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October 25, 2018

In reply refer to:
Project No. 2100-CA

Mr. Ted Craddock
Oroville Emergency Recovery - Spillways
California Department of Water Resources
P.O. Box 942836
Sacramento, California 94236-0001

Subject: Submittal of Lake Oroville Probable Maximum Flood Update, Spillway
Recovery Project

Dear Mr. Craddock:

This letter is in response to your December 27, 2017 letter transmitting the referenced report dated September 29, 2017 for the Oroville Dam, part of the Feather River Project, FERC Project No. 2100. In general, the probable maximum flood (PMF) study was performed in accordance with our Engineering Guidelines. The PMF determination resulted in a peak inflow of 743,800 cfs and a 72-hour volume of 3,092,000 acre-feet using the HEC-ResSim model to route the PMF inflow hydrograph. The updated PMF study fulfils a recommendation from the eighth Part 12D independent consultant safety inspection (GEI 2010) and addresses the recommendations from the 2012 review of the 2003 PMF determination.

We have reviewed the submittal and have the following comments:

1. HMR-59 PMP estimates are derived from NOAA Atlas 2 100-yr precipitation estimates. NOAA Atlas 2 was replaced by NOAA Atlas 14 in California in 2011. Please provide an assessment of how the updated precipitation estimates from NOAA Atlas 14 would influence the precipitation estimates provided in HMR 59 and the PMF for Lake Oroville.
2. The wind wave setup and runup calculations appear to be based upon historical maximum wind speeds over a relatively short period of record of 58 years. Please provide a frequency analysis estimating the return frequency of the wind speeds used in the wind wave analysis.

Within 60 days of the date of this letter, please submit a plan and schedule to address the above two comments as they relate to revisions to the submittal.

Based on the conclusions of the report submittal and the ongoing spillway modification efforts, we have the following additional comments:

3. Given the lessons learned from the 2017 incident, as well as the magnitude of potential adverse consequences, a risk-informed decision making approach should be considered to address a number of uncertainties that factor into the appropriate selection of spillway adequacy for the project. For example, there are operational decision making uncertainties with longer duration inflow volume frequencies beyond the traditional 72-hr PMF determination that should be considered. As noted in your May 16, 2017 Technical Memorandum regarding the Frequency Curves for Long-term Risk Assessment (preliminary information provided for our review), a 500-year, 7-day inflow volume is about 2.9 MAF (Table 3 Page B-16). The 500-year event for a 15-day volume is 3.3 MAF (Table 4 Page B-16). The new PMF determination is 3.1 MAF. Thus, the traditional 72-hour PMF load case may not be the most critical hydrologic load case for the project. This cannot be determined without a full probabilistic flood frequency and reservoir storage analysis, which is beyond the scope of Chapter 8 of the Engineering Guidelines.
4. At the conclusion of the current spillway modifications, the original design capacity of the flood control outlet (FCO) will be restored; however, the design capacity of the emergency spillway is on the order of 100,000 cfs to 300,000 cfs lower than the maximum PMF discharge through the emergency spillway. The emergency spillway and natural discharge channel would likely sustain substantial headcutting erosion downstream of the secant pile wall when passing the expected full peak flow of approximately 420,000 cfs. In addition, it is likely the roller compacted concrete (RCC) apron section would experience moderate to severe damage from flows of this magnitude as well. A more robust and resilient design of the emergency spillway may be required to prevent the possibility of moderate to severe damage to the emergency spillway structure for the expected full peak flow of approximately 420,000 cfs. Further hydraulic and erodibility analyses of the emergency spillway structure should be performed to determine if it can safely pass PMF outflows.
5. Although the new PMF inflow is 18,800 cfs and 0.92 MAF greater than the previous (2003) determination, the resulting still water reservoir surface elevation is 2.9 feet below the top of dam. The wind wave setup and runup study showed that 3.8 feet of overtopping of the Main Dam is possible at the peak of the new PMF determination. Remedial modifications should be evaluated that eliminate overtopping of the embankment.

6. The emergency spillway should be reclassified as an auxiliary spillway since it is a secondary spillway in the project's current configuration and is being relied upon to pass more flow than the primary spillway (flood control outlet (FCO)) during a PMF event.

Within 60 days of the date of this letter, please submit a plan and schedule to address the above additional comments. We understand the Department of Water Resources (DWR) has currently initiated an Oroville project comprehensive needs assessment (CNA) that will be completed in December 2019. Some of the above additional comments may be incorporated into the appropriate tasks identified for the CNA work. Regarding Comment 3, DWR should contact this office within 30 days of the date of this letter to discuss the course of action to determine the appropriate project hydrologic loading.

We appreciate your cooperation in this aspect of the Commission's dam safety program. If you have questions, please contact me at (415) 369-3318.

Sincerely,

Frank L. Blackett, P.E.
Regional Engineer

cc:
Ms. Sharon Tapia, Chief
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