

Final Independent External Peer Review Report Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report

Prepared by
Battelle Memorial Institute

Prepared for
Department of the Army
U.S. Army Corps of Engineers
Risk Management Center
Huntington District

Contract No. W912HQ-15-D-0001
Task Order: W912HQ18F0154

February 20, 2019

This page is intentionally left blank.

CONTRACT NO. W912HQ-15-D-0001
Task Order: W912HQ18F0154

Final Independent External Peer Review Report Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report

Prepared by

Battelle
505 King Avenue
Columbus, Ohio 43201

for

Department of the Army
U.S. Army Corps of Engineers
Risk Management Center
Huntington District

February 20, 2019

This page is intentionally left blank.

Final Independent External Peer Review Report Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report

Executive Summary

PROJECT BACKGROUND AND PURPOSE

Whittier Narrows Dam is located at a natural gap in the hills that form the southern boundary of the San Gabriel Valley, in Los Angeles County, California, approximately 7.5 miles downstream from the Santa Fe Flood Control Basin. The Rio Hondo and the San Gabriel River flow through this gap and flood flows are constrained by the dam. The construction of the dam was authorized by the Flood Control Act of 1941 for the primary purpose of flood control. Recreation is a secondary purpose, as authorized by the Flood Control Act of 1944. A third purpose of the dam was set forth by the Chief of Engineers in 1956 for water conservation. The Federal government owns the project and the U.S. Army Corps of Engineers (USACE) operates and maintains the dam and all associated flood control facilities. Construction began in March 1950 on the first major contract for the project, and the final major contract was completed in March 1957. The dam consists of an approximately 16,960-foot-long earth embankment (designated west, central, and east) and two gated outlet structures. The outlet works discharge into the Rio Hondo, and the spillway discharges into the San Gabriel River. The reservoir is normally empty and a “crossover weir” within the reservoir diverts lower flows from the San Gabriel River to the Rio Hondo. Whittier Narrows Dam is located at the southern limit of the San Gabriel Valley, near the intersection of State Highway 60 and Interstate Highway 605, approximately 12 miles east of downtown Los Angeles.

An Issue Evaluation Study (IES) completed in March 2011 confirmed safety issues at the Whittier Narrows Dam and recommended the study proceed to the Dam Safety Modification Study (DSMS) phase. The DSMS is now nearing completion and Whittier Narrows Dam is currently classified as a Dam Safety Action Classification (DSAC) 1. The primary potential failure mode (PFM) contributors to the risk are backward erosion piping (PFM 4) and overtopping (PFM 21). Under Future without Federal Action Conditions, the annual probability of failure (APF) exceeds USACE’s guideline ($1E-4$) by greater than a half-order of magnitude; the average annual life loss exceeds guidelines by approximately three orders of magnitude.

The purpose of the DSMS is to identify a plan that, when implemented, will bring the APF and associated consequences to or below tolerable risk guidelines. Structural and nonstructural measures were identified and evaluated to address the significant risk driving PFMs.

Independent External Peer Review Process

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. USACE is conducting an Independent External Peer Review (IEPR) of the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DRMR; hereinafter: Whittier Narrows Dam DSMR IEPR). As a 501(c)(3) non-profit science and technology organization, Battelle is independent, free from conflicts of interest (COIs), and meets the requirements for an Outside Eligible Organization (OEO)

per guidance described in USACE (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: consequence/planning, environmental/National Environmental Policy Act (NEPA) impact assessment, geotechnical engineering, hydrology and hydraulic (H&H) engineering, and civil/relocation engineering. Battelle screened the candidates to identify those most closely meeting the selection criteria and evaluated them for COIs and availability. USACE was given the list of all the final candidates to independently confirm that they had no COIs, and Battelle made the final selection of the five-person Panel from this list.

The Panel received electronic versions of the decision documents (2,822 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 an in-person meeting held at the Baseyard on November 6, 2018; all panel members attended. As part of this meeting, USACE provided an in-depth presentation and led Battelle and the Panel on a site inspection of the Whittier Narrows Dam and abutting areas visible from the Dam. Other than this meeting and the Battelle-facilitated teleconferences, there was no direct communication between the Panel and USACE during the peer review process.

IEPR panel members reviewed the decision documents individually and produced individual comments in response to the charge questions. The panel members then met via teleconference with Battelle to review key technical comments and reach agreement on the Final Panel Comments to be provided to USACE.

Battelle received public comments from USACE on the Whittier Narrows Dam DSMR (approximately 28 separate written comments totaling 54 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 Whittier Narrows Dam DSMR review documents. After completing its review, the Panel identified two new issues and subsequently generated two additional Final Panel Comments that summarized the concerns.

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, 19 Final Panel Comments were identified and documented. Of these, one was identified as having medium significance, nine were identified as having medium/low significance, and nine had low significance.

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 Whittier Narrows Dam DSMR 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 DSMR and its appendices overall are excellent documents. Extensive amounts of data and analysis are presented in a consistent and understandable format. The documents present a logical basis for selection of the Tentatively Selected Plan (TSP). The Panel, however, did find some elements of the review documents that are incomplete, not adequately detailed, lack documentation, or are unclear. Therefore, some additional analyses are warranted, and some report sections require additional documentation or clarification.

Engineering: The Panel noted that the geotechnical site characterization is excellent, and the engineering analysis is complete, well documented, and leads to logical conclusions. In particular, the Panel found good detail and rigor in the hydrologic and hydraulic analyses related to overtopping failure mode, the Dam Safety Risk Assessment and life safety sections, and the use of the ‘rain-on-grid’ method.

Although the DSMR reports that utility relocation is needed and costs have been provided for this, the Panel believes that the utility relocation assumptions regarding the actual space, right-of-way (ROW), and reasonable work area needed for the relocation of all the various utilities cannot be assessed given the information provided. Additional information from a spatial conflict analysis, and obtained through discussions with the actual utility companies, will be necessary to gain a full understanding of these needs.

The Panel also noted other areas where the documents could be strengthened with additional information, in particular providing information on how the use of the rain-on-grid method accounts for non-linearity under flood flows, and challenges presented by the relocation of Rosemead Boulevard.

Environment: It is obvious to the Panel that a lot of time, effort, and detail has been put into the project. However, the Panel noted several documentation issues that should be addressed. For instance, the Draft Environmental Impact Statement (DEIS) does not describe compliance with various NEPA environmental statutes and regulations that may be pertinent to the project and has data gaps that could affect impact analyses (e.g., mineral resources, asbestos, potential impacts on Federally listed species). One example of information that may be particularly important to know is whether the operation of the Whittier Fertilizer Plant could impact project implementation or release hazardous materials during overtopping events. The Panel also notes that the DEIS has not been prepared in accordance with Council on Environmental Quality (CEQ) and USACE NEPA guidance on improving document preparation. There are several areas where the DEIS could be shortened if this guidance is implemented. Lastly, the discussion of natural resources baseline conditions is not detailed enough to adequately allow for the evaluation for forecasted conditions.

Consequence/Planning: The consequence evaluation in the Existing Conditions and Risk Assessment is very thorough and well done. However, the Panel believes that the life safety assumption that downstream populations with 2 feet or less of inundation would “shelter-in-place” is unrealistic, and that the residual risk from flooding following dam safety modification is not accurately portrayed.

Table ES-1. Overview of 19 Final Panel Comments Identified by the Whittier Narrows Dam DSMR IEPR Panel

No.	Final Panel Comment
Significance – Medium	
1	The utility relocation assumptions cannot be assessed without a spatial conflict analysis or consultation with utility companies on the relocation work to be performed.
Significance – Medium/Low	
2	The assumption that using the so-called “rain-on-grid” method adequately accounts for the non-linearity under flood flows approaching the PMF is not supported.
3	The DEIS does not describe compliance with various NEPA environmental statutes and regulations that may be pertinent to the project.
4	The DEIS and the DSMR do not assess whether the operation of the Whittier Fertilizer Plant could impact implementation of the project or could potentially release hazardous material during overtopping events.
5	The DEIS has data gaps that could affect impact analyses.
6	The DEIS has not been prepared in accordance with CEQ and USACE NEPA guidance on improving document preparation.
7	It is unclear whether USACE plans to conduct further validation of the HEC-HMS/HEC-RAS 2D runoff model using additional storm data that would need to be reconstituted to ensure model accuracy.
8	The relocation of Rosemead Boulevard presents unusual challenges not addressed in the DSMR.
9	The potential for groundwater contamination testing, treatment, and disposal as a result of site dewatering has not been fully addressed.
10	It is unclear whether the 2D hydraulic modeling accurately predicts the transient water surface elevation in the downstream impact area during the storage routing of the PMF emanating from Whittier Narrows Dam.

Table ES-1. Overview of Final Panel Comments Identified by the Whittier Narrows Dam DSMR IEPR Panel (cont.)

No.	Final Panel Comment
Significance – Low	
11	The discussion of natural resources baseline conditions in the DEIS is not detailed enough to adequately allow for the evaluation for forecasted conditions.
12	According to DSMR Table 10, the No Action Alternative meets the study objectives, yet it fails to address PFM 4 and PFM 21.
13	The impact of overtopping and flow down on the top-soil-covered roller-compacted-concrete (RCC) slope face has not been fully evaluated.
14	The criteria for acceptable gradient are unclear.
15	The life safety assumption that downstream populations with 2 feet or less of inundation would “shelter-in-place” is unrealistic.
16	The residual risk from flooding following dam safety modification is not portrayed accurately.
17	The time-to-failure values for the hypothetical breach scenarios of the Western and Central Embankments are outside the normally accepted ranges.
18	The Public identified that the potential impact of the Whittier Fault possibly passing beneath a portion of the dam and the consequences of possible fault rupture are not addressed.
19	A full description of all the PFMs that have been evaluated is not included in the DSMR.

This page is intentionally left blank.

Table of Contents

	Page
Executive Summary	i
1. INTRODUCTION.....	1
2. PURPOSE OF THE IEPR.....	2
3. METHODS FOR CONDUCTING THE IEPR	2
4. RESULTS OF THE IEPR.....	3
4.1 Summary of Final Panel Comments.....	3
4.2 Final Panel Comments	4
5. REFERENCES.....	30
Appendix A. IEPR Process for the Whittier Narrows Dam DSMR Project	
Appendix B. Identification and Selection of IEPR Panel Members for the Whittier Narrows Dam DSMR Project	
Appendix C. Final Charge for the Whittier Narrows Dam DSMR IEPR	
Appendix D. Conflict of Interest Form	

List of Tables

	Page
Table ES-1. Overview of 19 Final Panel Comments Identified by the Whittier Narrows Dam DSMR IEPR Panel.....	iv

LIST OF ACRONYMS

APF	Annual probability of failure
CEQ	Council on Environmental Quality
COI	Conflict of Interest
DEIS	Draft Environmental Impact Statement
DrChecks	Design Review and Checking System
DSAC	Dam Safety Action Classification
DSMR	Dam Safety Modification Report
DSMS	Dam Safety Modification Study
EAP	Emergency action plan
EC	Engineer Circular
ER	Engineer Regulation
ERDC	Engineer Research and Development Center
ESA	Environmental Site Assessment
FWAC	Future-Without Federal Action Risk Condition
H&H	Hydrology and hydraulic
HEC-HMS	Hydrologic Engineering Center Hydrologic Modeling System
HEC-RAS	Hydrologic Engineering Center River Analysis System
IEPR	Independent External Peer Review
IES	Issue Evaluation Study
HTRW	Hazardous, toxic, and radioactive waste
iPaC	Information, Planning, and Conservation System
IWR	Institute for Water Resources
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
OEO	Outside Eligible Organization
OMB	Office of Management and Budget
PCE	perchloroethylene
PDT	Project Delivery Team
PED	Planning, engineering, and design
PFM	Potential failure mode

PMF	Probable maximum flood
PMP	Probable maximum precipitation
REC	Recognized Environmental Conditions
RCC	Roller-compacted concrete
RCRA	Resource Conservation and Recovery Act
RMP	Risk Management Plans
ROW	Right of way
TFH	Time to failure
TSP	Tentatively Selected Plan
USACE	United States Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service

This page is intentionally left blank.

1. INTRODUCTION

Whittier Narrows Dam is located at a natural gap in the hills that form the southern boundary of the San Gabriel Valley, in Los Angeles County, California, approximately 7.5 miles downstream from the Santa Fe Flood Control Basin. The Rio Hondo and the San Gabriel River flow through this gap and flood flows are constrained by the dam. The construction of the dam was authorized by the Flood Control Act of 1941 for the primary purpose of flood control. Recreation is a secondary purpose, as authorized by the Flood Control Act of 1944. A third purpose of the dam was set forth by the Chief of Engineers in 1956 for water conservation. The Federal government owns the project and the U.S. Army Corps of Engineers (USACE) operates and maintains the dam and all associated flood control facilities. Construction began in March 1950 on the first major contract for the project, and the final major contract was completed in March 1957. The dam consists of an approximately 16,960-foot-long earth embankment (designated west, central, and east) and two gated outlet structures. The outlet works discharge into the Rio Hondo, and the spillway discharges into the San Gabriel River. The reservoir is normally empty and a “crossover weir” within the reservoir diverts lower flows from the San Gabriel River to the Rio Hondo. Whittier Narrows Dam is located at the southern limit of the San Gabriel Valley, near the intersection of State Highway 60 and Interstate Highway 605, approximately 12 miles east of downtown Los Angeles.

An Issue Evaluation Study (IES) completed in March 2011 confirmed safety issues at the Whittier Narrows Dam and recommended the study proceed to the Dam Safety Modification Study (DSMS) phase. The DSMS is now nearing completion and Whittier Narrows Dam is currently classified as a Dam Safety Action Classification (DSAC) 1. The primary potential failure mode (PFM) contributors to the risk are backward erosion piping (PFM 4) and overtopping (PFM 21). Under Future without Federal Action Conditions, the annual probability of failure (APF) exceeds USACE’s guideline ($1E-4$) by greater than a half-order of magnitude; the average annual life loss exceeds guideline by approximately three orders of magnitude.

The purpose of the DSMS is to identify a plan that, when implemented, will bring the APF and associated consequences to or below tolerable risk guidelines. Structural and nonstructural measures were identified and evaluated to address the significant risk driving PFMs.

Independent, objective peer review is regarded as a critical element in ensuring the reliability of scientific analysis. The objective of the work described here was to conduct an Independent External Peer Review (IEPR) of the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DSMR; hereinafter: Whittier Narrows Dam DSMR 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 Whittier Narrows Dam DSMR 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 Whittier Narrows Dam DSMR 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 Whittier Narrows Dam DSMR 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: consequence/planning, environmental/National Environmental Policy Act (NEPA) impact assessment, geotechnical engineering, hydrology and hydraulic (H&H) engineering, and civil/relocation engineering. The Panel reviewed the Whittier Narrows Dam DSMR documents and produced 19 Final Panel Comments in response to 41 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; p. D-4) in the Whittier Narrows Dam DSMR IEPR review documents. The following summarizes the Panel's findings.

Based on the Panel's review, the DSMR and its appendices overall are excellent documents. Extensive amounts of data and analysis are presented in a consistent and understandable format. The documents present a logical basis for selection of the Tentatively Selected Plan (TSP). The Panel, however, did find some elements of the review documents that are incomplete, not adequately detailed, lack documentation, or are unclear. Therefore, some additional analyses are warranted, and some report sections require additional documentation or clarification.

Engineering: The Panel noted that the geotechnical site characterization is excellent, and the engineering analysis is complete, well documented, and leads to logical conclusions. In particular, the Panel found good detail and rigor in the hydrologic and hydraulic analyses related to overtopping failure mode, the Dam Safety Risk Assessment and life safety sections, and the use of the 'rain-on-grid' method.

Although the DSMR reports that utility relocation is needed and costs have been provided for this, the Panel believes that the utility relocation assumptions regarding the actual space, right-of-way (ROW), and reasonable work area needed for the relocation of all the various utilities cannot be assessed given the information provided. Additional information from a spatial conflict analysis, and obtained through discussions with the actual utility companies, will be necessary to gain a full understanding of these needs.

The Panel also noted other areas where the documents could be strengthened with additional information, in particular providing information on how the use of the rain-on-grid method accounts for non-linearity under flood flows, and challenges presented by the relocation of Rosemead Boulevard.

Environment: It is obvious to the Panel that a lot of time, effort, and detail has been put into the project. However, the Panel noted several documentation issues that should be addressed. For instance, the Draft Environmental Impact Statement (DEIS) does not describe compliance with various NEPA environmental statutes and regulations that may be pertinent to the project and has data gaps that could affect impact analyses (e.g., mineral resources, asbestos, potential impacts on Federally listed species). One example of information that may be particularly important to know is whether the operation of the Whittier Fertilizer Plant could impact project implementation or release hazardous materials during overtopping events. The Panel also notes that the DEIS has not been prepared in accordance with Council on Environmental Quality (CEQ) and USACE NEPA guidance on improving document preparation. There are several areas where the DEIS could be shortened if this guidance is implemented. Lastly, the discussion of natural resources baseline conditions is not detailed enough to adequately allow for the evaluation for forecasted conditions.

Consequence/Planning: The consequence evaluation in the Existing Conditions and Risk Assessment is very thorough and well done. However, the Panel believes that the life safety assumption that downstream populations with 2 feet or less of inundation would “shelter-in-place” is unrealistic, and that the residual risk from flooding following dam safety modification is not accurately portrayed.

4.2 Final Panel Comments

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

Final Panel Comment 1

The utility relocation assumptions cannot be assessed without a spatial conflict analysis or consultation with utility companies on the relocation work to be performed.

Basis for Comment

The DSMR assumes that utilities (including monitoring wells) at the base of the embankment can be relocated outside the project construction footprint. In some cases, these utilities exceed a 48-inch diameter. The DEIS indicates that two monitoring wells are located approximately 100 feet downstream from the toe of the west embankment, but the relocation of these utilities, including the wells, is not addressed in the DSMR.

Upon review of the TSP-Plan 5, the Panel found that the energy dissipation structure as shown at the foot of the roller-compacted concrete (RCC) will require 80-100 feet perpendicular to the base of the embankment for construction. From Station 14+00 to 45+00 the limit of the RCC is very close to the right-of-way (ROW) line shown on the plans. The addition of a reasonable work area (excavation, concrete forms, equipment access) for construction would add a work zone of another 20 feet for a total of 100-120 feet perpendicular to the embankment. The Panel assumes that any relocated utility or well would have to be located beyond that 100-120 feet setback; in some areas these relocations may therefore extend beyond the ROW.

The drawings and reports provided for review do not provide the level of spatial detail required for the Panel to draw firm conclusions that adequate space is available for the utility relocation.

The Panel acknowledges that Appendices B, F, G, J, and L (TSP) discuss the need to relocate the utilities. In particular, Appendix B has very detailed estimates and contingency of the cost to relocate the utilities. Nevertheless, while the review documents provide adequate detail on the need and cost, they do not demonstrate that the relocation is practicable within the project footprint. Additional takings of land for utility relocation are not provided for in Appendix J.

Significance – Medium

A lack of space to relocate utilities would present a fundamental issue within the DSMR that may require extensive re-evaluation of the RCC concept, energy dissipation alternatives, cost engineering assumptions, environmental impacts, constructability, and real estate needs.

Recommendations for Resolution

1. Provide a better definition of the assumptions, uncertainty, and consequences of that uncertainty regarding utility and well relocation, perhaps in Sections 3.5.3 and 3.4.
2. Demonstrate that adequate space exists for permanent project features, temporary work area easements, and the relocated utility by including a plan view and cross-section drawings for the area from the toe of the embankment to the downstream property boundary wherever a utility relocation is required.

Final Panel Comment 1

3. Alternatively, meet in the field with representatives from respective utility companies. Use professional judgment augmented by field landmarks and a long tape measure to demonstrate that adequate space exists for permanent project features, temporary work area easements, and the relocated utilities. This alternative would also provide better information from utility owners on the temporal scale required for relocation work.
4. Consider modifying the RCC slope inclination to provide additional space at the embankment toe. Seepage calculation should be checked to assess the potential impacts of the modified embankment geometry.
5. Add utility relocation and road relocation costs to Appendix J to more fully reflect the land, easements, rights-of-way, relocation, and disposal costs of the project.

Final Panel Comment 2

The assumption that using the “rain-on-grid” method adequately accounts for the non-linearity under flood flows approaching the PMF is not supported.

Basis for Comment

A watershed’s hydrologic response to extreme storms (probable maximum flood or PMF) is significantly different than responses to more frequent storms (10-, 25-year, etc.). This is due to greater overbank flooding that hastens times of concentration and travel times, which creates disproportionately higher peak flows.

Appendix D, Attachment 1 suggests that the rain-on-grid approach, using the two-dimensional (2D) unsteady flow hydraulic model (Hydrologic Engineering Center River Analysis System [HEC-RAS]), accounts for this non-linear rainfall-runoff response. However, no justification, through a quantitative analysis comparison with lesser intense storms, is provided to back up this opinion.

The accuracy of the rainfall-runoff model has direct bearing on the resultant PMF inflow design for Whittier Narrows Dam.

Significance – Medium/Low

Not fully accounting for the non-linear phenomenon may result in under-predicting the magnitude of the PMF peak inflow design configuration of the Tentative Selected Plan (TSP, Protected Overtopping).

Recommendation for Resolution

1. Provide evidence that timing of peak inflow, for modelled subareas and combined flow at the Whittier Narrows headwater, under the PMF condition, is of a demonstrably shorter duration than for those of more frequent (i.e., 10-, 25-year, etc.) flooding events.

Final Panel Comment 3

The DEIS does not describe compliance with various NEPA environmental statutes and regulations that may be pertinent to the project.

Basis for Comment

ER 1105-2-100 (Section 2.7, Environmental Compliance, and Appendix C, Environmental Compliance), ER 200-2-2, and 40 CFR 1502.25 require that environmental reviews be conducted concurrently with reviews required by other environmental statutes and regulations.

DEIS Sections 4, 5, and 8.3 do not document compliance with the following statutes and regulations:

- Magnuson-Stevens Fisheries Conservation and Management Act
- Wild & Scenic Rivers Act
- Resource Conservation and Recovery Act (RCRA)
- Coastal Zone Management Act
- Bald and Golden Eagle Protection Act
- Rivers & Harbors Act.

In addition, Section 7.2 of the Section 404(b)(1) Evaluation (DEIS Appendix F), does not describe compliance with these statutes and regulations for biological resource impacts.

Significance – Medium/Low

The evaluation for compliance with these statutes and regulations would reaffirm the significance of impacts, while supporting the identification of the TSP.

Recommendation for Resolution

1. Update the DEIS to reflect compliance with the statutes and regulations listed in the Basis for Comment. If a statute or regulation is not applicable due to location, e.g., Wild & Scenic Rivers Act, then indicate as such.

Literature Cited

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

USACE (1988). Procedures for Implementing NEPA. ER 200-2-2. Department of the Army, U.S. Army Corps of Engineers, Washington, DC. March 4.

40 CFR §1502.25. (1978). Environmental review and consultation requirements.

Final Panel Comment 4

The DEIS and the DSMR do not assess whether the operation of the Whittier Fertilizer Plant could impact implementation of the project or could potentially release hazardous material during overtopping events.

Basis for Comment

DEIS Sections 4 and 5, DSMR Section 3.3.1.3, and DSMR Appendix G, Attachment G-5 identify Recognized Environmental Conditions (REC) in the project study area, and the potential impacts these RECs may have on the project. The Risk Management Plans (RMP) and TSP recognize that construction of the trench drain adjacent to the central embankment may impact the Whittier Fertilizer Company property. According to the DEIS (p. 4-79), the Whittier Fertilizer Company sells mulch, fertilizers, turf sod, and other landscaping products.

ER 1105-2-100 (USACE, 2000, p. 2-13) states that USACE evaluates potential impacts on hazardous, toxic, and radioactive waste materials (HTRW) during the feasibility phase and will not participate in the cleanup of materials regulated by the Comprehensive Environmental Response, Compensation, and Liability Act or RCRA. Materials stored and produced by the Whittier Fertilizer Company facility may include substances that are considered hazardous, toxic, and/or solid waste. Some of these materials may contain acidic, alkaline, or heavy metals, which may be considered hazardous (including explosive) or toxic. The DEIS and DSMR Appendix G, Attachment G-5, do not provide an analysis or review to determine if this facility was included in an analysis for RECs.

Disturbance of RECs during construction can result in exposure of workers or the public to unsafe conditions and may delay work. Disturbance of RECs during an overtopping event may have detrimental impacts on public health, safety, and welfare, and the environment. These impacts must be documented to determine the level of significance. DEIS Sections 5.8 and 7.0 (pp. 5-93 through 5-101 and p. 7-11) states that disturbance of RECs would have no impact on HTRW during construction.

Significance – Medium/Low

Identification of any RECs or HTRW at the Whittier Fertilizer Company would provide information important for implementing the TSP without significantly affecting human and physical environments.

Recommendations for Resolution

1. Prepare a supplemental Phase I ASTM 1527-13 Environmental Site Assessment (ESA) to update the 2017 ESA to include an analysis of the fertilizer plant to determine if RECs exist on the property.
2. Update the DEIS for each RMP and TSP (Sections 4 and 5) to reflect the revised ESA (if warranted). Prepare a supplement to the DSMR to reflect changes to the Phase I ESA and/or analysis performed regarding RECs in the DEIS.
3. Revise or include any environmental commitments addressing potential impacts on the plant from construction, as appropriate.

Literature Cited

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

Final Panel Comment 5

The DEIS has data gaps that could affect impact analyses.

Basis for Comment

The Panel identified several areas in the DEIS where data gaps could affect the impact analyses:

- DEIS Section 4.1 (p. 4-5) describes earth resources within the study area, but not other mineral resources outside of oil extraction that could be affected by the RMPs, e.g., sand, gravel, copper, and natural gas/gas condensate. It is unclear whether USACE or the U.S. has mineral rights within the project study area or only surface rights. Activities not affiliated with the implementation of the TSP could affect these resources and assumptions made in the DEIS.
- DEIS Section 4.2.2.2 (p. 4-13) describes water quality within the study area but does not provide information for the integrated 2014 and 2016 303(d) lists, which were approved by the EPA in April 2018. The DEIS seems to reflect the 303(d) List prior to 2018. Changes have occurred since 2012, which may include listing the Rio Hondo Reach 3, which is listed as impaired for iron and indicator bacteria (California State Water Board, 2018). These changes could affect the analysis of significance of impacts, depending on the impairment issues identified.
- DEIS Section 4.2.4 (pp. 4-14 through 4-16) states that a field delineation was not conducted to verify jurisdictional field indicators but would be done during the engineering and design phase of the project. According to the 404(b)(1) Evaluation in Appendix F (p. 5), 128.86 acres of wetlands are present within the project study area, as identified by aerial interpretation, field observations from biological surveys, and engineering surveys. The documentation of impacts in DEIS Section 5.2, seems to conflict with the impacts listed in the 404(b)(1) Evaluation. Given conflicting information between the DEIS and the 404(b)(1) Evaluation, it is unclear whether there is a data gap or there is enough information to quantify these resources within the study area and potential impacts.
- Asbestos- and lead-containing materials are not described in the HTRW analysis in DEIS Sections 4.8 and 5.8, and DSMR Appendix G (Attachment G-5). These materials could be within the structures of the project; disturbing these structures could potentially release contaminants into surface and groundwater resources and affect the human and physical environments. It is also unclear if RMP improvements may impact areas that contain these materials (e.g., Whittier Fertilizer Company, City of Pico Rivera Golf Course) and increase exposures to these materials.
- DEIS Sections 4.5 and 5.5, identify biological resources within the study areas, which include threatened and endangered species protected under the Endangered Species Act. The DEIS states (pp. 5-62 through 6-64, p. 7-2) that coordination and consultation is ongoing (but also states that would be conducted; p. 7-8) and provides an environmental commitment to perform surveys prior to the implementation of the TSP. Public comments received during the DEIS public notice period recommended a California gnatcatcher survey be conducted for RMP 5 specifically (Dowell, public comment, 2019). Given the potential impacts on critical habitat for listed species (California gnatcatcher) within the study area, it is unclear whether the USFWS will determine

Final Panel Comment 5

that impacts on the California gnatcatcher would jeopardize the existence of the species, which may result in a significant impact on biological resources.

Significance – Medium/Low

The absence of information about other mineral resources, asbestos and lead paint-based hazards in the project study area, inconsistency in documentation on water and wetland resources, and missing information about potential impacts on Federally listed species could affect the justification to implement the TSP.

Recommendations for Resolution

1. Revise the DEIS to reflect updated information on water quality, jurisdictional delineation for wetlands, and asbestos and lead-based paints.
2. Revise the DEIS to provide a summary of the biological assessment/evaluation performed and being coordinated with the USFWS. Include a reference in the DEIS to the biological assessment performed and include a copy as an appendix consistent with CEQ and USACE guidelines.
3. If this information is not available, identify as a data gap pursuant to 40 CFR 1502 and provide a clear environmental commitment and/or mitigation measures describing what will be performed when this information becomes available and impacts are quantified.

Literature Cited

California State Water Board (2018). 2014 and 2016 California Integrated Report (Clean Water Act Section 303(d) List and 305(b) Report).

https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

Dowell, Darren. January 28, 2019. Public comment received (provided by USACE).

Final Panel Comment 6

The DEIS has not been prepared in accordance with CEQ and USACE NEPA guidance on improving document preparation.

Basis for Comment

NEPA guidelines from the CEQ in 2012 and in 40 CFR 1502.8 require that Environmental Impact Statements (EISs) should be written in plain language and use appropriate graphics so that both decision makers and the public understand the project. The CEQ encourages Federal agencies to “...not produce an encyclopedia of all applicable information...” (p. 5), but “...should keep EISs as concise as possible...” (p. 5). ER 200-2-2 provides guidance for the implementation of the procedural provisions of NEPA, which are used in conjunction with CEQ regulations (p. 1).

The DEIS is currently written in a repetitive manner that describes in detail the RMPs, including the No Action RMP 1, and anticipated impacts of each of the RMPs. The DEIS gives the results of the scientific studies performed in great detail rather than summarizing the studies in the main body of the DEIS and placing the full studies in attachments. The CEQ also states (p. 5) that the agencies should “...continu[e] to relegate to appendices the relevant studies and technical analyses used to support the determinations and conclusions reached in the EIS.”

The Panel found that the graphics provided were difficult to read and understand due to their size (formatted to fit 8.5 x 11 inches). The Panel feels that preparing a concise DEIS, including graphics that are legible and easy to understand, would allow decision makers and the public to easily understand the project and details affiliated with it.

Based on public comments received during the DEIS process, several commenters (e.g. Citizens Coalition for a Safe Community (including Dr. Williams’ comments), City of South El Monte, and Los Angeles County Dept. of Parks & Recreation) requested various revisions to improve the organization and technical understanding of the DEIS.

Significance – Medium/Low

A DEIS that is not written in a style consistent with CEQ and USACE guidelines can affect the clarity and understanding of the project, which in turn could affect the public’s perception of the TSP.

Recommendations for Resolution

1. Consider alternatives to extensive text narratives, such as additional tables, graphs, and other graphics, to describe information that is currently text in the DEIS.
2. Revise the graphics in the DEIS to be legible and easy to understand. This may require multiple graphics with match lines, enlarged page size, e.g., 11x17 inch, and/or brighter and more pronounced colors and symbols.
3. Explore ways to reference existing studies and reports in lieu of detailed text descriptions. This change would, in the Panel’s opinion, reduce the length of the DEIS considerably.

Literature Cited

40 CFR §1502.8 (2012). Writing.

CEQ Memorandum (2012). Improving the Process for Preparing Efficient and Timely Environmental Reviews under the National Environmental Policy Act. USACE Planning Community Toolbox. ([https://planning.ercd.dren.mil/toolbox/processes.cfm?Id=231&Option=National%20Environmental%20Policy%20Act%20\(NEPA\)](https://planning.ercd.dren.mil/toolbox/processes.cfm?Id=231&Option=National%20Environmental%20Policy%20Act%20(NEPA)))

USACE (1988). Procedures for Implementing NEPA. ER 200-2-2. Department of the Army, U.S. Army Corps of Engineers, Washington, DC. March 4.

Final Panel Comment 7

It is unclear whether USACE plans to conduct further validation of the HEC-HMS/HEC-RAS 2D runoff model using additional storm data that would need to be reconstituted to ensure model accuracy.

Basis for Comment

According to DSMR Appendix D, Attachment 1, there was a paucity of available and adequate candidate storms (i.e., incremental streamflow gage data with short time steps) for the development of the HEC Hydrologic Modeling System/River Analysis System (HEC-HMS/RAS) rainfall-runoff model. Most of the streamflow data, from the seven available in-watershed gage stations, were measured as daily averages rather than the preferable incremental flow in short time steps. As a result, only three relatively recent candidate storms were identified: January 2005, February 2005, and December 2010. The 2005 storms were used for calibration and the December 2010 storm, for validation. While the number of candidate storms met the recommended minimum standard for deterministic model calibration/validation, it would have been preferable to have at least one or two additional storms for both the calibration and validation analysis of the runoff model. The USACE modelers did acknowledge this limitation in Appendix D, Attachment 1 (p. 122).

Furthermore, they indicated, “The parameterization and the performance of the models could be improved by reconstitution of hourly stream records for major historical flood events, such as the 1938, 1943, 1969, 1978, 1983 and 1993 events.” It is unclear to the IEPR Panel whether the USACE intends to conduct these reconstitution analyses.

Significance – Medium/Low

The greater the number of candidate storms that are used in model calibration/validation, the greater the confidence in the resultant rainfall-runoff model and associated PMF design inflow to the Whittier Narrows Reservoir.

Recommendation for Resolution

1. Conduct the reconstitution analyses of the 1938, 1943, 1969, 1978, 1983, and 1993 events, as alluded to in Appendix D.
2. Revise input variables to the Whittier rainfall-runoff model, as appropriate, based on results of the reconstitution analyses.
3. Revise PMF inflow modeling analysis, as appropriate, based on Recommendations 1 and 2.
4. Consider calibrating and verifying the runoff model to available, recorded stage data at Whittier Narrows Dam.

Final Panel Comment 8

The relocation of Rosemead Boulevard presents unusual challenges not addressed in the DSMR.

Basis for Comment

DSMR Section 3.5.3 acknowledges that post-DSMR work would identify and evaluate plans on how to provide overtopping protection at Rosemead Boulevard. The study currently assumes that the heavily traveled highway will have overtopping protection like the rest of the embankment with no closure structures. The Panel is uncertain that the study team has evaluated the cost, schedule, or operational risk for the current plan to armor and reconstruct Rosemead Boulevard.

The risk associated with armoring/relocating Rosemead Boulevard is acknowledged in Appendix B. Although it is listed in the Top 10 cost risk drivers, the Cost & Schedule Risk Register assigns it little contingency. Appendix B estimates three levels of contingency risk for lands and damages: best, middle, and worst case. The best and middle cases of contingency risk provide no cost and no additional contingency for Rosemead lands and damages. The worst case provides approximately \$19,000 for all project lands and damages (Appendix B implies a \$70,000 contingency). Given the great uncertainty of how Rosemead Boulevard will be reconstructed, the DSMR provides a relatively modest contingency for any additional lands that may be required due to the reconstruction, such as longer vertical curves or footprints of taller sloped embankments.

DSMR Section 3.5.3 (p. 82) and Appendix J (p. 9-10) state that Rosemead Boulevard armoring will match the rest of the embankment. However, Drawing C-4 notes the slope of the RCC is to be a constant slope from the top of dam to the toe of embankment, a condition not possible on that portion of the embankment coincident with Rosemead Boulevard due to the compound slope of the highway as it ascends the embankment.

Appendix L implies that the surface of Rosemead Boulevard will have to be raised 1 to 1.5 feet. Drawing C-6 indicates the top of the dam at Rosemead Boulevard is already at or near elevation 239 feet. Since raising the Rosemead Boulevard roadway elevation 1 to 1.5 feet is a significant cost and schedule driver, this inconsistency should be corrected.

The plan view on Drawing C-6 indicates a note to raise the crest (arrow pointing to top of dam) to elevation 249.2 feet. All other study references for Alternative 5 refer to raising the dam crease to elevation 239 feet. Since raising the embankment and additional 10 feet is a significant cost and schedule driver, this inconsistency should be corrected.

The Cost and Schedule Risk Register estimates three levels of contingency for construction. RCC Risk #2 assigns a worst-case risk that Caltrans would require Rosemead Boulevard to be reconstructed to current standards. The Panel does not view reconstruction to current standards a worst case, but rather the most likely case. The cost estimate should reflect the reconstruction to current standard.

Significance – Medium/Low

The inconsistent technical approach to armoring and reconstructing Rosemead Boulevard compared to the rest of the embankment may affect implementation of critical features of the TSP.

Final Panel Comment 8

Recommendations for Resolution

1. In DSMR Section 3.5.3, provide a better definition of the assumptions, uncertainty, and consequences of that uncertainty regarding Rosemead Boulevard through several options:
 - (a) Achieve a constant RCC slope by requiring removal of the entire Rosemead Boulevard fill down to the dam embankment to place the RCC; this would involve greater earthwork quantities, traffic disruption, and schedule duration.
 - (b) Keep the RCC nearer the surface but abandon the concept of a constant RCC slope and redesign for the roadway loading to accommodate what essentially becomes a diagonal flip bucket as the RCC crosses the road cross section.
 - (c) Raise Rosemead Boulevard and any top of dam embankment immediately upslope of Rosemead Boulevard (approximately station 40+00 to 60+00) three feet, use floodwalls to direct the PMF to flow around Rosemead Boulevard, and not armor Rosemead Boulevard or the embankment at all.

Any of these options involves significant cost and implementation uncertainty, which are not currently included in the project description or estimates.

2. Review cost and schedule assumptions to ensure that cost estimate contingency for the Rosemead Boulevard feature adequately provides for the feature risk.
3. To ensure that environmental impacts are adequately disclosed, review the DEIS based on the likely greater impacts from armoring and relocating Rosemead Boulevard than portrayed in the DSMR.
4. Schedule engagement with Caltrans at the earliest practical time to initiate detailed discussion of required design and implementations standards.

Final Panel Comment 9

The potential for groundwater contamination testing, treatment, and disposal as a result of site dewatering has not been fully addressed.

Basis for Comment

DSMR, Section 3.3.1.3, states (p. 38) that the Whittier Narrows Dam is located within the San Gabriel Valley Superfund groundwater contamination site. The contaminant is PCE (perchloroethylene, also called tetrachloroethylene) and exceeds California maximum allowable concentrations levels. To address this, a treatment plant and five extraction wells to feed that treatment plant were constructed within the basin. Depending on final design and groundwater conditions, dewatering may be required for the trench drain/energy dissipation system and utility relocation.

The local groundwater table can vary significantly year-to-year and within a given year. If this portion of the construction is installed during the summer months and a typical water year, it is anticipated that drawdowns of less than 5 feet would be necessary. While not defined in the report, it is the Panel's opinion that substantial quantities of groundwater may be generated by dewatering operations.

Given that a known contaminant plume is in the region, the Panel believes that it is very likely that regulatory agencies will require that the water generated from dewatering be contained and tested prior to discharge. If the contaminants exceed regulatory limits, treatment will be required prior to discharge. The potential need for groundwater containment, testing, or treatment is not accounted for in the Real Estate Memorandum, DEIS, cost estimate, or risk register, which states that treatment requirements are undefined.

Significance – Medium/Low

Containment, testing, and treatment of groundwater could impact project costs and schedule.

Recommendation for Resolution

1. Investigate groundwater quality, during planning, engineering, and design (PED), in the vicinity of the drainage trench excavation where dewatering may be required.
2. Clarify regulatory testing and discharge requirements with regulatory agencies.
3. Look for overlap of HTRW testing and discharge requirements with Clean Water Act Section 402 National Pollutant Discharge Elimination System (NPDES) permit project requirements.
4. Evaluate the feasibility of using the existing Superfund treatment plant and/or temporary on-site treatment systems during dewatering.
5. Address potential groundwater storage, testing, and treatment costs; update the risk register.

Final Panel Comment 10

It is unclear whether the 2D hydraulic modeling accurately predicts the transient water surface elevation in the downstream impact area during the storage routing of the PMF emanating from Whittier Narrows Dam.

Basis for Comment

The hydrology and hydraulics (H&H) analysis for Whittier Narrows Dam focused on the contributing drainage areas' response to the aerial and temporal distribution of the probable maximum precipitation (PMP). However, it is unclear whether the analysis has demonstrated whether resultant water surface levels associated with PMP loading have been accounted for in areas downstream of the dam. While the PMP pattern is centered over the Whittier Narrows drainage area, rainfall from the outer PMP isohyets will produce extreme runoff in the downstream areas of the Rio Hondo and San Gabriel floodplains. Understanding and accounting for the downstream rainfall-runoff response is important in conservatively predicting maximum water levels (and life loss) in the dam breach inundation zones.

In locations immediately downstream of Whittier Narrows Dam, understanding and predicting transient tailwater conditions may have a direct bearing on the headwater elevation vs. discharge (i.e., rating curve) characteristics of the Rio Hondo Outlet and San Gabriel Spillway structures. It appears that the flood routing model assumes a constant discharge over a range of high Whittier Narrows reservoir levels for the PMF routing. This assumption is based on full channel capacities in the Rio Hondo and San Gabriel Rivers rather than taking into account the transient nature of the tailwater over the full duration of the PMF.

Significance – Medium/Low

A complete hydraulic analysis of the relationship between tailwater conditions and the stage-discharge characteristics at the outlet and spillway is essential for predicting resultant maximum PMF water levels behind the dam. Without this comprehensive analysis, there is a likelihood that the PMF overtopping level will be under-predicted.

Recommendation for Resolution

1. Provide further justification that (a) the current hydraulic modeling depicts water levels in downstream impact areas resulting from PMP loading; and (b) transient tailwater conditions immediately at the toe of the dam are accounted for in the stage-discharge characteristics used for the Rio Hondo Outlet and San Gabriel Spillway.
2. As necessary (depending upon the outcome of Recommendation 1), revise and rerun the PMP routing models and update the water surface profile conditions above and below the dam.

Final Panel Comment 11

The discussion of natural resources baseline conditions in the DEIS is not detailed enough to adequately allow for the evaluation for forecasted conditions.

Basis for Comment

DEIS Section 4.5 (pp. 4-31 through 4-51), identifies biological resources within the project study areas, which were limited to the proposed RMPs, including the No-Action RMP 1. Although the DEIS provides detailed descriptions of each vegetation community present, it does not quantify these communities in acres. It is the Panel's experience that documentation of vegetation communities in acres is needed to help evaluate the significance of impacts on biological resources (documented in DEIS Section 5.5) that are dependent on these communities.

This section also does not mention potential suitable habitat for wintering bald eagles. There is the possibility of this species occurring within the project study area, given some limited bald eagle observations in the project vicinity: Pico Rivera (Whittier Daily News, 2008), the Whittier Narrows Recreation Area (eBird, 2019; Long, 2019), and the Whittier Narrows area (Tehachapi Renewable Transmission FEIS, 2009; USACE, 1998). Open water at the recreation area, as well as the presence of carrion from nearby roadways, provide potential feeding habitat for the bald eagle.

DEIS Section 4.5.3.6 (pp. 4-42 through 4-51), provides information about threatened and endangered species anticipated to be within the project study area. It is unclear whether additional Federally listed species are potentially present in the project study area; no information was given on either obtaining a species list from the U.S. Fish and Wildlife Service (USFWS) or obtaining this information from the Service's iPaC website. The References Site gives a species list compiled in 2010, which is outdated. The Panel cannot verify that the analysis evaluated all Federally listed species that may be present within the project study area. A biological assessment or evaluation does not appear to have been performed and coordination is stated to be ongoing with USFWS.

Significance – Low

A quantification of the area of the vegetation communities, documentation of potential suitable habitat for the wintering bald eagle, and verification of Federally listed species present within the study area would allow for a complete understanding of the potential impacts from the TSP.

Recommendations for Resolution

1. Revise the DEIS to quantify acreages of vegetation communities identified and measure potential impacts in the DEIS Section 5.5.
2. Revise the DEIS to reflect the potential for wintering bald eagles to be present within the study area, and, if suitable habitat is present, document potential effects on this species.
3. Provide a reference to obtaining species list/iPaC information for Federally listed species in the DEIS Section 4.5.3.6.

Literature Cited

eBird website – Whittier Narrows Rec Area. <https://ebird.org/hotspot/L467098>

Long, Michael C. 2019. *Supplement to The Birds of the Whittier Narrows Recreation Area; Los Angeles County, California*. Provided to USACE by Pasadena Audubon Society during DEIS public commenting period (January 29, 2019).

Tehachapi Renewable Transmission Project FEIS (2009). Section 3.4, Table 3.4-7.
https://openet.org/w/images/6/65/Tehachapi_Renewable_FEIS_Volume_I_3_Affected_Environment_and_Environmental_Consequences.pdf

USACE (1998). Los Angeles County Drainage Area (LACDA) Water Conservation and Supply and Santa Fe- Whittier Narrows Dams Feasibility Study: Environmental Impact Statement. Los Angeles District, Corps of Engineers Planning Division, Water Resources Branch, Los Angeles, CA.
<https://books.google.com/books?id=rzw0AQAAMAAJ&pg=SA3-PA15&lpg=SA3-PA15&dq=bald+eagle+%2B+whittier+narrows&source=bl&ots=4QktFTSbfD&sig=ACfU3U21B4XLtMHL1bgjFXBvtWLYAfua-w&hl=en&sa=X&ved=2ahUKEwjdupK2m4fgAhVDPq0KHQWWAZwQ6AEwCnoECAQQAQ#v=onepage&q=bald%20eagle%20%2B%20whittier%20narrows&f=false>.

Whittier Daily News (2008). Birders in a flutter over bald eagle sightings.
<https://www.whittierdailynews.com/2008/02/19/birders-in-a-flutter-over-bald-eagle-sightings/>

Final Panel Comment 12

According to DSMR Table 10, the No Action Alternative meets the study objectives, yet it fails to address PFM 4 and PFM 21.

Basis for Comment

The DSMR Executive Summary states (p. 1) that the purpose of the DSMS is to identify a plan that, when implemented, reduces the APF and life safety risk below tolerable thresholds. DSMR Section 3.2.3, states (p. 33) that the primary objective of the study is to identify the risk associated with the Whittier Narrows Dam and plans to reduce that risk to a level that satisfies individual and societal risk guidelines with due consideration to As-Low-As-Reasonably-Practicable and applicable essential USACE guidelines.

DSMR Table 10, Row 1 indicates that Plan 1-No Action Plan meets the study objective. However, the No Action Plan does not address PFM 4-Backward Erosion Piping and PFM 21-Overtopping, and therefore does not meet the stated purpose or objective.

It is not clear to the Panel whether the entry in Table 10 is a typographical error, or the belief of the Study Team.

Significance – Low

If this table entry represents the Study Team belief that the No Action Plan meets the study objective, the DSMR does not reflect that finding and significant updates will be necessary.

Recommendations for Resolution

1. Confirm whether this table entry is a typographical error or represents Study Team conclusions.
2. If this table entry is a typographical error, correct the table entry to indicate that the No Action alternative is carried forward for comparison to other alternatives.
3. If this table entry represents Study Team conclusions, provide text throughout the DSMR (specifically DSMR Section 3.4.2.2) and appendices to explain how the No Action Alternative adequately addresses dam safety risk.

Final Panel Comment 13

The impact of overtopping and flow down on the top-soil-covered RCC slope face has not been fully evaluated.

Basis for Comment

The DEIS indicates that the RCC will be placed on “steps” down the embankment. Two feet of topsoil will be replaced on the RCC steps. During controlled overtopping, the top soil will be eroded from the slope face and a mixture of soil and water will flow into adjacent downstream areas and become part of the debris flow.

It is the Panel’s understanding that USACE is considering conducting physical modeling during the PED phase to better establish the stepped configuration along the downstream face of the embankment and energy dissipation structures at the toe of the embankment.

Significance – Low

Additional documentation is required to clarify the expected impact of overtopping and top soil erosion on downstream areas.

Recommendation for Resolution

1. Modify the DSMR to indicate that during PED physical modeling will be conducted to demonstrate how the proposed design affects the lethality ($D \times V$) potential downstream of the embankment such that the “Do No Harm” criterion is satisfied.
2. Address the bulk densities of debris flow with and without RCC soil cover to measure impacts. Address those respective impacts in the DEIS.

Final Panel Comment 14

The criteria for acceptable gradient are unclear.

Basis for Comment

The criteria for acceptable gradient and how it was used are unclear in DSMR Appendix A (Risk Assessment) Sections 1.4 and 2.2. This applies to PMFs 4W1, 4C1,4C2, and 4W2. Acceptable gradient criteria by Bligh (1910), Schertmann (2002), Sellmeijer (2011), and Hoffmanns (2012) are graphically presented in the figures for Node #5, Progression--Hydraulic Condition.

The Panel agrees that appropriate methods were used, but there is no discussion of the various criteria nor are there any details on how they were used to judge the estimated probabilities of progression occurrence.

Significance – Low

Additional documentation would clarify this important aspect of the risk assessment

Recommendation for Resolution

1. Provide a discussion in the risk assessment regarding the rationales used to select and apply the criteria for acceptable gradient.

Final Panel Comment 15

The life safety assumption that downstream populations with 2 feet or less of inundation would “shelter-in-place” is unrealistic.

Basis for Comment

According to DSMR Appendix A (p. 2-45),

“For pool elevations where the spillway is activated, there is uncertainty as to the extent of the flooding downstream. The lack of confidence in the extent of hazardous flooding when spillway flows are anticipated leads the district to believe that a shelter-in-place assumption could cause people to lose their lives due to following the evacuation instructions.”

The impact of the assumption being incorrect results in significantly understating the potential loss of life in both Future-Without Federal Action Risk Condition (FWAC) and project alternatives.

In addition, DEIS Section 5.7 (pp. 5-69 through 5-71) and Section 7.0 (pp. 7 - 10) states that there would be no direct, indirect, and/or disproportionate adverse socioeconomic impacts from the No Action RMP 1; however, it does not appear to account for the uncertainty of the assumption in the risk assessment. The socioeconomic impacts could therefore be significant, depending on the extent of inundation and the population that decides to evacuate.

Significance – Low

Overestimation of those who would “shelter in place” will underestimate downstream populations that will evacuate, which could result in underestimations of traffic impacts, and other evacuation impacts.

Recommendations for Resolution

1. Include a sensitivity analysis of the impacts on the results of the loss of life analysis if the population assumed to shelter-in-place attempts to evacuate.
2. The non-breach (and near beach) scenarios and associated evacuation and life loss should be clearly enumerated in the DSMR.
3. Update the DEIS to reflect additional analysis for the loss of life if the population that is assumed to shelter-in-place does evacuate.

Final Panel Comment 16

The residual risk from flooding following dam safety modification is not portrayed accurately.

Basis for Comment

The DSMR states (p. 43) that at the time of the study, none of the 25 cities downstream of the dam had an existing emergency action plan (EAP) or defined emergency evacuation routes for flooding events. Further, evacuation routes were not identified, and sheltering-in-place areas and key messages for a flooding emergency had not been developed. The assumption that downstream communities will develop and have EAPs that include Multi-City Evacuation Plans and Regional Evacuation Plans in place is not reasonable. Therefore, the reduction of life safety risk below tolerable thresholds would also be incorrect for both FWAC and project alternatives, and the residual risk following dam safety modification is not accurately portrayed. The high non-breach loss of life (on the order of 4,000) indicates significant residual risk exists (DSMR Table 13, p. 74).

In addition, the DSMR does not adequately define important terms for the community, such as the term non-breach. It does not explain the difference in the incremental change from a near-PMF event (catastrophic, but the dam handles it safely) to a full PMF (catastrophic, with dam failure, and with a longer recovery).

Significance – Low

The inaccurate representation of the residual risk that would follow the dam safety modification affects the understanding or completeness of the study documents.

Recommendations for Resolution

1. Document in the risk assessment analysis and outcomes presented in the DSMR what will occur if the assumption that Emergency Action Plans, Multi-City Evacuation Plans, and Regional Evacuation Plans will be developed and implemented by downstream communities is not realized.
2. Clarify project residual risk by more complete explanation and comparison of breach (dam failure), non-breach (dam safety measures successful), and near PMF (dam safety measures successful but not required).

Final Panel Comment 17

The time-to-failure values for the hypothetical breach scenarios of the Western and Central Embankments are outside the normally accepted ranges.

Basis for Comment

As shown in DSMR Appendix A Tables 1-102 and 1-103, the adopted maximum formation time (or time to failure, TFH) for the hypothetical breaches for the Western and Central Embankment failure scenarios was 2.5 hours at pool elevation coincident with top of dam elevation 241.2 (NAVD88). It has been the Panel's experience that TFH values for embankment dams typically are about 0.5 hours. FERC (2015) guidance suggests (p. 2-A-8) that for embankment dams: $0.1 \text{ hrs.} \leq \text{TFH} \leq 1.0 \text{ hrs.}$

Significance – Low

Using a shorter duration for the TFH parameter in the breach analysis may materially increase the peak rate of uncontrolled discharge from Whittier Narrows Dam. This in turn may increase flood depths, velocities and related life loss for the existing dam condition.

Recommendation for Resolution

1. Provide back-up computations that show that the adopted TFH in the Risk Assessment produce conservative (high) breach discharges, or
2. Revise breach simulations for the Western and Central Embankment scenarios with a TFH approximating 0.5 hours, under the FWAC condition.

Literature Cited

FERC (2015). Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter 2: Selecting and Accommodating Inflow Design Floods for Dam, Appendix II-A: Dam Break Studies. Federal Energy Regulatory Commission. August. Online at: <https://ferc.gov/industries/hydropower/safety/guidelines/eng-guide/chap2.pdf>.

Final Panel Comment 18

The Public identified that the potential impact of the Whittier Fault possibly passing beneath a portion of the dam and the consequences of possible fault rupture are not addressed.

Basis for Comment

A public comment by Margot Eiser and James Flournoy of Citizens for Open Public Participation expressed concern that a branch of the Whittier Fault may underlie a portion of the dam. Although to the Panel's knowledge, current studies have not identified a Whittier fault branch beneath the dam. If a fault is present, the potential for fault rupture offset and its impact on the dam should be addressed. DEIS Sections 4.1 and 5.1 do not provide any information regarding the branch of the fault being under the dam. DEIS Section 5.1.3 (page 5-4 of Appendix C) indicates that the RMPs would have no effect to seismicity or faults within the project study area; however, it is unclear if this assessment included a branch of the Whittier Fault.

Significance – Low

If a fault beneath the dam were to exist, the joint probability of a large flood occurring before emergency or remedial repairs to address fault offset would be in place is sufficiently unlikely that the risk associated with this issue is probably insignificant but should be addressed.

Recommendation for Resolution

1. Update DSMR Section 2.2.2, to address the potential presence, activity, and offset potential of a branch of the Whittier Fault passing beneath the dam.
2. Evaluate the potential impacts of fault rupture and as necessary update DSMR Section 3.5.5 based on current USACE Guidelines.
3. Update DEIS Sections 4.1 and 5.1 (and subsequent RMP evaluation discussions) to address the potential presence, activity, offset potential of a branch of the Whittier Fault passing beneath the dam, and the associated risk of reservoir-induced seismicity.

Final Panel Comment 19

A full description of all the PFMs that have been evaluated is not included in the DSMR.

Basis for Comment

Public comments by Dr. Tom Williams, Senior Technical Adviser, Citizens Coalition for A Safe Community expressed concern that the PFM associated with seepage and internal erosion of the dam clay core has not been addressed. The Panel believes this is a misunderstanding due to the fact that the report and appendices do not include a full description of all the PFMs that were evaluated. The documents focus on significant PFMs identified in the 2006 Screenings for Portfolio Risk Analysis and the 2008-2011 Issues evaluation Study. However, these studies are not summarized or presented as reference documents.

Significance – Low

The PFM associated with seepage and internal erosion of the dam clay core was evaluated and was not considered a significant risk driver. Documentation on the evaluation of this and all other PFMs is important to ensure public confidence in the project.

Recommendation for Resolution

1. Provide a table summarizing all the PFMs considered in DSMR Section 2.3.1.1.
2. Include the previous 2006 Screening for Portfolio Risk Analysis and 2011 Issue Evaluation Study documents in the DSMR Appendix A Risk Assessment

5. REFERENCES

40 CFR §1502.25. (1978). Environmental review and consultation requirements.

40 CFR §1502.8 (2012). Writing.

California State Water Board (2018). 2014 and 2016 California Integrated Report (Clean Water Act Section 303(d) List and 305(b) Report).

https://www.waterboards.ca.gov/water_issues/programs/tmdl/integrated2014_2016.shtml

CEQ Memorandum (2012). Improving the Process for Preparing Efficient and Timely Environmental Reviews under the National Environmental Policy Act. USACE Planning Community Toolbox. ([https://planning.erdc.dren.mil/toolbox/processes.cfm?Id=231&Option=National%20Environmental%20Policy%20Act%20\(NEPA\)](https://planning.erdc.dren.mil/toolbox/processes.cfm?Id=231&Option=National%20Environmental%20Policy%20Act%20(NEPA)))

Dowell, Darren. January 28, 2019. Public comment received (provided by USACE).

eBird website – Whittier Narrows Rec Area. <https://ebird.org/hotspot/L467098>

FERC (2015). Engineering Guidelines for the Evaluation of Hydropower Projects, Chapter 2: Selecting and Accommodating Inflow Design Floods for Dam, Appendix II-A: Dam Break Studies. Federal Energy Regulatory Commission. August. Online at: <https://ferc.gov/industries/hydropower/safety/guidelines/engineering/chap2.pdf>.

Long, Michael C. 2019. *Supplement to The Birds of the Whittier Narrows Recreation Area; Los Angeles County, California*. Provided to USACE by Pasadena Audubon Society during DEIS public commenting period (January 29, 2019).

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.

Tehachapi Renewable Transmission Project FEIS (2009). Section 3.4, Table 3.4-7. https://openei.org/w/images/6/65/Tehachapi_Renewable_FEIS_Volume_1_3_Affected_Environment_and_Environmental_Consequences.pdf

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

USACE (1988). Procedures for Implementing NEPA. ER 200-2-2. Department of the Army, U.S. Army Corps of Engineers, Washington, DC. March 4.

USACE (1998). Los Angeles County Drainage Area (LACDA) Water Conservation and Supply and Santa Fe- Whittier Narrows Dams Feasibility Study: Environmental Impact Statement. Los Angeles District, Corps of Engineers Planning Division, Water Resources Branch, Los Angeles, CA. <https://books.google.com/books?id=rzw0AQAAMAAJ&pg=SA3-PA15&lpg=SA3-PA15&dq=bald+eagle+%2B+whittier+narrows&source=bl&ots=4QktFTSbfD&sig=ACfU3U21B4XLtMHL1bgjFXBvtWLYAfua-w&hl=en&sa=X&ved=2ahUKEwjdupK2m4fgAhVDPq0KHQWWAZwQ6AEwCnoECAQQAQ#v=onepage&q=bald%20eagle%20%2B%20whittier%20narrows&f=false>

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

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.

Whittier Daily News (2008). Birders in a flutter over bald eagle sightings.
<https://www.whittierdailynews.com/2008/02/19/birders-in-a-flutter-over-bald-eagle-sightings/>

This page is intentionally left blank.

APPENDIX A

IEPR Process for the Whittier Narrows Dam DSMR Project

This page is intentionally left blank.

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

Table A-1 presents the major milestones and deliverables of the Whittier Narrows Dam DSMR 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 December 10, 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 April 22, 2019. The actual date for contract end will depend on the date that all activities for this IEPR are conducted and subsequently completed.

Table A-1. Major Milestones and Deliverables of the Whittier Narrows Dam DSMR IEPR

Task	Action	Due Date
1	Award/Effective Date	9/28/2018
	Review documents available	12/10/2018
	Public comments available	2/7/2019
	Battelle submits draft Work Plan ^a	10/5/2018
	USACE provides comments on draft Work Plan	10/30/2018
	Battelle submits final Work Plan ^a	11/2/2018
2	Battelle submits list of selected panel members ^a	10/10/2018
	USACE confirms the panel members have no COI	10/25/2018
3	Battelle convenes kick-off meeting with USACE	10/31/2018
	Battelle convenes kick-off meeting with panel members	11/2/2018
	Battelle convenes kick-off meeting with USACE and panel members at the site visit	11/6/2018
4	Panel members complete their individual reviews	1/11/2019
	Panel members provide draft Final Panel Comments to Battelle	1/28/2019
	Battelle sends public comments to panel members for review	2/7/2019
	Panel confirms no additional Final Panel Comment is necessary with regard to the public comments	2/13/2019
	Panel finalizes Final Panel Comments	2/15/2019
5	Battelle submits Final IEPR Report to USACE ^a	2/20/2019
6 ^b	Battelle convenes Comment Response Teleconference with panel members and USACE	4/5/2019
	Battelle submits pdf printout of DrChecks project file ^a	4/22/2019
	Contract End/Delivery Date	3/29/2019 ^c

^a Deliverable.

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

^c An extension of the period of performance will be necessary to complete the Task 6 activities.

At the beginning of the Period of Performance for the Whittier Narrows Dam DSMR 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 38 charge questions provided by USACE, two overview questions and one public comment question added by Battelle (all questions were included in the draft and final Work Plans), and general guidance for the Panel on the conduct of the peer review (provided in Appendix C of this final report).

Prior to beginning their review and after their subcontracts were finalized, all the members of the Panel attended a kick-off meeting via teleconference planned and facilitated by Battelle in order to review the IEPR process, the schedule, communication procedures, and other pertinent information for the Panel. Battelle planned and facilitated an in-person meeting with USACE prior to the site visit during which USACE presented project details to the Panel. Before the meetings, the IEPR Panel received an electronic version of the final charge. The review documents and reference/supplemental materials listed in Table A-2 were supplied upon availability on December 10, 2018.

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

Review Documents	No. of Review Pages
DSMR Main Report	100
Appendix A Risk Assessment	310
Appendix B Cost Engineering	100
Appendix C Draft Environmental Impact Statement	800
Appendix D Hydrologic and Hydraulic Engineering	663
Appendix E Spillway Gates	419
Appendix F Constructability Review	20
Appendix G Geotechnical Engineering	231
Appendix J Real Estate Plan	30
Appendix L Plans 3E and 5	24
Appendix M Plan Formulation	75
Public Review Comments and Responses	54
Total Number of Review Pages	2,826

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

General

- EC 1105-2-412, Assuring Quality of Planning Models, 31 March 2011
- EC 1165-2-217, Review Policy for Civil Works, 20 February 2018
- ER 500-1-1, Civil Emergency Management Program, 30 September 2001

- ER 1110-1-12, Engineering and Design - Quality Management, 31 March 2011 (change 2)
- ER 1110-2-1150, Engineering and Design - Engineering and Design for Civil Works Projects, 31 August 1999
- ER 1110-2-1156, Engineering and Design - Safety of Dams - Policy and Procedures, 31 March 2014
- ER 1110-1-8159, Engineering and Design - DrChecks, 10 May 2001
- ER 1105-2-101, Risk Analysis for Flood Damage Reduction Studies, 3 January 2006
- National Academy of Sciences, "Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports," May 2003 for General Scientific and Technical Studies and Assistance. Available at: http://www.nationalacademies.org/site_assets/groups/nasite/documents/webpage/na_069688.pdf
- Water Resources Development Act of 2007, Sections 2034 & 2035, Pub. L. 110-114. Privacy Act, 5 U.S.C. § 522a as amended
- Best Practices in Dam and Levee Risk Analysis: <https://www.usbr.gov/ssle/damsafety/risk/methodology.html>

Environmental/Planning

- ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. CECWP, 28 December 1990
- Council on Environmental Quality. 1978. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 40 CFR Parts 1500-1508. Washington, DC: U.S. Government Printing Office, 29 November 1978).
- ER 200-2-2, Environmental Quality, Procedures for Implementing NEPA. CECWRE (now CECW-A), 4 March 1988
- National Environmental Policy Act of 1969
- National Historic Preservation Act of 1966
- 36 CFR 800
- Endangered Species Act
- Clean Air Act
- Clean Water Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- Engineer Regulation 200-1-5, Policy for Implementation and Integrated Application of the USACE Environmental Operating Principles (EOP) and Doctrine and Sustainability
- Executive Order 12898, Federal Actions to Address Environmental Justice in
- Minority Populations and Low-Income Populations
- Executive Order 13045 Protection of Children from Environmental Health Risks and Safety Risks

Geotechnical Engineering

- EM 1110-2-1901, Engineering and Design - Seepage Analysis and Control for Dams, 30 April 1993
- EM 1110-2-1908, Instrumentation of Embankment Dams and Levees, 30 July 2004
- EM 1110-2-1913, Engineering and Design - Design and Construction of Levees, 30 April 2000
- EM 1110-2-1914, Engineering and Design – Design, Construction, and Maintenance of Relief Wells, 29 May 1992

- ETL 1110-2-556 (or most recent guidance), Risk-based Analysis in Geotechnical Engineering for Support of Planning Studies or more current Hydraulic Engineering, 28 May 1999
- EM 1110-2-1413, Hydrologic Analysis of Interior Areas, 15 January 1987
- EM 1110-2-1415, Hydrologic Frequency Analysis, 5 March 1993
- EM 1110-2-1416, River Hydraulics, 15 October 1993
- EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1 August 1996
- EM 1110-2-2902, Engineering and Design - Conduits, Culverts, and Pipes, 31 March 1998
- MMC Production Center, Application of Simplified Physical Breach Method in HEC-RAS, 2 December 2016
- MMC Production Center, Levee Widening Erosion Rates, February 2016
- MMC Production Center, Standard operating procedures—Modeling, mapping and consequences, June 2014
- MMC Production Center, Modification of MMC Levee Analysis Standard Operation Procedure to Include Additional Overtopping Scenarios, January 2018

Peer Review

- USACE guidance, *Review Policy for Civil Works* (EC 1165-2-217), 20 February 2018
- Office of Management and Budget, *Final Information Quality Bulletin for Peer Review*, 16 December 2004.

The Panel did not have any clarifying questions for USACE during the course of their review. Therefore, Battelle determined, and the PCX confirmed, that a mid-review teleconference with USACE was not necessary.

A.2 Site Visit

An in-person meeting to discuss the Whittier Narrows Dam project was held at the USACE Baseyard on November 6, 2018. All five panel members and one Battelle staff member attended this meeting and the subsequent site visit. The meeting was conducted in two parts. The first part involved a detailed briefing by USACE of the project history, issues, actions, and review documents. Panel members asked several questions during the presentation, and an open discussion followed.

At the conclusion of the presentation, USACE, Battelle staff, and the panel members convened for the second part of the meeting, a site visit. USACE led Battelle and the Panel on a tour of the Whittier Narrows Dam site. The tour initially visited the San Gabriel River dam/control structure. The existing spillway and gates, control features, the proposed alternative auxiliary spillway and fuse plug, as well as existing land use were discussed. The second tour stop was on the central embankment where the proposed soil covered RCC facing and the need for an energy dissipating structure at the embankment toe were discussed. The tour then proceeded to the Rio Honda dam/control structure. The existing gates, spillway, and downstream channel were observed. The location of past sand boils and the extent of the 2000 drainage trench improvements were pointed out. The tour continued to the east embankment where the potential for flood waters flowing around the end of the embankment during rare events was discussed. USACE, Battelle, and the panel members observed surrounding conditions in-route and stopped at the various points along the tour (noted above) to note the general environment and key dam safety issues, including various geologic, hydrologic, and NEPA considerations.

Throughout the site visit, USACE staff pointed out specific project features to help the panel members better comprehend previous events, repairs, and issues associated with the existing project features and the intent of the project remediation. USACE staff then answered questions posed by the panel members. This tour provided an opportunity for the panel members to see the project area and project features and to ask clarifying questions of the USACE Project Delivery Team (PDT).

Following the site visit, the USACE PDT provided the presentation slides. These documents were provided to Battelle and then disseminated to the Panel. The document provided to the Panel was:

- IEPR Nov 2018 110518.pptx

A.3 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.4 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.5 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 Whittier Narrows Dam DSMR IEPR:

- **Lead Responsibility:** For each Final Panel Comment, one panel member was identified as the lead author responsible for coordinating the development of the Final Panel Comment and submitting it to Battelle. Battelle modified lead assignments at the direction of the Panel. To assist each lead in the development of the Final Panel Comments, Battelle distributed a summary email detailing each draft final comment statement, an example Final Panel Comment following the four-part structure described below, and templates for the preparation of each Final Panel Comment.

- Directive to the Lead: Each lead was encouraged to communicate directly with the other panel members as needed and to contribute to a particular Final Panel Comment. If a significant comment was identified that was not covered by one of the original Final Panel Comments, the appropriate lead was instructed to draft a new Final Panel Comment.
- Format for Final Panel Comments: Each Final Panel Comment was presented as part of a four-part structure:
 1. Comment Statement (succinct summary statement of concern)
 2. Basis for Comment (details regarding the concern)
 3. Significance (high, medium/high, medium, medium/low, and low; see description below)
 4. Recommendation(s) for Resolution (see description below).
- Criteria for Significance: The following were used as criteria for assigning a significance level to each Final Panel Comment:
 1. **High:** There is a fundamental issue within study documents or data that will influence the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 2. **Medium/High:** There is a fundamental issue within study documents or data that has a strong probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 3. **Medium:** There is a fundamental issue within study documents or data that has a low probability of influencing the technical or scientific basis for selection of, justification of, or ability to implement the recommended plan.
 4. **Medium/Low:** There is missing, incomplete, or inconsistent technical or scientific information that affects the clarity, understanding, or completeness of the study documents, and there is uncertainty whether the missing information will affect the selection of, justification of, or ability to implement the recommended plan.
 5. **Low:** There is a minor technical or scientific discrepancy or inconsistency that affects the clarity, understanding, or completeness of the study documents but does not influence the selection of, justification of, or ability to implement the recommended plan.
- Guidelines for Developing Recommendations: The recommendation section was to include specific actions that USACE should consider to resolve the Final Panel Comment (e.g., suggestions on how and where to incorporate data into the analysis, how and where to address insufficiencies, areas where additional documentation is needed).

Battelle reviewed and edited the Final Panel Comments for clarity, consistency with the comment statement, and adherence to guidance on the Panel's overall charge, which included ensuring that there were no comments regarding either the appropriateness of the selected alternative or USACE policy. At the end of this process, 19 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.6 Conduct of the Public Comment Review

Following the schedule in Table A-1, Battelle received PDF files containing 54 pages of public comments on the Whittier Narrows Dam DSMR (approximately 28 written comments) from USACE. Battelle then sent the public comments to the panel members in addition to the following charge question:

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

The Panel produced individual comments in response to the charge question. Each panel member's individual comments for the public comment review were shared with the full Panel. Battelle reviewed the Panel's findings to determine whether any new technical concerns were identified. Upon review, Battelle determined, and the Panel confirmed, that two new issues were identified in the public comments and accordingly developed two additional Final Panel Comments to address these concerns.

A.7 Final IEPR Report

After concluding the review and development 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.8 Comment Response Process

As part of Task 6, Battelle will enter the 19 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.

This page is intentionally left blank.

APPENDIX B

Identification and Selection of IEPR Panel Members for the Whittier Narrows Dam DSMR Project

This page is intentionally left blank.

B.1 Panel Identification

The candidates for the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (hereinafter: Whittier Narrows Dam DSMR IEPR) Panel were evaluated based on their technical expertise in the following key areas: consequence/planning, environmental/National Environmental Policy Act (NEPA) impact assessment, geotechnical engineering, hydrology and hydraulic (H&H) engineering, and civil/relocation engineering. These areas correspond to the technical content of the review documents and overall scope of the Whittier Narrows Dam DSMR project.

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

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

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

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Whittier Narrows Dam Safety Modification Report (DSMR)

1. Previous and/or current involvement by you or your firm in the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DSMR) and related projects.
2. Previous and/or current involvement by you or your firm in dam safety and flood risk around Los Angeles, California.
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 the area around Whittier Narrows Dam, Los Angeles, California and related projects.
4. Current employment by the U.S. Army Corps of Engineers (USACE).

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Whittier Narrows Dam Safety Modification Report (DSMR)

5. Previous and/or current involvement with paid or unpaid expert testimony related to the Whittier Narrows Dam, in Los Angeles, California or the Whittier Narrows Dam DSMR.
6. 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*):
 - Los Angeles County Department of Public Works
 - Los Angeles County Department of Parks and Recreation
 - City of Pico Rivera, CA
 - Montebello, CA
 - Rosemead, CA
 - City of Whittier, CA
 - Downey, CA
 - Lakewood, CA
 - U.S. Fish and Wildlife
 - Caltrans
 - Pico Boys Baseball Association
 - Artesia, CA
 - Bell Gardens, CA
 - Santa Fe Springs, CA
 - Norwalk, CA
 - Pico Rivera Sports Arena
 - Pico Rivera Golf Club
7. Past, current, or future interests or involvement (financial or otherwise) by you, your spouse, or your children related to the Los Angeles, California area.
8. Current personal involvement with other USACE projects, including whether involvement was to author any manuals or guidance documents for USACE. If yes, provide titles of documents or description of project, dates, and location (USACE district, division, Headquarters, Engineer Research and Development Center [ERDC], etc.), and position/role. Please highlight and discuss in greater detail any projects that are specifically with the Los Angeles District.
9. Previous or current involvement with the development or testing of models that will be used for, or in support of, the Whittier Narrows Dam, Los Angeles, California DSMR project.
10. Current firm involvement with other USACE projects, specifically those projects/contracts that are with the Los Angeles 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 Los Angeles District. Please explain.

Panel Conflict of Interest (COI) Screening Questionnaire for the IEPR of the Whittier Narrows Dam Safety Modification Report (DSMR)

11. Any previous employment by USACE as a direct employee, notably if employment was with the Los Angeles 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 Los Angeles District. If yes, provide title/description, dates employed, and place of employment (district, division, Headquarters, ERDC, etc.), and position/role.
13. Previous experience conducting technical peer reviews. If yes, please highlight and discuss any technical reviews concerning dam safety and flood risk, and include the client/agency and duration of review (approximate dates).
14. Pending, current, or future financial interests in contracts/awards from USACE related to the Whittier Narrows Dam, Los Angeles, California DSMR project.
15. Significant portion of your personal or office's revenues within the last three years came from USACE contracts.
16. Significant portion of your personal or office's revenues within the last three years came from Los Angeles County Department of Public Works contracts.
17. Any publicly documented statement (including, for example, advocating for or discouraging against) related to the Whittier Narrows Dam, Los Angeles, California DSMR project.
18. Participation in relevant prior and/or current Federal studies related to the Whittier Narrows Dam, Los Angeles, California DSMR project.
19. Previous and/or current participation in prior non-Federal studies related to the Whittier Narrows Dam, Los Angeles, California DSMR project.
20. Has your research or analysis been evaluated as part of the Whittier Narrows Dam, Los Angeles, California DSMR project?
21. Is there any past, present, or future activity, relationship, or interest (financial or otherwise) that could make it appear that you would be unable to provide unbiased services on this project? If so, please describe.

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

B.2 Panel Selection

In selecting the final members of the Panel, Battelle chose experts who best fit the expertise areas and had no COIs. Table B-1 provides information on each panel member's affiliation, location, education, and overall years of experience. Battelle established subcontracts with the panel members when they indicated their willingness to participate and confirmed the absence of COIs through a signed COI form. USACE was given the list of candidate panel members, but Battelle selected the final Panel.

Table B-1. Whittier Narrows Dam DSMR IEPR Panel: Summary of Panel Members

Name	Affiliation	Location	Education	P.E.	Exp. (yrs)
Environmental/NEPA Impact Assessment					
David Young	Independent consultant	Fulshear, TX	B.S., Marine Biology	N/A	25
Consequence/Planning					
Don Ator	Independent consultant	Baton Rouge, LA	M.S., Economics and Agriculture Economics M.B.A., Concentration in Finance and Accounting	N/A	40
Geotechnical Engineering					
R. William Rudolph	Independent consultant	Tahoe City, CA	M.S., Civil/Geotechnical Engineering	Yes	40
H&H Engineering					
Peter Baril	GZA GeoEnvironmental, Inc.	Norwood, MA	M.S., Hydrology	Yes	38
Civil/Relocations Engineering					
Phil Brozek	Brozek & Associates	Eugene, OR	B.S., Civil Engineering	Yes	38

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

Table B-2. Whittier Narrows Dam DSMR IEPR Panel: Technical Criteria and Areas of Expertise

Technical Criterion	Young	Ator	Rudolph	Baril	Brozek
Environmental/NEPA Impact Assessment					
Minimum 10 years of demonstrated experience in evaluating and conducting NEPA impact assessments, including cumulative effects analyses, for complex multi-objective public works project with competing trade-offs	X				
Minimum M.S. degree or higher in an appropriate field of study (waived by USACE due to years of experience)	X				
Experience should include multiple projects in which he/she was involved in the plan formulation process	X				
Experience should encompass determining the scope and appropriate methodologies for impact assessment and analyses for a variety of projects and programs with high public interagency interests and having project impacts on nearby sensitive habitats	X				
Consequence/Planning					
A minimum of 15 years of demonstrated experience in economics, with a minimum bachelor's degree or higher in economics		X			
Experience working for or with USACE is highly preferred but not required		X			
Expertise in flood risk management evaluating and conducting complex multi-objective public works projects with high public and interagency interest		X			
Familiarity with the USACE flood risk management analysis, economic calculations utilizing the Hydrologic Engineering Center's (HEC) Flood Damage Assessment software (HEC-FDA 1.4.2), and expertise in acceptable methodologies for estimating life loss via the use of HEC's LifeSim software (HEC-LifeSim 1.0 - preferred) and/or Flood Impact Analysis software (HEC-FIA 3.0 - acceptable)		X			
Familiarity with USACE plan formulation process, procedures, and standards as they relate to flood risk management		X			
A minimum of five years of experience directly dealing with the USACE six-step planning process, which is governed by ER 1105-2-100, Planning Guidance Notebook		X			
Geotechnical Engineering					
A senior-level geotechnical engineer with a minimum of 20 years of experience in the field of geotechnical engineering related to the analysis, design, and construction of embankment dams and levees, including rehabilitations of these structures, geological hazards, exploration techniques, field and laboratory testing, and instrumentation			X		

Table B-2. Whittier Narrows Dam DSMR IEPR Panel: Technical Criteria and Areas of Expertise (continued).

Technical Criterion	Young	Ator	Rudolph	Baril	Brozek
Knowledge and experience in the evaluation of seepage and piping potential failure modes in the foundations of embankment dams and levees, and in the development, design, and construction of remediation alternatives for correcting seepage and piping issues			X		
Experience in failure mode analysis, risk assessment of embankment dams or levees, evaluation of risk reduction measures for embankment dams and levees, and familiarity with the USACE levee and dam safety guidance			X		
Extensive experience in the actual design and construction of embankment dams and levees			X		
Working knowledge of applicable USACE design criteria and shall be a licensed professional engineer			X		
H&H Engineering					
Registered professional engineer with a minimum of 15 years of experience in hydrologic and hydraulic engineering				X	
Experience associated with flood risk management projects, and the analysis and design of hydraulic structures related to flood control projects including the design of hydraulic structures such as outlet works, spillways, and stilling basins, flood control channels and levees, diversion channel design, and large river control structures				X	
Must have performed work in hydrologic analysis, floodplain analysis, hydraulic design of channels and levees using various channel and bank protection works, and river sedimentation				X	
Demonstrated knowledge and experience with physical modeling and the application of data from physical model testing to the design of stilling basins and scour protection, and in the ability to coordinate, interpret, and explain testing results with other engineering disciplines, particularly structural engineers, geotechnical engineers, and geologists				X	
Demonstrated knowledge and experience with the routing of inflow hydrographs through multipurpose flood control reservoirs utilizing multiple discharge devices, including gated sluiceways and gated spillways				X	
Familiarity with Corps application of risk and uncertainty analyses in flood damage reduction studies and also have a familiarity with standard USACE hydrologic and hydraulic computer models (including but not limited to HEC-1, HEC-HMS, HEC-2, HEC-RAS, FLO-2D, and HEC-DSS) used in drawdown studies, dam break inundation studies, hydrologic modeling and analysis for dam safety investigations				X	

Table B-2. Whittier Narrows Dam DSMR IEPR Panel: Technical Criteria and Areas of Expertise (continued).

Technical Criterion	Young	Ator	Rudolph	Baril	Brozek
Civil/Relocations Engineering					
B.S. degree or higher in civil engineering					X
Minimum of 20 years of experience with dam construction and utility/roadway relocation					X
Member’s utility and roadway relocations experience should include a minimum of five projects in which he/she was the relocation’s lead or assistant					X

B.3 Panel Member Qualifications

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

Name	David Young
Role	Environmental/NEPA Impact Assessment
Affiliation	Independent Consultant

Mr. Young is an independent environmental/NEPA Impact Assessment consultant who earned his B.S. in marine biology from Texas A&M University at Galveston in 1993. He has 25 years of experience in wetland delineation, environmental assessments (EAs), water quality, and NEPA, and has been directly involved with water resource evaluation and NEPA assessments for more than 15 years. Throughout his career, he has been tasked with performing cumulative effects analyses for multi-objective public works projects, which include dam safety, flood control, navigation channel improvement projects, transportation, linear (utility), seismic exploration (geophysical exploration) on Federal lands, nuclear waste, and oil and gas prospect development on Federal lands.

Mr. Young has served as a NEPA, biology/ecology, and environmental expert for five IEPR reviews: the Mohawk Dam Major Rehabilitation Report (MRR), Chatfield Storage Reallocation Study and Environmental Impact Statement, Isabella Lake Dam Safety Modification Project, Leon Creek Watershed Feasibility Study, and Hunting Bayou Flood Risk Management Study (for the Harris County Flood Control District).

Mr. Young has also managed and provided technical support for the Houston Ship Channel-Placement Areas 14 and 15 navigational dredging project (USACE Galveston District). This project involved maintenance dredging of the Houston Ship Channel and the placement of dredged material for beneficial uses at Placement Areas 14 and 15. The project had potential impacts on environmental, estuarine, and coastal processes, and affected sensitive habitats such as oyster reef, seagrass beds, wetlands, and shallow-water estuarine ecosystems. It required the development of scope and appropriate

methodologies for assessing impacts and involved a multitude of public and private (non-governmental) interests. Mr. Young also managed and provided technical support for two flood control projects for Harris County Flood Control District: Hunting Bayou Detention Basin and White Oak Bayou Detention Basin. In both projects, an EA/Finding of No Significant Impact (FONSI) was prepared to evaluate the potential effects from the construction of a proposed regional stormwater retention/detention area to provide flood protection and enhance water quality to the citizens within the watershed. Federal Emergency Management Agency (FEMA) was the Federal sponsor, and the EA/FONSI was prepared in accordance with FEMA guidelines. The preparation of the EA/FONSI also included various environmental technical documents and public involvement activities.

He has also prepared several EA/FONSIs for proposed 3D seismic survey projects, which involved extensive coordination with the National Park Service, U.S. Forest Service, and U.S. Fish and Wildlife Service. These 3D seismic surveys included cumulative effects analysis for seismic exploration and oil and gas field development over extensive project areas (one project exceeded 80 square miles). Pre-plot surveys were conducted to provide avoidance measures to seismic drilling activities. An assessment for vegetation communities within the project area was documented using spatial and statistical analyses that were coordinated with the Federal agency. Impacts on sensitive habitats (freshwater marsh, freshwater cypress/tupelo swamp and brackish marshes) were also assessed. All activities, including scoping, were coordinated with various Federal, state, local and non-governmental stakeholders.

Mr. Young's project experience also includes the management and preparation of several EA/FONSIs for transportation projects for the Texas Department of Transportation. These projects required the preparation and technical review of various technical reports, including but are not limited to hazardous materials, regulatory permitting, biological assessments and other sensitive habitats, socio-economical/community resources reviews, indirect and cumulative impact assessments, and public involvement. These projects involved various project trade-offs, such as avoidance/minimization of impacts for one constraint versus others, balancing the purpose and need and public-perceived controversy.

He has been directly involved with water resource environmental evaluation or review and NEPA for more than 10 years, having prepared numerous NEPA documents for public and private clients, including USACE. His experience is highlighted by managing, preparing, and/or providing support on numerous Programmatic Categorical Exclusions, Categorical Exclusions, EAs/FONSIs, and Environmental Impact Statements (EISs). He has attended numerous training efforts on various aspects of NEPA, including Section 106 coordination, and state (Florida, Arizona, Texas) Department of Transportation processes related to NEPA compliance.

Name	Don Ator
Role	Consequence/Planning
Affiliation	Independent Consultant

Mr. Ator is an independent consultant and serves as Research Associate, Professor, and Undergraduate Advisor in the Department of Agriculture Economics and Agribusiness at Louisiana State University. He earned his M.S. in economics and agriculture economics and his M.B.A. with a concentration in finance and accounting from Louisiana State University. Mr. Ator's current research is in financial resiliency analysis and planning for local governments in Louisiana, Texas, Alabama, Mississippi, Florida, Georgia, Kentucky, and Nebraska.

He has 40 years of experience working for 28 USACE districts, first as a full-time employee with the Vicksburg District, then with a not-for-profit research institute, and later at three architect-engineer firms. He has demonstrated experience in flood risk management evaluating and conducting complex multi-objective public works projects with high public and interagency interest. A few examples of the more than 500 flood risk management projects Mr. Ator has conducted include Sensitivity Analysis of Benefit and Cost Evaluation Criteria to Risk and Uncertainty Associated with Study Parameters, Flood Damage Reduction Feasibility Study, Passaic River Basin, New York and New Jersey, USACE New York District; Rancho Palos Verdes, Rolling Hills Shoreline Erosion and Storm Damage Reduction Reconnaissance Study, Los Angeles, California, USACE Los Angeles District; Reconnaissance Study and Report for Flood Damage Prevention, St. Croix, U.S. Virgin Islands, USACE Jacksonville District; Reconnaissance Study and Report for Flood Damage Prevention, Sandusky River Basin, Ohio, USACE Buffalo District; Section 905(b) Flood Damage Reduction Reconnaissance Report, Lower Sabine River, Texas and Louisiana, USACE Galveston District; Section 205 Flood Damage Reduction Study, High School Branch, Newton County, Missouri, USACE Little Rock District; and Flood Damage Reduction Feasibility Study, Sweetwater Creek, Austell and Lithia Springs, Georgia, USACE Mobile District.

He has worked extensively with USACE conducting flood risk management analysis, performing economic calculations using the Hydrologic Engineering Center's (HEC) Flood Damage Assessment software (HEC-FDA 1.4.2). He has expertise in methodologies for estimating life loss via the use of HEC's LifeSim software (HEC-LifeSim 1.0) and/or Flood Impact Analysis software (HEC-FIA 3.0), and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review* (December 16, 2004).

The following are representative studies in which Mr. Ator has been involved: Depth-Damage Relationship Development for Structure, Contents, and Vehicles and Content to Structure to Value Ratios for Flood Risk Management Analysis and Benefit Calculations Using HEC-FDA, Morganza to the Gulf Feasibility Report, USACE New Orleans District; Structure and Content Depth Damage Determinations for HEC-FDA Economic Analysis for Structural Flood Risk Management Project, Ouachita Parish, Monroe and West Monroe, Louisiana, USACE, Vicksburg District; Structure and Content Depth/ Damage Relationship Development for HEC-FDA Economic Analysis for Structural Flood Risk Management Project, Lower River Des Peres, Watershed, Missouri, USACE, St. Louis District; Depth Damage Relationships for Structures, Contents, and Vehicles and Content-to-Structure Value Ratios for the Donaldsonville, Louisiana to the Gulf Flood Damage Reduction Feasibility Study, USACE, New Orleans District; Structure and Content Depth Damage Relationship Surveys for HEC-FDA Economic Analysis for Structural Flood Risk Management Project, Valley Park, Missouri, USACE, St. Louis District; Depth-Damage Relationship Development for Structure, Contents, and Vehicles and Content to Structure to Value Ratios Flood Risk Management Analysis and Benefit Calculations Using HEC-FDA, Lower Atchafalaya Floodway Reevaluation Report, USACE, New Orleans District; Development of Content to Structure Value Relationships for Urban Flood Control Economic Analysis, Cypress Creek, Texas, USACE, Galveston District; Donaldsonville to the Gulf - Flood Damage Risk Reduction Feasibility Study, Ascension, Assumption, St. James, St. John the Baptist, Lafourche, St. Charles, Jefferson, and Plaquemines, Parishes, Louisiana, USACE, New Orleans District; Pike and Levisa Counties, Kentucky, Structure Inventory Surveys, Flood Damage Reduction Study, USACE, Louisville District; and Orleans Parish, Louisiana, Urban Flood Control Feasibility Study, Structure Inventory, USACE, New Orleans District. He has also participated in the following IEPRs Dam Safety Modification Reports: Lewisville Dam, Dam Safety Modification Report and NEPA Document, Texas, USACE Fort Worth District, 2016; Bluestone Dam, Summers County, West Virginia, Draft Dam Safety Modification Report and NEPA Document, USACE Huntington District, 2016; and Dam Safety Modification Study, Rough River Dam,

Kentucky, USACE Louisville District, 2011, and Sutter Basin Pilot Feasibility Study (USACE Sacramento District).

Mr. Ator’s intimate familiarity with USACE plan formulation process, procedures, and standards is evidenced by the following examples of successfully completed risk management projects: Flood Damage Reduction Benefit Analysis Report, Imperial Valley, California, USACE Los Angeles District; Lower Rio Grande Basin, Flood Control and Major Drainage Project, Flood Damage Reduction Economic Benefits Texas, USACE Galveston District; Flood Damage Survey of Structures, Metro Louisville, Kentucky, USACE Louisville District; Analysis of Economic Development Benefits from the Construction of a Floodwall and Levee System along the Greenbrier River and Knapp Creek in Marlinton, West Virginia, USACE Huntington District; Greens Bayou Residual Flood Plain Properties Buyout Analysis, Texas, USACE Galveston District; Flood Damage Reduction Benefit Analysis for the Cerrillos Dam and Reservoir, Ponce, Puerto Rico, USACE Jacksonville District; Flood Proofing Costs and Benefits Analysis, Buffalo Bayou Watershed, Houston, Texas, USACE Galveston District; and Feasibility Study and EIS for Phase 2 General Reevaluation Report, L-8 Basin, West Palm Beach, Florida, USACE Jacksonville District.

Mr. Ator has extensive experience directly dealing with the USACE six-step planning process governed by ER 1105-2-100, Planning Guidance Notebook. He developed a template for preparing Project Management Plans (PMPs) for Feasibility Studies for USACE Regional Planning and Environment Division South in 2011 and field tested the template in 2012. In 2010 he served as a team leader while embedded in the Plan Formulation Branch directing plan formulation activities of three plan formulators, providing project oversight and review to ensure compliance with USACE guidelines.

Among the many projects completed by Mr. Ator are the following: Preparation of PMPs for Louisiana Coastal Ecosystem Restoration Study, Mississippi River Gulf Outlet, Louisiana, USACE New Orleans District; Economic Analysis of Alternate Regulation Plans for the Arkansas River, Oklahoma and Arkansas, USACE Tulsa District; Feasibility Report, Caño Martín Peña Ecosystem Restoration Project, San Juan, Puerto Rico, USACE Jacksonville District; Economic Analysis of Agricultural Flood Damages and Evaluation of the Impacts of Operational Changes, Lac Qui Parle Reservoir and the Minnesota River, Minnesota, USACE St. Paul District; Licking River Watershed and Dillon Lake Ecosystem Restoration Project Feasibility Study, Ohio, USACE Huntington District; and Missouri River Authorized Purposes Study Project Management Plan, Montana, Wyoming, Colorado, Kansas, North Dakota, South Dakota, Minnesota, Indiana, Nebraska, and Missouri, USACE, Omaha and Kansas City districts;

Mr. Ator is actively involved in related professional engineering and scientific societies, including the National Association for Business Economics, the Society of American Military Engineers, and the American Society of Civil Engineers.

Name	R. William Rudolph, P.E.
Role	Geotechnical Engineering
Affiliation	Independent Consultant

Mr. Rudolph is an independent geotechnical engineering consultant and has served as principal engineer and project manager on a wide variety of geotechnical projects throughout California and the West for over 30 years. He earned his M.S. in civil/geotechnical engineering in 1978 from the University of California at Berkeley and is a registered civil engineer and geotechnical engineer in California.

Mr. Rudolph specializes in flood control, earth fill dams and levees, and water resources projects. He is a geotechnical earthquake engineering expert with experience reviewing ground motions studies, liquefaction analyses, and seismic deformation analyses.

As the Principal Consultant for earth fill water supply reservoirs in California, he consulted on site selection, geologic and seismic assessment, and design alternatives, and provided recommendations for spillway design and modification and seepage cutoffs. His experience in piping and seepage failure mode analysis includes his involvement in the IEPR panel for the East St. Louis Flood Protection Project, which involved geotechnical engineering analysis of under-seepage and through-seepage as well as seepage mitigation alternatives; review of historic embankment seepage and piping problems; and review of geotechnical models, including the application of the blanket theory approach to under-seepage analysis and relief well design, and finite element seepage analyses (Seep/W). He also participated in the American River Common Features Project IEPR, for which he reviewed the geotechnical risk and reliability analysis of the embankments, including seepage, stability, and erosion analyses. He is familiar with the Sacramento District's Dam Safety Assurance Program, particularly seismic analysis, design, and remediation.

Mr. Rudolph has reviewed geotechnical models for (1) the Hamilton Wetlands Restoration Plan project levees (Novato, California), for which he used a variety of slope stability methods (including Spencer's Method) and interpreted computer outputs for Slope/W, UTEXAS4, and other slope stability programs, and (2) the Galbraith Upland Dredge Material Disposal Facility Port project (Oakland, California), for which he performed slope stability analyses for levee embankments on soft soils using UTEXAS4 and Slope/W. He has also participated in and reviewed advanced analytical models for static and seismic embankment deformation analysis using FLAC and recently completed a training course given by PLAXIS. Mr. Rudolph is also quite familiar with the DAMRAE software and the fundamentals of event tree analysis for dam safety risk.

Name	Peter Baril, P.E.
Role	H&H Engineering
Affiliation	GZA GeoEnvironmental, Inc

Mr. Baril is a principal and hydrologic engineer with GZA GeoEnvironmental, Inc. in Norwood, Massachusetts and a registered professional engineer in Massachusetts, Maine, Connecticut, and New Hampshire. He has over 38 years of experience in the fields of dam and water resources engineering and specializes in urban hydrology, flood control analysis and design, and surface water hydrology and open channel hydraulics. Much of his project experience has been focused in the areas of dam safety inspections, emergency action planning, and design/improvement of spillways and related hydraulic structures. Mr. Baril has made presentations to various regulators associated with project permitting at the local, state, and Federal levels and has provided expert witness testimony and value engineering consulting on water resource related projects. Mr. Baril is well-versed in hydrologic processes that rely on the latest state-of-the-practice computer applications, hydraulic modeling of riverine systems using HEC-RAS and two-dimensional dam break simulations. He is familiar with, and has participated in, technical review sessions for dam repair-related projects for the New York City (NYC) Office of Management and Budget/NYC Department of Environmental Protection (DEP) site visits (Gilboa and New Croton Dams) and workshops, with primary focus on augmenting spillway capacity to safely pass design floods. Mr. Baril

is well-versed in his area of expertise and can coordinate, interpret, and explain testing results with other engineering disciplines about hydrologic and hydraulic analyses.

He was a member of a panel of experts, hired by the NYC Office of Management and Budget, to provide detailed engineering review of the proposed improvements to the NYCDEP's Gilboa Dam to ensure its operation for another 100 years and to meet the current New York State Department of Environmental Conservation (NYSDEC) dam safety guidelines for existing dams. Mr. Baril evaluated the hydrologic and hydraulic aspects of the proposed reconstruction during value engineering sessions held both at the 30% and 60% design phase.

Mr. Baril was a member of the IEPR panel at Lake Isabella Dam, California, that reviewed the geotechnical, hydrological, hydraulic, structural, and economic aspects of the Dam Safety Modification Report. Mr. Baril worked as a subcontractor to Battelle for this assignment. The IEPR team evaluated the proposed \$500M design repairs at this critical flood control dam near Bakersfield, California. Mr. Baril's role was to review and comment on the USACE's Final Hydrology Report, Spillway Adequacy Study, and associated Baseline Risk Assessment Report. Much of Mr. Baril's efforts focused on the risk-informed decision-making methods employed for evaluating hydrologic loading probability characteristics, probabilities of overtopping potential failure mode, population at risk, and loss of life consequences.

Mr. Baril is currently part of a three-member subject matter expert team reviewing the design work performed by the Joint Venture Design Team dealing with development of spillway design criteria for the spillway structures associated with Ashokan Reservoir/Olive Bridge Dam, located in the Catskill Region of New York State. Ashokan is a key water supply reservoir owned and operated by the NYCDEP. Mr. Baril is reviewing and commenting on design documents and attending periodic workshops hosted by NYCDEP and the Joint Venture Design Team associated with meteorological methods and results dealing with the development of the Site-Specific Probable Maximum Precipitation as well as hydrologic and hydraulic methods associated with the estimation of the Probable Maximum Flood (PMF) and overtopping potential.

Mr. Baril was Principal-in-Charge of the hydrologic review of the spillway capacity for the USACE's Knightville Dam, a 160-foot high, 1,200-foot long earthen flood control structure located in western Massachusetts. Mr. Baril and his engineering staff reassessed the spillway design flood hydrograph for the 162 square mile water shed and estimated the magnitude of Threshold Flood. As part of the work, his firm evaluated various structural modifications to the spillway to pass the design flood (Probable Maximum Flood), review outlet works operation, and conduct dam break routing simulations for the USACE New England District.

He was also Principal-in-Charge of the oversight of a detailed engineering safety inspection and facilities planning study for Nepaug Reservoir Dam, Metropolitan District (Hartford, Connecticut). The work involved visual inspection of this 112-foot high concrete gravity dam and related embankment structures (Phelps Brook Dam and East Dike) and coordination of subcontractor field activities such as underwater diving and remotely operated vehicle inspection of intake structures and structural inspection of the bridge spanning the Nepaug spillway. Other engineering aspects of the project included drilling of concrete and underlying bedrock as well as shear testing of core samples. Critical analyses included detailed spillway design flood studies to access capacity under the full PMF as well as embankment and gravity section stability evaluations under static and seismic loading conditions. Results are being used by the District for ongoing capital planning and construction improvements.

As Principal-in-Charge of Dam Safety Repairs at West Hartford, CT Reservoir Dam No. 2, Mr. Baril was involved in designing repairs and submitting permit applications for repairs at the dam. Design modifications were intended to address embankment seepage and slope stability issues, as well as provide sufficient spillway capacity to pass the Spillway Design Flood, and upgrade outlets works to eliminate the original (100-year old) charged pipes through the embankment. Design repairs included regrading of downstream face, including installation of toe drains for improved stability and seepage control; repairs to low level outlets to provide gate control on the upstream side of the dam; addition of an auxiliary spillway to provide sufficient capacity and minimum freeboard under the design flood (full PMF) and breaching of a division dike to allow water to flow from the larger main basin to the new auxiliary spillway. The rehabilitation was successfully completed in 2013.

Mr. Baril served as NYCDEP liaison and Deputy Project Director for the investigation of Catskill and Delaware district dams. This investigatory contract included hydrology, hydraulics, PMF and related spillway capacity studies, and Emergency Action Plan (EAP) development. His role also included coordination of intake and release chamber inspections and underwater surveys and facilitation of hydrology, EAP, and inspection reports.

Mr. Baril was also Principal-in-Charge of the Wachusett Dam Spillway improvements in Clinton, Massachusetts. The Wachusett Dam is a critical element in the Metropolitan Boston Water Supply system. The stone dam and two earthen dikes were designed in the 1890s and constructed at the turn of the century. Changes in the design standards for the spillway test flood and seismic conditions for the dam and dikes resulted in a design study to recommend improvements. The spillway capacity was inadequate for the increased inflow generated by an HMR52-based PMF. As part of the design team, Mr. Baril evaluated and compared various combinations of spillway discharge channel improvements, crest modifications, and reservoir rim raising. Aesthetic constraints to maintain the character of the original structures were also factored into the design process. Mr. Baril is currently the Principal-in-Charge, responsible for the preparation of final design drawings and specifications for the Massachusetts Water Resources Authority. He also took the lead in bringing the project successfully through the Massachusetts Environmental Policy Act review process. The recommended plan was successfully constructed in 2008.

Name	Phillip Brozek, P.E.
Role	Civil/Relocations Engineering
Affiliation	Brozek & Associates

Mr. Brozek is a principal with Brozek & Associates with 36 years of experience as a practicing professional engineer in California. In his current position, Mr. Brozek provides analysis and consultation to governments, non-profits, and private business in the development and review of project plans to implement a wide range of desired outcomes for capital, natural resource conservation, and infrastructure projects. He earned his B.S. in civil engineering in 1979 from California State University, Sacramento, and is a registered professional engineer in California and Oregon. Mr. Brozek holds a Certificate in Hazardous Material Management from the University of California Extension, Davis, an Associate's Certificate in Project Management from George Washington University, and was a founding member of the Practitioner Advisory Committee at the California State University Sacramento, Department of Civil Engineering.

Mr. Brozek has very extensive experience with the USACE project implementation process, gained through more than 30 years of service at the USACE Sacramento District in diverse roles that included

construction Resident Engineer, engineering design section chief, and Senior Project Manager. Mr. Brozek has presented material to the Society of American Military Engineers about USACE Planning Modernization and on dam safety, and to state agencies and regional planning agency boards on the USACE Civil Works process and implementation. Mr. Brozek's portfolio of work includes leadership positions managing structural flood risk reduction projects, environmental restoration projects, conjunctive use projects, independent scoping assessments, dam modification projects that include significant attention to dam safety, accident investigation, and technical reviews of studies and project execution documents. Example projects include Folsom Dam Raise, Folsom Dam Auxiliary Spillway Joint Federal Project (JFP), Folsom Dam Revision to Water Control Manual, panel member for five USACE IEPRs, agency lead in the \$3.5 billion multi-agency restoration effort of the Lake Tahoe Basin, the South Sacramento Stream Group flood risk reduction and environmental restoration project, the San Lorenzo River flood risk reduction and environmental restoration project, the Yuba River General Reevaluation Report, and the Glenn-Colusa Irrigation District Gradient Control Facility (included fish passage facilities and post project monitoring) on the Sacramento River, San Lorenzo River Levee Vegetation Variance analysis, co-architect on a watershed-scale approach to aquatic invasive species management including basic and applied scientific research, monitoring plans, and integrated management and operation plans.

While a USACE Construction Engineer and Resident Engineer (1981-1991), USACE Senior Project Manager (1998-2009), and as Principal with Brozek & Associates, Mr. Brozek conducted reviews of project cost estimates using MCACES II (and predecessor) software as part of project review for planning, design, and construction documents. He is familiar with the development of flood risk unit costs (cubic yard unit price for embankments, square yard unit cost for floodwalls) and values for construction and operation and maintenance real estate easements. Mr. Brozek has direct experience documenting and managing cost and schedule risk. Mr. Brozek recognizes the importance of properly quantifying the project contingency factor, especially in this era of risk-based USACE decisions under Planning Modernization/SMART Planning.

Mr. Brozek has consulted for USACE Sacramento, in the period before the Risk Management Center was up and running, in implementation of Agency Technical Reviews and assisted in implementing Type II IEPRs in accordance with EC1165-2-209/214. Mr. Brozek is capable of addressing the USACE Safety Assurance Review (SAR) aspects of projects.

APPENDIX C

Final Charge for the Whittier Narrows Dam DSMR IEPR

This page is intentionally left blank.

Charge Questions and Guidance to the Panel Members for the Independent External Peer Review (IEPR) of the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report

This is the final Charge to the Panel for the Whittier Narrows Dam DSMR IEPR. This final Charge was submitted to USACE as part of the final Work Plan, originally submitted on November 2, 2018.

The dates and page counts in this document have not been updated to match actual changes made throughout the project.

BACKGROUND

Whittier Narrows Dam is located at a natural gap in the hills that form the southern boundary of the San Gabriel Valley, in Los Angeles County, California, approximately 7.5 miles downstream from the Santa Fe Flood Control Basin. The Rio Hondo and the San Gabriel River flow through this gap and flood flows are constrained by the dam. The construction of the dam was authorized by the Flood Control Act of 1941 for the primary purpose of flood control. Recreation is a secondary purpose, as authorized by the Flood Control Act of 1944. A third purpose of the dam was set forth by the Chief of Engineers in 1956 for water conservation. The Federal government owns the project and the U.S. Army Corps of Engineers (USACE) operates and maintains the dam and all associated flood control facilities. Construction began in March 1950 on the first major contract for the project, and the final major contract was completed in March 1957. The dam consists of an approximately 16,960-foot-long earth embankment (designated west, central, and east) and two gated outlet structures. The outlet works discharge into the Rio Hondo, and the spillway discharges into the San Gabriel River. The reservoir is normally empty and a “crossover weir” within the reservoir diverts lower flows from the San Gabriel River to the Rio Hondo. Whittier Narrows Dam is located at the southern limit of the San Gabriel Valley, near the intersection of State Highway 60 and Interstate Highway 605, approximately 12 miles east of downtown Los Angeles.

An Issue Evaluation Study (IES) completed in March 2011 confirmed safety issues at the Whittier Narrows Dam and recommended the study proceed to the Dam Safety Modification Study (DSMS) phase. The DSMS is now nearing completion and Whittier Narrows Dam is currently classified as a Dam Safety Action Classification (DSAC) 1. The primary potential failure mode (PFM) contributors to the risk are backward erosion piping (PFM 4) and overtopping (PFM 21). Under Future without Federal Action Conditions, the annual probability of failure (APF) exceeds USACE’s guideline ($1E-4$) by greater than half-order of magnitude; the average annual life loss exceeds guideline by approximately three orders of magnitude.

The purpose of the DSMS is to identify a plan that, when implemented, will bring the APF and associated consequences to or below tolerable risk guidelines. Structural and nonstructural measures were identified and evaluated to address the significant risk driving PFMs.

OBJECTIVES

The objective of this work is to conduct an independent external peer review (IEPR) of the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DSMR) (hereinafter: Whittier Narrows Dam DSMR IEPR) in accordance with the Department of the Army, USACE, Water Resources Policies and Authorities’ *Review Policy for Civil Works* (Engineer Circular [EC] 1165-2-217, dated February 20, 2018), and the Office of Management and Budget’s (OMB’s) *Final Information Quality Bulletin for Peer Review* (December 16, 2004). Peer review is one of the important procedures used to ensure that the quality of published information meets the standards of the scientific and technical

community. Peer review typically evaluates the clarity of hypotheses, validity of the research design, quality of data collection procedures, robustness of the methods employed, appropriateness of the methods for the hypotheses being tested, extent to which the conclusions follow from the analysis, and strengths and limitations of the overall product.

The purpose of the IEPR is to “assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, models used in evaluation of economic or environmental impacts, and any biological opinions” (EC 1165-2-217; p. 39) for the decision documents. The IEPR will be limited to technical review and will not involve policy review. The IEPR will be conducted by subject matter experts (i.e., IEPR panel members) who meet the technical criteria and areas of expertise required for and relevant to the project.

The Panel will be “charged” with responding to specific technical questions as well as providing a broad technical evaluation of the overall project. Per EC 1165-2-217 (p. 41), review panels should identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods. Review panels should be able to evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable. Reviews should focus on assumptions, data, methods, and models. The panel members may offer their opinions as to whether there are sufficient analyses upon which to base a recommendation.

DOCUMENTS PROVIDED

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

Review Documents	No. of Review Pages	Subject Matter Experts				
		Environmental/NEPA Impact Assessment	Consequence/Planning	Geotechnical Engineer	H&H Engineer	Civil/Relocations Engineer
DSMR Main Report	100	100	100	100	100	100
Appendix A Risk Assessment	310	310	310	310	310	310
Appendix B Cost Engineering	100		100			
Appendix C Draft Environmental Impact Statement	800	800				
Appendix D Hydrologic and Hydraulic Engineering	663				663	
Appendix E Spillway Gates	419			419	419	419
Appendix F Constructability Review	20	20	20	20	20	20
Appendix G Geotechnical Engineering	231			231		
Appendix J Real Estate Plan	30	30	30			
Appendix L Plans 3E and 5	24	24	24	24	24	24

Review Documents	No. of Review Pages	Subject Matter Experts				
		Environmental/NEPA Impact Assessment	Consequence/Planning	Geotechnical Engineer	H&H Engineer	Civil/Relocations Engineer
Appendix M Plan Formulation	75	75	75	75	75	75
Public Review Comments and Responses*	50	50	50	50	50	50
Total Number of Review Pages	2,822	1409	709	1229	1661	998

* Page count for public comments is approximate. USACE will submit public comments to Battelle, which will in turn submit the comments to the IEPR Panel.

Documents for Reference

General

- EC 1105-2-412, Assuring Quality of Planning Models, 31 March 2011
- EC 1165-2-217, Review Policy for Civil Works, 20 February 2018
- ER 500-1-1, Civil Emergency Management Program
- ER 1110-1-12, Engineering and Design - Quality Management, 31 March 2011 (change 2)
- ER 1110-2-1150, Engineering and Design - Engineering and Design for Civil Works Projects, 31 August 1999
- ER 1110-2-1156, Engineering and Design - Safety of Dams - Policy and Procedures, 31 March 2014
- ER 1110-1-8159, Engineering and Design - DrChecks, 10 May 2001
- ER 1105-2-101, Risk Analysis for Flood Damage Reduction Studies
- National Academy of Sciences, "Policy on Committee Composition and Balance and Conflicts of Interest for Committees Used in the Development of Reports," May 2003 for General Scientific and Technical Studies and Assistance. Available at: http://www.nationalacademies.org/site_assets/groups/nasite/documents/webpage/na_069688.pdf
- Water Resources Development Act of 2007, Sections 2034 & 2035, Pub. L. 110-114. Privacy Act, 5 U.S.C. § 522a as amended
- Best Practices in Dam and Levee Risk Analysis: <https://www.usbr.gov/ssle/damsafety/risk/methodology.html>

Environmental/Planning

- ER 1105-2-100, Guidance for Conducting Civil Works Planning Studies. CECWP, 28 December 1990
- Council on Environmental Quality. 1978. Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act. 40 CFR Parts 1500-1508. Washington, DC: U.S. Government Printing Office, 29 November 1978).
- ER 200-2-2, Environmental Quality, Procedures for Implementing NEPA. CECWRE (now CECW-A), 4 March 1988
- National Environmental Policy Act of 1969
- National Historic Preservation Act of 1966
- 36 CFR 800

- Endangered Species Act
- Clean Air Act
- Clean Water Act
- Migratory Bird Treaty Act
- National Historic Preservation Act
- Engineer Regulation 200-1-5, Policy for Implementation and Integrated Application of the USACE Environmental Operating Principles (EOP) and Doctrine and Sustainability
- Executive Order 12898, Federal Actions to Address Environmental Justice in
- Minority Populations and Low-Income Populations
- Executive Order 13045 Protection of Children from Environmental Health Risks and Safety Risks

Geotechnical Engineering

- EM 1110-2-1901, Engineering and Design - Seepage Analysis and Control for Dams, 30 April 1993
- EM 1110-2-1908, Instrumentation of Embankment Dams and Levees
- EM 1110-2-1913, Engineering and Design - Design and Construction of Levees, 30 April 2000
- EM 1110-2-1914, Engineering and Design – Design, Construction, and Maintenance of Relief Wells, 29 May 1992
- ETL 1110-2-556 (or most recent guidance), Risk-based Analysis in Geotechnical Engineering for Support of Planning Studies or more current Hydraulic Engineering
- EM 1110-2-1413, Hydrologic Analysis of Interior Areas, 15 January 1987
- EM 1110-2-1415, Hydrologic Frequency Analysis, 5 March 1993
- EM 1110-2-1416, River Hydraulics, 15 October 1993
- EM 1110-2-1619, Risk-Based Analysis for Flood Damage Reduction Studies, 1 August 1996
- EM 1110-2-2902, Engineering and Design - Conduits, Culverts, and Pipes, 31 March 1998
- MMC Production Center, Application of Simplified Physical Breach Method in HEC-RAS, 2 December 2016
- MMC Production Center, Levee Widening Erosion Rates, February 2016
- MMC Production Center, Standard operating procedures–Modeling, mapping and consequences, June 2014
- MMC Production Center, Modification of MMC Levee Analysis Standard Operation Procedure to Include Additional Overtopping Scenarios, January 2018

Peer Review

- USACE guidance *Review Policy for Civil Works*, (EC 1165-2-217, 20 February 2018)
- Office of Management and Budget's *Final Information Quality Bulletin for Peer Review*, 16 December 2004).

SCHEDULE & DELIVERABLES

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

Task	Action	Due Date
3	Subcontractors complete mandatory Operations Security (OPSEC) training	11/29/2018
	Battelle convenes kick-off meeting with USACE	10/31/2018
	Battelle sends review documents to panel members	12/4/2018
	Battelle convenes kick-off meeting with panel members	11/2/2018
	Battelle convenes site visit for panel members to view project specific locations	11/6/2018
	Battelle convenes mid-review teleconference for panel members to ask clarifying questions of USACE	12/27/2018
4	Panel members complete their individual reviews	1/4/2019
	Battelle provides talking points for Panel Review Teleconference to panel members	1/8/2019
	Battelle convenes Panel Review Teleconference	1/9/2019
	Battelle provides Final Panel Comment templates and instructions to panel members	1/10/2019
	Panel members provide draft Final Panel Comments to Battelle	1/16/2019
	Battelle provides feedback to panel members on draft Final Panel Comments; panel members revise Final Panel Comments	1/17/2019 1/24/2019
	Panel finalizes Final Panel Comments	1/25/2019
4¹	Battelle receives public comments from USACE	1/21/2019
	Battelle sends public comments to Panel	1/22/2019
	Panel completes its review of public comments	1/25/2019
	Battelle and Panel review the Panel's responses to the charge question regarding the public comments	1/28/2019
	Panel drafts Final Panel Comment for public comments, if necessary	1/30/2019
	Panel finalizes Final Panel Comment regarding public comments, if necessary	2/1/2019
5	Battelle provides Final IEPR Report to panel members for review	2/5/2019
	Panel members provide comments on Final IEPR Report	2/7/2019
	*Battelle submits Final IEPR Report to USACE	2/11/2019
	USACE Risk Management Center (RMC) provides decision on Final IEPR Report acceptance	2/19/2019

Task	Action	Due Date
6	Battelle inputs Final Panel Comments to Design Review and Checking System (DrChecks) and provides Final Panel Comment response template to USACE	2/21/2019
	Battelle convenes teleconference with Panel to review the Comment Response process	2/21/2019
	USACE Project Delivery Team (PDT) provides draft Evaluator Responses to USACE RMC for review	2/21/2019
	USACE RMC reviews draft Evaluator Responses and works with USACE PDT regarding clarifications to responses, if needed	3/7/2019
	USACE RMC provides draft PDT Evaluator Responses to Battelle	3/13/2019
	Battelle provides draft PDT Evaluator Responses to panel members	3/14/2019
	Panel members provide draft BackCheck Responses to Battelle	3/18/2019
	Battelle convenes teleconference with panel members to discuss draft BackCheck Responses	3/21/2019
	Battelle convenes Comment Response Teleconference with panel members and USACE	3/22/2019
	USACE inputs final PDT Evaluator Responses to DrChecks	3/25/2019
	Battelle provides final PDT Evaluator Responses to panel members	4/1/2019
	Panel members provide final BackCheck Responses to Battelle	4/2/2019
	Battelle inputs panel members' final BackCheck Responses to DrChecks	4/5/2019
	*Battelle submits pdf printout of DrChecks project file	4/8/2019

* Deliverables

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

CHARGE FOR PEER REVIEW

Members of this IEPR Panel are asked to determine whether the technical approach and scientific rationale presented in the decision documents are credible and whether the conclusions are valid. The Panel is asked to determine whether the technical work is adequate, competently performed, and properly documented; satisfies established quality requirements; and yields scientifically credible conclusions. The Panel is being asked to provide feedback on the economic, engineering, environmental resources, and plan formulation. The panel members are not being asked whether they would have conducted the work in a similar manner.

Specific questions for the Panel (by report section or appendix) are included in the general charge guidance, which is provided below.

General Charge Guidance

Please answer the scientific and technical questions listed below and conduct a broad overview of the decision documents. Please focus your review on the review materials assigned to your discipline/area of expertise and technical knowledge. Some sections have no questions associated with them; however, you may still comment on them. Please feel free to make any relevant and appropriate comment on any of the sections and appendices you were asked to review. In addition, please note that the Panel will be asked to provide an overall statement related to 2 and 3 below per USACE guidance (EC 1165-2-217).

1. Your response to the charge questions should not be limited to a “yes” or “no.” Please provide complete answers to fully explain your response.
2. Assess the adequacy and acceptability of the economic and environmental assumptions and projections, project evaluation data, and any biological opinions of the project study.
3. Assess the adequacy and acceptability of the economic analyses, environmental analyses, engineering analyses, formulation of alternative plans, methods for integrating risk and uncertainty, and models used in evaluating economic or environmental impacts of the proposed project.
4. If appropriate, offer opinions as to whether there are sufficient analyses upon which to base a recommendation.
5. Identify, explain, and comment upon assumptions that underlie all the analyses, as well as evaluate the soundness of models, surveys, investigations, and methods.
6. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
7. Please focus the review on assumptions, data, methods, and models.

Please **do not** make recommendations on whether a particular alternative should be implemented, or whether you would have conducted the work in a similar manner. Also, please **do not** comment on or make recommendations on policy issues and decision making. Comments should be provided based on your professional judgment, **not** the legality of the document.

1. If desired, panel members can contact one another. However, panel members **should not** contact anyone who is or was involved in the project, prepared the subject documents, or was part of the USACE Agency Technical Review (ATR).
2. Please contact the Battelle Program Manager (Lynn McLeod; mcleod@battelle.org) for requests or additional information.
3. In case of media contact, notify the Battelle Program Manager, Lynn McLeod (mcleod@battelle.org) immediately.
4. Your name will appear as one of the panel members in the peer review. Your comments will be included in the Final IEPR Report but will remain anonymous.

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

Independent External Peer Review of the Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DSMR)

Charge Questions and Relevant Sections as Supplied by USACE

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

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

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

Panel review comments are to be structured to fully communicate the Panel’s intent by including the comment, why it is important, any potential consequences of failure to address, and suggestions on how to address the comment. The Review Panel is asked to consider the following items as part of its review of the decision document and supporting materials.

Broad Evaluation Review Charge Questions

1. Are the need for and intent of the decision document clear?
2. Does the decision document adequately address the stated problem and intent relative to scientific and technical issues?
3. Do the methodologies used to inform the risk assessment align with accepted industry and scientific practices?

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

4. Project evaluation data used in the study analyses
5. Economic, life safety, environmental, and engineering assumptions that underlie the study analyses

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

Further:

12. Evaluate whether the interpretations of analysis and the conclusions based on analysis are reasonable.
13. Evaluate whether the life safety consequences are reasonable.
14. 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:

15. The models used to assess life safety hazards are appropriate
16. The tradeoffs of protecting life safety versus accepting risk for high consequence/low probability events have been adequately evaluated, including consideration of uncertainty
17. The assumptions made for the life safety hazards are appropriate
18. 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
19. 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
20. From a public safety perspective, the proposed alternative is reasonably appropriate or are there other alternatives that should be considered.

Specific Technical and Scientific Review Charge Questions

Plan Formulation/Evaluation

21. Was a reasonably complete array of possible measures considered in the development of alternatives, including non-structural measures?

Civil

22. Do the drawings provide adequate detail to illustrate and describe the alternatives?
23. Are the major scope items adequately captured, described, and illustrated so as to enable the development of an appropriate cost estimate with appropriate contingencies?
24. Are constructability issues addressed in adequate detail?
25. Is the intent of the TSP work limits adequately illustrated and described?

Geotechnical

26. Does the study clearly characterize the pertinent geologic conditions of the dam's foundation?
27. Does the study clearly describe the geological investigations and supporting studies completed to date?
28. Is the basis of the anticipated performance of the foundation with and without modifications appropriately documented? Is the anticipated performance of the foundation reasonable?

Hydrology and Hydraulics

29. Is the hydrology discussion sufficient to characterize current baseline conditions and to allow for evaluation of how forecasted conditions (with and without proposed actions) are likely to affect hydrologic conditions?
30. Is the hydrologic loading curve supported to the level to support the risk management plan selection?
31. Are the methodologies used to assess hydrologic loading and flood frequency appropriate?
32. Is the flood frequency analysis sufficient to support a decision to accept the risk of overtopping?
33. Is the anticipated performance of the TSP reasonable?

Environmental

34. Was the discussion of natural resources sufficient to characterize current baseline conditions and to allow for evaluation of forecasted conditions (with and without proposed actions)?
35. Are the analyses of the human environment including socio-economic and natural resources within the project area sufficient to support the estimation of impacts of the final array of alternatives?

36. Did the formulation process follow the requirement to avoid, minimize, and then mitigate adverse impacts on resources?
37. Does the conceptual mitigation compensate for unavoidable impacts as appropriate?
38. Does the supplemental EIS meet the NEPA requirements and implementing ER 200-2-2?

Battelle Summary Charge Questions to the Panel Members¹

Summary Questions

39. 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.
40. Please provide positive feedback on the project and/or review documents.

Public Comment Questions

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

¹ Questions 39 through 41 are Battelle-supplied questions and should not be construed or considered part of the list of USACE-supplied questions. These questions were delineated in a separate appendix in the final Work Plan submitted to USACE.

This page is intentionally left blank.

APPENDIX D

Conflict of Interest Form

This page is intentionally left blank.

David Kaplan
USACE, Institute for Water Resources
September 20, 2018
C-2

Conflicts of Interest Questionnaire
Independent External Peer Review

Whittier Narrows Dam, Los Angeles, California Dam Safety Modification Report (DSMR)

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: **Jason Jenkins**
TELEPHONE: **614-424-4873**
ADDRESS: **505 King Avenue, Columbus, Ohio 43201**
EMAIL ADDRESS: **jenkinsj@battelle.org**

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

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

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

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

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

No additional information to report.



Jason Jenkins

9/20/2018

Date

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

BATTELLE

It can be done