Final Independent External Peer Review Report Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study

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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Prepared by

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Executive Summary

PROJECT BACKGROUND AND PURPOSE

The U.S. Army Corps of Engineers (USACE) has undertaken a study that covers flood damage reduction, storm damage reduction, environmental restoration, navigation, watershed management, water supply, and other allied purposes in the Westchester County Streams study area, of which the Byram River is a sub-basin. This study was authorized by a resolution of the Committee on Public Works and Transportation of the United States House of Representatives, adopted May 2, 2007. The study reconnaissance report was approved September 2008.

Flooding on the Byram River primarily affects the Town of Greenwich, Connecticut, just south of the constructed project of levees at Pemberwick. The Byram River and its tributaries were the subject of a General Design Memorandum in 1958, which recommended 3,000 feet (ft) of levees on the Byram River mainstem at Pemberwick, Town of Greenwich, Fairfield County, Connecticut. Only part of the project at Pemberwick was constructed in the 1960s. The recommendation for flood risk management (FRM) was reinforced in the 1977 Westchester County Streams Feasibility Report, titled *Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basins, and Byram River Basin,* which recommended channel excavation and the construction of floodwalls and levees at Port Chester, New York, and the Town of Greenwich, Connecticut. Although the recommended plan, which included continuation of the levee features to the south, was subsequently authorized by Congress, it was not implemented due to local concerns about the negative aesthetic effects of the levees.

Based on recent discussions with area residents, flooding is a much greater concern now than aesthetics. The study team pursued a new feasibility study to identify new damage areas within the Byram River Basin that were not covered in the previous study and authorization, and to reassess the 1977 recommendation. A secondary damage area was identified to the north, on Bailiwick Bridge within the Town of Greenwich. This bridge is small, with low clearance, and it consequently traps debris on the river course, effectively acting as a dam. Its stone facing was stripped by raging floodwaters during an April 2007 storm.

There are also minor, tidally induced flood damages at the lower end of the Byram River within the Village of Port Chester, Westchester County, New York. Consequently, the study team pursued a new watershed-wide, single-purpose feasibility study for FRM in the Westchester County Stream, Byram River Basin, to characterize current conditions and ensure a comprehensive approach to address flooding. The current study focused on FRM alternatives in the Byram River Basin primarily within the Pemberwick area south of the previously constructed USACE levee as well as in the area of the Bailiwick Bridge to the north. At a minimum, the potential FRM measures that were examined in the current feasibility study

include channel modification, levees, floodwalls, and non-structural measures, as well as bridge modifications based on public feedback; in addition, a "no action" alternative was examined. Non-structural measures such as "buyouts" and preservation and/or creation of open space in the floodplain were also considered. Because measures considered were roughly in scale with those in the 1977 report, cost estimates from the 1977 report were used as a guideline to estimate the range of construction costs. Plans considered in the 1977 feasibility report ranged from \$3.5 million to \$9.5 million. Adjusted for inflation, construction costs for this project are estimated to range from \$14 million to \$36 million.

Based on results of the analysis of potential FRM measures, the team determined that the levee alternatives were not economically justified. At a 2015 public meeting, the team presented a non-structural plan as the plan most likely to move forward. The non-structural plan was not well received by the public or the Town of Greenwich because these stakeholders were concerned about residual risk. Incorporating the public's feedback, the team introduced bridge removal alternatives, including removal of the Route 1 bridges in the Village of Port Chester and a combination of Route 1 bridges removal with non-structural measures.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an IEPR of the Draft Integrated Feasibility Report & Environmental Impact Statement (DIFR/EIS) for the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study, Fairfield County, Connecticut, and Westchester County, New York (hereinafter: Byram River Basin 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: Civil Works planning / economics; environmental law compliance; civil engineering; structural engineering; and hydrology and hydraulic (H&H) 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 final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the five-person Panel from this list.

The Panel received electronic versions of the decision documents (943 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.

The 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, 11 Final Panel Comments were identified and documented. Of these, one was identified as having high significance, three had medium/high significance, five had medium/low significance, and two had low significance.

Battelle received public comments from USACE on the Byram River Basin (approximately 50 written comments, totaling 53 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 Byram River Basin review documents. After completing its review, the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments.

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

Based on the Panel's review, the report provides detail on methodology and assumptions which appear to be appropriate for the project need and intent. The understanding of flooding impacts and of alternatives that could lessen the impacts appears to be well defined. The analysis of non-structural alternatives was logical, thorough, and quantitative. Overall, there was a reasonable balance of detail and conciseness for SMART Planning. However, the Panel determined that the potential role of possible tidal versus fluvial flooding, given the coastal setting of the study area, is less clear in the report. Other concerns noted were related to adequate freeboard in bridge design, the lack of a localized channel improvement alternative, and an incomplete analysis of potential benefits that likely affects the project benefit-cost ratio (BCR). 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.

Engineering: The Panel noted that the evaluation of flooding impacts was very practical and provided a solid basis for the evaluation of alternatives. However, the Panel's most significant finding was that the tidal influence in the Byram River Basin extends to the downstream boundary of the study area, yet that condition has not been fully incorporated into the hydraulic models. Although the DIFR/EIS is focused on fluvial flooding, the physical processes acting at the downstream boundary of the system at the tidal interface are directly linked to the behavior of upstream fluvial flooding in the study area. Hydraulic models will be inaccurate and fluvial flooding will be misrepresented unless the downstream boundary conditions account for the actual physical behavior of the system. Additional Panel concerns included

bridge designs that do not meet minimum freeboard requirements, especially if the bridge is identified as a critical structure that warrants consideration of sea level rise (SLR) projections and future peak flows. The Panel noted that channel improvements combined with the Route 1 bridge replacements could be an effective and relatively low-cost alternative, but the channel improvements/bridge replacement combination was not evaluated. The Panel also noted that foundation and cofferdam designs are insufficiently developed, which could potentially be a source of uncertainty in the evaluation of the TSP.

Economics/Plan Formulation: The Panel noted that the analysis of potential benefits is incomplete because it does not include some benefit categories that could, if included, increase net benefits of the project. Given the substantial residual damages that exist with the TSP, the Panel felt that it was unclear why an alternative was not considered that included channel improvements in addition to replacement of the Route 1 bridges. The Panel also noted that it is unclear whether the evaluation of the TSP has fully accounted for potential impacts to local businesses. An additional Panel observation is that the Federal/non-Federal cost-share splits are listed differently in different parts of the DIFR/EIS; this inconsistency can be addressed by providing a clear explanation of how the cost-sharing guidelines apply to the project.

Environmental: The Panel found the environmental assumptions and analyses to be adequate (with the exception of the omission of the tidal influence noted above). However, the Panel noted that the DIFR/EIS does not consistently describe potential impacts to specific taxa/species groups or specific elements of a resource area under consideration; many of the existing condition descriptions and impacts regarding natural resources sound generic. The issue can be addressed by adding further details regarding, for example, the number of wetlands within the project area and the specific migratory bird species potentially subject to short-term impacts.

Table ES-1.Overview of 11 Final Panel Comments Identified by the Byram River Basin IEPRPanel

| No. | Final Panel Comment | | |
|--------------------|---|--|--|
| Sign | Significance – High | | |
| 1 | The hydraulic models used in the economic analysis do not fully account for the Byram River system's physical behavior, potentially increasing project risk and uncertainty. | | |
| Sign | Significance – Medium/High | | |
| 2 | The lack of adequate freeboard for the bridge design is a source of uncertainty for the TSP, especially with regard to costs and impacts from construction. | | |
| 3 | It is not clear why an alternative that included channel improvements in addition to replacement of Route 1 bridges was not considered. | | |
| 4 | Incomplete analysis of potential benefits could jeopardize the implementation of the TSP. | | |
| Sign | ificance – Medium/Low | | |
| 5 | The sediment transport analysis, and the documentation of how and under what conditions the sediment data were collected, are inadequate and increase uncertainty. | | |
| 6 | The H&H analysis does not adequately consider the effects of climate change, resulting in increased uncertainty. | | |
| 7 | Foundation and cofferdam designs are insufficiently developed to provide confidence in costs and construction schedules and are therefore a source of uncertainty in the evaluation of the TSP. | | |
| 8 | It is unclear whether the evaluation of the TSP has fully accounted for potential impacts to local businesses. | | |
| 9 | Increasing the flow area through the existing Route 1 bridges is not presented as an alternative to increase conveyance. | | |
| Significance – Low | | | |
| 10 | The Federal/non-Federal cost-share splits are listed differently in different parts of the DIFR/EIS. | | |
| 11 | Many of the existing conditions descriptions and impacts analyses regarding natural resources and other disciplines sound generic. | | |

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LIST OF ACRONYMS

| ADM | Agency Decision Milestone |
|------------|--|
| BCR | Benefit-Cost Ratio |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| COI | Conflict of Interest |
| DIFR/EIS | Draft Integrated Feasibility Report & Environmental Impact Statement |
| DrChecks | Design Review and Checking System |
| EA | Environmental Assessment |
| EC | Engineer Circular |
| EIS | Environmental Impact Statement |
| EM | Engineer Manual |
| EPA | U.S. Environmental Protection Agency |
| ER | Engineer Regulation |
| ERDC | Engineer Research and Development Center |
| ESA | Endangered Species Act |
| FRM | Flood Risk Management |
| FS | Feasibility Study |
| ft | Foot |
| GRR | General Reevaluation Report |
| H&H | Hydrology and Hydraulic |
| HEC-FDA | Hydrologic Engineering Center-Flood Damage Reduction Analysis (System) |
| HEC-GeoHMS | Hydrologic Engineering Center-Geospatial Hydrologic Modeling System |
| HEC-GeoRAS | Hydrologic Engineering Center-Geospatial River Analysis System |
| HEC-HMS | Hydrologic Engineering Center-Hydrologic Modeling System |
| HEC-RAS | Hydrologic Engineering Center-River Analysis System |
| HEP | Habitat Evaluation Procedure(s) |
| HTRW | Hazardous, Toxic, and Radioactive Waste |
| IEPR | Independent External Peer Review |
| IWR | Institute for Water Resources |
| MPT | Maintenance and Protection of Traffic |
| NED | National Economic Development |

| NEPA | National Environmental Policy Act |
|--------|---|
| NYSDOT | New York State Department of Transportation |
| O&M | Operations and Maintenance |
| OEO | Outside Eligible Organization |
| OMB | Office of Management and Budget |
| OPSEC | Operations Security |
| РСВ | Polychlorinated Biphenyl |
| PCX | Planning Center of Expertise |
| PDT | Project Delivery Team |
| PED | Preconstruction Engineering and Design |
| SAR | Safety Assurance Review |
| SLM | Senior Leader Meeting |
| SLR | Sea Level Rise |
| TSP | Tentatively Selected Plan |
| USACE | United States Army Corps of Engineers |

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1. INTRODUCTION

The U.S. Army Corps of Engineers (USACE)has undertaken a study that covers flood damage reduction, storm damage reduction, environmental restoration, navigation, watershed management, water supply, and other allied purposes in the Westchester County Streams study area, of which the Byram River is a sub-basin. This study was authorized by a resolution of the Committee on Public Works and Transportation of the United States House of Representatives, adopted May 2, 2007. The study reconnaissance report was approved September 2008.

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Based on results of the analysis of potential FRM measures, the team determined that the levee alternatives were not economically justified. At a 2015 public meeting, the team presented a non-structural plan as the plan most likely to move forward. The non-structural plan was not well received by

the public or the Town of Greenwich because these stakeholders were concerned about residual risk. Incorporating the public's feedback, the team introduced bridge removal alternatives, including removal of the Route 1 bridges in the Village of Port Chester and a combination of Route 1 bridges removal with non-structural measures.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an IEPR of the Draft Integrated Feasibility Report & Environmental Impact Statement (DIFR/EIS) for the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study, Fairfield County, Connecticut, and Westchester County, New York (hereinafter: Byram River Basin 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 Byram River Basin 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 Byram River Basin 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 Byram River Basin 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 five panel members to participate in the IEPR based on their expertise in the following disciplines: Civil Works planning / economics; environmental law compliance; civil engineering; structural engineering; and hydrology and hydraulic (H&H) engineering. The Panel reviewed the Byram River Basin documents and produced 11 Final Panel Comments in response to 16 charge questions provided by USACE for the review. This charge included two overview questions and one public comment question added by Battelle. Battelle instructed the Panel to develop the Final Panel Comments using a standardized four-part structure:

- 1. Comment Statement (succinct summary statement of concern)
- 2. Basis for Comment (details regarding the concern)
- 3. Significance (high, medium/high, medium, medium/low, or low; in accordance with specific criteria for determining level of significance)
- 4. Recommendation(s) for Resolution (at least one implementable action that could be taken to address the Final Panel Comment).

Battelle reviewed all Final Panel Comments for accuracy, adherence to USACE guidance (EC 1165-2-217), 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 Byram River Basin IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the report provides detail on methodology and assumptions which appear to be appropriate for the project need and intent. The understanding of flooding impacts and of alternatives that could lessen the impacts appears to be well defined. The analysis of non-structural alternatives was logical, thorough, and quantitative. Overall, there was a reasonable balance of detail and conciseness for SMART Planning. However, the Panel determined that the potential role of possible tidal versus fluvial flooding, given the coastal setting of the study area, is less clear in the report. Other concerns noted were related to adequate freeboard in bridge design, the lack of a channel improvement alternative, and an incomplete analysis of potential benefits that likely affects the project benefit-cost ratio (BCR). The following summarizes the Panel's findings.

Engineering: The Panel noted that the evaluation of flooding impacts was very practical and provided a solid basis for the evaluation of alternatives. However, the Panel's most significant finding was that the tidal influence in the Byram River Basin extends to the downstream boundary of the study area, yet that

condition has not been fully incorporated into the hydraulic models. Although the DIFR/EIS is focused on fluvial flooding, the physical processes acting at the downstream boundary of the system at the tidal interface are directly linked to the behavior of upstream fluvial flooding in the study area. Hydraulic models will be inaccurate and fluvial flooding will be misrepresented unless the downstream boundary conditions account for the actual physical behavior of the system. Additional Panel concerns included bridge designs that do not meet minimum freeboard requirements, especially if the bridge is identified as a critical structure that warrants consideration of sea level rise (SLR) projections and future peak flows. The Panel noted that channel improvements combined with the Route 1 bridge replacements could be an effective and relatively low-cost alternative, but the channel improvements/bridge replacement combination was not evaluated. The Panel also noted that foundation and cofferdam designs are insufficiently developed, which could potentially be a source of uncertainty in the evaluation of the TSP.

Economics/Plan Formulation: The Panel noted that the analysis of potential benefits is incomplete because it does not include some benefit categories that could, if included, increase net benefits of the project. Given the substantial residual damages that exist with the TSP, the Panel felt that it was unclear why an alternative was not considered that included channel improvements in addition to replacement of the Route 1 bridges. The Panel also noted that it is unclear whether the evaluation of the TSP has fully accounted for potential impacts to local businesses. An additional Panel observation is that the Federal/non-Federal cost-share splits are listed differently in different parts of the DIFR/EIS; this inconsistency can be addressed by providing a clear explanation of how the cost-sharing guidelines apply to the project.

Environmental: The Panel found the environmental assumptions and analyses to be adequate (with the exception of the omission of the tidal influence noted above). However, the Panel noted that the DIFR/EIS does not consistently describe potential impacts to specific taxa/species groups or specific elements of a resource area under consideration; many of the existing condition descriptions and impacts regarding natural resources sound generic. The issue can be addressed by adding further details regarding, for example, the number of wetlands within the project area and the specific migratory bird species potentially subject to short-term impacts.

4.2 Final Panel Comments

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

The hydraulic models used in the economic analysis do not fully account for the Byram River system's physical behavior, potentially increasing project risk and uncertainty.

Basis for Comment

Tidal influence in the Byram River Basin currently extends to the downstream boundary of the study area. Although the DIFR/EIS is exclusively focused on mitigating fluvial flooding, the physical processes acting at the downstream boundary of the system at the tidal interface are directly linked to the behavior of upstream fluvial flooding in the study area. Accordingly, hydraulic models will be inaccurate and fluvial flooding will be misrepresented unless the downstream boundary conditions take the actual physical behavior of the system into account. The Project Delivery Team's (PDT's) selection of the 50-percent stillwater elevation as the key downstream boundary condition for hydraulic modeling is not clearly justified with physical reasoning. Output from hydraulic modeling with boundary conditions that more accurately reflect physical processes at the downstream end of the study area would decrease risk and uncertainty of the BCR.

The PDT appears to have underestimated stage-discharge uncertainty at 0.5 feet by basing it solely on uncertainty in a single parameter as opposed to reasonable likely combinations of upper and lower bound estimates of model parameter values as stated in USACE Engineer Manual (EM) 1110-1619, section 5-7 (USACE, 1996). There is high confidence that SLR will affect downstream boundary conditions during the project planning period. As SLR occurs, interactions between tides and river flows in the study area will increase, and the joint probability of storm surge effects on fluvial flooding will increase as well. It appears that Hydrologic Engineering Center-River Analysis System (HEC-RAS) simulations of intermediate SLR were not used in quantifying uncertainty in the stage-discharge relationship. Further, the hydraulic model results were compared to field data on high water marks during previous storms, but for cases in which there is substantial disagreement between model predictions and observed high water marks, the field observations were deemed invalid without a clear rationale. This additional line of evidence suggests that the uncertainty in the stage-discharge relationship may be underestimated. The uncertainty (standard deviation) of the stage-discharge relationship directly affects the economic analysis, the BCR, and confidence intervals on the BCR.

Significance – High

Without more rigorous hydraulic modeling that incorporates effects on downstream model boundaries, project risk and uncertainty will increase, which could affect the project BCR and, ultimately, the technical basis for justifying the plan.

Recommendations for Resolution

- Reevaluate the downstream boundary condition of the hydraulic models used in the economic analysis by incorporating future SLR and tidal influences on fluvial flooding over the planning period and justify the selected downstream boundary conditions with physical reasoning.
- 2. Quantify the uncertainty of the stage-discharge relationship using reasonable likely combinations of upper and lower bound estimates of model parameter values as stated in

EM-1110-1619 section 5-7, as well as model testing against field observations of high water marks.

3. Perform a sensitivity analysis of the BCR to the updated boundary conditions and stagedischarge uncertainty to assess their effect on the economic viability of the project.

Literature Cited:

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) No. 1110-1619. August 1, 1996.

The lack of adequate freeboard for the bridge design is a source of uncertainty for the TSP, especially with regard to costs and impacts from construction.

Basis for Comment

The New York State Department of Transportation (NYSDOT) Bridge Manual, Section 3.2.3.1, requires that bridge low chord elevations provide a minimum of 2 feet of freeboard over the 50-year (2-percent) flood and clear the 1-percent flood, unless an evaluation is conducted to justify less freeboard and is specifically approved (NYSDOT, 2017). However, the proposed north bridge design (and possibly the south bridge design) does not meet these criteria, and the DIFR/EIS provides no documentation of an analysis performed to justify the lower elevation(s). The Bridge Manual also requires that applicable coastal design criteria be incorporated, up to and including the intermediate SLR projection. Additionally, if the bridge is considered a critical structure, then higher freeboard requirements and SLR projections apply. For replacement bridges in Region 8 (where the project is located), the Bridge Manual states that design discharges are to be increased by 20 percent to account for future peak flows, but this requirement has not been included in the design.

It is understood that water levels upstream of the bridges are sensitive to discharge through the bridges because of the relatively limited hydraulic storage capacity of that reach. Hence, the hydraulic analyses are sensitive to variations in modeling parameters, introducing a level of uncertainty to the reported floodwater levels immediately upstream of the bridges and the corresponding freeboard. In such situations, it would generally be considered prudent to include conservatism in establishing bridge elevations, rather than setting them lower than industry design standards, especially when considering that coastal and climate change factors will likely increase water levels over the 50-year period of analysis. As a result, the costs for bridge replacement and impacts of construction on adjacent properties may be significantly underestimated by setting the bridge(s) too low.

Conversely, there may be additional benefits that have not been considered in the BCR. The DIFR/EIS describes U.S. Route 1 as the largest road in the study area, a major east-west artery, the main access to and from I-95, and often an alternate route during I-95 congestion. As stated in Section 5.10 of the DIFR/EIS, impediments to evacuation may lead to a higher potential for loss of life. Improving the reliability of the Route 1 bridges would reduce the potential for road closures during flood events so that they remain usable during emergency conditions; therefore, related socioeconomic benefits can be accounted for in the justification for the project.

Significance – Medium/High

The potential for bridge design changes that may be required to resolve the inadequate freeboard could significantly impact project costs and change the estimated BCR.

Recommendations for Resolution

1. Ascertain and document whether the U.S. Route 1 bridges are considered critical bridges, and set the bridge elevations to provide at least the minimum flood freeboard in accordance

with the NYSDOT Bridge Manual. Document justification for any proposed exceptions to these criteria.

- 2. Account for the socioeconomic benefits of improved bridge reliability during flood events when developing the value of project benefits.
- 3. Evaluate the potential variation of flood water level(s) for bridge elevation selection. Consider the sensitivity / confidence intervals of water levels in the upstream reach to the combinations of modeling parameters used, as well as the potential effects of storm surge, tidal fluctuations, climate change and SLR on the boundary conditions that affect fluvial flooding.
- 4. Estimate costs for bridge replacement and impacts of construction on adjacent properties based on setting the bridge elevation(s) in accordance with industry design standards, or document the justification for not meeting those criteria.
- 5. Update the BCR for the TSP using the information developed in these analyses.

Literature Cited:

NYSDOT (2017). Bridge Manual – US Customary Edition – 2017. New York State Department of Transportation. Last revised August 2017.

It is not clear why an alternative that included channel improvements in addition to replacement of Route 1 bridges was not considered.

Basis for Comment

Appendix D of the DIFR/EIS states that expected annual flood reduction benefits under the TSP would be about \$0.77 million, but there are \$1.3 million of residual expected annual damages (Table 13 of Appendix D). Table 2 of Appendix B3 states that 128 structures remain in the 1% Annual Exceedance Probability floodplain with the TSP in place. The substantial residual damages under the TSP indicate that additional measures that might increase the project benefits should be considered.

The DIFR/EIS indicates that a dredging-only scenario based on the river bed profile proposed in the 1977 Feasibility Report (USACE, 1977) was considered. This scenario resulted in a 2.2-foot reduction in water levels upstream of the southbound Route 1 bridge, but flood damages were not significantly reduced and the measure was dropped. Channel improvements, if combined with the Route 1 bridge replacements, could be an effective and relatively low-cost measure compared to levees, floodwalls, pumps, etc. Additionally, several of the public comments are related to observations of fallen trees, other vegetation, and sediment that could continue to exacerbate flooding despite the bridge replacements.

The TSP includes minor channel improvements adjacent to the bridges, but there is no explanation why additional upstream channel improvements were not considered to increase benefits. A sensitivity analysis with HEC-RAS could be used to estimate changes to water surface elevations and impacts to the project BCR resulting from additional channel improvements in critical locations. One factor to consider under this type of analysis would be the longevity of dredging / channel improvement benefits given longitudinal changes in sediment transport capacity and future potential for re-accumulation of sediment / debris between stations 10000-12000, despite replacement of the Route 1 bridges. Future maintenance dredging may need to be a project component in order to maintain benefits.

Significance – Medium/High

Without an evaluation of channel improvements combined with bridge replacements, it is possible that an alternative exists that would provide greater net National Economic Development (NED) benefits.

Recommendations for Resolution

- 1. Formulate and evaluate an alternative that includes upstream channel improvements in addition to replacement of the Route 1 bridges to determine whether the net NED benefits would increase relative to the current TSP.
- 2. Consider the longevity of dredging / channel improvement benefits given longitudinal changes in sediment transport capacity and future potential for re-accumulation of sediment / debris, and determine whether maintenance dredging would be needed in order to maintain benefits.

Literature Cited:

USACE (1977). Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basin, New York and Byram River Basin, Connecticut, Volumes 1 and 2. U.S. Army Corps of Engineers, October 1977.

Incomplete analysis of potential benefits could jeopardize the implementation of the TSP.

Basis for Comment

The TSP's BCR of 1.13 is not likely to satisfy USACE budget guidelines, which are published yearly in USACE Engineer Circular (EC) 11-2-208 (USACE, 2015). Because funding is limited, only those projects that will produce the greatest benefits are included in the budget. The budget criteria require a better BCR based on a higher discount rate. As a result, unless greater benefits are identified in the DIFR/EIS, it is likely the project would not receive funding for preconstruction engineering and design (PED) and would not be implemented.

There are benefit categories that could potentially improve the BCR and the net benefits of the project, but these categories are not evaluated. Appendix D (p. D-27) identifies these categories as:

- Emergency cost reduction
- Traffic delays and diversions with bridge replacements, traffic would not be interrupted as frequently due to water levels rising to the low chord of the bridge
- Damage to outside property and landscaping
- Cleanup cost reduction
- Reduced damages to roads, bridges, and utilities
- Reduced damages to other infrastructure

Additionally, Table 21 of the DIFR/EIS includes \$25,000 of Annual Operations and Maintenance Costs in the annual total costs. The DIFR/EIS states (p. 62) that the operations and maintenance (O&M) costs of the new bridges would be less than the cost for the existing bridges, which should be a benefit similar to the benefits associated with extending the life of the bridges.

Significance – Medium/High

By not evaluating all benefit categories, the BCR will not be great enough to meet the USACE budget criteria.

Recommendations for Resolution

- 1. Evaluate the benefit categories listed in the Basis for Comment.
- Assess potential benefits associated with reduced O&M costs, or eliminate O&M costs from the total project cost.

Literature Cited:

USACE (2015). Corps of Engineers Civil Works Direct Program Development Policy Guidance Fiscal Year 2017. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Circular (EC) No. 11-2-208. March 31, 2015 (updated annually).

The sediment transport analysis, and the documentation of how and under what conditions the sediment data were collected, are inadequate and increase uncertainty.

Basis for Comment

The Byram River watershed contains several dams and impoundments that alter sediment transport and supply throughout its drainage network (DIFR/EIS; Appendix B2, p. B2-17). Despite these features, substantial sediment and debris have accumulated between river stations 9000-13000 below an abrupt reduction in bed slope and directly upstream of the Route 1 bridges. This accumulation of sediment and debris and the resulting reduction in channel capacity are well known, as evidenced by the 1977 Feasibility Report (USACE, 1977), public comments, and the development of large gravel bars around the Route 1 bridges. Further, it appears that the bed profile resulting from deposition of sediment and debris in this river segment creates a backwater effect (Appendix B2, Figure 7). This river bed aggradation suggests that, at least historically, there has been appreciable sediment supply to the river segment upstream of the Route 1 bridges despite the numerous upstream dams.

The sediment transport analysis in Appendix B2, Section 7, primarily consists of a brief description of six sediment samples collected in a previous study, and a modeling analysis of pre- and post-project flow velocities in the immediate vicinity of the Route 1 bridges. The methods used to collect the suspended sediment samples and the extent to which these samples may be representative of washload versus bed material load are not discussed. Based on the six samples and small velocity changes anticipated at the Route 1 bridges, the PDT concludes that the sediment supply is limited and of no consequence to the TSP. The DIFR/EIS does not discuss the sediment sources and processes that have resulted in aggradation between river stations 9000-13000 to an extent that potentially warrants dredging. Further, there is no meaningful discussion of the effects of deposited sediment and debris on water surface profiles in the vicinity of river station 12000 and how conditions might change after the bridges are replaced.

Significance – Medium/Low

The lack of sediment transport analysis and data related to the observed accumulation of sediment and its impact on water surface profiles affects the clarity and completeness of the report, and adds to uncertainty regarding the potential benefits of channel improvements combined with bridge replacement.

Recommendations for Resolution

- 1. Clarify in the DIFR/EIS how sediment accumulation has occurred between river stations 9000-12000 despite supply being limited by upstream impoundments.
- Discuss the effects of sediment and debris accumulation on water surface profiles between river stations 9000-12000 under current conditions and after implementation of the TSP in the project documentation.
- Use the HEC-RAS model to examine the effect of combining the Route 1 bridge replacements with the bed profile from the 1977 Feasibility Report and interpret the results in the DIFR/EIS.

Literature Cited:

USACE (1977). Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basin, New York and Byram River Basin, Connecticut, Volumes 1 and 2. U.S. Army Corps of Engineers, October 1977.

The H&H analysis does not adequately consider the effects of climate change, resulting in increased uncertainty.

Basis for Comment

USACE policy (Engineer Regulation [ER] No. 1100-2-8162) requires consideration of the potential effects of climate change on proposed projects (USACE, 2013). To this end, the DIFR/EIS includes an analysis of peak flow trends at the nearby Norwalk River at the South Wilton, Connecticut, streamflow gage. Regression analysis was used to assess whether peak flows have increased or shifted as a result of potential changes in precipitation. The conclusion is that there is no trend in peak flows; however, it appears that approximately four out of the six highest flows since 1963 have occurred in the last eight years of the record used in the analysis. More robust statistical tests would include a Mann-Kendall test (possibly for unequal variance) and a Pettitt test for shifts. The present trend analysis of peak flow data is highly susceptible to a Type II error (concluding there is no trend or shift when there really is one) due to low statistical power.

The study also includes HEC-RAS modeling of three SLR scenarios in accordance with ER 1100-2-8162; however, it is unclear how these analyses were utilized to assess the potential effects of SLR on project performance. This is a fluvial flooding study, but the physical processes that control fluvial flooding in the study area will be directly affected by SLR during the planning period. Therefore, the project and report would benefit from a more thorough consideration of uncertainty and risk associated with SLR.

Significance – Medium/Low

The present analysis and discussion of the potential effects of climate change leads to uncertainty with regard to whether this lack of information will affect the justification of the TSP.

Recommendations for Resolution

- 1. Acknowledge the limitations of the current regression analysis in assessing the potential for future increases in peak flows as a result of climate change.
- 2. Use the HEC-RAS simulations of SLR that were performed to evaluate and explain the potential impacts of SLR on the freeboard and potential overtopping of the Route 1 bridges during the 1-percent and 2-percent floods.
- 3. Consider and further discuss the potential ramifications of an upward shift in peak flows and SLR on the benefits of the TSP in the DIFR/EIS.

Literature Cited:

USACE (2013). Incorporating Sea Level Change in Civil Works Programs. Department of the Army, U.S. Army Corps of Engineers, Washington, D.C. Engineer Regulation (ER) No. 1100-2-8162. December 31, 2013.

Foundation and cofferdam designs are insufficiently developed to provide confidence in costs and construction schedules and are therefore a source of uncertainty in the evaluation of the TSP.

Basis for Comment

Details and assumptions supporting the estimated cost of the TSP are not clear in the DIFR/EIS. Sitespecific geotechnical data are insufficient to develop detailed designs, especially with regard to depth to bedrock and existing bridge foundations. It appears that a number of design aspects which could have a significant effect on project costs have not been taken into account, including the following:

- The cost estimates on the last two pages of the DIFR/EIS Appendix B4 indicate pile-supported bridge abutments, but these structures are not described in the report and the bridge profiles in Appendix B4 show T-wall construction.
- Excavation requirements for removal of the existing structures and construction of new abutments have not been defined. The site is confined, with the bridges in close proximity to adjacent businesses. There is a gas station within about 30 feet of both east bridge abutments, and existing buildings that very nearly adjoin the north bridge at its west abutment. Because the proposed bridges are approximately equal in width to the existing bridges, it is likely that shoring will be needed to protect the adjacent properties. Furthermore, it would not be uncommon for existing stone structures of that era to be founded on timber mats over timber piles. Such wood foundations may extend well beyond the structure limits and may well cross the stream channel, influencing design and construction of the cofferdams and new substructures. However, estimates have not been prepared for site-specific conditions, and potential unforeseen costs may not be adequately covered by the general contingency.
- The construction schedule assumes that both abutments for each bridge will be constructed concurrently. However, the DIFR/EIS provides no details concerning the cofferdams that will be needed to remove the existing foundations and construct the new bridge abutments. As described above, existing bridge foundations may require partial removal for cofferdam installation. Furthermore, cofferdams are commonly designed for 10-percent floods in order to mitigate contractors' risks during construction and may impede the passage of floods. The Panel sees no evidence of an analysis to assess whether the potential for flooding will be exacerbated during construction or whether abutment demolition and reconstruction at each end will need to be staggered to mitigate flood impacts.

Despite a relatively detailed evaluation of the applicable bridge type and arrangement considerations, a preliminary-phase approach was used to estimate bridge costs by merely applying square-foot unit prices to shoulder break areas. The cost estimate was not developed by preparing quantity estimates or assigning allowances for the various components and certain site-specific features that may significantly influence construction cost and schedule.

Significance – Medium/Low

The lack of site-specific detail in development of construction activities, features, and schedule related to foundations and cofferdams reduces confidence in the estimated costs for the TSP.

Recommendations for Resolution

- 1. Document assumptions and identify risks, including potential foundation and cofferdam issues that must be resolved and investigations that must be performed during the next phase of design in order to move the design forward and improve the accuracy of the cost estimate.
- 2. Evaluate the potential for flooding impacts resulting from installing cofferdams at both abutments simultaneously to determine whether schedule and costs may be underestimated.
- 3. Update the cost estimate for the TSP using estimated quantities and realistic allowances where appropriate for the various elements of construction, based on rational assumptions for the work required at the project site.

It is unclear whether the evaluation of the TSP has fully accounted for potential impacts to local businesses.

Basis for Comment

Substantial grade increases have been identified in the road alignments for the TSP:

- South bridge up to 3.0 feet east of the bridge and up to 6.0 feet west of the bridge.
- North bridge less than 3 feet each side of the bridge; however, this grade increase is based on a bridge elevation that is not in conformance with NYSDOT standards and may therefore increase.

The south entrance to the Putnam Village Center (plaza) parking lot east of the river is shown to be raised approximately 5.5 feet in the proposed road profile (DIFR/EIS, Appendix B4, Figure 7). The entrance is adjacent to an auto detailer and gas station (602 Main St.), which both rely on at-grade entrance across the sidewalk (as can be seen on Google Street View ®). The gas station is configured for eastbound through-traffic only. Building first floors are also at or near grade. The following structural mitigation measures are identified in DIFR/EIS Appendix B4, Table 6:

- Resetting or relocating gas pumps
- Reconfiguring or reconstructing the driveway(s)
- Improving drainage

However, raising the south Putnam Village Center parking lot entrance ramp enough to provide a safe grade change and lines of sight for exiting traffic to merge onto eastbound Route 1 may effectively leave the businesses at 602 Main St. inaccessible. It therefore appears likely that mitigation would also need to include elevating those buildings to a level equal to the road grade change. Those businesses would also be inaccessible throughout road and/or facility reconstruction, and it does not appear that lost business and building relocations have been included in the assessment of project costs.

Similar issues may occur near the north entrance if it is determined that the north bridge elevation must change.

With the change in traffic patterns and temporary loss of entrances during construction, access to and from businesses in and adjacent to the traffic circle will be impeded. In addition, there is a bus stop on the far side of Hillside Avenue across from the plaza. However, there has not been any discussion of pedestrian access to the plaza. Maintenance and protection of traffic (MPT), including pedestrian traffic, during construction will be critical to the continued operation of those businesses and to public safety.

Significance – Medium/Low

Because potential impacts to local businesses do not appear to have been considered in the analysis, project costs may have been underestimated.

Recommendations for Resolution

- 1. Develop details for Putnam Village Center parking lot entrance changes and reconstruction requirements for businesses within and adjacent to the traffic circle after confirming the bridge elevations.
- 2. Develop MPT plans for the TSP that consider access to the local businesses and pedestrian safety during construction.
- 3. Account for all direct and indirect impacts in developing project costs.

Increasing the flow area through the existing Route 1 bridges is not presented as an alternative to increase conveyance.

Basis for Comment

The TSP demonstrates that an increased flow area will reduce fluvial-related water elevations upstream of the bridges. However, the cross-sectional flow area through the existing bridges and through bridge replacement under the TSP are not defined and compared in the DIFR/EIS, so it is not clear how much channel deepening would be required to have a hydraulic impact comparable to bridge replacement.

Depending on the relative increase(s) and on the foundation conditions of the existing Route 1 bridges (e.g., foundation depth, materials and possible timber cribbing), there may be alternative means to increase flow area and reduce flow constrictions at the bridges. If structurally practicable, such means could include deepening the channel, hardening it with concrete lining, and/or improving the approach and exit configurations in order to mitigate losses at changes in cross-section and reduce the potential for debris accumulation. This option could cost less than bridge replacement while minimizing traffic disturbance and yielding a higher BCR.

However, alternative means of improving hydraulics have not been compared with the TSP or eliminated from consideration as being impracticable.

Significance – Medium/Low

Increasing the flow area through the existing bridges by implementing local channel improvements may provide greater net NED benefits.

Recommendations for Resolution

- 1. Determine the needed increases in channel cross-section and other factors affecting conveyance, such as roughness and transitions, that would provide water level reductions comparable to the TSP.
- 2. Formulate an alternative that includes channel improvements at bridge locations in lieu of Route 1 bridge replacements, and evaluate whether such improvements are structurally feasible.
- 3. If feasible, prepare benefit and cost analyses to determine whether the net NED benefits would be increased through channel improvements.

The Federal/non-Federal cost-share splits are listed differently in different parts of the DIFR/EIS.

Basis for Comment

The Executive Summary of the DIFR/EIS presents a 65% Federal/35% non-Federal share. It also states that replacement of the bridges would be a relocation, which is a real estate cost that is a 100% non-Federal responsibility. This description is not complete. The model Project Partnership Agreement for structural flood risk management projects states that the non-Federal share is a minimum of 35% with a maximum of 50%. The non-Federal sponsor must contribute cash equal to 5% of construction costs. Additionally, the non-Federal sponsor must pay 100% of the real property interests, placement area improvement, and relocations. If the cost of these items exceeds 45% of construction costs, at its sole discretion, the Federal Government may perform any of the remaining relocations with the cost of such work included as a part of the Federal Government's cost of construction. Table 35 details the project cost, resulting in a 50% Federal / 50% non-Federal project cost sharing. There is no clear explanation in the Executive Summary or in Section 8.5, Cost Sharing and Non-Federal Partner Responsibilities, of why the non-Federal share was not 35%.

Significance – Low

Inconsistent presentation of Federal and non-Federal cost sharing responsibilities affects the clarity and understanding of the DIFR/EIS.

Recommendations for Resolution

1. Revise the Executive Summary and Section 8.5 to be consistent with Table 35 of the DIFR/EIS, which results in a 50% Federal/50% non-Federal project sharing.

Many of the existing conditions descriptions and impacts analyses regarding natural resources and other disciplines sound generic.

Basis for Comment

The DIFR/EIS does not consistently describe actual specific potential impacts to specific taxa/species groups or specific elements of a resource area under consideration. There are several examples where the DIFR/EIS can provide more detail to support the impacts analysis and conclusions.

Sections 2.8 and 2.9: If no site-specific survey was conducted, local sources would likely be able to provide lists of potentially affected species. For example, the National Audubon Society nature center in Greenwich maintains lists of birds and mammals that can be cited to describe the presence of such species regionally.

http://greenwich.audubon.org/sites/g/files/amh711/f/birdchecklist4audubongreenwich_0.pdf

Section 2.14, second paragraph, indicates that there are essentially no wetlands in the project area. This contradicts Section 2.2.3 (second paragraph under "Connecticut regulated wetlands"), which indicates that there are 16 wetlands (each less than 0.1 acre) within the project area.

Several subsections of Section 5 that discuss natural resources impacts warrant further detail in support of the conclusions that project impacts would be negligible. For example:

- Section 5.2.2 discusses "minor short-term impacts to aquatic habitats" but does not provide acreage or square feet of extent to justify use of the word "minor."
- Section 5.5 discusses negligible impacts to aquatic macroinvertebrates, but again does not cite the acreage of the project footprint that would be impacted in support of this conclusion.
- Section 5.6 concludes that impacts to reptiles and amphibians would be negligible but should also cite the fact that wetlands would not be impacted, and that project impacts would be limited to open-water areas that are not as commonly frequented by these species.
- Section 5.7 describes short-term minor impacts to migratory bird species but does not specify which species. Bridges, even in populated areas, often provide nesting locations for swallows and other species (e.g., Eastern phoebe); therefore, the text should explain why taxa might be impacted and why project impacts would not affect local populations.
- Section 5.8 describes impacts to mammals as short-term adverse impacts associated with removal of vegetation and trees but ignores the issue of bridges. Bridges may be used as roosting sites by some species of bats.

Section 2.3.2 also contains a discussion on mitigation and monitoring which sounds like a generic treatment of replanting techniques. This discussion is not warranted under this section because there are no project impacts to wetlands.

Finally, Section 6.4 of the DIFR/EIS concludes: "The TSP and any current and future actions taken by others will result in negligible short-term and moderate long-term adverse impacts to riparian vegetation within the project area. Short-term impacts include removal of vegetation within construction workspaces. These impacts will have minor cumulative impacts due to the restoration of impacted areas. The loss of mature trees in a watershed with high density development may have moderate cumulative impacts." Supporting details in terms of number of acres impacted or number of mature trees to be removed are not provided in support of the conclusion. It is acknowledged that the overall conclusions of the impact analysis are not likely to change significantly due to the highly developed nature of the watershed and limited areas to be impacted by the project.

Significance – Low

Detailed descriptions of conditions and analysis results in the DIFR/EIS would better inform the public and agencies and would support the overall conclusions regarding impacts to natural resources.

Recommendations for Resolution

 Add further details as suggested to the sections cited to support the conclusions of the DIFR/EIS and the findings of no significant impact to natural resources.

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, 2004.

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

NYSDOT (2017). Bridge Manual – US Customary Edition – 2017. New York State Department of Transportation. Last revised August 2017.

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, 2018.

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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) No. 1110-1619. August 1, 1996.

USACE (1977). Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basin, New York and Byram River Basin, Connecticut, Volumes 1 and 2. U.S. Army Corps of Engineers, October 1977.
APPENDIX A

IEPR Process for the Byram River Basin Project

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

Table A-1 presents the major milestones and deliverables of the Byram River Basin 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 July 17, 2018. Note that the actions listed under Task 6 occur after the submission of this report. Battelle anticipates submitting the pdf printout of the USACE's Design Review and Checking System (DrChecks) project file (the final deliverable) on December 13, 2018. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

| Task | Action | Due Date |
|------------|---|---------------------|
| | Award/Effective Date | 7/16/2018 |
| | Review documents available | 7/17/2018 |
| | Public comments available | 8/21/2018 |
| 1 | Battelle submits draft Work Plan ^a | 7/25/2018 |
| | USACE provides comments on draft Work Plan | 8/6/2018 |
| | Battelle submits final Work Plan ^a | 8/8/2018 |
| | Battelle submits list of selected panel members ^a | 7/30/2018 |
| 2 | USACE confirms the panel members have no COI | 8/1/2018 |
| | Battelle convenes kick-off meeting with USACE | 7/23/2018 |
| 3 | Battelle convenes kick-off meeting with panel members | 8/10/2018 |
| | Battelle convenes kick-off meeting with USACE and panel members | 8/13/2018 |
| | Panel members complete their individual reviews | 9/12/2018 |
| | Panel members provide draft Final Panel Comments to Battelle | 9/20/2018 |
| 4 | Battelle sends public comments to panel members for review | 9/14/2018 |
| | Panel confirms no additional Final Panel Comment is necessary with regard to the public comments | 9/20/2018 |
| | Panel finalizes Final Panel Comments | 9/28/2018 |
| 5 | Battelle submits Final IEPR Report to USACE ^a | 10/9/2018 |
| eh | Battelle convenes Comment Response Teleconference with panel members and USACE | 11/28/2018 |
| 6 ° | Battelle submits pdf printout of DrChecks project file ^a | 12/13/2018 |
| | Agency Decision Milestone (ADM) meeting ^c | 11/1/2018 |
| | Post-ADM Senior Leader Meeting (SLM) ^c | To Be Determined |
| | Contract End/Delivery Date | 8/13/2019 |

| Table A-1. Major Milestone | and Deliverables of the E | Byram River Basin IEPR |
|----------------------------|---------------------------|------------------------|
|----------------------------|---------------------------|------------------------|

^a Deliverable.

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

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

At the beginning of the Period of Performance for the Byram River Basin 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 17 charge questions provided by USACE, 2 overview questions and 1 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.

| Review Documents | No. of Review Pages |
|---|------------------------|
| Main Report | 122 |
| Appendix A: Environmental Resource Figures | 27 |
| Appendix A2: Section 404 (b)(1) Analysis | 8 |
| Appendix A3: USFWS Correspondence | 22 |
| Appendix A4: MOA and SHPO Correspondence | 41 |
| Appendix A5: Essential Fish Habitat Assessment | 24 |
| Appendix A6: Coastal Zone Management Compliance Statement | 51 |
| Appendix A7: Phase I Environmental Site Assessment | 4 |
| Appendix A8: General Conformity Analysis | 11 |
| Appendix A9: ESA Section 7 Consultation | 46 |
| Appendix A10: Traffic Analysis | 84 |
| Appendix A11: General Coordination | 10 |
| Appendix A12: Draft Report Distribution List | 3 |
| Appendix B1: Hydrology | 47 |
| Appendix B2: Hydraulics | 41 |
| Appendix B3: Non-Structural | 55 |
| Appendix B4: Structural | 55 |
| Appendix B5: Geotechnical | 111 |
| Appendix C: Cost Engineering | 14 |
| Appendix D: Economic Analysis | 39 |
| Appendix E: Real Estate | 24 |
| Appendix F: Pertinent Correspondence | 4 |
| Public Comments | 53 |
| Total Number of Review Pages | 896 |

| Table A-2. Documents t | o Be Reviewed and | Provided as R | eference/Supp | olemental Information |
|------------------------|-------------------|---------------|---------------|-----------------------|
| | | | | |

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

- USACE guidance, Review Policy for Civil Works (EC 1165-2-217), February 20, 2018
- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review,* December 16, 2004.
- USACE Climate Change Adaptation Plan (June 2014)
- Foundations of SMART Planning
- Feasibility Study Milestones (Planning Bulletin 2017-01)
- SMART Planning Overview
- Planning Modernization Fact Sheet

About halfway through the review, a teleconference was held with USACE, Battelle, and the Panel so that USACE could answer any questions the Panel had concerning either the review documents or the project. Prior to this teleconference, Battelle submitted 48 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.

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 Byram River Basin IEPR:

- Lead Responsibility: For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.
- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a fourpart 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 descriptions 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.
 - 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.
 - 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, 11 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 53 pages of public comments on the Byram River Basin 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, Battelle determined and the Panel confirmed that no new issues or concerns were identified other than those already covered in the Final Panel Comments.

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 11 Final Panel Comments developed by the Panel into USACE's Design Review and Checking System (DrChecks), a Web-based software system for documenting and sharing comments on reports and design documents, so that USACE can review and respond to them. USACE will provide responses (Evaluator Responses) to the Final Panel Comments, and the Panel will respond (BackCheck Responses) to the Evaluator Responses. All USACE and Panel responses will be documented by Battelle. Battelle will provide USACE and the Panel a pdf printout of all DrChecks entries, through comment closeout, as a final deliverable and record of the IEPR results.

APPENDIX B

Identification and Selection of IEPR Panel Members for the Byram River Basin Project

B.1 Panel Identification

The candidates for the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study (hereinafter: Byram River Basin IEPR) Panel were evaluated based on their technical expertise in the following key areas: Civil Works planning/economics; environmental law compliance; civil engineering; structural engineering; and hydrology and hydraulic (H&H) engineering. These areas correspond to the technical content of the review documents and overall scope of the Byram River Basin project.

To identify candidate panel members, Battelle reviewed the credentials of the experts in Battelle's Peer Reviewer Database, sought recommendations from colleagues, contacted former panel members, and conducted targeted Internet searches. Battelle evaluated these candidate panel members in terms of their technical expertise and potential conflicts of interest (COIs). Of these candidates, Battelle chose the most qualified individuals, confirmed their interest and availability, and ultimately selected five experts for the final Panel. The remaining candidates were not proposed for a variety of reasons, including lack of availability, disclosed COIs, or lack of the precise technical expertise required.

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

"...when a scientist is awarded a government research grant through an investigator-initiated, peer-reviewed competition, there generally should be no question as to that scientist's ability to offer independent scientific advice to the agency on other projects. This contrasts, for example, to a situation in which a scientist has a consulting or contractual arrangement with the agency or office sponsoring a peer review. Likewise, when the agency and a researcher work together (e.g., through a cooperative agreement) to design or implement a study, there is less independence from the agency. Furthermore, if a scientist has repeatedly served as a reviewer for the same agency, some may question whether that scientist is sufficiently independent from the agency to be employed as a peer reviewer on agency-sponsored projects."

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Byram River Basin

- Previous and/or current involvement by you or your firm in the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study (FS) and related projects.
- 2. Previous and/or current involvement by you or your firm in flood risk management in Westchester County, New York, or Fairfield County, Connecticut.
- 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 Westchester County, Byram River Basin, or Fairfield County, Connecticut and New York.
- 4. Current employment by the U.S. Army Corps of Engineers (USACE).

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Byram River Basin

- 5. Previous and/or current involvement with paid or unpaid expert testimony related to the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.
- Previous and/or current employment or affiliation with members of 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*):
 - Town of Greenwich, Connecticut
 - Port Chester, New York
 - New York State Department of Transportation
 - New York State Department of Environmental Conservation.
- 7. Past, current, or future interests or involvements (financial or otherwise) by you, your spouse, or your children related to Westchester County, New York and Fairfield County, Connecticut.
- 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 New York District.
- Previous or current involvement with the development or testing of models that will be used for, or in support of the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.

Note. Models called out in the document include Hydrologic Engineering Center (HEC)-Flood Damage Reduction Analysis, HEC-Hydrologic Modeling System, HEC-River Analysis System

- 10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the New York 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 New York District. Please explain.
- 11. Any previous employment by USACE as a direct employee, notably if employment was with the New York District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- 12. Any previous employment by USACE as a contractor (either as an individual or through your firm) within the last 10 years, notably if those projects/contracts are with the New York District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
- Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning flood management and include the client/agency and duration of review (approximate dates).

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Byram River Basin

- 14. Pending, current, or future financial interests in contracts/awards from USACE related to the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.
- 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 Town of Greenwich, Connecticut or Port Chester, New York contracts.
- 17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.
- 18. Participation in relevant prior and/or current Federal studies related to the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.
- 19. Previous and/or current participation in prior non-Federal studies related to the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS.
- 20. Has your research or analysis been evaluated as part of the Westchester County Streams, Byram River Basin, Connecticut and New York, FRM FS?
- 21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

Providing a positive response to a COI screening question did not automatically preclude a candidate from serving on the Panel. For example, participation in previous USACE technical peer review committees and other technical review panel experience was included as a COI screening question. A positive response to this question could be considered a benefit. The term "firm" in a screening question referred to any joint venture in which a firm was involved. It applied whether that firm serves as a prime or as a subcontractor to a prime. Candidates were asked to clarify the relationship in the screening questions.

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. 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.

Battelle is proposing five highly qualified experts for this IEPR with the following educational waiver (W¹) for one of the experts (see Table B-2). As noted in Table 2 above, the performance work statement states that the Civil Works planner/economist panel member should have "Minimum M.S. degree or higher in a related field." Mr. Lewis Hornung earned a B.S. in civil engineering and has 39 years of experience

directly related to Civil Works planning and economic analysis, including 19 years with USACE. He has served successfully on other Flood Risk Management IEPRs in this capacity over several years. Battelle is confident that Mr. Hornung is a qualified expert for this panel position.

| Name | Affiliation | Location | Education | P.E. | Exp. (yrs.) | | | |
|--------------------|---------------------------------|------------------|---|------|-------------|--|--|--|
| Civil Works Plann | Civil Works Planner / Economist | | | | | | | |
| Lewis Hornung | DR Reed & Associates, Inc. | Jupiter, FL | B.S., Civil Engineering | Yes | 40 | | | |
| Environmental La | w Compliance Specialist | | | | | | | |
| Paul Bovitz | Ecological Consulting, LLC | Hillsborough, NJ | M.S., Ecology | NA | 32 | | | |
| Civil Engineer | | | | | | | | |
| Bill Remington | Kleinschmidt Associates | Lexington, SC | M.S., Civil Engineering | Yes | 36 | | | |
| Structural Enginee | r | | | | | | | |
| Rex Powell | Bergmann Associates | Buffalo, NY | B.S., Civil Engineering | Yes | 37 | | | |
| H&H Engineer | | | | | | | | |
| Brian Bledsoe | University of Georgia | Athens, GA | Ph.D., Civil Engineering – River Mechanics | Yes | 30 | | | |

Table B-1. Byram River Basin IEPR Panel: Summary of Panel Members

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

| | bunı | itz | lington | ell | soe |
|--|------------------|-----|---------|-----|------|
| Technical Criterion | Horn | Bov | Rem | Pow | Blec |
| Civil Works Planner/Economist | | | | | |
| Minimum of 15 years of demonstrated experience in economics | X | | | | |
| Master's degree or higher in economics | \mathbf{W}^{1} | | | | |
| At least 10 years of experience directly related to water resource economic evaluation, a comprehensive understanding of regional economic development as well as traditional USACE national economic development benefits | x | | | | |
| Familiarity with USACE plan formulation processes, procedures, and standards as they relate to flood risk management projects | x | | | | |
| Minimum of 5 years of directly dealing with the USACE six-step planning process and policies, which are governed by ER 1105-2-100, Planning Guidance Notebook | x | | | | |
| Familiarity with USACE application of risk and uncertainty analyses in storm risk management studies and with the standard USACE Engineering Center economic modeling computer software including HEC Flood Damage Analysis | x | | | | |
| Environmental Law Compliance Specialist | | | | | |
| Minimum of 15 years of experience directly related to water resources environmental evaluation or review | | x | | | |
| Master's degree or higher in related field | | Х | | | |
| At least 10 years of experience in evaluating and conducting National Environmental Policy Act (NEPA) impact assessments, including cumulative effects analyses for complex, multi-objective public works projects with competing trade-offs and environmental mitigation needs in urban/suburban environments | | x | | | |
| Familiarity with fish and wildlife habitat and species, socioeconomic factors, and cultural resources that may be affected by the project alternative in the study area and region | | x | | | |
| Familiarity and experience with U.S. Fish and Wildlife Service Habitat Evaluation Procedures (HEP) (USFWS, 1980), Clean Water Act, Endangered Species Act (ESA), National Historic Preservation Act, and state and Federal laws/executive orders pertaining to American Indian Tribes | | x | | | |
| Civil Engineering | | | | | |
| Registered professional engineer | | | X | | |
| Minimum of 10 years of experience in civil engineering and design | | | X | | |
| Master's degree or higher in engineering | | | X | | |
| Thorough understanding of design of channel improvements, structural and non- structural measures in an urban setting | | | x | | |
| Transportation systems background or experience with traffic studies | | | Х | | |

Table B-2. Byram River Basin IEPR Panel: Technical Criteria and Areas of Expertise

| Technical Criterion | Hornung | Bovitz | Remington | Powell | Bledsoe |
|---|---------|--------|-----------|--------|---------|
| Structural Engineer | | | | | |
| Minimum of 15 years of experience directly related to understanding of both structural and non-structural measures to include, but not be limited to, bridge removals and replacements, retaining walls, channel improvements, and levees | | | | x | |
| Demonstrate at least 10 years of experience as a certified professional engineer | | | | Х | |
| Hydrology and Hydraulic Engineer | | | | | |
| Registered professional engineer | | | | | Х |
| Minimum of 15 years of experience in hydrologic and hydraulic engineering | | | | | Х |
| Experienced with all aspects of hydrology and hydraulic engineering with an emphasis on flood risk management projects | | | | | х |
| Familiarity with floodplain mapping, hydrologic statistics, sediment transport analysis, channel stability analysis, and risk and uncertainty analysis | | | | | x |
| Familiarity with floodplain mapping, hydrologic statistics, sediment transport analysis, channel stability analysis, and risk and uncertainty analysis | | | | | x |
| W ¹ - See Section B.2 for Panel Member Waiver Statement. | | | | | |

Table 2. Byram River Basin IEPR Panel: Technical Criteria and Areas of Expertise

B.3 Panel Member Qualifications

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

| Name | Lewis Hornung, P.E. |
|-------------|-------------------------------|
| Role | Civil Works Planner/Economist |
| Affiliation | DR Reed & Associates, Inc. |

Mr. Hornung is a planning expert with DR Reed & Associates in Jupiter, Florida, specializing in the planning, economics, design phase, and operation of integrated water resources and public works projects. He earned his B.S. in civil engineering from the University of Houston. His 40-year career includes 19 years with USACE, 7 years with the South Florida Water Management District, and 14 years with architectural/engineering firms. Mr. Hornung has worked on dozens of USACE Civil Works projects since 1977 and is very familiar with applying the Principles and Guidelines. He has taken part in previous IEPR panels for Battelle as an economist/Civil Works planning expert.

Mr. Hornung has direct experience in USACE plan formulation processes, procedures, and standards. He spent more than 12 years in the Planning Divisions of the Galveston and Jacksonville Districts. He then moved to project management where he continued to lead planning projects, including the Kissimmee

River Restoration Feasibility Study (FS) and the Comprehensive Everglades Restoration Plan FS. In both cases, he managed the projects during the planning phase through Congressional authorization.

Mr. Hornung applied the USACE six-step planning process, governed by Engineer Regulation (ER) 1105-2-100 (Planning Guidance Notebook), for dredged material management plans, reconnaissance studies, FSs, limited reevaluation reports, general reevaluation reports (GRRs), major rehabilitation reports, and continuing authority studies. He has experience evaluating whether adequate information was available and appropriate technical analyses were completed to support selection of a Tentatively Selected Plan (TSP) within the context of the risk-informed decision-making process for these studies.

Mr. Hornung's experience includes structural and non-structural flood risk management projects; water quality; inland, deep-, and shallow-draft navigation; and water supply studies. Relevant flood risk management studies include the C-111 GRR, Jacksonville District; the C-51 West GRR; the Lake Okeechobee Watershed FS; the Herbert Hoover Dike Major Rehabilitation Report; the Alexandria to the Gulf of Mexico Flood Control FS, New Orleans District; and the North West El Paso Flood Risk Management (FRM) FS, Albuquerque District.

Mr. Hornung has more than 30 years of experience conducting traditional National Economic Development (NED) benefits analyses associated with FRM and shallow- and deep-draft navigation projects. Mr. Hornung has applied the Hydrologic Engineering Center-Flood Damage Reduction Analysis (HEC-FDA) model using HEC River Analysis System (HEC-RAS) model results on many projects, including Alexandria to the Gulf (2012), Pajaro River (2016), and West El Paso (2017). In addition, Mr. Hornung served on the IEPR Panel to evaluate the NED analysis that was performed using the HEC-RAS and HEC-FDA models for the West Sacramento Flood Risk Management GRR (Sacramento District) and the Middle Mississippi River Study (Albuquerque District). His extensive experience conducting NED evaluations reflects his capability in evaluating traditional NED plan benefits associated with hurricane and coastal storm risk management projects.

| Name | Paul Bovitz, PWS, LSRP, CEM, LEED AP |
|-------------|---|
| Role | Environmental Law Compliance Specialist |
| Affiliation | Ecological Consulting, LLC |

Mr. Bovitz is an environmental scientist and project manager based in Hillsborough, New Jersey. He has more than 30 years of technical experience in ecological assessment and natural resources management in public, private, and academic sectors, engaging in both theoretical and applied aspects of ecological research and encompassing a variety of geographic regions and aquatic environments. He has a bachelor's degree in wildlife biology and earned an M.S. in ecology from Rutgers University in 1992. Mr. Bovitz has over 20 years of experience evaluating and conducting National Environmental Policy Act (NEPA) impact assessments, first working for the USACE New York District as project manager on the Meadowlands Mills Environmental Impact Statement (EIS) on behalf of the Regulatory Branch from 1998 through 2002. As principal investigator, he has managed a variety of projects and programs with varied environmental impacts, including environmental Protection Agency (EPA) National Priority List sites nationwide; water quality and storm water studies; wetlands delineation, assessment, mitigation and permitting; and essential fish habitat investigation.

Working largely in the New York/New Jersey area, Mr. Bovitz gained extensive expertise on endangered species issues ranging from Atlantic sturgeon to bog turtle and swamp pink issues. As part of his EIS and EA experience, he has dealt extensively with cultural resources and historic structures issues. As a wildlife biologist, he has also dealt with Habitat Evaluation Procedures (HEPs) and other habitat evaluation models both in terrestrial and aquatic situations.

Mr. Bovitz is very familiar with both state and Federal regulations in the New York area pertinent to water resources projects. He has worked extensively with the New York State Department of Environmental Conservation, the New Jersey Department of Environmental Protection, regional stakeholders such as the Port Authority of New York and New Jersey and regional transportation agencies, and municipal governments. Mr. Bovitz has also acted as project manager on community relations plans for the New York District for Jamaica Bay ecological restoration and the Former Raritan Arsenal investigation and clean-up.

Mr. Bovitz has demonstrated expertise in reclamation and habitat restoration in contaminated aquatic areas in a variety of projects throughout the United States. He has led restoration efforts for contaminated wetlands at several sites in New Jersey and made recommendations regarding sites in several Midwestern states (Indiana, Michigan, and Wisconsin) and in New York and Massachusetts. For example, on the Hatco Facility (Fords, New Jersey) Ecological Risk Assessment and Restoration project, he directed the design and implementation of a 4.5-acre wetland restoration project adjacent to an active chemical manufacturing facility associated with the removal of over 20,000 cubic yards of polychlorinated biphenyl (PCB)-contaminated sediments. The project involved removing historical fill, stabilizing stream channels, replanting over 1,200 trees and 2,000 shrubs, and removing invasive species. He has also been involved in ecological assessments and site characterization studies in Wisconsin, Michigan, Utah, and Colorado with EPA Environmental Response Teams.

Mr. Bovitz has a strong knowledge of law and policy associated with hazardous, toxic, and radioactive waste (HTRW) issues, including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). He is a Licensed Site Remediation Professional in New Jersey and has extensive experience as a USACE and EPA contractor in investigation and remediation of CERCLA sites. He is also a certified Professional Wetland Scientist and a Certified Energy Manager.

Mr. Bovitz is a member of the New Jersey Governor's Science Advisory Board, Ecological Sciences Committee, and served on the New Jersey Department of Environmental Protection, Comparative Ecological Risk Analysis Panel. Relevant Midwest experience includes his participation in the Ecological Assessment of Kalamazoo River, Enbridge Oil Spill, Marshall, Michigan, EPA Region 5, (EPA Representative); and his participation as an IEPR panel member focused on identifying ecological and HTRW issues for the Wood River Flood Control Project, USACE, St. Louis District. He has served on other IEPRs that included various degrees of ecological restoration components as well.

Mr. Bovitz is an active member of several professional organizations, including the Society of American Military Engineers and a New Jersey chapter of the Society of Environmental Toxicology and Chemistry. He also attends Association of Environmental and Engineering Geologist meetings. In 2014, he chaired a session on urban ecological restoration for the Conference on Ecological and Ecosystem Restoration meeting in New Orleans.

| Name | Bill Remington, P.E. |
|-------------|-------------------------|
| Role | Civil Engineer |
| Affiliation | Kleinschmidt Associates |

Mr. Remington is a senior engineering consultant with Kleinschmidt Associates specializing in civil, structural, hydraulic, transportation, and environmental engineering, as well as construction contract administration and project management. He earned an A.A.S. degree from the State University of New York-Delhi, a B.S. and M.S. in civil engineering from Clarkson University in Potsdam, New York, and an M.B.A. from Thomas College in Waterville, Maine. Mr. Remington is a registered professional engineer in Georgia, South Carolina, Virginia, Maryland, Delaware, Maine, and Pennsylvania, with recently retired licenses in New York, Vermont, and New Hampshire. He is Kleinschmidt's Senior Project Manager and Quality Control Reviewer for civil, site, water resource, structural, and hydroelectric/dam safety-related projects.

Mr. Remington has substantial experience with site improvements, stormwater management, water/wastewater treatment systems, municipal utilities and roads, industrial facilities, airports, railroads, transportation, hydroelectric, dams, planning, site remediation, site development, flood protection, and water resources projects. He has experience in construction management as well as design/build project management. He is also the Corporate Safety Officer for Kleinschmidt Associates, setting up and maintaining the safety program and procedures.

Mr. Remington has over 25 years of experience in municipal services, including serving as Superintendent of Public Works for Warren County in upstate New York. He was responsible for all Department of Public Works operations, which included divisions of highways and bridges (Highway Manager), buildings and grounds, equipment maintenance, parks and recreation (Director), railroad, airport (Airport Manager), engineering, water/wastewater, county capital projects, New York State and Federal capital projects, solid waste and recycling, and civil defense and natural disaster (Director of Civil Defense and Natural Disaster). Administration included planning, personnel, union issues, safety, facilities, equipment, construction projects, environmental issues, budgets, grants, permitting, and legal matters. He served as Chairman of the Adirondack/Glens Falls Transportation Council Technical Advisory Committee (Metropolitan Planning Organization), Executive Board Member of the New York State County Highway Superintendents Association, and member of the New York State and Warren County Traffic Safety Boards, the County Planning Board, and numerous other associated affiliations.

In other municipal and government experience, Mr. Remington has been the on-call consulting engineer for numerous towns and counties in Maryland, Delaware, and Virginia. This on-call service included design, project management, planning reviews, maintenance/operations recommendations, studies, and environmental permitting. He has also been the Project Manager and Engineer-in-Charge of National Aeronautics and Space Administration projects in Wallops Island, Virginia.

Mr. Remington has industrial experience in the paper industry including capital project management, emergency repairs, and environmental compliance. He was worked on several construction management teams to plan, construct, start up, and implement operational and maintenance training. He is a member of the American Society of Civil Engineers (past president of Maryland Eastern Shore Chapter) and has substantial training in Occupational Safety and Health Act safety, project management, quality control, contract documents, construction supervision, and the Cornell Local Roads Program.

| Name | Rex C. Powell, P.E. |
|-------------|---------------------|
| Role | Structural Engineer |
| Affiliation | Bergmann Associates |

Mr. Powell is a Senior Discipline Specialist (Waterway Structures) and Project Manager for Bergmann Associates, Buffalo, New York. A registered professional engineer in New York State, he has 37 years of experience in civil/structural engineering, with an emphasis on design and analysis of structures as well as mechanical, geotechnical, and hydraulics design. He earned his A.S. in Engineering Science from State University of New York-Delhi in 1979 and his B.S. from Rensselaer Polytechnic Institute in 1981. He has been responsible for the design of all structural aspects of hydropower plants and dams, and structural designs for industrial plants and transportation projects. He is experienced in the design of concrete gravity dams and structures, including pre-stressed and post-tensioned elements, structural steel, timber, and masonry design. He has been the independent consultant on several Federal Energy Regulatory Commission Part 12 dam safety inspections. Some of Mr. Powell's most recent work has included repair and rehabilitation of existing locks and dams and other concrete and steel hydraulic structures.

Mr. Powell has worked on a number of large public works projects requiring design, analysis, and construction expertise for various local, state, and Federal agencies, including the New York State Canal Corporation (post-Irene improvements, Erie Canal), St. Lawrence Seaway Management Corporation (Welland Canal installation and reconstruction projects, St. Catharines, Ontario, Canada), St. Lawrence Seaway Development Corporation (U.S. Department of Transportation, Massena, New York) and USACE. He has designed, analyzed, and constructed hydraulic steel structures, including spillway, power, and closure gates, using USACE guidelines. He is familiar with the requirements of USACE Engineer Manual (EM) 1110-2-1913 and has reviewed stability of levees.

For more than 30 years, Mr. Powell has been involved in dam designs for flood risk management. As Technical Design Manager for the Devils Lake (North Dakota) City Embankments project, he was responsible for reinforced concrete and steel design of a four-unit and an eight-unit pump station and ancillary equipment; an inverted T-wall inlet headwall; outlet works; abandonment/closure of existing outlet works; and cantilever sheet pile walls for embankment toe excavation. He is familiar with the concept of relocation for flood protection. He also has designed a number of T- and L-walls and is familiar with I-wall design and construction. In addition, Mr. Powell has designed or rehabilitated a variety of closure structures such as rolling gates, stoplogs, miter gates, flap gates, and slide gates.

Mr. Powell is familiar with USACE policies and design standards. He has participated in several safety assurance reviews (SARs) for USACE projects, including the Herbert Hoover Dike improvements (Lake Okeechobee, Florida) SAR and the Canton Dam (Canton, Oklahoma) SAR. He also has performed engineering peer reviews of large dam projects for USACE, evaluating structural aspects to correct dam safety issues and to satisfy dam safety requirements.

Mr. Powell's professional affiliations include the Society of American Military Engineers, the Association of State Dam Safety Officials, and the American Institute of Steel Construction.

| Name E | Brian Bledsoe, Ph.D., P.E. |
|-------------------|---|
| Role⊢Affiliation∪ | Hydrology and Hydraulic Engineer University of Georgia |

Dr. Bledsoe is Georgia Athletic Association Distinguished Professor in the College of Engineering at the University of Georgia. He has 30 years of experience as a civil and environmental engineer, hydrologist, and environmental scientist in the private and public sectors. He holds degrees from Georgia Tech, North Carolina State University, and Colorado State University.

Before entering the professorate, Dr. Bledsoe worked as a consulting engineer and surveyor, and as a watershed restoration specialist and nonpoint source program coordinator for the State of North Carolina. His research is focused on the interface of engineering, hydrology, and ecology with an emphasis on river hydraulics, flood hazards, stormwater, infrastructure, water quality, and restoration of river and wetland ecosystems. He is experienced in all aspects of hydrologic and hydraulic (H&H) engineering and has published numerous peer-reviewed papers on sediment transport analysis, channel stability analysis, and statistical hydrology.

Dr. Bledsoe is well versed in the application of many USACE models: HEC River Analysis System (HEC-RAS) (1-D, 2-D, and hydraulic design modules), HEC Geospatial RAS (HEC-GeoRAS), HEC Hydrologic Modeling System (HEC-HMS), HEC Geospatial HMS (HEC-GeoHMS), and HEC Flood Damage Reduction Analysis (HEC-FDA). He is familiar with floodplain mapping and flood management projects and with risk and uncertainty analysis. He has developed practical guidance for design hydrology at stream crossings and analytical channel design for stability under land use change for the National Cooperative Highway Research, as well as tools for predicting and mitigating channel instability resulting from hydromodification for several municipalities and the State of California Water Board.

Dr. Bledsoe has served as an expert peer reviewer for several flood mitigation and ecosystem restoration projects: Southwest Coastal Louisiana FS; Orestimba Creek-West Stanislaus County, California, FS; Louisiana Coastal Area Barataria Basin Barrier Shoreline Restoration Project; Biscayne Bay Coastal Wetlands Project; and Louisiana Coastal Area Amite River Diversion Canal Modification Project FS and Supplemental EIS. He currently leads the urban flooding research group for the National Science Foundation's Urban Water Innovation Network.

Dr. Bledsoe received a National Science Foundation CAREER Award in 2006; served as a Fulbright Scholar in Chile with a focus on hydraulic and river engineering research in 2008; is past president of the American Ecological Engineering Society; and was elected a Fellow of the American Society of Civil Engineers in 2017. Dr. Bledsoe is a registered Professional Civil Engineer in Colorado and North Carolina and has authored more than 60 publications related to river mechanics, hydraulics and hydrology, channel stability, stream and watershed restoration, and water quality.

APPENDIX C

Final Charge for the Byram River Basin IEPR

Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study

This is the final Charge to the Panel for the Byram River Basin IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on August 8, 2018. The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

The current study was authorized by a resolution of the Committee on Public Works and Transportation of the United States House of Representatives adopted 2 May 2007 covering flood damage reduction, storm damage reduction, environmental restoration, navigation, watershed management, water supply, and other allied purposes in the Westchester County Streams study area, of which the Byram River is a sub-basin. The reconnaissance report was approved September 2008.

Flooding on the Byram River primarily affects the Town of Greenwich, Connecticut, just south of the constructed project of levees at Pemberwick. The Byram River and its tributaries were the subject of a General Design Memorandum in 1958, which recommended 3,000 feet of levees on the Byram River mainstem at Pemberwick, Town of Greenwich, Fairfield County, Connecticut. Only part of the project at Pemberwick was constructed in the 1960s. The recommendation for flood risk management (FRM) was reinforced in the 1977 Westchester County Streams Feasibility Report, titled "Feasibility Report for Flood Control, Mamaroneck and Sheldrake Rivers Basins, and Byram River Basin," which recommended channel excavation and the construction of floodwalls and levees at Port Chester, New York, and the Town of Greenwich, Connecticut. Although the recommended plan, which included continuation of the levee features to the south, was subsequently authorized by Congress, it was not implemented due to lack of non-Federal sponsor support.

After two large flooding events in 2007, there was a renewed interest in pursuing a FRM project. The study team completed a reconnaissance report in 2008 recommending a feasibility study (FS) to develop flood risk management alternatives, and a feasibility cost-share agreement was signed with the Town of Greenwich in 2012.

The study focused on FRM alternatives in the Byram River Basin primarily within the Pemberwick area south of the previously constructed USACE levee as well as in the area of the Bailiwick Bridge to the north. At a minimum, the potential FRM measures that were examined in the FS included channel modification, levees, floodwalls, non-structural measures, as well as bridge modifications based on public feedback, and the "no action" alternative. Non-structural measures such as "buyouts" and preservation and/or creation of open space in the floodplain were also considered.

Based on results from the analysis of potential FRM measures, the team determined that the levee alternatives were not economically justified. At a 2015 public meeting, the team presented a non-structural plan as the plan most likely to move forward. The non-structural plan was not well received by the public or the Town of Greenwich because they were concerned about residual risk. Incorporating the public's feedback, the team introduced bridge removal alternatives; this included removal and replacement of the U.S. Route 1 bridges in Port Chester and a combination of Route 1 bridges removal and replacement with nonstructural measures.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study (hereinafter: Byram River Basin IEPR) in accordance with the Department of the Army, U.S. Army Corps of Engineers (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

| | Subject Matter Experts | | | | | |
|---|---------------------------|---|--------------------------------------|-------------------|-----------------|------------------------|
| Review Documents | No. of Review Pages | Civil Works Planner/ Economist | Environ- mental Law Compliance | Civil Engineer | H&H Engineer | Structural Engineer |
| Main Report | 122 | 122 | 122 | 122 | 122 | 122 |
| Appendix A: Environmental Resource Figures | 27 | | 27 | | | |
| Appendix A2: Section 404 (b)(1) Analysis | 8 | | 8 | | | |
| Appendix A3: USFWS Correspondence | 22 | | 22 | | | |
| Appendix A4: MOA and SHPO Correspondence | 41 | | 41 | | | |
| Appendix A5: Essential Fish Habitat Assessment | 24 | | 24 | | | |

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.

| | Subject Matter Experts | | | | | |
|--|---------------------------|---|--------------------------------------|-------------------|-----------------|------------------------|
| Review Documents | No. of Review Pages | Civil Works Planner/ Economist | Environ- mental Law Compliance | Civil Engineer | H&H Engineer | Structural Engineer |
| Appendix A6: Coastal Zone Management Compliance Statement | 51 | | 51 | | | |
| Appendix A7: Phase I Environmental Site Assessment | 4 | | 4 | | | |
| Appendix A8: General Conformity Analysis | 11 | | 11 | | | |
| Appendix A9: ESA Section 7 Consultation | 46 | | 46 | | | |
| Appendix A10: Traffic Analysis | 84 | | 84 | | | |
| Appendix A11: General Coordination | 10 | 10 | | | | |
| Appendix A12: Draft Report Distribution List | 3 | 3 | | | | |
| Appendix B1: Hydrology | 47 | | | | 47 | |
| Appendix B2: Hydraulics | 41 | | | | 41 | |
| Appendix B3: Non-Structural | 55 | | | 55 | | |
| Appendix B4: Structural | 55 | | | | | 55 |
| Appendix B5: Geotechnical | 111 | | | 111 | 111 | 111 |
| Appendix C: Cost Engineering | 14 | 14 | | 14 | | |
| Appendix D: Economic Analysis | 39 | 39 | | | | |
| Appendix E: Real Estate | 24 | | 24 | | | |
| Appendix F: Pertinent Correspondence * | 4 | | | | | |
| Public Comments * | 100 | 100 | 100 | 100 | 100 | 100 |
| Total Number of Review Pages | 943 | 288 | 564 | 402 | 421 | 388 |

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

Documents for Reference

- USACE guidance 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)
- USACE Climate Change Adaptation Plan (June 2014)
- Foundations of SMART Planning
- Feasibility Study Milestones (Planning Bulletin 2017-01)
- SMART Planning Overview
- Planning Modernization Fact Sheet

SCHEDULE & DELIVERABLES

This schedule is based on the receipt date of the final review documents. This schedule may also change due to circumstances out of Battelle's control such as changes to USACE's project schedule and unforeseen changes to panel member and USACE availability. As part of each task, the panel member

will prepare deliverables by the dates indicated in the table (or as directed by Battelle). All deliverables will be submitted in an electronic format compatible with MS Word (Office 2003).

| Task | Action | Due Date |
|--|--|------------|
| Attend Meetings and Begin Peer Review | Subcontractors complete mandatory Operations Security (OPSEC) training | 9/9/2018 |
| | Battelle convenes kick-off meeting with USACE | 7/23/2018 |
| | Battelle sends review documents to panel members | 8/10/2018 |
| | Battelle convenes kick-off meeting with panel members | 8/10/2018 |
| | Battelle convenes kick-off meeting with USACE and panel members | 8/13/2018 |
| | Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE | 8/28/2018 |
| Prepare Final Panel Comments | Panel members complete their individual reviews | 9/12/2018 |
| | Battelle provides talking points for Panel Review Teleconference to panel members | 9/13/2018 |
| | Battelle convenes Panel Review Teleconference | 9/13/2018 |
| | Battelle provides Final Panel Comment templates and instructions to panel members | 9/13/2018 |
| | Panel members provide draft Final Panel Comments to Battelle | 9/20/2018 |
| | Battelle provides feedback to panel members on draft Final Panel | 9/21/2018 |
| | Comments; panel members revise Final Panel Comments | 9/27/2018 |
| | Panel finalizes Final Panel Comments | 9/28/2018 |
| Review Public Comments ** | Battelle receives public comments from USACE | 8/20/2018 |
| | Battelle sends public comments to Panel | 9/14/2018 |
| | Panel completes its review of public comments | 9/19/2018 |
| | Battelle and Panel review the Panel's responses to the charge question regarding the public comments | 9/20/2018 |
| | Panel drafts Final Panel Comment for public comments, if necessary | 9/25/2018 |
| | Panel finalizes Final Panel Comment regarding public comments, if necessary | 9/27/2018 |
| Review Final | Battelle provides Final IEPR Report to panel members for review | 10/2/2018 |
| ЕРК Кероп | Panel members provide comments on Final IEPR Report | 10/4/2018 |
| | *Battelle submits Final IEPR Report to USACE | 10/9/2018 |
| | USACE Planning Center of Expertise (PCX) provides decision on Final IEPR Report acceptance | 10/16/2018 |
| Comment/ Response Process | Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE | 10/18/2018 |

| Task | Action | Due Date |
|-------|---|------------|
| | Battelle convenes teleconference with USACE to review the Comment Response process | 10/18/2018 |
| | Battelle convenes teleconference with Panel to review the Comment Response process | 10/18/2018 |
| | USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE PCX for review | 11/8/2018 |
| | USACE PCX reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed | 11/14/2018 |
| | USACE PCX provides draft PDT Evaluator Responses to Battelle | 11/15/2018 |
| | Battelle provides draft PDT Evaluator Responses to panel members | 11/19/2018 |
| | Panel members provide draft BackCheck Responses to Battelle | 11/26/2018 |
| | Battelle convenes teleconference with panel members to discuss draft BackCheck Responses | 11/27/2018 |
| | Battelle convenes Comment Response Teleconference with panel members and USACE | 11/28/2018 |
| | USACE inputs final PDT Evaluator Responses to DrChecks | 12/5/2018 |
| | Battelle provides final PDT Evaluator Responses to panel members | 12/6/2018 |
| | Panel members provide final BackCheck Responses to Battelle | 12/11/2018 |
| | Battelle inputs panel members' final BackCheck Responses to DrChecks | 12/12/2018 |
| | *Battelle submits pdf printout of DrChecks project file | 12/13/2018 |
| SLM 1 | Senior Leader Meeting (SLM) 1 - Agency Decision Milestone (ADM) Meeting | 11/1/2018 |
| SLM 2 | Senior Leader Meeting 2 – Post-ADM | TBD |

* 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

ber 9, 2018

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 (Lynn McLeod; <u>mcleod@battelle.org</u>) for requests or additional information.
- 3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (<u>mcleod@battelle.org</u>) 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 Westchester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Study

Charge Questions and Relevant Sections as Supplied by USACE

The following Charge to Reviewers outlines the objective of the Independent External Peer Review (IEPR) for the subject study and the specific advice sought from the IEPR 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 Panel is requested to offer a broad evaluation of the overall study decision document in addition to addressing the specific technical and scientific questions included in the charge. The Panel has the flexibility to bring important issues to the attention of decision makers, including positive feedback or issues outside those specific areas outlined in the charge.

The Panel review is to focus on scientific and technical matters, leaving policy determinations for USACE and the Army. The Panel should not make recommendations on 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 Panel may have assumed the role of advisors as well as reviewers, thus introducing bias and potential conflict in their ability to provide objective review.

Panel review comments are to be structured to fully communicate the Panel's intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment. The IEPR Performance Work Statement provides additional details on how comments should be structured.

Broad Evaluation Charge Questions

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

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

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

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

Further:

- 11. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
- 12. Assess the considered and tentatively selected alternatives from the perspective of systems, including systemic aspects being considered from a temporal perspective, including the potential effects of climate change.
- For the tentatively selected plan, assess whether:
- 13. The models used to assess life safety hazards are appropriate.
- 14. The assumptions made for the life safety hazards are appropriate.
- 15. The quality and quantity of the surveys, investigations, and engineering are sufficient for a concept design considering the life safety hazards and to support the models and assumptions made for determining the hazards.
- 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

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.

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?

APPENDIX D

Conflict of Interest Form

BATTELLE | October 9, 2018

Byram River Basin IEPR | Final IEPR Report
David Kaplan USACE, Institute for Water Resources July 5, 2018 C-2

Conflicts of Interest Questionnaire

Independent External Peer Review West Chester County Streams, Byram River Basin, Connecticut and New York, Flood Risk Management Feasibility Report

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: Aaron J. MacDiarmid TELEPHONE: 614-424-7806 ADDRESS: 505 King Avenue, Columbus, Ohio 43201 EMAIL ADDRESS: <u>MacDiarmid@battelle.org</u>

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.

Aaron J. MacDiarmid

July 5, 2018 Date

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

