Final Independent External Peer Review Report Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment

Prepared by
Battelle Memorial Institute

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

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Photo by NOAA

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Columbus, Ohio 43201

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Executive Summary

Project Background and Purpose

The project area encompasses the entire Papillion Creek Watershed in Nebraska. The watershed covers most of Douglas County and parts of Washington and Sarpy counties. It drains an area of approximately 396 square miles. The main streams draining the watershed are the Big Papillion Creek, the Little Papillion Creek, and the West Papillion Creek. The topography of the watershed is generally moderate to steeply sloping hills, with overland slopes ranging from 0 percent to approximately 30 percent. Deep, narrow valleys with relatively steep valley slopes also characterize the watershed.

The soils in the upper portions of the basin are generally deep, well-drained silt loam to silty clay loam formed in loess. Permeability is moderate, and the available water capacity is high. Bottomland soils, or soils in the lower portions of the basins, generally consist of poorly drained silty clay to fine sandy loam. Permeability is moderate and the available water capacity is low.

The stream channels in the watershed have changed dramatically from their original conditions due to development in the basin, eroding soils, and other factors. The original channels were sinuous, with relatively narrow bottoms, sloping wooded banks, and limited discharge capacity. Now, streams in the rural areas of the watershed are generally characterized as incised channels with tributary slopes averaging from 5 feet to 200 feet per mile. Streams in the urbanized areas of the watershed vary from incised channels to stream segments with improved channel sections and levees that are continually maintained. In addition to channel improvements and levees, many reservoirs have also been constructed in the watershed during development.

Floods or threats of floods occur almost every year during the summer thunderstorm season, when about 40 percent of the annual precipitation occurs. Major floods occurred in 1959, 1960, 1964, and 1965. The Big Papillion Creek drainage area sustained flood damage in all 4 years. The Little Papillion Creek drainage area escaped the 1964 flood but sustained heavy flood damages in 1960 and 1965. The 1964 flood, which was the basin's most damaging flood, centered over the West Papillion Creek drainage area. The loss of seven lives was attributed to this flood. Several more recent flood events (1994, 1997, 1999, 2004, 2008, and 2014) continue to highlight that severe flood risks remain, and the 1999, 2004, and 2014 events resulted in one fatality each. The Papillion Creek basin has sustained damage from virtually every flood event because of the discharge concentration from the three major tributaries that converge on this stream.

As a result of the floods in the 1960s, a 21-dam project was authorized by the Flood Control Act of 1968. Since then, the project has experienced considerable delays and size reduction because of significant

changes in costs, regulations, and new legislation, as well as local opposition. A plan evaluation report was completed in September 1975, and a reevaluation report on the West Papillion Creek basin was completed in March 1979. As a result of information presented in these two reports, only four of the authorized dams have been constructed by the U.S. Army Corps of Engineers (USACE).

An additional reevaluation report was completed in March 1985. This report recommended channel improvements on Big Papillion Creek with a maximum 2% annual exceedance probability level of protection, which was completed in 2002. Due to ongoing development in the basin and increases in hydrology, significant flood risk remains.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report (GRR) and Environmental Assessment (EA) (hereinafter: Papillion Creek GRR/EA IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, is free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO) per guidance described in USACE (2018). 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 (2018) 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: plan formulation/ economics, environmental law compliance/cultural resources, hydrology and hydraulic (H&H) engineering, civil engineering, and geotechnical/soils engineering. 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 (1,455 pages in total), along with a charge that solicited comments on specific sections of the documents to be reviewed. Following guidance provided in USACE (2018) 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, 18 Final Panel Comments were identified and documented. Of these, one was identified as having high significance, two had medium significance, eleven had medium/low significance, and four had low significance.

Battelle received public comments from USACE on the Papillion Creek Draft Feasibility Report (DFR)/EA (totaling 80 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 Papillion Creek DFR/EA. After completing its review, the Panel identified one new issue and subsequently generated one Final Panel Comment that summarized the concern.

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, 2018) in the Papillion Creek DFR/EA. Table ES-1 lists the Final Panel Comment statements by level of significance. The full text of the Final Panel Comments is presented in Section 4.2 of this report. The following summarizes the Panel's findings.

Based on the Panel's review, the report is well-written, and the document presented the material in a comprehensive and logical approach. However, the Panel identified several elements of the project where additional analysis is needed and where project findings and objectives need to be documented or clarified.

Economics/Plan Formulation: The DFR/EA does a very good job of documenting a long history of flooding problems in the study area. However, the Panel noted that the DFR//EA does not clearly define the future without-project conditions; therefore, alternative plans to reduce future flood risk could not be fully evaluated. The DFR/EA presents a clear and thorough description of existing conditions but stops short of describing how those conditions would change in the absence of the Federal project to reduce flood risk in the future. The Panel is also unclear on why the DFR/EA evaluates risk with an additional 3 feet of freeboard added to existing levees. This practice is discouraged by Engineer Regulation (ER) 1105-2-100, Appendix E, as it unnecessarily inflates project costs. Adding height to a proposed levee system without including benefits attributable to the increased height affects the total project and net project benefits.

Engineering: The Tentatively Selected Plan (TSP), which includes a mix of targeted nonstructural approaches and structural measures where warranted, seems well-balanced. The Panel noted that the DFR/EA lacked information on levee and dam design that would allow slope stability, settlement, and bearing capacity to be evaluated. This limited the geotechnical and civil evaluations and potentially would affect the ability to implement the TSP. Furthermore, the DFR/EA lacks information on the following: levee and dam design; details for Dry Dams 10 and 19; construction analysis and design for floodwalls and utility relocation; erosion protection for levees or walls; and the footprint of the project area. The lack of information also precludes a comprehensive evaluation of project cost and design, potentially impacting the ability to implement the TSP and in some cases potentially underestimating construction costs and schedule.

The Panel is also concerned that the uncertainty analysis does not identify a broad range of opportunities to reduce residual risk and increase resilience given the likely future conditions, which include climate change. Furthermore, some of the assumptions regarding performance during flood events appeared overly optimistic, which could impact the results of the life safety analysis and underestimate risks that may be present after construction.

Environmental: Existing conditions and environmental consequences are well-documented and supported in the DFR/EA. The project used the Nebraska Stream Conditions Assessment Procedures (NeSCAP) model to evaluate habitat. The DFR/EA would benefit from a brief statement documenting the process for model selection and the model's overall assumptions and limitations. The use of field data and assumptions that are inconsistent with model methodology and requirements were noted. Clarification is needed to ensure that the model results neither over- nor under-estimate the benefits from ecological services and mitigation requirements.

Table ES-1. Overview of 18 Final Panel Comments Identified by the Papillion Creek GRR/EA IEPR Panel

No.	Final Panel Comment
Significance – High	
1	The DFR/EA does not clearly define the future without-project conditions; therefore, alternative plans to reduce future flood risk cannot be fully evaluated.
Significance – Medium	
2	Some of the assumptions regarding performance during flood events seem to be non-conservative.
3	The DFR/EA lacks information on levee and dam design that would allow for slope stability, settlement, and bearing capacity to be evaluated.
Significance – Medium/Low	
4	The uncertainty analysis does not currently identify a broad range of opportunities to reduce risk and increase resilience given likely future conditions, including climate change.
5	Adding 3 feet of freeboard or overbuilding to the calculated necessary levee/floodwall structures to address uncertainty in levee/floodwall performance under future conditions is technically unsound and discouraged by ER 1105-2-100, Appendix E, and unnecessarily inflates project costs.
6	The future without-project condition does not include the effectiveness of the currently existing levees.
7	Agricultural benefits, including the reduction of flood risk, erosion, and sedimentation, are not included in the project planning.
8	The DFR/EA does not identify high-value assets potentially at risk or include those higher values in the Benefit Cost Ratio (BCR) analysis.
9	The induced damages identified in Appendix F of the DFR/EA have not been fully documented to thoroughly understand what must be avoided or mitigated in the future.
10	The amount of available engineering detail regarding the proposed dry dam designs at Dam Sites 10 and 19 is limited, precluding comprehensive assessments of the conceptual design and cost estimates.

Table ES-1. Overview of 18 Final Panel Comments Identified by the Papillion Creek GRR/EA IEPR Panel (continued)

No.	Final Panel Comment
Significance – Medium/Low (continued)	
11	It is unclear what civil engineering activities associated with floodwalls and utility relocations have been conducted and what remains to be done.
12	Appendix C, Geotechnical, lacks details regarding the need for erosion protection for levees and floodwalls.
13	The final TSP cost estimate includes real estate, but it is not clear what right-of-way was used to estimate total acreage.
14	A public comment has identified a discrepancy in how real estate costs are calculated for Dam Site 10.
Significance – Low	
15	The criteria used to select the NeSCAP model for habitat evaluation are not identified in the DFR/EA.
16	Methods used for field data collection (Appendix A of Appendix H) to delineate fluvial geomorphic characteristics are inconsistent with model requirements and could result in an over- or under-estimation of the benefits from ecological services and mitigation requirements.
17	The alternative scoring method utilized and outlined in the NeSCAP document for converting a stream to a lacustrine system (Variable 3) yielded results contradictory to the text of the NeSCAP document, affecting the accuracy in reporting the impacts of Dam Sites 10 and 19.
18	The description of residual risks associated with levee, floodwall, and dam failure appears to either minimize or overlook some of the consequences of such failures in the DFR/EA.

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LIST OF ACRONYMS

ADM	Agency Decision Milestone
BCR	Benefit-Cost Ratio
CIR	Condition Index Rating
COI	Conflict of Interest
CPT	Cone Penetration Test
CSRM	Coastal Storm Risk Management
CSV	Content-Structure Value
DFR	Draft Feasibility Report
DrChecks	Design Review and Checking System
EA	Environmental Assessment
EC	Engineer Circular
EM	Engineer Manual
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
FEMA	Federal Emergency Management Agency
FRM	Flood Risk Management
GRR	General Reevaluation Report
H&H	Hydrology and Hydraulics
HEC-FDA	Hydrologic Engineering Center-Flood Damage Reduction Analysis
HEC-HMS	Hydrologic Engineering Center-Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center-River Analysis System
HSPF	Hydrological Simulation Program - FORTRAN
IEPR	Independent External Peer Review
IWR	Institute for Water Resources
NED	National Economic Development
NEPA	National Environmental Policy Act
NeSCAP	Nebraska Stream Conditions Assessment Procedures
O&M	Operation and Maintenance
OEO	Outside Eligible Organization
OMB	Office of Management and Budget

OPSEC	Operations Security
PCX	Planning Center of Excellence
PDT	Project Delivery Team
RECONS	Regional Economic System
SAR	Safety Assurance Review
T&E	Threatened and Endangered
TSP	Tentatively Selected Plan
UNF	University of North Florida
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service

1. INTRODUCTION

The project area encompasses the entire Papillion Creek Watershed in Nebraska. The watershed covers most of Douglas County and parts of Washington and Sarpy counties. It drains an area of approximately 396 square miles. The main streams draining the watershed are the Big Papillion Creek, the Little Papillion Creek, and the West Papillion Creek. The topography of the watershed is generally moderate to steeply sloping hills, with overland slopes ranging from 0 percent to approximately 30 percent. Deep, narrow valleys with relatively steep valley slopes also characterize the watershed

The soils in the upper portions of the basin are generally deep, well-drained silt loam to silty clay loam formed in loess. Permeability is moderate, and the available water capacity is high. Bottomland soils, or soils in the lower portions of the basins, generally consist of poorly drained silty clay to fine sandy loam. Permeability is moderate and the available water capacity is low.

The stream channels in the watershed have changed dramatically from their original conditions due to development in the basin, eroding soils, and other factors. The original channels were sinuous, with relatively narrow bottoms, sloping wooded banks, and limited discharge capacity. Now, streams in the rural areas of the watershed are generally characterized as incised channels with tributary slopes averaging from 5 feet to 200 feet per mile. Streams in the urbanized areas of the watershed vary from incised channels to stream segments with improved channel sections and levees that are continually maintained. In addition to channel improvements and levees, many reservoirs have also been constructed in the watershed during development.

Floods or threats of floods occur almost every year during the summer thunderstorm season, when about 40 percent of the annual precipitation occurs. Major floods occurred in 1959, 1960, 1964, and 1965. The Big Papillion Creek drainage area sustained flood damage in all 4 years. The Little Papillion Creek drainage area escaped the 1964 flood but sustained heavy flood damages in 1960 and 1965. The 1964 flood, which was the basin's most damaging flood, centered over the West Papillion Creek drainage area. The loss of seven lives was attributed to this flood. Several more recent flood events (1994, 1997, 1999, 2004, 2008, and 2014) continue to highlight that severe flood risks remain, and the 1999, 2004, and 2014 events resulted in one fatality each. The Papillion Creek basin has sustained damage from virtually every flood event because of the discharge concentration from the three major tributaries that converge on this stream.

As a result of the floods in the 1960s, a 21-dam project was authorized by the Flood Control Act of 1968. Since then, the project has experienced considerable delays and size reduction because of significant changes in costs, regulations, and new legislation, as well as local opposition. A plan evaluation report was completed in September 1975, and a reevaluation report on the West Papillion Creek basin was completed in March 1979. As a result of information presented in these two reports, only four of the authorized dams have been constructed by the U.S. Army Corps of Engineers (USACE).

An additional reevaluation report was completed in March 1985. This report recommended channel improvements on Big Papillion Creek with a maximum 2% annual exceedance probability level of protection, which was completed in 2002. Due to ongoing development in the basin and increases in hydrology, significant flood risk remains.

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 Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report (GRR) and Environmental Assessment(EA) (hereinafter: Papillion Creek GRR/EA IEPR) in accordance with procedures described in the Department of the Army, USACE, Engineer Circular (EC) *Review Policy for Civil Works* (EC 1165-2-217) (USACE, 2018) 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 Papillion Creek GRR/EA IEPR documents (Section 4). Appendix A describes in detail how the IEPR was planned and conducted, including the schedule followed in executing the IEPR. Appendix B provides biographical information on the IEPR panel members and describes the method Battelle followed to select them. Appendix C presents the final charge to the IEPR panel members for their use during the review; the final charge was submitted to USACE in the final Work Plan according to the schedule listed in Table A-1. Appendix D presents the organizational COI form that Battelle completed and submitted to the Institute for Water Resources (IWR) prior to the award of the Papillion Creek GRR/EA IEPR.

2. PURPOSE OF THE IEPR

To ensure that USACE documents are supported by the best scientific and technical information, USACE has implemented a peer review process that uses IEPR to complement the Agency Technical Review, as described in USACE (2018).

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 Papillion Creek GRR/EA was conducted and managed using contract support from Battelle, which is an Outside Eligible Organization (OEO) (as defined by EC 1165-2-217). Battelle, a 501(c)(3) organization under the U.S. Internal Revenue Code, has experience conducting IEPRs for USACE.

3. METHODS FOR CONDUCTING THE IEPR

The methods used to conduct the IEPR are briefly described in this section; a detailed description can be found in Appendix A. The IEPR was completed in accordance with established due dates for milestones and deliverables as part of the final Work Plan; the due dates are based on the award/effective date and the receipt of review documents.

Battelle identified, screened, and selected four panel members to participate in the IEPR based on their expertise in the following disciplines: plan formulation/economics, environmental law compliance/cultural

resources, hydrology and hydraulic (H&H) engineering, civil engineering, and geotechnical/soils engineering. The Panel reviewed the Papillion Creek GRR/EA documents and produced 18 Final Panel Comments in response to 16 charge questions provided by USACE for the review. This charge also included two overview questions and one public comment question added by Battelle, for a total of 19 questions. 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 1165-2-217), 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, 2018) in the Papillion Creek GRR/EA IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the report is well-written, and the document presented the material in a comprehensive and logical approach. However, the Panel identified several elements of the project where additional analysis is needed and where project findings and objectives need to be documented or clarified.

Economics/Plan Formulation: The DFR/EA does a very good job of documenting a long history of flooding problems in the study area. However, the Panel noted that the DFR/EA does not clearly define the future without-project conditions; therefore, alternative plans to reduce future flood risk could not be fully evaluated. The DFR/EA presents a clear and thorough description of existing conditions but stops short of describing how those conditions would change in the absence of the Federal project to reduce flood risk in the future. The Panel is also unclear on why the DFR/EA evaluates risk with an additional 3 feet of freeboard added to existing levees. This practice is discouraged by Engineer Regulation (ER) 1105-2-100, Appendix E, as it unnecessarily inflates project costs. Adding height to a proposed levee system without including benefits attributable to the increased height affects the total project and net project benefits.

Engineering: The Tentatively Selected Plan (TSP), which includes a mix of targeted nonstructural approaches and structural measures where warranted, seems well-balanced. The Panel noted that the DFR/EA lacked information on levee and dam design that would allow slope stability, settlement, and bearing capacity to be evaluated. This limited the geotechnical and civil evaluations and potentially would affect the ability to implement the TSP. Furthermore, the DFR/EA lacks information on the following: levee and dam design; details for Dry Dams 10 and 19; construction analysis and design for floodwalls and utility relocation; erosion protection for levees or walls; and the footprint of the project area. The lack of information also precludes a comprehensive evaluation of project cost and design, potentially impacting the ability to implement the TSP and in some cases potentially underestimating construction costs and schedule.

The Panel is also concerned that the uncertainty analysis does not identify a broad range of opportunities to reduce residual risk and increase resilience given the likely future conditions, which include climate change. Furthermore, some of the assumptions regarding performance during flood events appeared overly optimistic, which could impact the results of the life safety analysis and underestimate risks that may be present after construction.

Environmental: Existing conditions and environmental consequences are well-documented and supported in the DFR/EA. The project used the Nebraska Stream Conditions Assessment Procedures (NeSCAP) model to evaluate habitat. The DFR/EA would benefit from a brief statement documenting the process for model selection and the model's overall assumptions and limitations. The use of field data and assumptions that are inconsistent with model methodology and requirements were noted. Clarification is needed to ensure that the model results neither over- nor under-estimate the benefits from ecological services and mitigation requirements.

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 DFR/EA does not clearly define the future without-project conditions; therefore, alternative plans to reduce future flood risk cannot be fully evaluated.

Basis for Comment

A clear understanding of the future without-project conditions forms the basis upon which all alternative plans are compared. The DFR/EA presents a clear and thorough description of existing conditions for the Papillion Creek and Tributaries watershed but stops short of describing how those conditions would change in the absence of a Federal project to reduce flood risk in the future. Section 4.1 of the DFR/EA indicates that while the future-condition Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA) H&H modeling of the watershed has been completed, the future economic modeling has not. The Panel is unclear on what conditions are evaluated in Section 4.5.

Future without-project H&H conditions are not suited for comparison to existing-condition economics because flood flows are expected to increase in the future, resulting in higher stages across the stage-frequency curve and therefore different damages across the stage-damage curve. As a result, the expected annual damages produced by such an analysis are likely underestimated by a significant amount.

Depending on the magnitude of underestimation, management measures that might not otherwise be feasible may become so, and the scope of alternative plans could be different from what has been considered. This scenario could completely change the scope of the project, and the recommended plan could differ significantly from what is contemplated in the DFR/EA.

There are additional issues with the level of detail in the establishment of finished floor elevations relative to channel cross section elevation. Differences in the methods used to establish finished floor elevations and channel cross section elevations can introduce uncertainty in how modeled flood stages actually affect structures at risk. Due to time and funding constraints, finished floor elevations are often obtained from mapping and/or geospatial databases rather than surveys using instruments. Channel cross section elevation and channel geometries are obtained through field surveys. Refinements in both channel cross section and structure finished floor elevations can significantly affect the stage-damage relationships for all alternatives, including the future without-project alternative.

Significance – High

A clearly defined future without-project condition for both H&H and economics is necessary to formulate and compare alternatives.

Recommendations for Resolution

1. Develop and refine assumptions regarding the floodplain inventory that reflect future assets at risk of flooding.
2. Conduct field surveys for a representative sample of structures in the floodplain, compare the survey results to mapping/geospatial estimates for consistency, and address any correction errors relative to channel cross section elevations.
3. Perform HEC-FDA modeling using H&H and economic conditions representing the future without-project condition.

Final Panel Comment 2

Some of the assumptions regarding performance during flood events seem to be non-conservative.

Basis for Comment

Several assumptions regarding performance during flood events appear to be optimistic, or at least non-conservative. These include:

- The life safety analysis assumes that an overtopping event would "only have 2 ft overland flow in the leveed area" for proposed conditions (Appendix L, p. 22). For Big Papillion Alternative 3, the proposed levee heights are over 9 feet in some locations, so the analysis seems to assume that these levees will overtop without breaching. If a 9-foot-high levee were to breach during overtopping, there would be a potential for considerably more than 2 feet of inundation in portions of leveed areas. Unless specific design measures are incorporated to deter breaching, it is not conservative to assume that such a high levee would not erode and breach from flow overtopping.
- The recommended alternative proposes to use HESCO basket closure structures for protection at several road crossings (five on Little Papillion, up to two on Big Papillion). Given the rapid rises characteristic of flooding in this system, as described in Section 4.1.1 of the DFR/EA, this would require a very rapid deployment of these closures during the run-up to a storm event. This apparently presumes that the local sponsor would be relied on to identify when deployment is needed in time to prioritize and mobilize crews to put all of these structures in place, essentially simultaneously before flooding occurs.
- The life safety analysis assumes that 90% of the affected public would be evacuated prior to an overtopping event (Appendix L, p. 22). Given the rapid rise in flood levels, this seems to presume that actions would be taken prior to the onset of the storm in order to prepare and evacuate threatened individuals.

Unless measures are taken to ensure that these assumptions are valid, the analysis results may overestimate the degree of risk reduction the project would actually provide.

Significance – Medium

Overly optimistic assumptions could skew the results of the life safety analysis and underestimate the actual risks remaining after project implementation.

Final Panel Comment 2 (continued)

Recommendations for Resolution

1. Either incorporate measures into levee designs to deter breaching during overtopping or revise the life safety analysis to include the potential for increased inundation depths during such events where appropriate.
2. Either describe measures intended to ensure that the local sponsor will be able to reliably deploy the HESCO baskets under the likely pre-flood circumstances or incorporate other means of establishing closures into the relevant alternatives.
3. Describe measures to be taken to prepare for evacuation in Section 4.7.1 of the DFR/EA and make it clear that without these actions, the life safety risk would be higher.

Final Panel Comment 3

The DFR/EA lacks information on levee and dam design that would allow for slope stability, settlement, and bearing capacity to be evaluated.

Basis for Comment

The amount of geotechnical data and geotechnical engineering design provided in the report does not allow for an evaluation of geotechnical issues and an understanding of residual risks associated with existing levees to be modified. The Panel understands that levee and dam designs are based upon existing analogues in the watershed in the case of dams and some levees. Other existing levees are proposed for modification, but there is limited data on their character or construction.

No geotechnical soil cross sections and no core boring logs or cone penetration test (CPT) logs are provided. Core borings are mentioned and some locations of these data referenced (e.g., Union Pacific Railroad crossing), but none of the relevant field data is included in Appendix C, Geotechnical. A few key (representative) boring logs would add to the understanding of the geotechnical assumptions.

There are limited narrative discussions of the various foundation conditions, but these discussions are very brief, generally have limited basis, and vary considerably in the level of detail. Some external geotechnical engineering reports are referenced, but in most cases no comprehensive summary of these reports is provided. Tables of proposed geotechnical design parameters (e.g., phi angles, undrained shear strength) are not provided; instead, assumptions on safe levee slopes are presented (generally 3:1). Given that the literature data and existing core borings are the primary basis for conceptual design, it would be helpful to have some of that information summarized, assessed (including the basis for each design parameter), and presented as a stand-alone document to the DFR/EA.

In addition, no geotechnical engineering analysis is presented in Appendix C, Geotechnical. No stability analysis was completed for retaining walls or levees, no seepage analysis is evident, no bearing capacity assessments were made, and no order-of-magnitude settlement estimates are provided. This information is important to support the assumed feature geometries, including retaining wall width and height as well as levee side slopes, height, and top width.

Also, there are only a few figures or drawings that show “typical” sections for various features. These are shown in very small scale in Appendix C, Geotechnical.

Significance –Medium

Because the geotechnical analysis and conceptual design are incomplete, the understanding of the study documents and of the ability to implement the TSP is affected.

Final Panel Comment 3 (continued)

Recommendations for Resolution

1. Provide a more complete summary of external geotechnical literature, including all assumptions and bases for selecting various geotechnical design parameters.
2. Provide a few typical soil cross-sections for key features of the TSP, including new levees or levee modifications.
3. Include key or “typical” core boring or CPT logs in Appendix C, Geotechnical, in order to link conceptual design to field data.
4. Provide a soil “type log” or assumed soil section for each flood mitigation reach that contains new retaining walls, levees, or levee modifications.
5. Complete preliminary stability evaluations, seepage analysis, bearing capacity evaluations, and order-of-magnitude settlement estimates for representative new levee sections, retaining wall sections, and levee modifications.

Final Panel Comment 4

The uncertainty analysis does not currently identify a broad range of opportunities to reduce risk and increase resilience given likely future conditions, including climate change.

Basis for Comment

A formal uncertainty analysis was run on the hydraulic modeling results, but the modeling uncertainty is only a portion of the uncertainty involved in assessing the alternatives. The DFR/EA states that hydrologic modeling does account for some future development within the watershed, but quantitative climate change issues have not been incorporated. Increased rainfall intensity and flood intensification are identified as likely future conditions (DFR/EA, Section 4.1.4), but the current plan does not explicitly consider these increases.

The Panel agrees with the recommendation noted in the /EADFR/EA, Section 4.1.4, to “consider which [alternatives] are most resilient to increases in loading from the watershed and easiest to modify for these increases in the future” (p. 21), and to that end believes that a sensitivity analysis should be developed during project design to identify portions of the system most susceptible to future water surface profile changes due to foreseeable potential flow recurrence changes. This analysis should include various factors that affect flow rates, profile elevations, and potential damages. Special consideration should be given to “hardened structures” like floodwalls, where future modifications (e.g., raising) might be difficult to implement cost effectively.

In addition, some reaches, such as Reaches BP6, LP1, and LP5, appear to have only small reductions of risk due to project implementation. As part of the more detailed analysis, it would be prudent to consider potential measures in such reaches during detailed design to see if further cost-effective risk reduction is possible.

Significance – Medium/Low

Identification of potential measures to reduce vulnerability to uncertain future conditions and increase risk reduction benefits would increase the resilience and the value provided by the constructed project.

Recommendations for Resolution

1. As the design is advanced further, conduct a more complete uncertainty analysis to identify any locations that are particularly vulnerable to increased stages over the life of the project and to consider potential design elements which would contribute to resilience and/or potential for project modifications.
2. Examine whether there are any cost-effective opportunities to increase risk reduction benefits in reaches currently receiving only small benefits from the project, specifically including Reaches BP6, LP1, and LP5.

Final Panel Comment 5

Adding 3 feet of freeboard or overbuilding to the calculated necessary levee/floodwall structures to address uncertainty in levee/floodwall performance under future conditions is technically unsound and discouraged by ER 1105-2-100, Appendix E, and unnecessarily inflates project costs.

Basis for Comment

Adding freeboard to a contemplated levee system is likely to provide protection above the target level of conveyance. The purpose of adding freeboard is to reduce or eliminate residual risk, which in turn provides protection over and above the target protection. However, the DFR/EA does not fully evaluate the technical need or economic performance of the additional protection.

Current USACE policy and existing technical approaches to evaluating levee performance do not allow for the use of freeboard to eliminate residual risk or improve a levee system's ability to withstand a given flood event. As currently presented in the DFR/EA and appendices, the freeboard is not being added to improve expected performance relative to the incremental costs of adding it.

Engineer Regulation (ER) 1105-2-100, 3-3b(2)(b) (USACE, 2000) states:

> "Projects are analyzed and described in terms of their expected performance, not in terms of levels of protection. Contingencies are acknowledged and residual risk is not routinely reduced by overbuilding or by inclusions of freeboard. The regulation identifies key variables that must be explicitly incorporated into the risk-based analysis. At a minimum, the stage damage function for economic studies (with special emphasis on first floor elevation, and content and structure values for urban studies), discharge associated with exceedance frequency for hydrologic studies, and conveyance roughness and cross-section geometry for hydraulic studies must be incorporated in the risk-based analysis. ER 1105-2-101 further requires a probabilistic display of benefits and eliminates freeboard to account for hydraulic uncertainty." (p. 3-11)

Appendix E of ER 1105-2-100, Section E-18 (p. E-87), repeats the policy above with more details on how a levee system is to be analyzed and how deviations from the National Economic Development (NED) plan are to be documented. Section E-18 explicitly discourages use of freeboard as "unaffordable." Engineer Manual (EM) 1110-2-1619 (USACE, 1996) goes into even greater detail as to why the arbitrary addition of features such as freeboard do not reduce uncertainty in performance.

From an economics and plan formulation perspective, adding height to a proposed levee system without including benefits attributable to the increased height affects total project and net project benefits. It is likely that the additional 3 feet of freeboard included in the DFR/EA provides measurable protection against less frequent events, such as the 250- and 500-year events. This means that the actual level of protection is disguised. Technical practice calls for any measurable degree of protection to be estimated and included in the risk-based performance evaluation as described in the guidance.

Final Panel Comment 5 (continued)

Significance – Medium/Low

As evaluated, the levee systems with freeboard have a very high likelihood of having cost implications in the benefit-cost portion of the screening analysis, without demonstrating that the added freeboard improves performance or reduces uncertainty.

Recommendations for Resolution

1. Explain why 3 feet of freeboard is justified in terms of overall performance.
2. Analyze the additional height in terms of expected benefits vs. expected costs, add it as a non-Federal expense, or remove it as a feature altogether.
3. Include any additional protection provided by the freeboard in the benefit analysis.

Literature Cited

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

USACE (1996). Risk-Based Analysis for Flood Damage Reduction Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Manual (EM) 1110-2-1619. August 1.

Final Panel Comment 6

The future without-project condition does not include the effectiveness of the currently existing levees.

Basis for Comment

USACE guidance in ER 1105-2-100, Appendix E (USACE, 2000), directs using a systematic technical approach to determine degrees of reliability in existing levee systems:

> "Investigations for flood damage prevention involving the evaluation of the physical effectiveness of existing levees and the related effect on the economic analysis shall use a systematic approach to resolving indeterminate, or arguable, degrees of reliability. Reasonable technical investigations shall be pursued to establish the minimum and, to the extent possible, the maximum estimated levels of physical effectiveness. Necessary information and summary of analyses shall be included in report presentations of plan formulation and shall be documented in appropriate supporting materials." (p. E-106)

While it appears that USACE has conducted a risk assessment of existing levee systems in the Papillion Creek watershed, it is not clear whether the assessment meets or exceeds the existing levee systems requirements described above. The DFR/EA does not document this compliance with ER 1105-2-100, Appendix E.

While the elevation of the existing levee may exceed certain target stages predicted by the H&H modeling, overtopping is not the only failure mode that could occur in the study area. Piping and underseepage have resulted in catastrophic levee failures elsewhere in the country. In the estimated 75- and 60-year events at Elba, Alabama, in 1990 and 1998 respectively, piping and/or underseepage led to catastrophic failures. Piping and underseepage were also issues with the Zoar Levee system in Ohio.

Significance – Medium/Low

For studies involving existing levee systems, documentation of their expected performance and compliance with ER 1105-2-100, Appendix E, is required.

Recommendations for Resolution

1. Explain, if possible and in detail, how the comprehensive levee risk analysis meets or exceeds the requirements of ER 1105-2-100, Appendix E.
2. Delineate levee reaches or river stations using appropriate economic, geotechnical, and hydrologic/hydraulic criteria.
3. Assign probable non-failure and failure elevations to the levees for each location in a manner compliant with ER 1105-2-100, pp. 105-107.
4. Estimate the consequences of failure, even if those consequences are not related to the NED analysis.

Literature Cited

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

USACE (2015). Zoar Levee & Diversion Dam, Dam Safety Modification Report & Draft Environmental Assessment, Department of the Army, U.S. Army Corps of Engineers. 2015.

Final Panel Comment 7

Agricultural benefits, including the reduction of flood risk, erosion, and sedimentation, are not included in the project planning.

Basis for Comment

Slightly more than one-third of the floodplain in the Papillion Creek watershed has an agricultural land use classification. While USACE is justified in formulating a project to address urban flood risk in a watershed dominated by urban land use, it is likely that agricultural flood risk may be reduced as an incidental beneficial effect.

While flood risk reduction projects are rarely formulated to reduce damages to crops, significant incidental benefits may accrue to projects that reduce flood stages in agricultural areas, particularly when flood risk is highest during peak planting, growing, and harvesting seasons. The detailed explanation of historical flooding within the Papillion Creek watershed indicates that the highest risk periods may well coincide with at least one of these periods. There may also be opportunities to reduce streambank erosion and sediment displacement that may be occurring within the watershed.

The recommended plan has a benefit-cost ratio (BCR) of just over 2.0 and net annual NED benefits of just over $4 million. These figures could be significantly enhanced if agricultural flood risk reduction and erosion/sediment control benefits were included.

Significance – Medium/Low

Inclusion of agricultural flood risk reduction would further improve project economic justification.

Recommendations for Resolution

1. Evaluate the agricultural setting to determine if there are problems and opportunities that could be addressed by the alternative plans already considered.
2. Perform rough-order benefit estimation.
3. Include benefits accruing to the agricultural sector in the NED benefits of the recommended plan.

Final Panel Comment 8

The DFR/EA does not identify high-value assets potentially at risk or include those higher values in the BCR analysis.

Basis for Comment

Certain specialized structures such as hospitals, medical testing facilities, manufacturing operations, and electronics assembly and repair facilities often have unique construction and very high content-structure value (CSV) ratios. These high-value assets are often found in the larger economic centers of states with a rural setting. They can have significant impacts to floodplain inventory values, and separate modeling can change the nature and extent of management measures designed to reduce their risk. The DFR/EA does not discuss the presence or absence of such facilities.

A review of floodplain inventories in Albany, Georgia, and Hattiesburg, Mississippi, revealed medical and higher education facilities not usually found in other parts of the country. These facilities were given their own reaches within the HEC-FDA models. The study teams developed custom depth-damage functions and obtained structure content values from the owner/operators. The additional modeling significantly increased the cost of without-project damages and reduced the cost of with-project damages. Further investigation of the Papillion Creek study area could have a similar impact.

Significance – Medium/Low

Identifying high-value structures at risk could increase potential flood risk management benefits and improve confidence in the results of the analyses.

Recommendations for Resolution

1. Investigate the floodplain for the presence of unique or high-value structures.
2. Determine whether separate modeling could impact the expected value of flood risk.
3. Develop customized depth-damage curves and content values.
4. Separate each such structure or structure group into their own reaches and model future without-project and future with-project flood damages.

Final Panel Comment 9

The induced damages identified in Appendix F of the DFR/EA have not been fully documented to thoroughly understand what must be avoided or mitigated in the future.

Basis for Comment

Section 4.11 of the DFR/EA (p. 65) states "The potential for induced flooding was not fully captured in the development of the TSP…." The Panel was not able to locate a definition of "induced flooding" or a description of the location or magnitude of the potential impacts within the DFR/EA. Section 4.11 of the DFR/EA (p. 65) also states that "The potential induced flooding will be further investigated during feasibility-level design with completion of unsteady flow modeling. If the induced flooding is confirmed, measures would be formulated to appropriately address the issue." However, the DFR/EA does not describe what these measures might be or the potential cost implications.

In Section 6.2 of Appendix F, Economic Analysis, Tables 20, 30, 37, and 40 show damages increasing in the future. The DFR/EA (Section 4.11) states that the steady flow H&H modeling may not have been able to capture the induced flooding anomaly, and that further modeling using unsteady flow may provide greater insight as to the cause and potential methods of avoidance or mitigation. The numbers presented in the referenced tables in Appendix F indicate net damages due to the project in those reaches, and so represent a minimum estimate of the project-induced damages to be mitigated; additional mitigation could be required in specific areas of reaches that demonstrate net benefits as a whole. The Panel understands that the unsteady flow analysis could increase or decrease induced flooding, and thereby projected damages, in these and possibly other reaches.

Avoiding or mitigating induced damages is a technical and policy requirement. As such, this is typically treated as a constraint in Step 1 of the six-step planning process. When treated as a constraint, management measures and alternative plans that induce damages are screened out and not carried forward unless they are accompanied by measures that mitigate or avoid them.

It is not possible to determine the likely cost or implementation impacts of the additional required mitigation without a basic understanding of the number, magnitude, or cost of these measures, so information regarding mitigation requirements is relevant to assess the feasibility of Alternative 3. If induced damages are confirmed with further modeling, the nature, extent, and economic feasibility of the recommended plan could change. The eventual plan could be significantly different from what is described in the DFR/EA.

Significance – Medium/Low

Documenting and addressing the induced flooding issue could change the recommended plan or present serious obstacles to implementing it.

Final Panel Comment 9 (continued)

Recommendations for Resolution

1. Define" induced flooding" as it pertains to this project in more detail in Section 4.11 of the DFR/EA, and state that the final project should be optimized to avoid or minimize induced damages at any location.
2. Complete the H&H modeling using both steady and unsteady flow schemes to identify and isolate any induced higher flows under with-project conditions.
3. Complete HEC-FDA modeling for future without-project and future with-project conditions.
4. Calculate the magnitude of induced flood damages and identify means and methods to mitigate or avoid them.
5. Add language to Section 4.11, Subheading "Hydraulics and Hydrology," of the DFR/EA describing potential locations where mitigation for water level increases may be required, anticipated mitigation measures, and a qualitative statement regarding likely impacts on project costs, specifically referencing the measures to address increases in reaches LP5 and LP8.

Final Panel Comment 10

The amount of available engineering detail regarding the proposed dry dam designs at Dam Sites 10 and 19 is limited, precluding comprehensive assessments of the conceptual design and cost estimates.

Basis for Comment

DFR/EA Appendix C, Geotechnical, provides a brief discussion for the basis of the multi-purpose (e.g., "Wet") dam design at Dam Sites 10 and 19. At Dam Site 10, a preliminary layout was based upon previous dam design work completed by USACE in 1975. At Dam Site 19, a preliminary layout was based upon dam design work completed by HDR in 2018. However, neither the Geotechnical Appendix nor the DFR/EA provides a comparable engineering design or layout for the proposed dry dam project features at Dam Sites 10 and 19, yet an economic evaluation is included as part of the evaluation of the TSP. A dry dam at each site might be a different embankment design entirely, given the opportunity to save costs since no permanent pool would be included. The basis for the economic evaluation of the dry dams cannot be understood if no design layout has been completed for either one.

A majority of the detailed engineering is proposed to occur after the resolution of the TSP; however, since the reservoirs are such a large part of the total cost of several alternatives, further engineering detail should be included as part of the final selection process for the TSP.

In addition, only a few figures or drawings show the various design features of the proposed multi-purpose dams. At a minimum, a conceptual design would include typical cross-sections of each embankment dam, seepage collection system, primary outlet works, and auxiliary emergency spillway. These sections could serve as part of the improved basis of design for the cost estimate of each reservoir.

Significance –Medium/Low

Due to the low level of engineering detail completed on the reservoir project, the construction costs and schedule may be underestimated.

Recommendations for Resolution

1. Provide a narrative in the FR/EA that describes the dry dam design at each site, and clearly state whether the design is proposed to be the same as or different than the comparable multi-purpose reservoir option.
2. Develop typical embankment sections and plan layouts for the dry dam designs at Dam Sites 10 and 19 and include them in Appendix C, Geotechnical.
3. Provide a more complete set of figures, plans, or schematics for the multi-purpose reservoir designs at Dam Sites 10 and 19 and include them in Appendix C, Geotechnical.
4. Revise cost estimates for TSP alternatives, as necessary, based upon the expanded reservoir conceptual designs for dry dam options and multi-purpose options.

Final Panel Comment 11

It is unclear what civil engineering activities associated with floodwalls and utility relocations have been conducted and what remains to be done.

Basis for Comment

Structural engineering for the project has not yet been completed. This information is slated to be provided for the Final FR/EA. However, the TSP includes significant retaining wall elements that require some level of structural stability design. Also, it is not clear what type of retaining wall is being considered by USACE, since this issue is not discussed in detail. L-walls and T-walls are assumed to be the most logical choice. In addition, very little work has yet been completed with regard to utility relocations. In such an urbanized study area, utilities would seem to be an important element in the construction schedule. Public comments mention the need for relocation of water supply wells and oil/gas lines at a minimum.

Significance – Medium/Low

The structural analysis and conceptual design are incomplete, thereby affecting the understanding of the study documents as well as the ability to implement the TSP.

Recommendations for Resolution

1. Prepare a conceptual-level design of retaining walls throughout the various project reaches. The design should include preliminary global stability evaluations.
2. Provide some detailed figures or typical cross-sections of the final retaining wall layout and design.
3. Provide a narrative in the DFR/EA and Appendix D (to be developed) that discusses the retaining wall types and configurations to be utilized per reach.
4. Provide a more thorough discussion and evaluation of the required utility relocations needed for the TSP.
5. Revise cost estimates for TSP alternatives, as necessary, based upon the expanded structural design and revised utility relocation assessment.

Final Panel Comment 12

Appendix C, Geotechnical, lacks details regarding the need for erosion protection for levees and floodwalls.

Basis for Comment

Many levees and some of the anticipated retaining walls included in the TSP appear to be susceptible to erosion. Levees are anticipated to be built throughout the project area, while retaining walls are included in several areas and reaches. There is a risk that during an extreme storm event, high flows may cause erosion of the levee or foundation of the floodwalls until they collapsed. Measures such as armoring to minimize soil erosion may reduce this risk, but they are not discussed in the document.

Although it is not entirely clear in the DFR/EA or Appendix C, Geotechnical, narrative and figures, it appears that only turf protection is assumed for all levee sections. This would likely be insufficient in many areas of the project. More likely, some type of armoring of levees would be required to protect them from erosion. During Hurricane Katrina, many levees that were constructed of erodible materials were damaged or destroyed entirely due to lack of erosion protection. And since much of the available borrow material considered for this current study is also erodible, it seems likely that armoring of the levees will be required. This has important implications for the overall cost of the project as well as plan implementation. Armor stone is likely not available locally and must be imported for the levee construction. Alternatively, concrete mattress or soil-cement could be considered.

Significance – Medium/Low

Because the levee and floodwall conceptual design does not address erosion, the ability to implement the TSP is not clearly substantiated.

Recommendations for Resolution

1. Provide a new section in the geotechnical or structural engineering appendices discussing conceptual armor design for the various levee and retaining wall sections.
2. Develop a typical section of levee that includes armor protection.
3. Update the levee and retaining wall cost estimate and construction schedule as required based on the inclusion of armor protection.

Final Panel Comment 13

The final TSP cost estimate includes real estate, but it is not clear what right-of-way was used to estimate total acreage.

Basis for Comment

Typically, plan sheets or figures are developed for the DFR/EA that show the assumed project right-of-way for each flood mitigation reach of consequence under the TSP. The total right-of-way requirement provides a basis for real estate needs for the project. Since the TSP cost estimate includes real estate costs, it is assumed that these cost estimates have already been completed, but they are not provided or presented adequately in the DFR/EA or in an appendix.

Significance – Medium/Low

Without clear information on rights-of-way, total acreage, and real estate costs, the TSP cost estimate is incomplete.

Recommendations for Resolution

1. Include project right-of-way plan sheets or figures in Appendix C, Geotechnical, or in Appendix D, Structural Engineering.
2. Discuss the right-of-way needs under the TSP in the DFR/EA based upon the right-of-way maps, presented by flood mitigation reach.

Final Panel Comment 14

A public comment has identified a discrepancy in how real estate costs are calculated for Dam Site 10.

Basis for Comment

A commenter identifies what appear to be discrepancies with the real estate costs and expected annual damages reduced (project benefits). Either the flowage easement costs may have been calculated incorrectly, or the text of Appendix J does not reflect any adjustments that were made to the calculations to explain the difference.

If the flowage easement costs are incorrect, the commenter correctly notes that mitigation and interest during construction could also be affected, with associated impacts to net project benefits and the BCR.

If the flowage easement calculation includes an adjustment, that adjustment is not identified or explained in Appendix J.

Significance – Medium/Low

A discrepancy in real estate costs could affect total project costs, the BCR, and overall project justification.

Recommendations for Resolution

1. Review the text and calculations in Appendix J for accuracy and consistency.
2. Describe any adjustments made to calculations and explain why they are necessary.
3. Revise Appendix J as necessary to ensure internal consistency and clarity.

Final Panel Comment 15

The criteria used to select the NeSCAP model for habitat evaluation are not identified in the DFR/EA.

Basis for Comment

To ensure accurate, consistent, and comparable results, models used to determine the environmental services and mitigation accounting should be able to account for the range of conditions to be evaluated in existing and expected conditions. This also includes identifying the limitations of the model used and models considered. To increase transparency and validity to the model selection process, identifying any coordination with external natural resource agencies and providing a list of alternative models considered would demonstrate that a thorough evaluation of potential models was conducted.

Significance –Low

Without identifying the criteria used to select the model used for quantifying environmental services and mitigation accounting, the technical quality of the DFR/EA is reduced.

Recommendations for Resolution

1. Modify the existing text to include the assumptions/limitations used to select the model.
2. List the other models/approaches that were considered.
3. Identify if other natural resources agencies were involved in model selection.

Final Panel Comment 16

Methods used for field data collection (Appendix A of Appendix H) to delineate fluvial geomorphic characteristics are inconsistent with model requirements and could result in an over- or under-estimation of the benefits from ecological services and mitigation requirements.

Basis for Comment

The field measurements for two specific fluvial geomorphic characteristics, bankfull and flood-prone area, are not consistent with the required measurements for the NeSCAP model. Inconsistencies are provided below:

- Section 2.3 of Appendix A (Papillion Creek Basin Environmental Analysis: Comparative Analysis of Baseline Conditions to "With Project" Conditions and the Associated Environmental Impacts) of Appendix H states: "The floodprone area was assumed to be the entire stream channel below the top of bank" (p. 8). This field method used is inconsistent with the method identified in the NeSCAP guidance document (USACE, 2012), which states that "The floodprone area is determined in the field by projecting the elevation corresponding to two times the maximum depth of the bankfull channel…" (p. 5)
- Section 2.3 of Appendix A (Papillion Creek Basin Environmental Analysis: Comparative Analysis of Baseline Conditions to "With Project" Conditions and the Associated Environmental Impacts) of Appendix H conservatively "…assumed that this [bankfull] bench represents the 2- to 3-year event elevation in all reaches analyzed" (p. 9). This is inconsistent with the method identified in the NeSCAP guidance document (USACE, 2012), which states bankfull discharge, which develops the bankfull bench, "with a recurrence interval seldom outside the 1 to 2 year range." (p. 7)

The identified locations of these two geomorphic characteristics affects three of the six model variables, thus influencing their condition index rating score and the overall individual assessments. The Panel believes that the definitions for floodprone and bankfull, outlined in the NeSCAP guidance document, should be carefully followed during data collection to ensure true, consistent, and comparable results. The effect of any inconsistencies could lead to an over- or under-estimation of existing and projected ecological services and mitigation requirements used to support the TSP.

Significance – Low

By utilizing data collected following the methods outlined in the NeSCAP guidance document, the accuracy and precision of analysis results obtained can be confirmed.

Final Panel Comment 16 (continued)

Recommendations for Resolution

1. Develop a flow duration curve for bankfull discharge to determine if discharge measurements support this deviation from the NeSCAP document.
2. Modify the existing text with rationale for this deviation from the NeSCAP document.
3. If the previous recommendations are difficult to support, reconduct the survey following guidance in the NeSCAP document and rerun the analysis.

Literature Cited

USACE (2012). Interim Nebraska Stream Condition Assessment Procedure (NeSCAP). M.C. Gilbert, K.L. Lawrence, and M.T. Wray, eds. U.S. Army Corps of Engineers-Omaha District. CENWO-OD-RF Technical Report 05-12.

Final Panel Comment 17

The alternative scoring method utilized and outlined in the NeSCAP document for converting a stream to a lacustrine system (Variable 3) yielded results contradictory to the text of the NeSCAP document, affecting the accuracy in reporting the impacts of Dam Sites 10 and 19.

Basis for Comment

The alternative scoring method used and outlined in the NeSCAP guidance document (USACE, 2012) for converting a stream to an impounded lacustrine system was followed; however, the results provided in Figures 4 and 6 of Appendix A in Appendix H contradict the text in both the NeSCAP guidance document (p. 15; Table 3) and Appendix A of Appendix H (p. 5) and are likely inadequate to address stream connectivity for aquatic organisms. Under the TSP, Dam Sites 10 and 19, where sections of Thomas Creek and South Papillion Creek, respectively, are to be converted to an impounded lacustrine system, both projects received a post condition index rating (CIR) of 1.0 for Variable 3 of the model (pp. 14 and 16, respectively). However, Appendix A of Appendix H states that “To receive a 1.00, the floodplain must not be physically manipulated, no surface alterations such as dams, dikes, diversions or concrete lining may be present” (p. 5). Additionally, the NeSCAP guidance document (USACE, 2012) indicates similar conditions on Table 3 (p. 15).

Significance – Low

Because the TSP “with project” CIR values for Variable 3 at Dam Sites 10 and 19 are inconsistent with the text of both the NeSCAP guidance document and Appendix A of Appendix H, the results provided in the DFR/EA could be incorrect.

Recommendations for Resolution

1. Limit the maximum CIR value of the alternative scoring method to a value represented on Table 3 of the NeSCAP guidance document (i.e., CIR of <1.0).
2. Include the rationale for maintaining the CIR of 1.0 for Dam Sites 10 and 19.

Literature Cited

USACE (2012). Interim Nebraska Stream Condition Assessment Procedure (NeSCAP). M.C. Gilbert, K.L. Lawrence, and M.T. Wray, eds. U.S. Army Corps of Engineers-Omaha District. CENWO-OD-RF Technical Report 05-12.

Final Panel Comment 18

The description of residual risks associated with levee, floodwall, and dam failure appears to either minimize or overlook some of the consequences of such failures in the DFR/EA.

Basis for Comment

Constructing and/or raising levees and floodwalls introduces or increases the potential consequences of failure, including locally high velocities and debris flows near the breach as well as potentially more rapidly rising inundation levels than would have occurred without the structure. Constructing a dam will introduce the risk of dam failure, which could result in high velocities, debris flows, and more extensive inundation than would have occurred without the dam. There is also an element of complacency engendered in the protected public that might reduce the tendency to evacuate, increasing exposure to these conditions, especially if they occur unexpectedly due to failure at less than design conditions.

The life safety analysis presumes that the risk associated with levee breaches prior to overtopping is negligible (Appendix L, Section 5.0, p. 21), due to short flood durations and low breach likelihood. From a probabilistic perspective this may be defensible, as the overtopping events are larger and may be recurrent enough that they are more frequent than the occurrence of a breach prior to overtopping. However, the dangers posed by breaching are qualitatively different from overtopping flooding—breaches tend to be more unexpected and may have more dangerous local impacts—and these dangers are not described in the DFR/EA.

Also, Appendix L, p. 21, states “For this screening level approach, resources are not available to estimate properly the breach zone on the overall fatality rate. Therefore, fatalities in the breach zone are not accounted for in the assessment.” During the mid-review teleconference call, the PDT indicated that this analysis should be updated to include such information once the design has progressed appropriately.

Significance – Low

Description of potential risks present after construction of these structures is necessary for the complete discussion of project impacts.

Recommendations for Resolution

1. Describe the risk and potential consequences of levee/floodwall/dam failure in DFR/EA Section 4.12.
2. As design progresses, update the life-safety analysis to include information regarding possible loss of life at levee breach locations.

5. REFERENCES

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.

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USACE (2018). Water Resources Policies and Authorities: Review Policy for Civil Works. Engineer Circular (EC) 1165-2-217. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. February 20.

USACE (2015). Zoar Levee & Diversion Dam, Dam Safety Modification Report & Draft Environmental Assessment, Department of the Army, U.S. Army Corps of Engineers. 2015.

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

USACE (1996). Risk-Based Analysis for Flood Damage Reduction Studies. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Manual (EM) 1110-2-1619. August 1.

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APPENDIX A

IEPR Process for the Papillion Creek GRR/EA 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 Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report (GRR) and Environmental Assessment (EA) (Papillion Creek GRR/EA) Independent External Peer Review (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 November 21, 2019. 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 April 9, 2020. 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 Papillion Creek GRR/EA IEPR

Task	Action	Due Date
1	Award/Effective Date	8/20/2019
	Review documents available	11/21/2019
	Public comments available	1/13/2020
	Battelle submits draft Work Plan[a]	8/29/2019
	USACE provides comments on draft Work Plan	9/18/2019
	Battelle submits final Work Plan[a]	9/24/2019
2	Battelle submits list of selected panel members[a]	9/6/2019
	USACE confirms the panel members have no COI	9/12/2019
3	Battelle convenes kick-off meeting with USACE	8/29/2019
	Battelle convenes kick-off meeting with panel members	11/12/2019
	Battelle convenes kick-off meeting with USACE and panel members	11/14/2019
4	Panel members complete their individual reviews	12/20/2019
	Panel members provide draft Final Panel Comments to Battelle	1/21/2020
	Battelle sends public comments to panel members for review	1/13/2020
	Panel drafts Final Panel Comment(s) regarding public comments, if necessary	1/213/2020
	Panel finalizes Final Panel Comments	1/21/2020
5	Battelle submits Final IEPR Report to USACE[a]	2/5/2020
6[b]	Battelle convenes Comment Response Teleconference with panel members and USACE	2/14/2020
	Battelle submits pdf printout of DrChecks project file[a]	4/9/2020
	Agency Decision Milestone (ADM) meeting[c]	3/10/2020
	Contract End/Delivery Date	9/2/2020

[a] *Deliverable.*
[b] *Task 6 occurs after the submission of this report.*
[c] *The ADM 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 Papillion Creek GRR/EA IEPR, Battelle held a kick-off meeting with USACE to review the preliminary/suggested schedule, discuss the IEPR process, and address any questions regarding the scope (e.g., terminology to use, access to DrChecks, etc.). Any revisions to the schedule were submitted as part of the final Work Plan. The final charge consisted of 16 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle 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
Draft Feasibility Report/Environmental Assessment (DFR/EA)	91
Appendix A: Hydrology	121
Appendix B: Hydraulics	529
Appendix C: Geotechnical	28
Appendix D: Structural Engineering	20
Appendix E: Cost Engineer	12
Appendix F: Economics	85
Appendix G: Nonstructural	37
Appendix H: Environmental	341
Appendix I: Cultural Resources	12
Appendix J: Real Estate Plan	5
Appendix K: Recreation	147
Appendix L: Public and Tribal Engagement	27
Total Number of Review Pages	**1,455**
Public Comments [a, b]	80

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

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

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

- Review Policy for Civil Works (EC 1165-2-217, February 20, 2018)
- USACE ER 1110-1-8159, Engineering and Design, DrChecks (May 10, 2001)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018, and PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015)
- Procedures to Evaluate SLR Change Impacts Responses Adaptation (ETL 1100-2-1 – June 30, 2014)
- Incorporating SLR Change in CW Programs (ER 1100-2-8162 – December 31, 2013).

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 six panel member questions to USACE. USACE was able to provide responses to all the questions during the teleconference, or was able to provide written responses to all the questions prior to the end of the review.

In addition, throughout the review period, USACE provided documents at the request of panel members. These documents were provided to Battelle and then sent to the Panel as additional information only and were not part of the official review. A list of these additional documents requested by the Panel is provided below.

- Model Review Plan NeSCAP for Omaha District, 13 Feb 2019
- Memorandum: Certification of Regional Use - Nebraska Stream Condition Assessment Procedure (NeSCAP) 11 July 2019
- Memorandum: Northwest Division Review Plan for the Papillion Creek and Tributaries Lakes, Nebraska GRR/EA, 28 October 2019
- Review Plan, Papillion Creek and Tributaries Lakes, Nebraska, September 2019
- Fishes of the Papillion Creek Tributaries Basin, Nebraska. Thesis. A. Luke Wallace, University of Nebraska at Omaha, May 2006

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 Papillion Creek GRR/EA 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 e-mail detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
    1. Comment Statement (succinct summary statement of concern)
    2. Basis for Comment (details regarding the concern)
    3. Significance (high, medium/high, medium, medium/low, and low; see description below)
    4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
    1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.

4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.

5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.

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

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 18 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 a PDF file containing 80 pages of public comments on the Papillion Creek DFR/EA from USACE. Battelle then sent the public comments to the panel members in addition to the following charge question:

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

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the comments to identify any new technical concerns that had not been previously identified during the initial IEPR. Upon review, the Panel noted that some of the issues raised in the public comments were similar to concerns raised in the IEPR Final Panel Comments and the Panel generated one new comment,

A.6 Final IEPR Report

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

A.7 Comment Response Process

As part of Task 6, Battelle will enter the 18 Final Panel Comments developed by the Panel into USACE's 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 Papillion Creek GRR/EA Project

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B.1 Panel Identification

The candidates for the Independent External Peer Review of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report (GRR) and Environmental Assessment (EA) (hereinafter: Papillion Creek GRR/EA IEPR) Panel were evaluated based on their technical expertise in the following key areas: planning formulation/economics, environmental law compliance/cultural resources, hydrology and hydraulic (H&H) engineering, civil engineering, and geotechnical/soils engineering. These areas correspond to the technical content of the review documents and overall scope of the Papillion Creek GRR/EA 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 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."

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

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment

1. Previous and/or current involvement by you or your firm in the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation and Environmental Assessment (hereinafter: Papillion Creek GRR/EA) and related projects.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment
2. Previous and/or current involvement by you or your firm in flood control, flood management, and the watershed of the Papillion Creek and its tributaries in Nebraska
3. Previous and/or current involvement by you or your firm in the conceptual or actual design, construction, or operation and maintenance (O&M) of any projects in Papillion Creek GRR/EA related projects.
4. Current employment by the U.S. Army Corps of Engineers (USACE).
5. Previous and/or current involvement with paid or unpaid expert testimony related to Papillion Creek GRR/EA.
6. Previous and/or current employment or affiliation with members of the cooperating agencies or local sponsors OR the non-Federal sponsors or any of the following cooperating Federal, State, County, local and regional agencies, environmental organizations, and interested groups *(for pay or pro bono):* • Papio-Missouri River Natural Resource District • Nebraska Department of Environmental Quality
7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to the Papillion Creek watershed.
8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Omaha District.
9. Previous or current involvement with the development or testing of models that will be used for, or in support of the Papillion Creek GRR/EA project. Note – Models used for this GRR/EA include Hydrologic Engineering Center's (HEC) River Analysis System (HEC-RAS), Hydrologic Modeling System (HEC-HMS), Flood Damage Reduction Analysis (HEC-FDA), and the Nebraska Stream Channel Assessment Protocol (NeSCAP)
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Omaha District. If yes, provide title/description, dates, and location (USACE district, division, Headquarters, ERDC, etc.), and position/role. Please also clearly delineate the percentage of work you personally are currently conducting for the Omaha District. Please explain.
11. Any previous employment by USACE as a direct employee, notably if employment was with the Omaha District. 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 Questionnaire for the IEPR of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment
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 Omaha District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood management and flood risk management and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the Papillion Creek GRR/EA project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from Papio-Missouri River Natural Resource District.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Papillion Creek GRR/EA project.
18. Participation in relevant prior and/or current Federal studies related to the Papillion Creek GRR/EA project.
19. Previous and/or current participation in prior non-Federal studies related to the Papillion Creek GRR/EA project.
20. Has your research or analysis been evaluated as part of the Papillion Creek GRR/EA project?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit.

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. 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. Papillion Creek GRR/EA IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Planning Formulator / Economist					
David Luckie	Independent consultant	Mobile, AL	B.A., Economics and Finance	N/A	31
Environmental Law Compliance / Cultural Resources Specialist					
Dane Shuman	Trutta Environmental Solutions	Hendersonville, TN	M.S. Natural Resource Science – Aquatic Ecology Focus	N/A	20+
Hydraulics & Hydrology Engineer / Civil Engineer (Dual Role)					
Michael Schwar	Stony Point Hydrology, LLC	Mukwonago, WI	Ph.D., Civil and Environmental Engineering	Yes	30
Geotechnical / Soils Engineer					
Chris Brown	University of North Florida	Jacksonville, FL	Ph.D., Civil Engineering/Hydrology	Yes	29

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 on the panel members and their areas of technical expertise is given in Section B.3.

Table B-2. Papillion Creek GRR/EA IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Luckie	Shuman	Schwar	Brown
Planning Formulator / Economist				
Minimum 15 years of demonstrated experience in economics and planning	X			
M.S. degree or higher in economics	W[1]			
Minimum of five years of experience directly dealing with the with USACE six-step planning process which is governed by Engineer Regulation (ER) 1105-2-100, Planning Guidance Notebook	X			
Experience related to economic evaluation of traditional National Economic Development (NED) plans and trade-off analysis.	X			
Familiarity with the Civil Works flood works management projects	X			
A thorough understanding of the use of models similar to the Hydrologic Engineering Center's Flood Damage Reduction Analysis (HEC-FDA)	X			

Technical Criterion	Luckie	Shuman	Schwar	Brown
Environmental Law Compliance Specialist / Cultural Resources Specialist				
At least 15 years of experience directly related to water resources environmental evaluation or review and the National Environmental Policy Act (NEPA) process and analysis		X		
A biological or environmental background with familiarity with the project area and environmental impact analysis and mitigation		X		
Familiarity with habitat, fish, and wildlife species that may be affected by the project alternative in the study area and region		X		
A basic understanding of stream habitat modeling is required		X		
Familiarity and experience with the Clean Water Act and Endangered Species Act.		X		
H&H Engineer / Civil Engineer (Dual Role)				
Registered professional engineer			X	
Minimum 15 years of experience in hydrology and hydraulic engineering and civil engineering and design			X	
Familiarity with HEC River Analysis System (RAS) and HEC Hydrologic Modeling System (HMS)			X	
Recent knowledge of accepted and certified hydrologic, hydraulic, and sediment transport models			X	
Familiar with application of detention/retention basins, application of floodwalls, non-structural solutions involving flood warning systems and flood proofing.			X	
BS or higher in engineering			X	
Experienced in designing channel modifications, levee systems, earthwork, retention/detention facilities			X	
Working knowledge of construction and capability of making professional determinations based on experience			X	
Geotechnical / Soils Engineer				
Registered professional engineer or geologist				X
Minimum 10 years of experience in the field of geotechnical engineering				X
MS degree or higher				X
Expert in soils and subsurface geology, material and bank stability and stabilization, grading, and engineering drawings.				X
Safety Assurance Review				X

[1] - USACE waived this criteria for this panel member.

B.3 Panel Member Qualifications

Detailed biographical information on each panel member's credentials, qualifications, and areas of technical expertise is summarized in the following paragraphs.

Name	**David Luckie**
Role	**Planning Formulator / Economist**
Affiliation	**Independent consultant**

Mr. Luckie is an independent consultant with 31 years of professional experience in water resource economics, planning, plan formulation, benefit-cost analysis, and risk-based analysis. His public works experience encompasses decades of work with Federal and non-Federal agencies, as well as local and state organizations. He earned his B.S. in economics and finance from the University of South Alabama in 1986. His professional experience includes working with multidisciplinary teams to provide or review complex planning studies for coastal storm risk management (CSRM), dam safety, flood risk management (FRM), ecosystem restoration, and water supply and water quality studies. He is intimately familiar with Engineer Regulation (ER) 1105-2-100 and the six-step planning process and has prepared, supervised, or reviewed numerous planning studies in his career.

Mr. Luckie is familiar with the evaluation of alternative plans for both CSRM and FRM studies and has conducted, supervised, or reviewed several water resource studies featuring numerous alternative plans constructed from an array of different management measures. Over the last three decades, Mr. Luckie has been involved in numerous FRM studies. Two examples are the Hunting Bayou General Reevaluation Report for Houston, Texas, a multipurpose project that included structural, non-structural, and recreation outputs, and the Mississippi Coastal Improvements Program following Hurricanes Katrina and Rita. He has also served as a panel member on the IEPRs of the Leon Creek Watershed Feasibility Study in Tennessee and the Dallas Floodway Extension Feasibility Study in Texas. He applied his knowledge of ER-1105-2-100 and the six-step planning process in each of these high-profile efforts.

Least cost analysis, also known as cost-effectiveness analysis, has been a very important aspect of Mr. Luckie's decades of work. He is familiar with the evaluation of alternative plans. As a Regional Economist with the U.S. Army Corps of Engineers (USACE) Mobile District (1988-2006), Mr. Luckie conducted, supervised, or reviewed benefit-cost analyses for a variety of single-purpose and multi-purpose water resource projects covering the full range of USACE missions. Relevant studies include the Apalachicola-Chattahoochee-Flint River and the Alabama-Coosa-Tallapoosa Comprehensive Studies; the draft Programmatic Environmental Impact Statements covering the states of Alabama, Florida, and Georgia; and the Hunting Bayou GRR in Houston, Texas.

Mr. Luckie is very familiar with USACE standards and procedures. He has extensive experience in performing National Economic Development (NED) analyses, specifically as they relate to flood and coastal risk management. For more than 25 years, he has performed, supervised, or reviewed NED procedures for technical accuracy and for compliance with policy, guidance and accepted planning principles. Such studies as Panama City Beaches and Mississippi Coastal Improvements reflect this expertise.

Mr. Luckie has been using the Hydrologic Engineering Center (HEC) Flood Damage Reduction Analysis (HEC-FDA) software since its inception in the 1990s. He has also performed, reviewed, or trouble-shot

scores of HEC-FDA analyses for Federal, non-Federal, and private sector clients. In addition, he has mentored interns and junior economists in USACE methodologies for CSRM, requiring them to calculate without- and with-project condition damages, either by hand or with a Microsoft Excel spreadsheet, before allowing them to use HEC-FDA. He is also very familiar with the USACE Regional Economic System (RECONS) model and the estimation of Regional Economic Development benefits and has used the model for both Federal and non-Federal project proponents since its inception.

Name	**Dane Shuman**
Role	**Environmental Law Compliance / Cultural Resources Specialist**
Affiliation	**Trutta Environmental Solutions, LLC**

Mr. Shuman is an expert in fisheries and aquatic conservation and management, specifically threatened and endangered (T&E) species, with over 20 years of experience in the State of Nebraska and the upper Great Plains working in habitats ranging from small streams to the Missouri River. He received his M.S. in Natural Resource Sciences with specialization in Aquatic Ecology from the University of Nebraska-Lincoln in 2003. Mr. Shuman's extensive professional development training includes three stream restoration courses instructed by hydrologist/geomorphologist Dave Rosgen (River Assessment and Monitoring, River Morphology and Applications, and Applied Fluvial Geomorphology) and one provided through the U.S. Fish and Wildlife Service (USFWS).

Mr. Shuman has spent most of his career assessing fish and wildlife habitat in Nebraska and the upper Great Plains. He was on staff for the USFWS from 2004 to 2017, beginning as a Fisheries Biologist and rising to Fisheries Supervisor, where he oversaw the Federal management of fisheries programs in South Dakota, Nebraska, and Kansas. He is currently a Senior Aquatic Biologist for Trutta Environmental Solutions, LLC, where he is part of a team to develop and implement a high-definition stream survey platform. He is also researching and reviewing fundamental river and stream sampling methods, protocols, and stream habitat suitability models with a focus on T&E species habitat requirements and major aquatic parameters (e.g., depth substrate, bank condition, habitat type). Mr. Shuman was also the initial project coordinator for the comprehensive Nebraska Statewide Stream Fisheries Inventory Project initiated in 2004, which assessed distribution, abundance, and habitat for stream fishes throughout Nebraska.

Mr. Shuman has authored and co-authored 17 manuscripts, 32 reports, and 55 presentations on native fish and habitat to promote and support the effective management of fisheries resources throughout the Great Plains, including more than a dozen peer-reviewed publications focusing on fish and fish habitat in Nebraska. He has participated on 16 technical teams, work groups, or committees that helped direct the management and recovery actions for endangered species, conservation of native fish, and continuing education for natural resource management professionals primarily in Nebraska and the upper Great Plains.

As a Supervisory Fish Biologist with the USFWS Great Plans Fish and Wildlife Conservation Office in Pierre, South Dakota, Mr. Shuman oversaw technical assistance programs to State, Federal, and Tribal agencies in South Dakota, Nebraska, and Kansas and initiated programs such as the stocking requests and sampling permits for endangered fishes in South Dakota and Nebraska. Throughout his career, he collaborated on various projects with State, Federal, Tribal, and local partners, including USACE and the Nebraska Game and Park Commission, on river and stream fish and habitat issues. He also represented

the USFWS on numerous workgroup committees and technical teams, including serving as the lead to develop decision criteria for the Missouri River Adaptive Management Plan on the endangered pallid sturgeon.

Mr. Shuman has demonstrated his expertise working under the National Environmental Policy Act (NEPA) by addressing species-specific criteria (i.e., pallid sturgeon) and broad, system-wide (Missouri River) planning efforts under the Missouri River Management Plan and the Missouri River Ecosystem Recovery Plan, respectively. In that capacity, Mr. Shuman drew on his expertise and existing scientific literature and research to identify and re-evaluate threats, current conditions, and potential changes to those conditions to examine and address alternative solutions. Additionally, Mr. Shuman has expertise working in conformance with the requirements of the Endangered Species Act, Sikes Act, and Fish and Wildlife Coordination Act, where he designed and performed assessments, developed management actions, and provided project alternatives.

Name	**Michael Schwar, Ph.D., P.E.**
Role	**H&H Engineer / Civil Engineer (Dual Role)**
Affiliation	**Stony Point Hydrology, LLC**

Dr. Schwar, Principal Water Resources Engineer with Stony Point Hydrology LLC in Mukwonago, Wisconsin, has 30 years of professional and academic experience focusing on the hydrology and hydraulics (H&H) of surface water systems, with special emphasis on the restoration of streams, rivers, lakes, and wetlands. He earned an M.S. in environmental engineering and sciences from the University of Washington in 1991 and a Ph.D. in civil and environmental engineering from the University of Wisconsin-Madison in 2002. He has worked on more than 150 surface water projects in 21 states, Canada, and Puerto Rico. He is a registered professional engineer (P.E.) in six states (Washington, Wisconsin, North Dakota, Iowa, Arizona, and Illinois) and is a Certified Floodplain Manager (CFM), and has been recognized as a Diplomate, Water Resources Engineer (D.WRE) by the American Academy of Water Resources Engineers.

While a hydraulic engineer with the USACE Rock Island District, Dr. Schwar worked on ecosystem restoration projects (specifically, riverine, backwater and floodplain wetland, fish passage enhancement, and stream restoration projects), both along the mainstem Mississippi and Illinois Rivers and within the tributary watersheds. He was one of the primary authors of the Illinois River Basin Restoration Comprehensive Plan, which received the Mississippi Valley Division's "Outstanding Planning Achievement Award" in 2007.

Dr. Schwar's graduate work focused on the restoration of freshwater ecosystems, first in lakes and then in rivers and wetlands. His background provides him with the basis to analyze both the physical drivers (such as flows, water levels, substrate) and the water quality aspects (such as nutrients, dissolved oxygen) that are key to supporting healthy ecosystems. Throughout his career, he has planned and implemented restoration projects, working at scales ranging from site-specific practices to watershed plans encompassing thousands of square miles.

Dr. Schwar has demonstrated experience in aquatic ecosystem restoration, particularly techniques and practices used in wetland and riverine restoration. That experience has been applied specifically for the creation or restoration of freshwater estuarine wetlands (marshes, marsh atolls, riparian forests, beaches

and dunes, reefs, and fish passage structures). Among his relevant design projects are several backwater wetland restorations along the Illinois and Mississippi Rivers, island creation in Peoria Lake (Illinois River), Grand Isle dune rehabilitation (Louisiana), and restoration of the lower Kinnickinnic River/Milwaukee River Estuary. He has also designed channel creation, stabilization, and softening projects, as well as invasive species removal and dredging projects. He has designed restoration measures focusing on habitat enhancement, channel reconstruction, and restoration of sediment and geomorphic processes within 17 rivers and streams in five states (Wisconsin, Illinois, Iowa, Missouri, and Arizona).

Dr. Schwar has led the analysis of over 20 flood risk reduction projects, including detention facilities, levees/floodwalls, conveyance improvements and channel modification, located in Wisconsin, Washington, Missouri, Illinois, and Puerto Rico. He was the assistant project manager and led the engineering services during construction for the Milwaukee County Grounds floodwater facility and Phase 1 (levee and floodplain construction) of the Western Milwaukee project. He was also project manager and led the design for the Western Milwaukee Phase 2A project.

Dr. Schwar is trained in the advanced analysis and design of open-channel flood management systems. He has extensive experience with hydraulic models such as the Storm Water Management Model, HEC River Analysis System (HEC-RAS), and FLO-2D, and hydrologic models such as the Hydrological Simulation Program - FORTRAN (HSPF) and HEC Hydrologic Modeling System (HEC-HMS). He is also familiar with the use of more specialized models to evaluate specific problems. He has analyzed and designed channel modifications for flood risk reduction, stabilization, sediment transport, and ecosystem restoration. Projects include Boneyard Creek Restoration (Urbana, Illinois), Blue River Grade Control (USACE Kansas City), Menomonee River-Western Milwaukee (Milwaukee Metropolitan Sewerage District, Wisconsin), Tres Rios Phase 3A (USACE Los Angeles), and Ebner Coulee Creek (La Crosse, Wisconsin). He is specifically familiar with the hydraulics of water control structures, including ungated low-head dams, gated navigation dams, and high-head/hydroelectric dams. He has contributed to projects that analyzed fish-passage enhancement within various systems, including the Mississippi-Illinois River watershed, the Great Lakes, and the Pacific Northwest.

Dr. Schwar has contributed to the assessment of flood risk for 21 levee systems in six states (Wisconsin, Iowa, Illinois, Missouri, New Jersey, and Texas) and seven dams in three states (Wisconsin, Illinois, and Washington). He also led the floodplain permitting, including Federal Emergency Management Agency (FEMA) coordination where necessary, for eight other projects. He developed and currently teaches courses titled “Watercourse Design” and “GIS Applications for Water Resources Engineering” at the Milwaukee School of Engineering.

Dr. Schwar is a member of the American Society of Civil Engineers, the Environmental and Water Resources Institute River Restoration Task Committee (past chair), the Association of State Floodplain Managers, the Water Environment Federation and its Watershed Management Committee, and the Society of American Military Engineers.

Name	**Christopher Brown, Ph.D., P.E.**
Role	**Geotechnical / Soils Engineer**
Affiliation	**University of North Florida**

Dr. Brown is an associate professor at the University of North Florida (UNF), teaching courses in civil engineering, fluid mechanics, hydraulics, senior design, foundation engineering, and engineering geology. He earned his Ph.D. in civil engineering in 2005 from the University of Florida; an M.A. in civil engineering (geo-environmental concentration) in 1997 from Villanova University; and a B.S. in civil engineering from Temple University in 1991. Dr. Brown is a licensed, practicing P.E. in Florida and Pennsylvania focusing on water resources and geotechnical engineering. He has 29 years of civil engineering experience, which includes planning, design, construction, inspection, and teaching. He has worked with and for USACE as a civilian geotechnical engineer (Philadelphia District, 1991-1999, and Jacksonville District, 1999-2006), as well as municipal governments and private engineering firms.

Dr. Brown has worked on a wide variety of large public works projects, including dams, levees, shore protection, coastal structures, navigation (e.g., dredging and lock/dam projects), and environmental restoration (e.g., Everglades restoration work). He has worked on several large channel modification projects as both a design engineer and a peer reviewer. His work efforts have included the evaluation of surface soils and subsurface geology, bank and channel stability projects, and multiple modeling efforts. Past experience includes full preparation of designs, plans, drawing sets, and specifications. Dr. Brown started his computer-aided design and drafting work using AutoCAD version 1.0, demonstrating his significant experience with both AutoCAD and Microstation. As for specific projects, for the Molly Ann's Brook project in Haledon/Patterson, New Jersey, he worked on excavation plans and retaining wall design, and helped with the underpinning of existing buildings near the modified channel. As a peer reviewer, he has reviewed channel modification projects in North Carolina, Arizona, Illinois, Washington, and Texas.

Dr. Brown has helped project economists derive traditional economic benefits from transportation savings, reduced emergency response costs, and reduced inundation costs. He has used all manner of site investigations on flood control, shore protection, and navigation projects, including standard penetration test (SPT) borings, cone penetration test (CPT) borings, downhole geophysical investigations, vibracores, and test pits. Dr. Brown has used this information to determine channel modification depths, rock excavation requirements, and disposal estimates. For the Little Mill Creek project in Delaware, he determined the required depths of channel modification based upon the site investigation data. Dr. Brown was the primary design engineer for the modification of the Canaveral Harbor South Jetty, where he considered environmental impacts, natural geomorphology, and coastal processes to optimize the final modification design. He was the lead geotechnical engineer for the Barnegat Bay study in New Jersey, studying environmental restoration alternatives to restore natural areas in the study area as well as beneficial use of dredged sand. This study included the development of subsurface exploration plans for the entire large study area. Dr. Brown was also the lead geotechnical engineer evaluating both shore protection needs and dredging requirements in the Tampa Harbor complex. For that project, the project team investigated disposal of dredged material in open ocean environments, use as beneficial beach fill material, and disposal in upland confined disposal sites. A recent hydrologic study of the Fish Eating Creek basin included an evaluation of river flows, sediment, erosion, and nutrients. Dr. Brown prepared both a groundwater model using MODFLOW and a hydrology model using HEC-HMS.

Dr. Brown has also worked on traditional geotechnical designs of large buildings, structures, and coffer dams. He was the lead geotechnical engineer for the design of two massive liquefied natural gas storage tanks in Florida. The design included completion of SPT borings, downhole seismic investigations, and ground-penetrating radar studies. Dr. Brown used both GeoStudio Sigma/W and Plaxis to develop the final mat foundation design for each tank to minimize differential settlement and to ensure adequate bearing capacity. For the Dover Airforce Base PAX Terminal, Dr. Brown was the lead geotechnical engineer responsible for design of the large control tower. This design included evaluating drilled shafts and pile foundations as alternatives to support the control tower.

Dr. Brown has also worked as an expert witness, testifying in multiple trials involving differing site condition claims, foundation failures, and deficient designs. He has also testified in arbitration proceedings and in the International Court of Settlements. Dr. Brown has planning and design experience in Florida, Georgia, Delaware, Virginia, West Virginia, New Jersey, Delaware, Pennsylvania, and Puerto Rico. He teaches the water resources series of courses at UNF as well as the senior civil engineering capstone course. In the past, he has also taught engineering geology and foundation engineering. Dr. Brown has participated on several previous IEPR panels for multiple USACE districts.

Dr. Brown is also fully capable of addressing relevant safety assurance review (SAR) issues and has fulfilled this requirement for at least four other IEPR projects, including the Olmsted Locks and Dam 52 and 53 Replacement Project Post Authorization Change Report and the Dallas Floodway Feasibility Report and Environmental Impact Statement, Dallas, Texas.

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APPENDIX C

Final Charge for the Papillion Creek GRR/EA IEPR

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Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment

This is the final Charge to the Panel for the Papillion Creek GRR/EA IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on September 24, 2019. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The project area encompasses the entire Papillion Creek Watershed in Nebraska. The watershed covers most of Douglas County, and parts of Washington and Sarpy Counties. It drains an area of approximately 396 square miles. The main streams draining the watershed are the Big Papillion Creek, the Little Papillion Creek, and the West Papillion Creek.

The topography of the watershed is generally moderate to steeply sloping hills, with overland slopes ranging from 0 to approximately 30 percent. Deep, narrow valleys with relatively steep valley slopes also characterize the watershed.

The soils in the upper portions of the basin are generally deep, well-drained silt loam to silty clay loam formed in loess. Permeability is moderate, and the available water capacity is high. Bottomland soils, or soils in the lower portions of the basins, generally consist of poorly drained silty clay to fine sandy loam. Permeability is moderate and the available water capacity is low.

The stream channels in the watershed have changed dramatically from their original conditions due to development in the basin, eroding soils, and other factors. The original channels were sinuous, with relatively narrow bottoms, sloping wooded banks, and limited discharge capacity. Now, streams in the rural areas of the watershed are generally characterized as incised channels with tributary slopes averaging between 5 to 200 feet per mile. Streams in the urbanized areas of the watershed vary from incised channels to stream segments with improved channel sections and levees that are continually maintained. In addition to channel improvements and levees, many reservoirs have also been constructed in the watershed during development.

Floods or threats of floods occur almost every year during the summer thunderstorm season when about 40 percent of the annual precipitation occurs. Major floods occurred in 1959, 1960, 1964, and 1965. The Big Papillion Creek drainage area sustained flood damage in all 4 years. The Little Papillion Creek drainage area escaped the 1964 flood but sustained heavy flood damages in 1960 and 1965. The 1964 flood, which was the basin's most damaging flood, centered over the West Papillion Creek drainage area. The loss of seven lives was attributed to this flood. Several more recent flood events (1994, 1997, 1999, 2004, 2008, and 2014) continue to highlight that severe flood risks remain, and the 1999, 2004, and 2014 events resulted in one fatality each. The Papillion Creek basin has sustained damage from virtually every flood event because of the discharge concentration from the three major tributaries that converges on this stream.

As a result of the floods in the 1960s, a 21-dam project was authorized by the Flood Control Act of 1968. Since then, the project has experienced considerable delays and size reduction because of significant

changes in costs, regulations, and new legislation, as well as local opposition. A plan evaluation report was completed in September 1975 and a reevaluation report on the West Papillion Creek basin was completed in March 1979. As a result of information presented in these two reports, only four of the authorized dams have been constructed by the U.S. Army Corps of Engineers (USACE).

An additional reevaluation report was completed in March 1985. This report recommended channel improvements on Big Papillion with a maximum 2% annual exceedance probability level of protection, which was completed in 2002. Due to ongoing development in the basin and increases in hydrology, significant flood risk remains.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment (hereinafter: Papillion Creek GRR/EA IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities' *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the Office of Management and Budget's (OMB's) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to "assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions" (EC 1165-2-217; p. 39) 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 1165-2-217 (p. 41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

The following is a list of documents, supporting information, and reference materials that will be provided for the review. The review assignments for the panel members may vary slightly according to discipline.

Review Documents	No. of Review Pages	Subject Matter Experts				
		Planning Formulator/ Economist	Environ-mental Law Compliance/ Cultural Resources Specialist	Hydrology and Hydraulic Engineer	Civil Engineer	Geotechnical/ Soils Engineer
Draft Report & EA	300	300	300	300	300	300
Appendix A: Hydrology	200			200		
Appendix B: Hydraulics	400			400		
Appendix C: Geotechnical	400				400	400
Appendix D: Structural Engineering	20				20	20
Appendix E: Cost Engineer	100	100		100	100	100
Appendix F: Economics	175	175				
Appendix G: Nonstructural	50	50	50			
Appendix H: Environmental	300		300			
Appendix I: Cultural Resources	100		100			
Appendix J: Real Estate Plan	50	50	50			
Appendix K: Recreation	30	30	30			
Appendix L: Public and Tribal Engagement	100	100	100			
Total Number of Review Pages	**2,225**	**805**	**930**	**1000**	**820**	**820**
Public Review Comments[a]	100	100	100	100	100	100

[a] USACE will submit public comments to Battelle, which will in turn submit to the IEPR Panel.

Documents for Reference

- Review Policy for Civil Works, (EC 1165-2-217, February 20, 2018)
- Office of Management and Budget's Final Information Quality Bulletin for Peer Review (December 16, 2004)
- Foundations of SMART Planning
- Feasibility Study Milestones (PB 2018-01, September 30, 2018; PB 2018-01(S), June 20, 2019)
- SMART – Planning Overview
- Planning Modernization Fact Sheet
- USACE Climate Change Adaptation Plan (2015).

SCHEDULE

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

Task	Action	Due Date
3	Subcontractors complete mandatory Operations Security (OPSEC) training	10/23/2019
	Battelle sends review documents to panel members	11/5/2019
	Battelle convenes kick-off meeting with panel members	11/6/2019
	Battelle convenes kick-off meeting with USACE and panel members	10/19/2019
4	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	11/19/2019
	Panel members complete their review of the documents	12/6/2019
	Battelle provides talking points to panel members for Panel Review Teleconference	12/10/2019
	Battelle convenes Panel Review Teleconference	12/11/2019
	Battelle provides Final Panel Comment templates and instructions to panel members	12/12/2019
	Panel members provide draft Final Panel Comments to Battelle	12/18/2019
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	12/19/2019-12/29/2019
	Panel finalizes Final Panel Comments	12/30/2019
4**	Battelle receives public comments from USACE	12/9/2019
	Battelle sends public comments to Panel	12/11/2019
	Panel members complete their review of the public comments	12/16/2019
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	12/17/2019
	Panel drafts Final Panel Comment on public comments, if necessary	12/23/2019
5	Battelle provides Final IEPR Report to panel members for review	12/20/2016
	Panel members provide comments on Final IEPR Report	1/6/2019
	Battelle submits Final IEPR Report to USACE*	1/8/2019
	USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance	1/15/2019
6	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	1/17/2019
	Battelle convenes teleconference with Panel to review Comment Response process	1/17/2019
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review	2/10/2020
	USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	2/14/2020

Task	Action	Due Date
	USACE PCX provides draft PDT Evaluator Responses to Battelle	2/18/2020
	Battelle provides draft PDT Evaluator Responses to panel members	2/20/2020
	Panel members provide draft BackCheck Responses to Battelle	2/25/2020
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	2/26/2020
	Battelle convenes Comment Response Teleconference with panel members and USACE	2/27/2020
	USACE inputs final PDT Evaluator Responses to DrChecks	3/5/2020
	Battelle provides final PDT Evaluator Responses to panel members	3/6/2020
	Panel members provide final BackCheck Responses to Battelle	3/11/2020
	Battelle inputs the panel members' final BackCheck Responses to DrChecks	3/12/2020
	Battelle submits pdf printout of DrChecks project file*	3/13/2020
ADM	Agency Decision Milestone (ADM) Meeting	2/6/2020
	Contract End/Delivery Date	9/2/2020

* Deliverables

** Battelle will provide public comments to panel members 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. Some sections have no questions associated with them; however, you may still 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 1165-2-217).

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 (in-training) Patti Connaughton-Burns burnsp@battelle.org or Program Manager Lynn McLeod; mcleod@battelle.org for requests or additional information.

3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (mcleod@battelle.org) immediately.

4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report but will remain anonymous.

Please submit your comments in electronic form to the Project Manager, no later than 10 pm ET by the date listed in the schedule above.

Independent External Peer Review of the Papillion Creek and Tributaries Lakes, Nebraska General Reevaluation Report and Environmental Assessment

Charge Questions and Relevant Sections as Supplied by USACE

The following Review Charge to Reviewers outlines the objectives of the Independent External Peer Review (IEPR) for the subject study and identifies specific items for consideration for the IEPR Review Panel.

The objective of the IEPR is to obtain an independent evaluation of whether the interpretations of analysis and conclusions based on analysis are reasonable for the subject study. The IEPR Review Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the Review Charge. The Review Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the Review Charge. The Review Panel can use all available information to determine what scientific and technical issues related to the decision document may be important to raise to decision makers. This includes comments received from agencies and the public as part of the public review process.

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

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

The Review Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

<u>Broad Evaluation Charge Questions</u>

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

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

3. Project evaluation data used in the study analyses,
4. Economic, environmental, and engineering assumptions that underlie the study analyses,
5. Economic, environmental, and engineering methodologies, analyses, and projections,

6. 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, and
10. Overall assessment of significant environmental impacts and any biological analyses.

Further,

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

For the tentatively selected plan, assess whether:

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

Battelle Summary Charge Questions to the Panel Members[1]

The following questions will be included in the list of questions sent to the Panel for completion during their review. These questions are provided for Battelle's use in identifying the Panel's key technical issues.

[1] Questions 17 through 16 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.

Summary Questions

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

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

Public Comment Questions

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

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APPENDIX D

Conflict of Interest Form

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David Kaplan
USACE, Institute for Water Resources
August 7, 2019
C-2

Conflicts of Interest Questionnaire

Independent External Peer Review

Papillion Creek and Tributaries Lakes, Nebraska, General Reevaluation Report and Environmental Assessment

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

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

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

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

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

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

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

No additional information to report.

Courtney M. Brooks — August 07, 2019
Courtney Brooks — Date

Use or disclosure of data contained on this sheet is subject to the restriction on the title page of this proposal

BATTELLE

It can be done