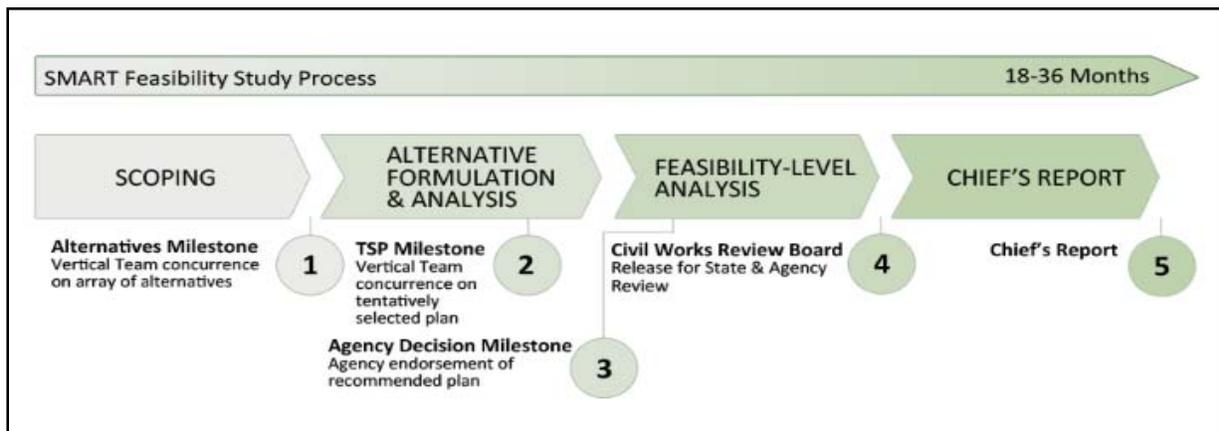
The GLMRIS Brandon Road Study has been developed to reflect the United States Army Corps of Engineers (USACE) modernized planning initiative, in which project studies use a risk-informed assessment, generally with only enough detail developed for each alternative to allow relative comparison

in order to determine the appropriate information to identify a TSP. Although this new process has altered the milestones and evaluation procedures in a feasibility study, the manner in which alternatives are developed from problems, opportunities, measures, and constraints remains the same.

Under the SMART Planning paradigm (Figure 1), IEPR occurs during concurrent review of the Decision Document, between the TSP Milestone meeting and the Agency Decision Milestone (ADM) meeting

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois (hereinafter: GLMRIS-Brandon Road IEPR) in accordance with the Department of the Army, 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*

Figure 1: SMART Planning Process

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.

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

Documents for Review

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.

Review Documents	Subject Experts				
	No. of Review Pages	Environmental	Economics	Civil Engineer	Risk Methods and Expert Elicitation
Integrated Feasibility Report/EIS	488	488	488	488	488
Appendix B: Plan Formulation	224		224		240
Appendix C: Risk Assessment	256	256	256	256	256
Appendix D: Economics/Safety Analysis/Waterway Traffic Demand Projections	202		202		
Appendix E: Hydrology and Hydraulics	188			188	
Appendix F: General Conformity Determination	21	21	21	21	21
Appendix G: Phase I HTRW	112	112		112	
Appendix H: Engineering	100			100	
Appendix J: Real Estate	28		28		
Appendix L: Monitoring and Adaptive Management	23	23			23
Total Number of Pages to be Reviewed	1,642	900	1219	1165	1028
Supplemental Documents*					
Appendix A: USFWS Draft Coordination Act Report	231	231			
Appendix I: Cost Estimate	50	50	50	50	50
Appendix K: Coordination	357	357	357	357	357
Appendix M: Distribution List	37	37	37	37	37
Public Comments**	100	100	100	100	100
Risk Register	10	10	10	10	10
Total Number of Reference Documents	785	785	554	554	554

* 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.

** USACE will submit public comments to Battelle upon their availability according to the schedule in Table A-1, who will in turn submit the comments to the IEPR Panel for review. A separate Addendum to the Final Report will be submitted if additional Final Panel Comments are necessary.

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. 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).

Task	Action	Due Date Working Days
Conduct Peer Review	Subcontractors complete mandatory Operations Security (OPSEC) training	11/12/2017
	Battelle sends review documents to panel members	10/16/2017
	Battelle convenes kick-off meeting with panel members	10/16/2017
	Battelle convenes kick-off meeting with USACE and panel members	10/17/2017
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	10/25/2017
	Panel members complete their review of the documents	11/6/2017
Prepare Final Panel Comments and Final IEPR Report	Battelle provides talking points to panel members for Panel Review Teleconference	11/8/2017
	Battelle convenes Panel Review Teleconference	11/9/2017
	Battelle provides Final Panel Comment templates and instructions to panel members	11/10/2017
	Panel members provide draft Final Panel Comments to Battelle	11/16/2017

Task	Action	Due Date Working Days
Prepare Final Panel Comments and Final IEPR Report	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	11/17/2017 - 11/27/2017
	Panel finalizes Final Panel Comments	11/28/2017
	Battelle receives public comments from USACE**	11/16-11/22/2017
	Battelle sends public comments to Panel	11/22/2017
	Panel members complete their review of the public comments	11/29/2017
	Battelle and Panel review Panel's responses to public comments	11/30/2017
	Panel drafts Final Panel Comment on public comments, if necessary	12/1/2017
	Panel finalizes Final Panel Comment regarding public comments, if necessary	12/4/2017
	Battelle provides Final IEPR Report to panel members for review	12/1/2017
	Panel members provide comments on Final IEPR Report	12/4/2017
	Battelle submits Final IEPR Report to USACE*	12/6/2017
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	12/13/2017
Comment/Response Process	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	1/5/2018
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	1/11/2018
	USACE PCX provides draft PDT Evaluator Responses to Battelle	1/12/2018
	Battelle provides draft PDT Evaluator Responses to panel members	1/17/2018
	Panel members provide draft BackCheck Responses to Battelle	1/22/2018
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	1/23/2018
	Battelle convenes Comment Response Teleconference with panel members and USACE	1/24/2018
	USACE inputs final PDT Evaluator Responses to DrChecks	1/31/2018
	Battelle provides final PDT Evaluator Responses to panel members	2/2/2018
	Panel members provide final BackCheck Responses to Battelle	2/7/2018

Task	Action	Due Date Working Days
Comment/ Response Process	Battelle inputs the panel members' final BackCheck Responses to DrChecks	2/8/2018
	Battelle submits pdf printout of DrChecks project file*	2/8/2018
Agency Decision Milestone (ADM) Meeting	Panel prepares and/or reviews slides for ADM	TBD
	Battelle participates in the Agency Decision Milestone (ADM) Meeting	1/18/2018
Senior Leader Meeting post-ADM	Panel prepares and/or reviews slides for post- ADM	TBD
	Battelle participates in the post Senior Leader Meeting post-ADM	TBD

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

Independent External Peer Review of the Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois

Charge Questions and Relevant Sections as Supplied by USACE

Broad Evaluation Review Charge Questions

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

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

Specific Technical and Scientific Review Charge Questions

Plan Formulation/EIS

14. Comment on whether you agree or disagree with how the preferred alternative was formulated and selected. Comment on the plan formulation. Does it meet the study objectives and avoid violating the study constraints?
15. Do you agree with the general analyses of the existing social, financial, and natural resources within the study area?
16. For your particular area of expertise, provide an in-depth review of whether the analyses of the existing social, financial, and natural resources within the project area are sufficient to support the estimate of the impacts of the array of alternatives.
17. Given your area of expertise, does the EIS appropriately address the existing conditions of all resources pertinent to the study?
18. Was a reasonably complete array of possible measures considered in the development of alternatives?
19. Are the scope and detail of the potential adverse effects that may arise as a result of project implementation sufficiently described and supported?
20. Have the short- and long-term impacts associated with the alternatives been adequately discussed and evaluated?
21. Are cumulative impacts adequately described and discussed? If not, please explain.
22. Is monitoring and adaptive management adequately addressed?
23. Are the required long-term commitments (both Federal and non-Federal) for sustaining the restored ecological resources adequately described and adequately demonstrated?

Engineering

24. Are future Operation, Maintenance, Repair, Replacement, and Rehabilitation efforts adequately described and are the estimated costs of those efforts reasonable for each alternative?
25. Are the descriptions of the risk and uncertainties associated with the level of detail in the designs that comprise the preferred alternative sufficiently comprehensive?
26. Were the technical assumptions outlined in the engineering appendix sufficiently comprehensive and conservative for a feasibility study, given the level of design detail?
27. Are the key assumptions used to complete the cost estimating adequate? Is anything missing? In your opinion, do the major findings of the cost estimates provide adequate support for scheduling, budgeting, and project control purposes?

28. Were appropriate engineering solutions (not engineered solutions) developed for achieving planning objectives related to ecosystem processes?

Economics

29. Was the methodology used to conduct the incremental cost analysis adequate and valid?
30. Was the methodology used to assess consequences to the Great Lakes resulting from the establishment of subject Aquatic Nuisance Species adequate and valid?
31. Was the methodology used to assess National Economic Development (NED) impacts on navigation adequate and valid?

Risk Assessment and Expert Elicitation

32. Was the methodology and process used to establish (P) probability of establishment adequate and valid?
33. When individual measures were combined to form alternatives, was the overall effectiveness of the combined measures adequately characterized in the report?
34. Are the formulated array of alternatives and recommended plan reasonable and supportable based on the Risk Assessment outputs?
35. Is the risk assessment and expert elicitation process and methodology fully documented? Is the process commensurate with current state of the practice procedures for completing an expert elicited risk assessment?
36. Are the limitations and associated risk and uncertainty regarding the expert elicitation process fully documented? How do these translate to the overall risk assessment model and decision making?

General/Summary

37. Was the best available science used to develop the alternatives and complete the impact analysis?
38. What is the most important concern you have with the document or its appendices that was not covered in your answers to the questions above?
39. Please identify the most critical concerns (up to five) you have with the study and/or review documents. These concerns can be (but do not need to be) new ideas or issues that have not been raised previously.

Battelle Summary Charge Questions to the Panel Members²

Summary Questions

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

Public Comment Questions

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

² Questions 1 and 2 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.

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APPENDIX D

Conflict of Interest Form

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Conflicts of Interest Questionnaire
Independent External Peer Review

Great Lakes and Mississippi River Interbasin Study (GLMRIS) at Brandon Road Lock and Dam, Joliet, Illinois, 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**
REPRESENTATIVE'S NAME: **Courtney M. Brooks**
TELEPHONE: **614-424-5623**
ADDRESS: **505 King Avenue, Columbus, OH 43201**
EMAIL ADDRESS: **brookscl@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

September 6, 2017

Date

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BATTELLE

It can be done