DATE: February 20, 2013

TO: Commissioner Art Torres, President
Commissioner Vince Courtney, Vice President
Commissioner Ann Moller Caen
Commissioner Francesca Vietor
Commissioner Anson B. Moran

THROUGH: Harlan L. Kelly, Jr., General Manager

FROM: Steven R. Ritchie, Assistant General Manager - Water
Julie L. Labonte, WSIP Director

RE: Water System Improvement Program (WSIP) 
Calaveras Dam Replacement Project
System Impact of 25-Month Project Delay

On January 22, 2013 the Commission approved revisions to the Calaveras Dam Replacement Project (CDRP). Those revisions included a revised project completion date (Finish Date of Closeout Phase) of August 31, 2013, which represents a 25-month delay. This memorandum summarized the impacts that delay may have on the operations of the Hetch Hetchy Regional Water System.

BACKGROUND

Calaveras Dam and Reservoir are important components of the SFPUC Regional Water System. Constructed between 1913 and 1925 and later modified, Calaveras Dam allows for storage of up to 96,850 acre-feet (AF) of local runoff in the Alameda Creek watershed. At this level of storage, Calaveras Dam is our largest San Francisco Bay Area (local) reservoir, providing about 40 percent of the SFPUC’s local water storage and 66 percent of local water yield.

Beginning in the winter of 2011, the SFPUC lowered water levels in the reservoir in response to safety concerns about the seismic reliability of the dam and a mandate from the California Department of Water Resources, Division of Safety of Dams (DSOD). The elevation of the lowered water level corresponds to about 38,100 AF of storage, which is approximately 60 percent less than the total reservoir capacity.
To restore the capacity of Calaveras Reservoir, the SFPUC in 2003 initiated the planning and environmental review for the construction of a new dam as part of the Water System Improvement Program (WSIP). The actual construction of the new dam was initiated and construction activities on the Calaveras Dam Replacement Project (CDRP) are now 35% complete.

PROJECT OBJECTIVES

The main objective of the CDRP is to restore the capacity of the reservoir to its pre-2001 storage level of 96,850 AF using water from the Alameda Creek watershed. This will in turn reestablish the reservoir's role within the SFPUC Regional Water System with respect to delivery reliability and water supply during planned and unplanned interruptions of the Hetch Hetchy water supply and during periods of drought. Additional objectives include enhanced seismic reliability through the construction of a replacement dam that can withstand the maximum credible earthquake (7.25 moment magnitude) on the Calaveras fault; and improved water quality by the creation of a deeper pool that will keep water temperatures cooler to limit algal growth in the reservoir.

Specific levels of service (LOS) goals consisting of seismic reliability, delivery reliability, water supply and water quality were established for the WSIP. Those goals provide quantifiable means to determine the scope of the program and the design criteria of each project. The CDRP was designed to contribute primarily to the delivery reliability goal and secondarily to the seismic reliability and water supply goals.

IMPACTS OF PROJECT DELAY

We plan to begin impounding water behind the new dam as early as possible after the new dam is substantially complete. Based on the substantial completion date of September 2017, the dam will be ready to impound water generated during the winter of 2017/2018.

However, the SFPUC may be able to begin impounding water earlier than the substantial completion date if certain critical milestones are met. Namely, it is anticipated that the new spillway will be substantially complete and the dam will be at full height by Spring 2017. Therefore, the SFPUC will pursue discussions with the DSOD to request that water impoundment be permitted to begin in late Spring 2017 provided that these critical milestones are achieved on schedule. The degree to which early water impoundment can begin will depend upon numerous factors, including potential weather delays in the winter of 2016/2017.

Below is a description of how the delay in the construction of the CDRP may impact system operations.
Impacts on Water Supply

The water supply LOS goal for the WSIP consists of the following:

- Meet average annual water demand of 265 millions of gallons per day (mgd) from the SFPUC watersheds for retail and wholesale customers during non-drought years for system demands through 2018.
- Meet dry-year delivery needs through 2018 while limiting rationing to a maximum 20 percent system-wide reduction in water service during extended droughts.
- Diversify water supply options during non-drought and drought periods.¹
- Improve use of new water sources and drought management, including groundwater, recycled water, conservation, and transfers.

At the time the WSIP LOS goals were set in early 2005, the SFPUC’s service area demand was approximately 265 mgd. Under those demand assumptions, the SFPUC’s rationing exposure during a repeat of an 82-year historic hydrology (1921-2002) was about 6 in 82 years for 10% rationing and 8 in 82 years for 20% rationing. In addition, during the SFPUC’s long-term planning drought of 8.5 years ("design drought"), the SFPUC would have to impose 1 year of 10% rationing, 5 years of 20% rationing and 1.5 years of 25% rationing. To meet the WSIP LOS goals, the SFPUC designed a water supply program that would improve the ability for the SFPUC to meet demands during dry-years. The water supply program includes the following components:

- Restoration of Calaveras Reservoir capacity: 7 mgd²
- Restoration of Crystal Springs Reservoir capacity: 0.5 mgd³
- Groundwater Storage and Recovery Project: 7.2 mgd⁴
- Water Transfer from Modesto Irrigation District and/or Turlock Irrigation District (MID/TID): 2 mgd

Implementation of these projects results in reducing the SFPUC’s rationing exposure over the 82-year historic hydrology (1921-2002) to about 6 in 82 years for 10% rationing and 2 in 82 years for 20% rationing under a demand of 265 mgd. During the SFPUC’s "design drought" of

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¹ As part of the WSIP Phased Variant, this included 10 mgd of demand reduction by both the Wholesale and Retail Customers through conservation, recycled water, and groundwater.
² 7 mgd (or 7,840 acre-feet per year) is derived by dividing the increment of restored water storage (58,800 acre-feet) in Calaveras Reservoir by 7.5 years. Seven and a half years relates to the number of years within the SFPUC’s long-term planning drought ("design drought") that assume the need for supplemental dry-year supplies.
³ 0.5 mgd is derived by dividing the restored capacity of Crystal Springs Reservoir by 7.5 years consistent with the description in Footnote 2.
⁴ 7.2 mgd is derived by dividing the storage capacity of the Groundwater Storage and Recovery project volume by 7.5 years consistent with the description in Footnote 2.
8.5 years, the SFPUC would reduce rationing to 3 years of 10% rationing, 3.5 years of 20% rationing and no years of 25% rationing.

By extending the construction period of the CDRP, the SFPUC will continue to operate without the 7 mgd of dry-year supply for an additional period of about two years beyond the original completion date of the WSIP. The extended schedule of CDRP also increases the probability of rationing occurring because the number of years before completion has increased by two years. While the SFPUC will not be able to meet its WSIP water supply LOS goals until construction of the new dam is complete, current SFPUC demands are significantly lower than 265 mgd. At current demand levels of approximately 224.1 mgd\(^5\), the SFPUC exposure to rationing over the historic hydrology is 3 in 82 years for 10% rationing and no years for 20% rationing. Rationing exposure over the design drought is 3.5 years of 10% rationing, no years of 20% rationing and no years of 25% rationing.\(^6\)

Once substantial completion of the Calaveras Dam spillway and restored height of the dam is achieved (scheduled for Fall of 2017), refilling of Calaveras Reservoir will take 4 years assuming average hydrologic conditions. The actual amount of time it will take to fill the reservoir after substantial completion will depend on (1) approval from the California DSOD to begin refilling the reservoir; (2) the actual hydrology during the refill period; and (3) the operation of Calaveras Reservoir in terms of the amount of water drafted from the reservoir during the refill period. Current demand projections indicate SFPUC demand to be 251.5 mgd\(^7\) in 2018. Assuming this demand level at the start of the refill period, SFPUC exposure to rationing over the historic hydrology is 10 out of 82 years for 10% rationing and 4 out of 82 years for 20% rationing. Rationing exposure over the design drought is 3 years of 10% rationing, 4.5 years of 20% rationing and no years of 25% rationing.\(^6\) Assuming refill takes approximately 4 years, the full restored volume of Calaveras Reservoir would not be available until 2022. In which case, the rationing exposure may be slightly greater than what can be anticipated under 2018 demand conditions. However, it should be noted that other dry-year water supply projects should be in place in 2018 including the Groundwater Storage and Recovery project, the restored capacity at

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\(^5\) This is the demand in FY09-10. The demand was 218.1 mgd and 219.9 mgd in FY 10-11 and FY11-12, respectively. The SFPUC used the FY09-10 demand to reflect the highest most recent demand for modeling purposes.

\(^6\) The hydrologic modeling performed to analyze exposure to rationing over the historic hydrologic record presents a conservative worst-case scenario. The modeling includes assumptions that restrict operations at Calaveras Reservoir during construction. These assumptions include restricting reservoir elevations to 690' November-March each year and 705' the remainder of the year to avoid inundating construction areas. It is also assumed that Calaveras Reservoir outlet works are shutdown between April and December of each year. The SFPUC does not anticipate these outlet work limitations to be in effect every year of the construction period; however, they are assumed every year for a worst-case analysis. In the event of a multi-year drought, it would be possible to access more water from Calaveras Reservoir than the modeling indicates is available.

Crystal Springs Reservoir, and possibly a water transfer. These projects would reduce the amount of rationing exposure in 2018 and beyond. Similarly, rationing levels will depend on total Calaveras Reservoir storage at the time of the dry year.

**Impacts on Seismic and Delivery Reliability**

A Post-WSIP Preliminary Maintenance Plan has been developed to address the system’s maintenance needs after completion of the WSIP. The plan identifies what needs to be done to maintain or restore the regional water transmission system to a state of good repair. It considers major water transmission pipelines and tunnels from Hetch Hetchy Reservoir through the Crystal Springs Bypass Tunnel, and planned outage durations of 2 to 3 months for regular maintenance, as well as repair and replacement, or essentially, continued delivery reliability. The basis for this 2 to 3 months outage depended on Calaveras Reservoir being at full capacity in order for the Sunol Valley Water Treatment Plant to supply 160 mgd when the Hetchy Hetchy supply is down (with Calaveras providing 90 mgd of the 160 mgd). If Calaveras Reservoir supply is unavailable, the planned outage duration of 2-3 months would be reduced to only 1 month, or 30 days, which would impact or limit the SFPUC’s ability to perform planned maintenance work on the transmission system until Calaveras Reservoir is at or near full capacity. For example, repairs to the Mountain and Foothill Tunnels may have to be delayed until completion of the Calaveras Dam.

Each time the reliability model was run in the past to verify compliance with the WSIP’s LOS goals, Calaveras Reservoir was not considered to be necessary to meet the seismic reliability goal which is to meet minimum system demand (winter month demand) to 70% of turnout in all customer groups within 24 hours of a major seismic event. As stated in Appendix A: Seismic Risk Profile Comparison, of the March 2006 Notice of Changes, “...the completion of a core group of major projects substantially reduces (seismic) vulnerability...” and “The core group includes the three(3) “arterial projects” of the Alameda Siphon; New Irvington Tunnel; and BDPL Reliability Upgrade.” In addition, “…upgrades to Harry Tracy Water Treatment Plant, Crystal Springs Transmission System, Crystal Springs Pipeline No. 2 and Capuchino, Baden, and San Pedro Valve Lots are key aspects of reduction of system vulnerability.” However, reinforcement of the dam to meet seismic standards will assist the entire system in long-term seismic reliability; this is why Calaveras Dam has a “secondary” seismic reliability benefit.

Should you have any questions regarding the content of this memorandum, you can contract me at (415) 554-1856.

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