



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS  
441 G STREET, NW  
WASHINGTON, DC 20314-1000

AUG 14 2019

CECW-SPD

MEMORANDUM FOR Assistant Secretary Of The Army (Civil Works), 108 Army  
Pentagon, Washington, D.C. 20310-0108

SUBJECT: Whittier Narrows Dam, Los Angeles, California, Dam Safety Modification  
Report

1. An Independent External Peer Review (IEPR) was conducted for the subject project in accordance with Section 2034 of the Water Resource Development Act of 2007, Engineering Circular (EC) 1165-2-217, and the Office of Management and Budget's Final Information Quality Bulletin for Peer Review (2004).
2. Battelle Memorial Institute, a not-for-profit science and technology organization with experience in establishing and administering peer review panels for the U.S. Army Corps of Engineers (Corps), was engaged to conduct the IEPR for the Whittier Narrows Dam Safety Modification Report and its supporting documentation. The IEPR panel consisted of five members with expertise in civil works planning/consequence economics, biological resources and environmental law compliance, geotechnical engineering, civil engineering/relocations, and hydrology and hydraulic engineering.
3. The enclosed document contains the approved final written responses of the Chief of Engineers to the issues raised and the recommendations contained in the IEPR Report. The IEPR Report and the Corps responses have been coordinated with the vertical team and will be posted on the internet, as required by EC 1165-2-217.
4. Questions or concerns should be directed to Bradd Schwichtenberg, Deputy Chief, South Pacific Division Regional Integration Team, at (202) 761-1367.

Encl

A handwritten signature in blue ink, appearing to read "J. Dalton".

JAMES C. DALTON, P.E.  
Director of Civil Works

**Whittier Narrows Dam, California  
Dam Safety Modification Report**

**U.S. Army Corps of Engineers Response to  
Independent External Peer Review  
July 2019**

Independent External Peer Review (IEPR) was conducted for the Whittier Narrows Dam, California, Dam Safety Modification Study in accordance with Section 2034 of the Water Resources Development Act of 2007, the U.S. Army Corps of Engineers (USACE) peer review policy (currently, Engineer Circular 1165-2-217) and the Office of Management and Budget's *Final Information Quality Bulletin for Peer Review (2004)*. The goal of the USACE Civil Works program is to always provide scientifically sound, sustainable water resources solutions for the nation. The USACE review processes are essential to ensuring project safety and quality of the products USACE provides to the American people.

Battelle Memorial Institute (Battelle), a non-profit science and technology organization with experience in establishing and administering peer review panels for the USACE, was engaged to conduct the IEPR for the Whittier Narrows Dam, California, Dam Safety Modification Study (DSMS), and its supporting documentation. Battelle identified potential candidates for the Panel in the following key technical areas: National Environmental Policy Act (NEPA) impact assessment, consequences/planning, hydrology and hydraulic engineering, geotechnical engineering, and civil/relocations engineering. Battelle made the final selection of the five-person Panel.

Battelle issued its Final IEPR Report on May 1, 2019, to include consideration of public review comments that were received subsequent to finalization of the initial report. Overall, 19 Final Panel Comments were identified and documented. Of these, one was identified as having medium significance, nine had a medium/low significance, and nine had low significance.

USACE concurred with 16 comments and non-concurred with three comments. As a result of the Panel Backcheck and subsequent USACE responses, 52 recommendations were proposed. Of these 52 recommendations, 35 were adopted and 17 were not adopted. The following discussion presents the Final Response by the Agency to the 19 comments.

**1. IEPR Comment - *Significance – Medium.* The utility relocation assumptions cannot be assessed without a spatial conflict analysis or consultation with utility companies on the relocation work to be performed.**

This comment includes five recommendations. All five recommendations were adopted.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** Section 3.5.3 has been expanded to provide the assumptions, uncertainties, and consequences of the uncertainty regarding utility and well relocations. An assumption is that in general, the utilities will be relocated to their original location as the required site modifications are completed. The cost allocation for the relocations will be based upon the existing agreements. For example, multiple utilities traverse the dam in Lincoln Avenue to the west. These utilities will be relocated within the road as it is raised at Government expense (per the Real Estate Appendix). Likewise, the four to seven active utilities which cross the embankment in the three galleries (tunnels built under the dam during the original construction) will be relocated in place at Government expense. Several utilities were installed by entities other than USACE using Section 408 permits following completion of the dam and will be relocated by the owners as necessary. Available space is not generally anticipated to be the most significant constraint. Negotiating with the owners on relocation costs and schedule are believed to be the highest risk issues.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** These details will be developed during Preconstruction Engineering and Design (PED). As mentioned in Section 3.5.4 of the DSMR, “Significant additional studies will be required during PED to assess the nature and depth of the energy dissipation system, how it integrates with the trench drain, and the impacts to existing infrastructure (roads, utilities).”

The team plans to temporarily relocate the utilities where they exit the gallery, do the required foundation work, and return the utilities to the approximate same alignment. At all three locations downstream of the dam, the space opens up. The most critical area will be in the immediate vicinity of the gallery.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** Refinement of the assessment of feasibility with more detailed evaluations of the energy dissipation system will be performed in PED, as mentioned in Section 3.5.4. At that time, the draft alignments and proposed designs for the modifications will be refined for meetings with the utility owners.

**Recommendation 4.** Consider modifying the Roller Compacted Concrete (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.

**USACE Response: Adopted**

**Actions Taken:** Modifying the RCC slope inclination is one of the suite of measures that will be evaluated during PED. It is one of the design considerations for the trench drain uncertainty that will need to be addressed during PED, as mentioned in Section 3.5.4.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** The estimated costs have been added as recommended in Section 14 of Appendix J and match those on the Total Project Cost Summary.

2. **IEPR Comment 2 - *Significance – Medium/Low*. The assumption that using the “rain-on-grid” method adequately accounts for the non-linearity under flood flows approaching the Probable Maximum Flood (PMF) is not supported.**

This comment includes one recommendation which was adopted.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** A summary of the research articles and USACE Hydrology Committee review was provided and included in the Introduction section (Overview of Previous Studies PMF Studies) of the PMF Analysis Report of Appendix D, and in Table 2 in the same section. 2-dimensional modeling to evaluate the PMF was presented to and accepted by the USACE Hydrology Committee in 2017.

3. **IEPR Comment 3 - *Significance – Medium/Low.* The Draft Environmental Impact Statement (DEIS) does not describe compliance with various National Environmental Policy Act (NEPA) environmental statutes and regulations that may be pertinent to the project.**

This comment includes one recommendation which was adopted.

**Recommendation 1.** Update the DEIS to reflect compliance with the statutes and regulations listed with the following: Magnuson-Stevens Fisheries Conservation and Management Act, Wild & Scenic Rivers Act, Resource Conservation and Recovery Act, Coastal Zone Management Act, Bald & Golden Eagle Protection Act, and Rivers & Harbors Act.

**USACE Response: Adopted**

**Actions Taken:** The following sections of the DEIS have been revised to address compliance with the Bald and Golden Eagle Protection Act of 1940 (BGEPA); sections 5.5.1 and 8.3.7 contain information about the biological resources and applicable statutes associated with BGEPA, respectively.

The remaining acts do not apply to the project. The Magnuson-Stevens Fishery Management and Conservation Act does not apply because there is no Essential Fish Habitat (EFH) within the San Gabriel River or the Rio Hondo, there are no fish in the rivers as they are dry 90% of the year, and the EFH applies to the marine zone. The Wild and Scenic Rivers Act does not apply because neither the San Gabriel River nor the Rio Hondo are designated as such, there is no recreation within the rivers, there is no remarkable scenery, and neither have a historic value as they were realigned by USACE in the mid-20<sup>th</sup> century. The Resource Conservation and Recovery Act does not apply because no materials classified as hazardous are proposed to be used for the project. The Coastal Zone Management Act does not apply because Whittier Narrows Dam is located 17 miles upstream of the Pacific Ocean and does not have any tidal or estuary influence. Both rivers are dry 90% of the year and no effects of the project or the alternatives would reach the coastal zone. The Rivers and Harbors Act does not apply because the project would not alter the course, location, condition, or capacity of the rivers.

4. **IEPR Comment 4 - *Significance – Medium/Low.* The DEIS and the Dam Safety Modification Report (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.**

This comment includes three recommendations, all of which were adopted.

**Recommendation 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 Recognized Environmental Conditions (RECs) exist on the property.

**USACE Response: Adopted**

**Actions Taken:** As noted in Section 5.8.3 of the EIS, the lessee will be required to demonstrate that the portion of land on the Government easement is free of Hazardous, Toxic, and Radioactive Waste (HTRW) concerns. Specifically, environmental commitment HW-6 states, “As a condition for termination of the easement utilized by the Whittier Fertilizer Company, the City of Pico Rivera will be required to demonstrate that the soils are free from harmful contaminants and mitigate as required by the Corps of Engineers.”

**Recommendation 2.** Update the DEIS for each Risk Management Plan and the Tentatively Selected Plan (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.

**USACE Response: Adopted**

**Actions Taken:** Sections 4 and 5 have been revised to reflect that the lessee will be required to demonstrate the portion of the land on the Government easement is free of HTRW concerns. Specific updates are covered in Section 5.8.3 (environmental commitments) and 5.9.4.2 (Plan 5, under trench drain and filter blanket) and 5.9.4.3 (Plan 3E, under trench drain and filter blanket). In addition, environmental commitment HW-6 requires the City of Pico Rivera to demonstrate that the soils at the easement are free from harmful contaminants and mitigate as required by the Corps of Engineers.

**Recommendation 3.** Revise or include any environmental commitments addressing potential impacts on the plant from construction, as appropriate.

**USACE Response: Adopted**

**Actions Taken:** Section 5.8.3 has been revised and includes the following commitment: “HW-6: As a condition for termination of the easement utilized by the Whittier Fertilizer Company, the City of Pico Rivera will be required to demonstrate that the soils are free from harmful contaminants and mitigate as required by the Corps of Engineers.”

**5. IEPR Comment 5 - Significance – Medium/Low. The DEIS has data gaps that could affect impact analyses.**

This comment includes three recommendations, all of which were adopted.

**Recommendation 1.** Revise the DEIS to reflect updated information on water quality, jurisdictional delineation for wetlands, and asbestos and lead-based paints.

**USACE Response: Adopted**

**Actions Taken:** There is no ongoing mineral extraction currently within the Whittier Narrows Reservoir. As noted in Section 3.3.1.4.1 of the DSMR, “Though still continuing in the Montebello Hills, mineral extraction in the Whittier Narrows Dam Reservoir ended in approximately 2004...” No proposed project work would be implemented within the Rio Hondo within the Reservoir, so the 303(d) listing is not applicable. Wetlands information has been updated and is in Section 4.2.4 of the final EIS, starting with “As shown in Figure

4.2-5 three types of Waters of the U.S. were delineated...” The Biological Assessment has also been finalized and is included in the Final EIS, appendix I.

**Recommendation 2.** Revise the DEIS to provide a summary of the biological assessment/evaluation performed and being coordinated with the U.S. Fish and Wildlife Service (USFWS). Include a reference in the DEIS to the biological assessment performed and include a copy as an appendix consistent with California Environmental Quality and USACE guidelines.

**USACE Response: Adopted**

**Actions Taken:** Preparation of the Biological Assessment (Appendix I of the final EIS) was completed on May 29, 2019. In addition, Errata #56 of the Final EIS states “Coordination with the U.S. Fish and Wildlife Service (USFWS) on potential effects of the action began in 2013. Corps and USFWS representatives met in the field at the project site on several occasions and again in 2018. The Corps began informal consultation with the USFWS under Section 7(a)2 of the Endangered Species Act for potential effects to the federally endangered least Bell’s vireo, the federally threatened California gnatcatcher and California gnatcatcher designated critical habitat. Formal consultation was initiated on May 29, 2019.” The final Biological Opinion was completed July 24, 2019.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** The information is in the Biological Assessment, included as Appendix I of the Final EIS.

**6. IEPR Comment 6 - Significance – Medium/Low. The DEIS has not been prepared in accordance with California Environmental Quality and USACE NEPA guidance on improving document preparation.**

This comment includes three recommendations, of which all were adopted.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** Text and graphics have been revised to consolidate information for easier understanding of information and impacts associated with the identified alternative risk management plans. Some examples are shown in Figures 3.7.1-3.7.5 of the EIS and Figures 3.7.7-3.7.11 of the EIS.

**Recommendation 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, and/or brighter and more pronounced colors and symbols.

**USACE Response: Adopted**

**Actions Taken:** Graphics have been revised and enlarged where appropriate as needed to display information; in particular, the majority of maps have been enlarged to a full page. Some of the figures modified include Figures 1.2-1, 1.2-2, 2.3-1, and 2.4-1.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** USACE has shortened and simplified the EIS where appropriate. The analysis chapter (chapter 5) was reformatted to streamline and eliminate duplication of analysis when components of each of the alternatives was the same/similar. Examples include the batch plants, the trench drain, and utility relocation process for both RMP 3E and 5.

- 7. IEPR Comment 7 - *Significance – Medium/Low*. 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.**

This comment included four recommendations, none of which were adopted.

**Recommendation 1.** Conduct the reconstitution analyses of the 1938, 1943, 1969, 1978, 1983, and 1993 events, as alluded to in Appendix D.

**USACE Response: Not Adopted**

**Actions Taken:** The Modeling Limitations Section of Appendix D (Page 121) state that “both the HEC-HMS and HEC-RAS models adequately simulate reservoir inflow behavior at Whittier Narrows” but mention that any (minor) modeling errors are due to a number of causes, including limited data for calibration and validation. USACE conducted sensitivity analysis on various parameters to quantify the range of potential variability in headwater elevation and inflow. All of the sensitivity analyses show that there is overtopping at Whittier Narrows Dam. Therefore, no additional validation analysis will be conducted at this time.

**Recommendation 2.** Revise input variables to the Whittier rainfall-runoff model, as appropriate, based on results of the reconstitution analyses.

**USACE Response: Not Adopted**

**Actions Taken:** Because the models adequately simulate reservoir inflow behavior at Whittier Narrows, as mentioned in Appendix D, Modeling Limitations Section (page 121), no additional validation analysis is planned. As noted above, the sensitivity analysis (including starting pool elevation, lag time between antecedent and main flood events, probable maximum precipitation, and constant loss rate) show overtopping at Whittier Narrows Dam.

**Recommendation 3.** Revise PMF inflow modeling analysis, as appropriate, based on Recommendations 1 and 2

**USACE Response: Not Adopted**

**Actions Taken:** Because the models adequately simulate reservoir inflow behavior at Whittier Narrows (Appendix D, Modeling Limitations Section, page 121), no additional validation analysis is planned.

**Recommendation 4.** Consider calibrating and verifying the runoff model to available, recorded stage data at Whittier Narrows Dam.

**USACE Response: Not Adopted**

**Actions Taken:** Because the models adequately simulate reservoir inflow behavior at Whittier Narrows (Appendix D, Modeling Limitations Section, page 121), no additional validation analysis is planned. No additional validation analysis will be conducted at this time as all of the previous sensitivity analyses showed overtopping at Whittier Narrows Dam.

**8. IEPR Comment 8 - *Significance – Medium/Low.* The relocation of Rosemead Boulevard presents unusual challenges not addressed in the DSMR.**

This comment included four recommendations, all of which were adopted.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** An improved definition of the assumptions, uncertainty, and consequences of the uncertainty regarding Rosemead Boulevard has been provided in Sections 3.5.1.9 and 3.5.3. The feasibility level design assumptions most closely match those in assumption (b). The study assumes that, in the immediate vicinity of Rosemead, the existing lines, grades,

and cross sections will remain unchanged but that the surface will be hardened to prevent erosion. Additional information, such as “Rosemead Boulevard, between the west and central embankments, will be hardened to prevent erosion during overtopping” has been included in Section 3.5.1.9 to include the assumptions described here. More details are also provided in Appendix L, Section 4.1.1.3, under Road Modifications.

**Recommendation 2.** Review cost and schedule assumptions to ensure that cost estimate contingency for the Rosemead Boulevard feature adequately provides for the feature risk.

**USACE Response: Adopted**

**Actions Taken:** The current estimate assumes Rosemead will be armored and constructed in two different phases: closing half of Rosemead, armoring the road, rebuilding the road, opening the section back up to traffic, then closing and working on the other half of the road. The costs are approximately \$16M total (\$5.5M for armoring, \$10.5M for roadway demolition, reconstruction, and traffic control). The Cost and Schedule Risk Analysis considers a worst case scenario of additional \$5.4M needed due to the preliminary scope of work. All of the information is available on Page 108 of Appendix B (Cost Engineering Appendix), under Rosemead Armoring and Reconstruction.

**Recommendation 3.** To ensure 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.

**USACE Response: Adopted**

**Actions Taken:** The EIS has been revised to assure that impacts from armoring and the construction of that armoring are appropriately represented. The information on the environmental impacts is located in Section 5.5.4.2 of the EIS, under Road Modifications. The relevant text starts with “For RMP 5, the footprint for the road modifications is anticipated to be similar to, but somewhat smaller than, footprints identified for RMP 3E. For purposes of analysis, however, acreage impacted is considered to be the same as RMP 3E” and continues with the next paragraph.

**Recommendation 4.** Schedule engagement with CALTRANS at the earliest practical time to initiate detailed discussion of required design and implementation standards.

**USACE Response: Adopted**

**Actions Taken:** In order to identify the potential impacts to both Rosemead and the high tension towers and to develop viable plans, additional hydraulic evaluation is required. During PED, USACE will conduct this analysis and prepare preliminary design drawings. The analysis and drawings will provide a basis for meeting with Los Angeles City Department of Water and Power on this and several other issues. The Design Phase PMP, Section 4.1.2.1.2, states “The A/E will coordinate with the owners and the USACE Lead Engineer to schedule a meeting at a mutually acceptable location in order to present the proposed modification and to identify and document their standards, constraints, key concerns, material requirements, points of contact (and contact information), review processes, and fee schedules (as applicable).”

**9. IEPR Comment 9 - *Significance – Medium/Low*. The Operations and Maintenance scope and costs for the recommended plan appear insufficient to meet the objectives and function of the project design.**

This comment includes five recommendations, all of which were adopted.

**Recommendation 1.** Investigate groundwater quality, during PED, in the vicinity of the drainage trench excavation where dewatering may be required.

**USACE Response: Adopted**

**Actions Taken:** The Design Phase Project Management Plan (PMP) (Appendix N) states that anticipated groundwater elevation and water quality will be characterized, including a water quality mitigation plan for dewatering and associated dewatering requirements. Relevant text in Section 3.1.1.2.1.4 of the PMP states “The District will procure, install, and monitor 10 piezometers/data loggers and locking caps in existing wells to monitor seasonal changes in groundwater elevation across the two-mile long reach where the trench drain will be installed. Samples will be collected for water quality testing.”

**Recommendation 2.** Clarify regulatory testing and discharge requirements with regulatory agencies.

**USACE Response: Adopted**

**Actions Taken:** The evaluation of the discharge requirements has been incorporated into the plan through testing of water quality data. In addition, Section 5.2.4.3 of the EIS, under the Foundation/Sheetpile section, has been added and states, “Sheetpile driving and dewatering operations, including dewatering depth, would be coordinated in conjunction with the U.S. EPA and the Department of Toxic Substances Control, the state regulatory agency responsible for operating and overseeing contaminated groundwater extraction and treatment operations.”

**Recommendation 3.** Look for overlap of HTRW testing and discharge requirements with Clean Water Act Section 402 National Pollutant Discharge Elimination System permit project requirements.

**USACE Response: Adopted**

**Actions Taken:** Prior to conducting water quality testing, the Clean Water Act maximum tolerable limits for applicable chemicals will be determined, and the PDT will use those targets to set up and conduct the sampling and testing planned in Section 3.1.1.2.1.4 of the PMP (Appendix N). A dewatering plan which addresses NPDES requirements is one of the deliverables for the Intermediate Design Document Report (Appendix N, Section 3.2, referring to “dewatering plan to be developed for the purpose of the Government Estimate.”)

**Recommendation 4.** Evaluate the feasibility of using the existing Superfund treatment plant and/or temporary on-site treatment systems during dewatering.

**USACE Response: Adopted**

**Actions Taken:** This will be evaluated during PED and coordination with the plant owner will be conducted. Coordination with “the U.S. EPA and the Department of Toxic Substances Control, the state regulatory agency responsible for operating and overseeing contaminated groundwater extraction and treatment operations,” as noted in Section 5.2.4.3 of the EIS, will be conducted to assess if those treatment systems will be needed.

**Recommendation 5.** Address potential groundwater storage, testing, and treatment costs, then update the risk register.

**USACE Response: Adopted**

**Actions Taken:** The project documentation will include results from groundwater testing, as mentioned in Section 3.1.1.2.1.4 of Appendix N, which states “The District will procure, install, and monitor 10 piezometers/data loggers and locking caps in existing wells to monitor seasonal changes in groundwater elevation across the two-mile long reach where the trench drain will be installed. Samples will be collected for water quality testing.” As necessary, a concept treatment system will be prepared to support the Independent Government Estimate as part of the “dewatering plans for IGE” item in Section 4.2.4.1.1.1 of Appendix N.

**10. IEPR Comment 10 - *Significance – Medium/Low*. 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.**

This comment includes two recommendations; neither was adopted.

**Recommendation 1.** Provide further justification that (a) the current hydraulic modeling depicts water levels in downstream impact areas resulting from probable maximum precipitation; 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 the San Gabriel Spillway.

**USACE Response: Not Adopted**

**Actions Taken:** The complete simulation of the antecedent event and the PMF main event provide starting conditions for the PMF event. In Appendix D, under Probable Maximum Flood, there is a section that discusses modeling refinements compared to prior PMF study efforts; relevant text includes “Antecedent flood event (60% of the PMP) and PMF main flood event were modeled as a complete simulation...this ensures the watershed system has the proper boundary conditions for the main event.”

**Recommendation 2.** As necessary (depending upon the outcome of Recommendation 1), revise and rerun the probable maximum precipitation routing models and update the water surface profile conditions above and below the dam.

**USACE Response: Not Adopted**

**Actions Taken:** As the complete simulation of the antecedent event and the PMF main event provide starting conditions for the PMF event, the routing models do not need to be rerun. That information can be found in Appendix D, under Probable Maximum Flood section, including the text “Antecedent flood event (60% of the PMP) and PMF main flood event were modeled as a complete simulation.”

**11. IEPR Comment 11 - *Significance – Low*. The discussion of natural resources baseline conditions in the DEIS is not detailed enough to adequately allow for the evaluation for forecasted conditions.**

This comment includes three recommendations. The first two recommendations were adopted and the third recommendation was not adopted.

**Recommendation 1.** Revise the DEIS to quantify acreages of vegetation communities identified and measure potential impacts in DEIS Section 5.5.

**USACE Response: Adopted**

**Actions Taken:** These descriptions are in general for the entire Whittier Narrows Reservoir. The main action area of Alternative 5 is below the dam; however, there are some actions above the dam, such as the batch plants and haul routes that have some vegetation types described. The vegetation types have undergone recent substantial changes due to a 5-year drought and various wildfires (started by homeless encampments) in which invasive plants have become dominant.

In light of these changes to the vegetation communities, there is a plan to perform vegetation mapping during PED. This task has been included in the cost estimate in the table in Section 3.4.4.1.2. Relevant text states “map invasive species in Whittier Narrows Reservoir” in the table. As part of the invasive species eradication planned in Section 3.5.6.6 (relevant text says “Invasive plant eradication for O&M Vegetation Clearing in California gnatcatcher designated critical habitat; Invasive species eradication over 242 acres for five years; includes mowing & herbicide application for multiple years.”) mapping of the vegetation present in the reservoir would occur.

**Recommendation 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 the species.

**USACE Response: Adopted**

**Actions Taken:** Text has been added to Sections 4.5.3 (“Bald eagles and golden eagles (*Aquila chrysaetos*) are not part of the ecology of the proposed RMP sites and they had only been observed flying over the aforementioned areas”) and Section 5.5 (starting with “The Bald and Golden Eagle Protection Act of 1940”) to indicate the observations of immature/young bald eagles and the protections provided by the BGEPA, respectively. Additional BGEPA language (starting with “The Bald and Golden Eagle Protection Act of 1940 protects bald and golden eagles...”) has been also added to Section 8.3.7. No recent

sightings has been recorded and the previous sightings are outside of the proposed Risk Management Plan sites, so adverse impacts to bald or golden eagles as a result of project implementation are not expected.

**Recommendation 3.** Provide a reference to obtaining species list and Information Planning and Consultation (iPaC) data for Federally listed species in Section 4.5.3.6 of the DEIS.

**USACE Response: Not Adopted**

**Actions Taken:** USACE coordinates closely with the U.S. Fish and Wildlife Service on the presence of Federally listed species at or within Whittier Narrows Reservoir. The needed species lists are obtained through this process in lieu of using the iPaC process.

**12. IEPR Comment 12 - *Significance –Low*. According to DSMR Table 10, the No Action Alternative meets the study objectives, yet it fails to address Potential Failure Modes (PFM) 4 and 21.**

This comment includes three recommendations, of which the first two were adopted and the third was not adopted.

**Recommendation 1.** Confirm whether this table entry is a typographical error or represents Study Team conclusions.

**USACE Response: Adopted**

**Actions Taken:** Table 10 in Section 3.4.3.1 has been corrected to reflect that the No Action Plan does not meet the objective.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** Table 10 in Section 3.4.3.1 has been corrected to reflect that the No Action Plan does not meet the objective, but it is carried forward for comparison to other alternatives, as required as part of the plan formulation strategy and NEPA.

**Recommendation 3.** If this table entry represents Study Team conclusions, provide text throughout the DSMR (specifically Section 3.4.2.2) and appendices to explain how the No Action alternative adequately addresses dam safety risk.

**USACE Response: Not Adopted**

**Actions Taken:** As Table 10 in Section 3.4.3.1 includes a typographical error that has since been corrected, no further action needs to be taken on this recommendation.

**13. IEPR Comment 13 - *Significance –Low*. The impact of overtopping and flow down on the topsoil-covered RCC slope face has not been fully evaluated.**

This comment includes two recommendations; the first recommendation was not adopted, and the second recommendation was adopted.

**Recommendation 1.** Modify the DSMR to indicate that during PED physical modeling will be conducted to demonstrate how the proposed design affects the lethality (Depth x Velocity) potential downstream of the embankment such that the “Do No Harm” criterion is satisfied.

**USACE Response: Not Adopted**

**Actions Taken:** Additional numerical modeling will be required to design the toe/stilling basin during PED, but the need for physical modeling will be evaluated at that time. The modeling will focus on the design of the energy dissipation system, and any such design that does not effectively and efficiently prevent dam failure will not be implemented.

**Recommendation 2.** Address the bulk densities of debris flow with and without RCC soil cover to measure impacts. Address those respective impacts in the DEIS.

**USACE Response: Adopted**

**Actions Taken:** The bulk density of debris flow over the 70 square mile area will likely not provide significant insight as the impacts are anticipated to be on the structures closest to the dam. The value of burying the RCC will be evaluated during the design phase but will focus on impacts to hydraulic performance, the trench drain, and maintenance. Appendix L, Section 4.1.1.1, under uncertainties, includes the following: “The assumption that the RCC will be buried will be further evaluated during PED. Uncertainties include impact on public perceptions of performance during overtopping...potential impact on overall spillway performance during overtopping...”

**14. IEPR Comment 14 - *Significance –Low*. The criteria for acceptable gradient are unclear.**

This comment includes one recommendation which was adopted.

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

**USACE Response: Adopted**

**Actions Taken:** The rationales for selection and application of the gradient have been clarified in Appendix A, Section 1.4.4.5, which addresses the likelihood of failure due if “sufficient exit gradient exists to initiate backward erosion piping at the unfiltered seepage exit.” Table 1-16 in Appendix A also includes the favorable and unfavorable factors for this potential failure mode.

**15. IEPR Comment 15 - *Significance –Low*. The life safety assumption that downstream populations with 2 feet or less of inundation would “shelter-in-place” is unrealistic.**

This comment includes three recommendations; the first was adopted but the other two were not adopted.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** As mentioned in Pages 2-43 to 2-45 of Appendix A, the “shelter-in-place” instruction would only be in non-breach scenarios where the pool elevation is not yet at 228.5 feet. The Future Without Action Condition (FWAC) assumes that the zones are in place and that they are executed well. If the assumption is not met, life loss and consequences in general would be expected to increase because additional vehicles would be present on the streets under the same evacuation routes. In addition, the analysis of consequences assumed a small percentage of people would ignore the shelter-in-place order, as mentioned on page 2-44 (“it is assumed that there will still be people that attempt to evacuate regardless of the message to stay home. The percentage of population that would attempt to evacuate in the shelter-in-place region was defined as 5% on average...”)

**Recommendation 2.** The non-breach and near-breach scenarios and associated evacuation and life loss should be clearly enumerated in the DSMR.

**USACE Response: Not Adopted**

**Actions Taken:** There are no non-breach scenarios where a shelter-in-place assumption was used; shelter-in-place was assumed for breach scenarios occurring during lower pools. Life loss for the breach and non-breach scenarios is presented in Appendix A.

**Recommendation 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.

**USACE Response: Not Adopted**

**Actions Taken:** The FWAC condition assumes that the FWAC zones are executed well, and shelter-in-place is assumed for the breach scenarios during lower pools only.

**16. IEPR Comment 16 - *Significance –Low*. The residual risk from flooding following dam safety modification is not portrayed accurately.**

This comment includes two recommendations, of which the first was not adopted and the second was adopted.

**Recommendation 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.

**USACE Response: Not Adopted**

**Actions Taken:** The Existing Condition Risk Assessment (ECRA) reflects the assumptions

in the general case, but the PMF for Whittier Narrows was modified post-ECRA. USACE decided to proceed with the FWAC without updating the ECRA because the risk already exceeded guidelines and because of the extremely high urgency. ECRA consequences would be worse if the updated PMF were applied. In addition, because at least some of the Interim Risk Reduction Measures (part of the FWAC) are in progress, the ECRA would be overly conservative.

**Recommendation 2.** Clarify project residual risk by a 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).

**USACE Response: Adopted**

**Actions Taken:** The protected overtopping component does little to change residual flood risk for most of the population at risk (PAR) since the exposure is governed by spillway releases; Section 3.3.1.5.4 of the DSMR states "...the non-breach risk at Whittier Narrows is very high... the non-breach risk provides a relative contribution of approximately 95 percent of the life safety flood risk." The dam may withstand the overtopping and the Corps will have accomplished the dam safety objective to reduce incremental risk, but the PAR will be severely impacted. In addition, a statement in EIS Section 3.9 has been added to make it clear that "flood risk will remain after dam modification due to spillway release potential." None of the proposed modifications will change that.

**17. IEPR Comment 17 - *Significance –Low*. The time-to-failure values for the hypothetical breach scenarios of the Western and Central Embankments are outside the normally accepted ranges.**

This comment includes two recommendations, of which neither were adopted.

**Recommendation 1.** Provide back-up computations that show that the adopted time-to-failure in the Risk Assessment produce conservative (high) breach discharges.

**USACE Response: Not Adopted**

**Actions Taken:** As mentioned in Section 2 of Appendix A, overtopping erosion was modeled using WinDAM B (ECRA) and revisited using DLBreach (during FWAC). Modelled breach times were slower (longer) with DLBreach, so the breach times for WinDAM (B) are expected to be conservative. Breach formation time may be on the higher end for a compacted earthen embankment, but it likely does not have a significant effect on the results, based on the following reference: Chitwood, D., (2014), Lessons in Internal Erosion and Overtopping from Cofferdams; ASDSO National Conference, 2014. Time-to-failure ranges are 0.1 to 4 hours based on Table 3 of the following link: (<https://www.hec.usace.army.mil/publications/TrainingDocuments/TD-39.pdf>).

**Recommendation 2.** Alternatively, revise breach simulations for the Western and Central Embankment scenarios with a time-to-failure approximating 0.5 hours, under the FWAC.

**USACE Response: Not Adopted**

**Actions Taken:** As mentioned in Section 2 of Appendix A, the time to failure modeled using WinDAM B is expected to be conservative. Overtopping of two other cofferdams in Southern California indicated at least 75 minutes of overtopping needed to induce a breach of one of the cofferdams; the other one did not in spite of four hours of overtopping. These results were found in the following reference: Chitwood, D., (2014), Lessons in Internal Erosion and Overtopping from Cofferdams; ASDSO National Conference, 2014. The WinDAM B times are within normal ranges of 0.1 to 4 hours, as noted in Table 3 in here: (<https://www.hec.usace.army.mil/publications/TrainingDocuments/TD-39.pdf>).

**18. IEPR Comment 18 - *Significance –Low*. 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.**

This comment includes three recommendations, of which the first two were not adopted and the third was adopted.

**Recommendation 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.

**USACE Response: Not Adopted**

**Actions Taken:** The EIS has been revised in Section 4.1.1.3 per the response to recommendation 3 below in order to address public concerns to the extent possible and appropriate.

**Recommendation 2.** Evaluate the potential impacts of fault rupture and as necessary update DSMR Section 3.5.5 based on current Corps guidelines.

**USACE Response: Not Adopted**

**Actions Taken:** The effect on project risk were evaluated during the Issue Evaluation Study and was shown to be insignificant. During PED USACE will update the seismicity and structural response and incorporate effective and efficient features to assure appropriate level of protection to the structure and the public. Features may include filters, minor foundation improvements, and instrumentation to facilitate evaluation of post-seismic deformation. Features may include filters, minor foundation improvements, and instrumentation to facilitate evaluation of post-seismic deformation.

**Recommendation 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.

**USACE Response: Adopted**

**Actions Taken:** Section 4.1.1.3 of the EIS has been revised to include the following, with italicized text reflecting changes: “The major fault in the region downstream of the Dam is the Newport Inglewood fault, which transverses the area northwest to southeast just north of

the Long Beach area (Figure 4.1-2). *The map also shows the known location of the Whittier Fault. The Fault is known to occur southeast of the project area and east of Interstate Highway 605 (Jennings, 1994). There is no information available as to the location of the extension of the Fault through the Whittier Narrows basin.*” The fault map has also been revised to show the location of Whittier Narrows Dam. EIS chapter 5 already states that the risk associated with seismic events is insufficient and therefore is not considered a risk driver.

**19. IEPR Comment 19 - *Significance –Low*. A full description of all PFMs that have been evaluated is not included in the DSMR.**

This comment includes two recommendations, the first was not adopted and the second was adopted.

**Recommendation 1.** Provide a table summarizing all the PFMs considered in DSMR Section 2.3.1.1.

**USACE Response: Not Adopted**

**Actions Taken:** A Final EIS errata sheet includes a modification to EIS Section 2.8 which identifies that the remaining broad array of PFMs have a risk associated with them of less than 1% if the risk associated with the three PFMs that dominate the risk at Whittier Narrows Dam.

**Recommendation 2.** Include the previous 2006 Screening for Portfolio Risk Analysis and 2011 IES documents in the DSMR Appendix A Risk Assessment.

**USACE Response: Adopted**

**Actions Taken:** The recommendation addresses how the PFMs are tracked and would assure documentation is available for those conducting future Potential Failure Mode Analyses. The previous reports are available to those doing preliminary assessments on the Risk Management Center’s ProjectWise site, found here: [Approved Document](#).