



DEPARTMENT OF THE ARMY
CHIEF OF ENGINEERS
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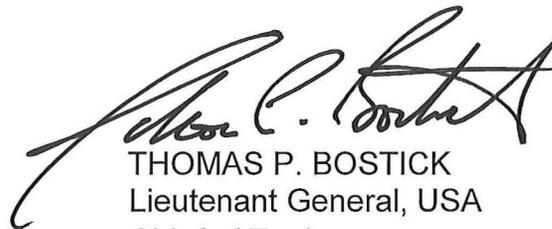
MEMORANDUM FOR Assistant Secretary of the Army (Civil Works)
108 Army Pentagon, Washington, D.C. 20310-0108

FEB 23 2016

SUBJECT: Princeville, North Carolina, Flood Risk Management Study – Final USACE
Response to Independent External Peer Review

1. Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resources Development Act of 2007, EC 1165-2-214, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).
2. The IEPR was conducted by Battelle Memorial Institute. The IEPR panel consisted of five members with technical expertise in civil/structural engineering, geotechnical engineering, hydraulic and hydrologic engineering, biology/ecology, and economics/planning/social effects.
3. The final written responses to the IEPR are hereby approved. The enclosed document contains the final written responses of the Chief of Engineers to the issues raised and the recommendations contained in the IEPR. The IEPR Report and the USACE responses have been coordinated with the vertical team and will be posted on the Internet, as required in EC 1165-2-214.
4. If you have any questions on this matter, please contact me or have a member of your staff contact Ms. Stacey Brown, Deputy Chief, South Atlantic Division Regional Integration Team, at 202-761-4106.

Encl


THOMAS P. BOSTICK
Lieutenant General, USA
Chief of Engineers

**Princeville, North Carolina Flood Risk Management
Integrated Feasibility Report and
Environmental Assessment
U.S. Army Corps of Engineers Response to
Independent External Peer Review
January 2016**

Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of WRDA 2007, EC 1165-2-214 and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review (2004)*.

The goal of the U.S. Army Corps of Engineers (USACE) Civil Works program is to always provide the most scientifically sound, sustainable water resource solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people. Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for USACE, was engaged to conduct the IEPR of Princeville, North Carolina Flood Risk Management Integrated Feasibility Report and Environmental Assessment (EA).

The IEPR panel reviewed the integrated feasibility report and environmental assessment as well as supporting documentation. The Final IEPR Battelle Report was issued on 28 August 2014. Overall, eleven comments were identified and documented; one were identified as having high significance, three were identified as having medium/high significance, six were identified as having medium significance, and one was identified as having medium/low significance. The following discussions present the USACE Final Response to the eleven comments.

1. Comment – *High Significance*: Geotechnical site characterization and design analysis has not been conducted per USACE guidance so that detailed design can begin immediately following receipt of Preconstruction Engineering Design (PED) funds

This comment included eighteen recommendations; ten were adopted and eight were not adopted as discussed below. The comment expresses the concern that the lack of geotechnical site characterization (geologic model, topography, soil profiles, and materials properties) and geotechnical analyses (seepage, slope stability, settlement, etc.), as required by ER 1110-2-1150 affects the complete analysis of the alternatives (including cost and schedule), the potential environmental impacts, and ultimately, the project design.

USACE Response: Adopted

Actions to be Taken: The IEPR panel recommended (1) that complete investigations, testing, analyses, and design as outlined in ER 1110-2-1150 and EM-1110-2-1913 be accomplished to allow refinement of project features, (2) that a geologic model be developed as outlined in EM 1110-2-1913 and ER 1110-2-1150 and correlated with the NRCS Soil Survey Map and the historic channel analysis, (4) that seepage (Seep/W) analysis locations be selected from the geologic model, accounting for abandoned channel locations, levee geometry, and in situ foundation soils (which vary across the project area), (8) that in situ soils along the levee alignment are tested to verify the estimated range of material properties, including hydraulic conductivity, (10) that levee fill should be differentiated from native soils, (15) that shallow and deep-seated stability on flood- and protected-sides of the levee is evaluated as defined slip surfaces (Appendix C, Figures 21-29) did not appear consistent with regards to exploration of shallow and deep-seated failures, and (18) that the recommended studies presented in ER 1110-2-1150, Appendix C, pp. C4-C5 and EM 1110-2-1913 are completed. In response, further modeling, subsurface investigation, testing, analyses, and design of the recommended plan will be conducted in the Preconstruction, Engineering, and Design (PED) phase of the study, as per ER 1110-2-1150. Additionally, Sections 5.2, 10, and 14 of Appendix C (Geotechnical Engineering) have been updated to clarify the existing work that has been done and the additional work that will be accomplished during PED. The analyses and modeling performed and data that have already been collected during the feasibility phase of the study are considered sufficient for identifying and determining the impacts of the recommended plan.

Actions Taken: The IEPR panel recommended (5) that a consistent datum is used for the project design and analysis. In response, all references throughout the Main Report and Geotechnical Appendix have been revised to reflect conversion to the NAVD88 Datum. The IEPR panel recommended (6) that a topographic model be developed for use in geotechnical evaluation that is suitable for engineering analysis and design, as recommended by ER 1110-2-115. In response, Section 5.2 and Section 7 of Appendix C (Geotechnical) were revised to explain that seepage and stability modeling were performed, and that geometry used to create the models was taken from the as-built cross sections from the repairs to the levee following Hurricane Floyd, and as built cross sections were created from a topographic survey performed following construction of the repairs. The IEPR panel recommended (13) that the anticipated flood hydrograph is used to analyze how pore pressures respond and propagate throughout the levee and foundation section, especially in historic channel deposits. In response, Section 5.3 of Appendix C was revised to explain how the anticipated flood hydrograph was used for comparison to the current seepage analyses performed to evaluate responses to pore water pressure and propagation of the water through the levee.

USACE Response: Not Adopted

The IEPR panel recommended (3) exploring and (12) defining the lateral extents of cohesionless deposits be explored through soil borings, and CPTs, etc. so they can be accurately mapped and evaluated in both seepage and slope stability analyses. However, previous borings taken in at the riverside and landside toe of the levee, as well as through the centerline of the levee, already provided sufficient information on foundational conditions showing the extents of the cohesionless deposits. In the evaluation of the underseepage, the cohesionless deposits were assumed to extend well beyond the landside toe of the levee, yielding conservative results in the

seepage analysis. The IEPR panel recommended (7) that all embankment encroachment locations be identified and evaluated. However, all encroachments are already identified through yearly inspections to determine eligibility status for the Rehabilitation Program pursuant to Public Law (P.L.) 84-99. Each encroachment is subsequently evaluated to determine if it has an impact the performance of the levee. The IEPR panel recommended (9) that actual values, and not a range of soil properties, should be reported in the analyses; if a suite of values were used, this should be noted and described, and; if “probabilistic” or sensitivity analyses were completed, the analyses and results should be included. However, the purpose of the range of values given in Appendix C on pg 5 was to provide the results of the various soil borings tested at each cross section along the current earthen levee and not to report the values used in the analyses. The IEPR panel recommended (11) that potential changes resulting from of embankment loading are evaluated and accounted for and considered when using soil properties from the 1964 geotechnical exploration program, as soil borings performed for the original levee alignment (CS series) were performed prior to construction of the existing levee and some consolidation and strength improvement may have occurred. The 1964 geotechnical data was presented in the report for reference only, and was not utilized for any analysis. The foundation information used in the current seepage and stability analysis was based on conservative estimates made from the different soil properties taken from a 2009 subsurface investigation. The IEPR panel recommended (14) that seepage-related critical sections are selected based on historic observed seeps and/or sand boils on the protected side of the levee with elevated water levels on the flood side, resulting in a hydraulic gradient through the levee and under the levee, through the levee foundation soils, and/or locations that coincide with pervious zones (such as abandoned stream courses) that traverse through the levee foundation footprint. The selection of critical sections were based on observed areas of overtopping and erosion during Hurricane Floyd in 1999, and prior to that event, no seeps and/or sand boils had been observed along the levee during high water events. The IEPR panel recommended (16) that the three recommended shear strength configurations (per EM 1110-2-1902) are evaluated with respect to sudden draw down analyses. The three shear strength procedures utilized in Appendix G of EM 1110-2-1902 include the Corps of Engineers method, the Simplified Bishop Method, and the Modified Swedish Method. Per paragraph G-8 of the EM, the Corps of Engineers rapid drawdown procedure is “inherently conservative”, and the Modified Swedish Method “overestimates the factor of safety as compared with more accurate methods (Simplified Bishop or the Spencer Method)”. Hence, only Spencer’s Method was utilized in determining the Factor of Safety in the rapid drawdown stability model. The IEPR panel recommended (17) that feasibility-stage side slopes of 5H:1V be used as recommended in EM 1110-2-1913 in areas where no slope stability analyses have been completed. In areas where slope stability analyses have not been conducted, the 3H:1V slopes of the existing levee, which has not demonstrated any stability issues based on existing modeling, were utilized. However, additional stability and seepage analyses will be conducted during the PED phase of the study and the side slopes will be modified then if warranted.

2. Comment – *Medium/High Significance*: It cannot be ascertained whether sufficient hydrologic and hydraulic analyses have been conducted on Levee Alignment I due to a lack of detailed description and analysis.

This comment included three recommendations; all three were adopted, as discussed below. The comment expresses a concern that Levee Alignment I was not included in the hydrological and hydraulic analyses and model reviewed by the Hydrological Engineering Center (HEC).

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) confirming whether Levee Alignment I was included in the hydraulic evaluation of alternatives presented in the FR/EA Main Report and Appendix A (Hydrology and Hydraulics), (2) that documentation be provided in the report that clearly describes the effect of Levee Alignment I if it is already included in the hydraulic evaluation of alternatives, and (3) that the hydraulic analysis associated with Levee Alignment I is performed and the analysis and results are documented in the report if they are not yet included in the hydraulic evaluation of alternatives. In response, Appendix A, Chapter 5 has been revised to present a more detailed discussion of the limited hydraulic analysis that was conducted to determine limited backwater effects of alignment I to the Shiloh Farms community that was previously within the leveed area.

3. Comment – *Medium/High Significance*: The non-structural measures of the TSP, including residual risk communication and evacuation plans, could not be evaluated because they are not included in the FR/EA.

This comment included four recommendations, all four of which were adopted, as discussed below. The comment expresses a concern that the TSP is affected by the lack of development or description of its non-structural elements: communication of risk, education, and the evacuation of the vulnerable population of the Town of Princeville in the event of a storm that exceeds the level of protection being provided.

USACE Response: Adopted

Action to be Taken: The IEPR panel recommended (1) that a residual risk communication plan (with an education component and evacuation plan) be developed and provided specifically for the Town of Princeville and its vulnerable population and (2) that the report include in the residual risk communication plan consideration of the area demographics and specific communication methods appropriate for Princeville’s population. In response, a residual risk communication plan will be developed during the Preconstruction Engineering and Design (PED) phase of the study. The residual risk communication plan will take into consideration Princeville’s demographics. Information regarding future completion of a risk communication plan has also been added to Section 7.3 of the Main Report. The IEPR Panel recommended (3) that the rationale behind recommendation of the TSP versus a plan with a higher level of flood risk reduction is described more fully in the report, given that any plan is likely to have a benefit-to-cost ratio less than one and (4) that the potential for induced flooding in nearby communities is described more fully if a higher level of protection were to be provided for the Town of Princeville. In response, additional information regarding the rationale for selection of the TSP rather than a larger plan, including the potential for larger plans to result in significant amounts of induced flooding in neighboring communities, was added to Section 6.1 of the Main Report.

4. Comment – *Medium/High Significance*: Future without-project condition impacts related to climate change in the project area and on the TSP are not adequately described or evaluated per USACE guidance.

This comment included six recommendations, five were adopted and one was not adopted as discussed below. This comment expresses a concern that the potential effects of climate change on the Tentatively Selected Plan (TSP) are not considered in accordance with USACE guidance.

USACE Response: Adopted

Action to be Taken: The IEPR Panel recommended (2) that the uncertainty of climate change impacts should be bounded by ‘worst-case,’ ‘best-case,’ and ‘expected’ scenarios to capture the magnitude of potential impacts on the project as a result of the spectrum of climate change potential influence on project hazards. In response, Section 8.13.6 was added to the Main Report to state that this uncertainty could be addressed into the report in the future should data become available to support an analysis. In that case, a Post-Authorization Change study could be initiated, to determine the best way of dealing with identified changes.

The IEPR Panel recommended (6) providing a plan to communicate to the residents of the Town of Princeville and other stakeholders the risks associated with climate change on the future without-project and future with-project conditions. Such communications should include potential downgrading of the level of flood protection from the TSP as a result of increased upstream river flow from climate change. In response, a public meeting to discuss this information will be held during the PED phase of the study.

Action Taken: The IEPR Panel recommended (1) that the potential effects of climate change on the TSP using the methods outlined in ECB No. 2014-10 are described and evaluated, (4) that documentation be provided on the impacts of climate change and sedimentation on risks associated with the TSP, and (5) that report documentation be revised to include the information contained in earlier recommendations. In response, three analytical tools were applied to show that the proposed project does not appear to be vulnerable to climate change impacts. A description of this analysis and the results were added to Section 8.13.6 of the Main Report. These analyses were done in lieu of strictly following ECB No. 2014-10, since the selection of the recommended plan pre-dated the issuance of that guidance.

USACE Response: Not Adopted

The IEPR Panel recommended (3) that the report show whether and how the potential increased upstream flows and potential increased sedimentation in the Tar River were considered in plan formulation. However, plan formulation is based on a “most likely” future scenario. In this case, the “most likely” future does not include increased upstream flows and increased sedimentation in the Tar River. The IEPR Panel recommended (5) that report documentation be revised to include the information contained in earlier recommendations.

5. Comment – *Medium Significance*: Conclusions reached in the Environmental Assessment with respect to cumulative effects appear to be based only on issues related to

the TSP and do not consider, as required, past, present, and reasonably foreseeable future actions as required by NEPA.

This comment included three recommendations, all of which were not adopted as discussed below. The comment expresses concerns that the Environmental Assessment considers a limited range of cumulative effects related directly to the Tentatively Selected Plan (TSP), but does not consider broader past, present, and future actions. The cumulative effects analysis mandated by the National Environmental Policy Act (NEPA) requires a more comprehensive “hard look” inclusive of actions that may be undertaken by others.

USACE Response: Not Adopted

The IEPR panel recommended (1) that a comprehensive list of reasonably foreseeable future actions (based on known future projects, planned and proposed projects, and past/predicted regional and local patterns) is included in the report for actions that may be undertaken in the project area, and (2) that the cumulative effects, both adverse and positive, that the TSP may have on those future actions should be forecasted and evaluated, as well as the potential effects that those activities may have on the TSP itself, with particular attention given to socioeconomic effects associated with residual risk and potential induced flooding. However, there are no identified upcoming planned projects, the Recommended Plan will not have or incur any socioeconomic effects or increased residual risk and potential induced flooding on the Princeville community or other portions of Edgecombe County, or upstream and downstream portions of the watershed. Section 8.15.4 explains that the project review area was expanded to include all of Edgecombe County for the cumulative effects analysis, and that there are currently no ongoing or future projects planned for the Edgecombe County area. As the area upstream is not one of the highly-developing areas of North Carolina, or in close proximity to those, and the watershed area so large, cumulative effects of unforeseen development are viewed to be minimal. Since there are no upcoming projects no comprehensive list is necessary. The IEPR Panel recommended (3) that any anticipated measures to mitigate adverse cumulative effects, be described including those that may be adverse to the project and to the vulnerable population of the Town of Princeville. However, no mitigation for adverse cumulative effects will be needed since there is no current or reasonably foreseeable projects projected for the Town of Princeville, Edgecombe County, nor in nearby or upstream counties and communities that could negatively impact the study area.

6. Comment – *Medium Significance*: Erosion (via wave action and overtopping), as a failure mode in levee design, is not assessed.

This comment contained five recommendations, all of which were adopted as discussed below. The comment expresses the concern that the performance of the levee system could be compromised unless erosion control measures are included in the design of the TSP.

USACE Response: Adopted

Action to be Taken: The IEPR panel recommended (1) that the impact of wind-generated wave action, overtopping, and erosion is evaluated in accordance with USACE guidance, (2) that an erosion protection scheme is developed to maintain levee integrity and document the selected

erosion protection scheme in the report if erosion evaluation conducted in Recommendation 1 finds unacceptable erosion, and (3) that a conceptual design of the selected erosion protection measures be completed in Appendix B, and (4) that the Fully Funded Cost Estimate be revised as necessary to incorporate costs of any included erosion protection scheme. In response, these analyses will be conducted during the Preconstruction, Engineering, and Design (PED) phase of the study, and reference to this future action being taken was added to Chapter 6 of Appendix A (Hydrology and Hydraulics). Due to relatively short wind fetches and shallow depths of flooding, significant wave overtopping and subsequent erosion are not anticipated. Hence, this analysis was not performed during the feasibility phase due to the low risk and the unlikelihood that it would have affected the selection of the recommended plan. Additionally, the possibility of having to incorporate erosional control measures or design changes into the project design was added into the project cost contingency. The IEPR Panel recommended (5) that the fully funded cost estimate for the TSP be revised if (after further review) it is determined that the current levee costs are underestimated. In response Chapter 6 of Appendix A (Hydrology and Hydraulics) was revised to indicate that if necessary (based on the analysis resulting from Recommendation #1), the PDT will update the cost estimate resulting from an updated design in PED. Additionally, the possibility of having to incorporate erosional control measures or design changes into the project design was added into the project cost contingency

7. Comment – *Medium Significance*: The flood wall component of the TSP is not addressed so its expected performance and impact on the total project cost cannot be assessed.

This comment included four recommendations, all of which were not adopted as discussed below. This comment expresses the Panel’s concern that although the flood wall section of the Tentatively Selected Plan (TSP) is small when compared to the adjacent levee sections, it exerts an outsize risk in the flood protection system because of the complicated transition from flood wall to levee, and even though the overall cost implications may be small due to the small cost contribution from the flood wall element, some limited design for the flood wall as part of the Feasibility Study is required to ensure any costs are captured in the Cost Engineering Appendix . . .

USACE Response: Not Adopted

Action Taken: The IEPR panel recommended (1) a preliminary flood wall design is developed as part of the revised FR/EA, (2) that a flood wall design detail is prepared with appropriate dimensions, (3) that a design detail of the flood wall to levee section transitions is prepared, and (4) that the total project cost estimate be revised to include the new flood wall cost, if necessary. These recommendations were not implemented since due to project design changes, the flood wall is no longer a necessary feature of the final recommended plan.

8. Comment – *Medium Significance*: The location of the proposed levees along U.S. Highway 64 (Segment 2) is unresolved due to costs and environmental impacts on wetlands.

This comment included three recommendations; all three were adopted as discussed below. The comment expresses the concern that the placement of the proposed levees along U.S. Highway 64 appears still unresolved based on ongoing coordination between North Carolina Department of

Transportation (NCDOT) and USACE to address the NCDOT preference to build the levee on the west side of the proposed U.S. 64 roadside to protect U.S. 64 as an evacuation route.

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) that the report document the understanding between USACE and NCDOT on the location of the levee adjacent to the U.S. 64 roadway and (2) that the report provide the mechanism to address the NCDOT feedback on the proposed roadside levee adjacent to the U.S. 64 roadway on the west side of the project. In response, additional detail has been added to Section 1.5 of Appendix B (Design) regarding discussions with NCDOT as to the decision to move the shoulder levee to the west (river-side) of the roadway in the final recommended plan. The IEPR Panel recommended (3) the the report document the additional cost, financial risk, and environmental risk associated with this plan alteration if USACE still considers locating the levee adjacent to U.S. 64 on the west side of the U.S. 64 roadway. In response, the total project cost and environmental impacts documented in the report now reflect the location of the levee on the west side of the U.S. 64 roadway in the final recommended plan.

9. Comment – *Medium Significance:* The assumption used in the development of the stage and discharge relationship may not be realistic, and therefore can potentially affect the results of the HEC-RAS model calibration, river flow and stage exceedance probability analysis, and interior drainage analysis.

The comment included six recommendations, all of which were adopted, as discussed below. The comment expresses the concern that changes in the developed Q-h curve can (a) weaken or undermine the HEC-RAS model calibration and verification, (b) make the results of the analysis of model sensitivity to Manning's n questionable if historical river bed vertical movement is larger than the exhibited model sensitivity (i.e., 2 - 3 ft change in model calculated stage), and (c) alter the estimated stages in the annual frequency curve

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) the report provide documentation on the historical bed elevation of Tar River at the U.S. Geological Survey gage station at the Main Street Bridge (USGS 02083500 Tar River at Tarboro, North Carolina. In response, this documentation was added to Chapter 4 of Appendix A (Hydrology and Hydraulics). The IEPR Panel recommended (2) that a detailed description is provided in the report for estimation of the stage and elevation data in Table 4-4 in Appendix A as well as a detailed description of the sources of plotted discharges and stages in Figure 5-6 in Appendix A. In response, this information was added to Appendix A in the recommended locations. The IEPR Panel recommended (3) that the report evaluate the effect of changes in bed elevation at the Main Street Bridge on the stage-discharge relationship. In response, the Corps coordinated with the US Geological Survey (USGS) in North Carolina and determined, based on the limited number of rating shifts throughout the gage's history, that the site is extremely stable given its underlying geology. Hence, no further evaluations related to this matter were considered necessary. Additional discussion related to this issue was added to Chapter 4 of Appendix A. The IEPR Panel recommended (4) that the report evaluate the impact on the 1931–2008 estimated stage-discharge relationship by accounting for

effects on stage as a result of the construction of the Princeville levee. In response, it was determined through the adequately-long period of record at this gage that effects from the construction of the existing levee have already been incorporated into the existing rating established at the gage. Additional text presenting the analysis of gage rating shifts in conjunction with more detailed hydraulic modeling, as well as detail on how this information is utilized to evaluate stage impacts due to levee construction, was added to Chapter 4 of Appendix A. The IEPR Panel recommended (5) that the report evaluate the effect of changes in stage-discharge relationship on HEC-RAS model calibration, model verification, and model sensitivity to bed friction and (6) that the report evaluate the effect of changes in stage-discharge relationship on estimated stages in the annual frequency curve. In response, additional calibration was carried out on the HEC-RAS model to include the stage-discharge relationship and with respect to changes in the estimated stages in the annual frequency curve. Discussion of this additional calibration was added to Chapter 5 of Appendix A.

10. Comment – *Medium Significance*: The estimated project costs for PED and construction management are not well supported in the FR/EA, possibly indicating that the cost is overestimated.

The comment included three recommendations, two were adopted and one was not adopted, as discussed below. The comment expresses the concern that the fully funded cost estimate includes construction management and Preconstruction Engineering and Design (PED) cost percentages that appear high when compared to similar projects conducted by USACE and in the private sector.

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) the report provide further documentation and support for the high PED and construction management cost estimates in Appendix D. In response, the Section 7b of Appendix D (Cost) and has been revised with additional documentation and support for PED and construction management estimates. The IEPR Panel recommended (2) that the report provide further details regarding geotechnical explorations planned as part of PED and break out those costs separately in Appendix D. In response Paragraph 10 of Appendix C (Geotechnical Engineering) and Section 7b of Appendix D have been revised to provide additional details on geotechnical explorations to be conducted in PED.

USACE Response: Not Adopted

The IEPR panel recommended (3) that the report revise the cost estimates for PED and construction management if, after further review, it is determined that the costs are overestimated. The costs were reviewed and determined to be appropriate, however Section 7b of Appendix D (Cost) has been revised with additional documentation and support for PED and construction management estimates.

11. Comment – *Medium/Low Significance*: The adequacy and acceptability of the methods and analyses used to evaluate future with-project conditions cannot be assessed because the information presented in Appendix A lacks sufficient detail.

The comment included two recommendations, both of which were adopted, as discussed below. The comment expresses the concern that a more detailed discussion of the extensive analyses in Appendix A will improve the overall documentation of the hydrology and hydraulic analysis.

USACE Response: Adopted

Action Taken: The IEPR panel recommended (1) the report provide detailed discussions of the analytical methods and results for the evaluation of future with- project conditions in Appendix A. In response additional text has been added to Chapter 5 of Appendix A (Hydrology and Hydraulics) to accompany tables and figures throughout the Appendix. The IEPR Panel recommended (2) that the report provide the details of the hydraulic analyses decision process that led to the findings and conclusions for each alternative in Appendix A. In response, the decision processes used for modeling alternatives of the without- & with-project conditions was added to Chapter 5 of Appendix A.