MEMORANDUM

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cc: Kelley Capone, Ellen Levin — SFPUC
Elaine Warren, Donn Furman — City Attorney's Office

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Subject: San Francisco Public Utilities Commission's Water System Improvement Program, Final Program Environmental Impact Report — Supplemental Review on 2 mgd Water Transfer from MID to SFPUC

BACKGROUND

On October 8, 2008, the San Francisco Planning Commission certified the Final Program Environmental Impact Report (PEIR) on the San Francisco Public Utilities Commission's (SFPUC) Water System Improvement Program (WSIP) (Planning Department Case No. 2010.0493E, State Clearinghouse No. 2005092026) in fulfillment of the requirements of the California Environmental Quality Act (CEQA). Subsequent to the certification action, the SFPUC approved the Phased WSIP and adopted CEQA Findings, a statement of overriding considerations, and the WSIP Mitigation Monitoring and Reporting Program. Because the 30-day statute of limitations for a CEQA challenge lapsed without the filing of litigation, the PEIR is deemed adequate for its intended purposes as a matter of law (See Pub. Resources Code, Section 21167.2). The SFPUC is now actively implementing components of the adopted WSIP in compliance with CEQA, with completion of the WSIP scheduled for 2016.

The Modesto Irrigation District (MID), as a responsible agency under the WSIP PEIR, is currently proposing to implement a water transfer of 2 million gallons per day (mgd) to the SFPUC, as envisioned and approved under the adopted Phased WSIP (referred to hereinafter as "adopted WSIP" or simply "WSIP"). Consistent with Section 15164 of the CEQA Guidelines,[1] the purpose of this memorandum is to review relevant environmental information that has been developed since certification of the PEIR to determine if this new information raises the potential for any new significant or more severe environmental impacts beyond those described in the PEIR for the 2 mgd water transfer and if this information would trigger any additional environmental review requirements under CEQA prior to the SFPUC and MID's approval actions on the water transfer.

[1] The CEQA Guidelines are found in Title 14 of the California Code of Regulations, commencing with Section 15000.

A copy of the PEIR is available for review at the San Francisco Planning Department (1650 Mission Street, Suite 400, San Francisco, California 94103; and at the Modesto Irrigation District (1231 11th Street, P.O. Box 4060, Modesto, CA 95352-4060).

INTRODUCTION

The WSIP is a program of improvements to the SFPUC's regional water system that serves drinking water to all or parts of San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties, shown schematically in **Figure 1**. The program is designed to increase system reliability with respect to water quality, seismic response, water delivery, and water supply to meet water delivery goals in the service area through the year 2018. The WSIP consists of modifications to its water supply and system operations located in three watersheds (Tuolumne River, Alameda Creek, and Peninsula watersheds) together with construction and operation of a series of facility improvement and water supply projects located in seven counties (San Francisco, San Mateo, Santa Clara, Alameda, San Joaquin, Stanislaus, and Tuolumne Counties).

As described and analyzed in the PEIR (Vol. 7a, p. 13-8, Table 13.2, and Vol. 8, Appendix O-3), the adopted WSIP would result in an increase in average annual diversions of 2 mgd from the Tuolumne River over existing conditions due to several systemwide reliability improvement and water supply projects, including a 2 mgd dry-year water transfer from MID and/or the Turlock Irrigation District (TID). The PEIR analysis identified potentially significant impacts associated with this 2-mgd increase in average annual diversion in the area along the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs (see **Figure 2**). Since certification of the PEIR, new information has become available that could potentially affect the PEIR's environmental analysis related to this reach of the Tuolumne River. Specifically, this new information consists of climate change and ecosystem studies that have been conducted on the upper Tuolumne River watershed, including this same reach of the river. Because the PEIR impact analysis of the dry-year water transfer could be affected by this new information, this memorandum reviews the relevant new environmental information for the potential for any new significant or more severe environmental impacts beyond those described in the PEIR.

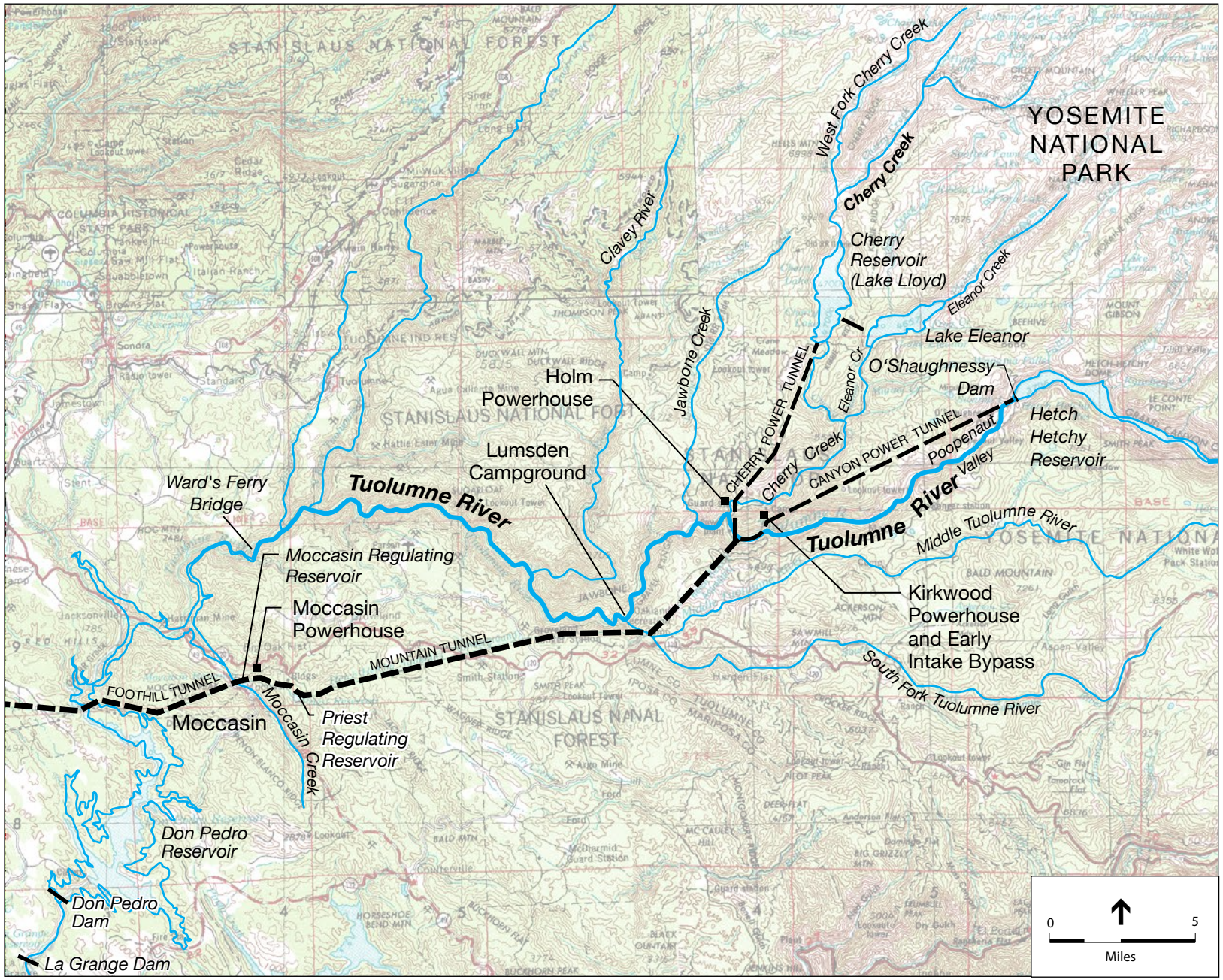
This memorandum provides written documentation that the MID water transfer does not warrant additional formal environmental review beyond what is presented in the PEIR. Consistent with CEQA Section 21166 and CEQA Guidelines Sections 15162 and for the reasons discussed below, the new information developed since publication of the PEIR would not result in: (1) substantial changes requiring major revisions to the PEIR and involving new significant environmental effects or a substantial increase in the severity of previously identified significant effects; (2) substantial changes that occur with respect to the circumstances under which the project is taken that would require major revision to the PEIR due to new or more severe impacts; and (3) new information of substantial importance which was not known and could not have been know at the time of the PEIR certification and that would (a) raise new significant impacts, (b) substantially increase the severity of previously identified impacts, (c) demonstrate the feasibility of mitigation measures or alternatives previously rejected as infeasible, or (d) lead to new feasible mitigation measures or alternatives considerably different from those previously considered in the PEIR that would substantially reduce one or more significant effects on the environment.

SOURCE: ESA + Orion

MID-SFPUC 2mgd Water Transfer

Figure 1

SFPUC Regional Water System



SOURCE: ESA+Orion, 2012; USGS 1970

MID-SFPUC 2mgd Water Transfer

Figure 2
Upper Tuolumne River Watershed,
Hetch Hetchy Reservoir to Don Pedro Reservoir

The 2-mgd water transfer is described below relative to the WSIP and the WSIP PEIR. This description is then followed by a summary of the environmental impacts, mitigation measures, and alternatives related to the water transfer as identified in the PEIR. This memorandum then identifies potentially relevant new information available subsequent to certification of the PEIR and provides both a summary of the new information and a discussion of why this new information does not affect the findings or conclusions of the PEIR and how it does not: (1) result in any new significant environmental impacts; (2) substantially increase the severity of previously identified environmental effects; (3) provide information demonstrating the feasibility of mitigation measures or alternatives previously rejected as infeasible; and (4) lead to new feasible mitigation measures or alternatives. Other considerations, including the status of the relicensing process for Don Pedro Dam and the updated SFPUC water demand and water supply projects, are discussed in terms of any potential effects on the analysis or conclusions presented in the PEIR.

WSIP SUMMARY AND DESCRIPTION OF WATER TRANSFER

Under the WSIP, the SFPUC will construct and operate all of the WSIP facility improvement and water supply projects identified in the PEIR while (1) limiting water sales to an average annual amount of 265 mgd from the SFPUC watersheds through 2018; and (2) improving water supply reliability to meet the goals and objectives of the WSIP, including no greater than 20 percent systemwide rationing in any one year of a drought. The limitation on average annual water sales of 265 mgd generally represents the base-year level of supply delivered from the SFPUC watersheds through the regional water system to both the retail and wholesale customers analyzed in the PEIR.[2] The SFPUC would maintain the 265 mgd average annual delivery of surface water from the SFPUC watersheds to existing levels through 2018, and the SFPUC and wholesale customers would collectively develop 20 mgd in conservation, recycled water, and groundwater to meet or offset the increasing regional water system projected purchase request of 285 mgd in 2018. Through completion of several of the facility improvement projects and modifications to system operations, the SFPUC would also implement the delivery and drought reliability elements of the WSIP, which would increase average annual diversions from the Tuolumne River by about 2 mgd over the base-year conditions.

As one of the WSIP actions identified to implement the delivery and drought reliability components of the WSIP, the SFPUC and MID propose to enter into an agreement for the SFPUC to purchase from MID 2 mgd of long-term water supply from the Tuolumne River watershed.[3] The water would be delivered at

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[2] The SFPUC watersheds that supply surface water to the regional system include the local watersheds—the Alameda Creek and Peninsula watersheds—and the Tuolumne River watershed. Under the adopted WSIP, similar to existing conditions, the Tuolumne River watershed would provide approximately 85 percent and the local watersheds would provide approximately 15 percent of the water supply delivered to customers.

[3] In addition to the MID and/or TID water transfer, the WSIP includes another supplemental dry-year water supply component, the Westside Basin conjunctive use program. Project-level environmental review of the Westside Basin conjunctive use program (now known as the "Regional Groundwater Storage and Recovery Project," State Clearinghouse No. 2009062096) is currently underway. Other WSIP projects needed to achieve the WSIP drought and system reliability goals include restoration of the capacities of Crystal Springs and Calaveras Reservoirs. Project-level environmental review of the Lower Crystal Springs Dam Improvements and Calaveras Dam Replacement projects was completed in 2010 and 2011, under State Clearinghouse Nos. 2007012002 and 2005102102, respectively. See PEIR Vol. 7a, Table 13.2, pp. 13-13 to 13-14, and Vol. 8, Appendix O-3, for further description.

Hetch Hetchy Reservoir and is based on MID's pre-1914 water rights. The water transfer would not require construction of any new facilities but would be accounted for through changes in the bypass or releases at the SFPUC's Hetch Hetchy facilities and the agreed upon allocation of the Districts' water right entitlements and calculation of SFPUC water bank account in the downstream Don Pedro Reservoir, which is owned and operated by MID and TID. While the WSIP identifies the water transfer as a supplemental dry-year source for the SFPUC regional water system, implementation of the water transfer would occur every year, regardless of rainfall conditions. In most years (i.e., about 4 out of 5, see PEIR Table 13.3, Vol. 7a, p. 13-15), the dry-year water supply would not be needed to meet the WSIP water supply levels of service, and water would be released from Hetch Hetchy Reservoir and flow downstream to Don Pedro Reservoir for use by MID and TID. However, with the MID water transfer, during drought conditions, the SFPUC would have the ability to retain and store this additional 2 mgd in Hetch Hetchy Reservoir as a supplemental dry-year supply source for its regional customers. The water transfer agreement is consistent with all requirements specified in the Raker Act, and the SFPUC would operate its regional water system consistent with the strategy outlined in the PEIR (Vol. 7a, pp. 13-8 to 13-26).

REVIEW OF POTENTIAL ENVIRONMENTAL EFFECTS OF 2-MGD WATER TRANSFER

This section summarizes the environmental effects of the upper Tuolumne River watershed, including the MID water transfer as identified in the PEIR. As described above, this water transfer would be implemented entirely through existing facilities, and it would have no environmental effects related to construction and operation of the WSIP facility improvement projects or the water supply and system operations identified in the Alameda Creek and Peninsula watersheds in the PEIR. Therefore, impacts associated with the facility improvement projects and the Alameda Creek and Peninsula watersheds are not discussed in this section; instead, this section focuses only on the water supply and system operations impacts in the upper Tuolumne River watershed.

Impacts on the Upper Tuolumne River Watershed

In the Tuolumne River watershed, the PEIR described and analyzed impacts on the following potentially affected resources (see PEIR Vol. 3, Section 5.3, and Vol. 7a, Sections 14.5, 14.6, and 14.7): stream flow and reservoir water levels; geomorphology; surface water quality; surface water supplies; groundwater; fisheries; terrestrial biological resources, recreational and visual resources; and energy resources. With one exception, the PEIR determined that impacts of the adopted WSIP—including the MID water transfer—on potentially affected resources in the Tuolumne River watershed and downstream water bodies would be less than significant, and no mitigation measures would be required. The one exception is that the PEIR identified potentially significant—but mitigable—impacts to terrestrial biological resources in the Tuolumne River watershed due to an increase in average annual diversions from the Tuolumne River and the associated modifications in releases from Hetch Hetchy Reservoir. These impacts were identified for the reach of the river between O'Shaughnessy Dam (Hetch Hetchy Reservoir) and Don Pedro Reservoir, with particular impacts to meadow and alluvial features in this reach,

including the Poopenaut Valley (see Figure 2), and are explained below. Because impacts on biological resources are based on changes in stream flow, the WSIP impacts on stream flow are briefly described first, followed by the description of the potentially significant impact on biological resources. Please see PEIR, Vol. 3, Section 5.3, as augmented in Vol. 7a, Sections 14.5, 14.6, and 14.7, for a description of the less-than-significant impacts on the other potentially affected resources.

The adopted WSIP includes an expected increase in average annual diversions of 2 mgd from the Tuolumne River over existing conditions as a result of the combined effects of several systemwide reliability improvements, including the Groundwater Storage and Recovery project, restoring the capacities of Calaveras and Crystal Springs Reservoirs, and the 2 mgd dry-year water transfer from MID. The PEIR determined that the WSIP would result in slight modifications to volume, frequency and timing of releases from Hetch Hetchy Reservoir, thereby changing flow patterns in the Tuolumne River below the reservoir compared to the baseline conditions (PEIR, Vol. 3, Section 5.3; Vol. 7a, Section 14.6; and Vol. 8, Appendix O-3).

Below Hetch Hetchy Reservoir, the effects of the WSIP would generally consist of a few days delay in releases of water from the reservoir and a slight reduction in the total volume of releases to the river in normal, below-normal, and dry years, and a slight increase in reservoir releases in wet years. While these changes were determined to be less than significant relative to stream flow, the PEIR determined that the WSIP would result in *potentially significant* impacts on terrestrial biological resources along the Tuolumne River from O'Shaughnessy Dam to Don Pedro Reservoir, and specifically to the sensitive wetland and riparian habitat and associated plant and wildlife species in the Poopenaut Valley (PEIR Impact 5.3.7-2, Vol. 3, pp. 5.3.7-21 to 5.3.7-22, and Vol. 7a, pp. 14.6-1 to 14.6-13).

The PEIR also determined that implementation of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits (Vol. 4, Section 6.4.2, pp. 6-49 to 6-50), would reduce the severity of this impact to a less-than-significant level. Mitigation Measure 5.3.7-2, which was adopted as part of the WSIP Mitigation Monitoring and Reporting Program, requires the SFPUC to manage releases from Hetch Hetchy Reservoir to promote recharge of groundwater in riverside meadows in the Poopenaut Valley and streamside alluvial deposits. As part of this measure, the SFPUC is required to gather data about environmental conditions in the Poopenaut Valley, which the SFPUC is currently doing in coordination with the National Park Service and other involved agencies (see discussion of Upper Tuolumne River Ecosystem Project, below). With implementation of this measure, it is expected that meadow conditions in the Poopenaut Valley will be maintained in the pre-WSIP state or improved.

PEIR Alternatives Analysis

As required under CEQA, the PEIR analyzed a reasonable range alternatives that would feasibly attain most of the project's basic objectives but that would avoid or substantially lessen any significant adverse environmental effects of the project. The PEIR (Vol. 4, Chapter 9) evaluated the following eight CEQA alternatives: (1) No Program; (2) No Purchase Request Increase; (3) Aggressive Conservation/Water Recycling and Local Groundwater Alternative with no supplemental Tuolumne River supply; (4) Aggressive Conservation/Water Recycling and Local Groundwater Alternative with supplemental

Tuolumne River supply; (5) Lower Tuolumne River Diversion; (6) Year-round Desalination at Oceanside; (7) Regional Desalination for Drought; and (8) Modified WSIP. With the exception of the No Program Alternative, all of the alternatives included components that are intended to reduce identified impacts on the Tuolumne River watershed. However, these components were generally related to systemwide approaches to reduce deliveries from the watersheds and did not relate specifically to impacts in the upper Tuolumne River watershed. Hence, none of the new information regarding climate change and ecosystem studies on the upper Tuolumne River watershed, described below, affects the feasibility analysis of the CEQA alternatives analyzed in the PEIR.

RECENT STUDIES DEVELOPED SUBSEQUENT TO PEIR CERTIFICATION

Several studies related to the SFPUC's water supply and regional water system have been either ongoing or developed subsequent to certification of the PEIR. In general, these studies support information presented in the WSIP PEIR and further inform ongoing implementation of WSIP facility improvement projects and/or implementation of WSIP-related mitigation measures. This section summarizes and reviews recent studies on the upper Tuolumne River watershed, discusses potential relevance to the WSIP (specifically changes in Tuolumne River flows), and determines if any new information would affect the conclusions of the PEIR, either by indicating the potential for a new significant impact or a substantial increase in the severity of an identified impact, demonstrating the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, or leading to a new feasible mitigation measure or alternative.

Overall, as described in detail below, none of the new information developed subsequent to the PEIR certification would affect the environmental analysis or impact conclusions presented in the PEIR related to the MID water transfer such that it would cause new significant impacts or result in the substantial increase in the severity of impacts previously identified in the PEIR.

Upper Tuolumne River Ecosystem Project

The Upper Tuolumne River Ecosystem Project (UTREP) is a long-term, science-based effort to: (1) understand historical and current ecosystem conditions on the upper Tuolumne River, (2) assess the relationship of current ecosystem conditions to Hetch Hetchy regional water system operations, and (3) provide recommendations for environmental water releases and other river management measures that support broad ecosystem values while meeting water supply and power generation needs. The UTREP is being coordinated by the SFPUC in coordination with Yosemite National Park staff of the National Park Service (NPS), the U.S. Fish and Wildlife Service (USFWS), and Stanislaus National Forest. Work under UTREP is currently focused on developing environmental flow recommendations for O'Shaughnessy Dam. One aspect of the study effort is to develop the necessary information to implement the PEIR upper Tuolumne River mitigation measure for spill management—Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits. The UTREP currently lists 16 reports and publications relevant to the project dating from 1976 to 2012; ten of

these documents were published subsequent to the publication of the PEIR and are reviewed below. Of the remaining six documents, the PEIR referred to two of them.[4]

O'Shaughnessy Dam Instream Flow Evaluation Study Plan

Summary of Study

The *Upper Tuolumne River Ecosystem Project: O'Shaughnessy Dam Instream Flow Evaluation Study Plan* (McBain & Trush, Inc., 2009) provides an initial study plan for studying the biological and geomorphic relationships between the annual hydrograph and ecosystems in the Hetch Hetchy reach of the upper Tuolumne River between O'Shaughnessy Dam and Early Intake.

The study plan outlines methods for conducting fish and wildlife studies, developing flow-habitat relationships, monitoring and modeling water temperature, and evaluating geomorphology and riparian vegetation dynamics. Ongoing and planned studies proposed by the study plan, including amphibian, reptile, fish, avian, and benthic macroinvertebrate surveys, will update and broaden the understanding of fish and other wildlife in the Hetch Hetchy reach and provide baseline data for future monitoring and adaptive management. The study plan recommends the use of a variety of methods for developing flow-habitat relationships based on the strengths of those methods; the results will then be used to ascertain how flow releases relate to ecological benefits. The study plan proposes to develop flow-habitat relationships for focal species such as rainbow trout, Sacramento sucker, foothill yellow-legged frog, and benthic macroinvertebrates, using a combination of microhabitat mapping, 2-D habitat modeling, and transect-based evaluations. Since flow-habitat relationships only address whether the physical habitat could exist under a range of flows, temperature monitoring and modeling in pools and streams is proposed to assess how critical water temperatures are to support the physical habitat. Fluvial geomorphic process investigations will associate depositional features with habitat and estimate the threshold of high snowmelt or rainfall flood peaks necessary to mobilize and maintain these features. Backwater pool investigations will evaluate how pools function both from a hydraulic and habitat perspective in response to the annual hydrograph. Three main stem depositional sites are proposed for monitoring and modeling woody riparian seedling germination and establishment, and for the possible reversal of conifer encroachment. Per the study plan, SFPUC will coordinate with NPS and USFWS to formulate a limnological (i.e., water temperature and dissolved oxygen stratification) and ecological (e.g., timing and abundance of pond turtle habitat) characterization of Poopenaut Valley pond and wetlands that will directly link to instream flows (and ongoing hydrograph components analyses) in the main stem channel and shallow groundwater flux.

The study plan also recommends that the SFPUC collaborate with the USFWS and NPS to construct an initial analytical framework for evaluating instream flow management scenarios through integration of the abovementioned investigations. The plan recommends a user-friendly gaming tool to manage and integrate the various models and facilitate the development of ecological flow recommendations. The

[4] The PEIR referred to McBain & Trush, 2007, *Upper Tuolumne River: Descriptions of River Ecosystem and Recommended Monitoring Actions*, in Vol. 7a, Section 14.6, p. 14.6-11, regarding potential geomorphology issues. In addition, the PEIR referred to U.S. Fish and Wildlife Service, 1992, Instream flow requirements for rainbow and brown trout in the Tuolumne River between O'Shaughnessy Dam and Early Intake, in Vol. 3, Section 5.3.6, pp. 5.3.6-1 to 5.3.6-3, regarding potential fisheries issues. Other documents listed under the UTREP published prior to PEIR publication were either incorporated into subsequent documents that were referenced in the PEIR or else were not directly relevant to the PEIR impact analysis.

gaming tool should incorporate flow-habitat curves, ecological thresholds/objectives, a riparian initiation model, as well as water supply and management constraints.

Relevance to WSIP

The PEIR (Vol. 3, Section 5.3.7, Impact 5.3.7-2, pp. 5.3.7-24 to 5.3.7-25) determined that the SFPUC proposed operation of O'Shaughnessy Dam under the 2030 version of the WSIP would result in potentially significant impacts on terrestrial biological resources due to potential effects on riparian habitat and species of concern below the dam; for the adopted WSIP, impacts would be less severe due to the substantially reduced diversions but still potentially significant. The PEIR determined that these impacts would be reduced to less than significant with implementation of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, which would require that the SFPUC manage releases from Hetch Hetchy Reservoir.

Conclusion

The *Upper Tuolumne River Ecosystem Project: O'Shaughnessy Dam Instream Flow Evaluation Study Plan* (McBain & Trush, Inc., 2009) is designed to increase the understanding of ecological and geomorphic processes below O'Shaughnessy Dam, and how these processes are affected by releases from the dam. The study will inform the implementation of Mitigation Measure 5.3.7-2 and will increase the effectiveness of the measure in maintaining/enhancing sensitive habitat and species in the Poopenaut Valley. The study plan itself does not raise the potential for new impacts, substantial increases in the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger the need for new mitigation measures or alternatives not previously addressed in the PEIR.

Hydrology Modeling Study

Summary of Study

Improving Riparian Wetland Conditions Based on Infiltration and Drainage Behavior During and After Controlled Flooding (Russo et al., 2012) reported on an observational and modeling study of the hydrologic response to a controlled flood sequence in the Poopenaut Valley in 2009. A primary goal was to assess the importance of inundation versus groundwater rise in establishing and maintaining riparian wetland conditions. Observational data, such as soil texture, moisture, and transmissivity were measured, then a simulated model evaluated three principal flooding scenarios to determine which would produce the greatest wetland benefit with the least volume of released water. Wetland conditions identified in this study were based on the definition used by the U.S. Army Corps of Engineers, which is saturation within 30 centimeters (12 inches) of the surface for 14 consecutive days in 5 out of every 10 years. This definition is widely applied and could be considered useful for study purposes. The observational results showed that inundation is the more important method for maintaining saturation in the root zone, although an elevated water table helped to extend the duration of soil saturation. The three principal flooding scenarios evaluated were: (1) inundation at a constant rate of release for 12 days; (2) inundation with a high initial pulse lasting two days then maintaining a release at a constant, but lower, level for 10 days;

and (3) cycling higher and lower releases throughout a 12-day period. These scenarios were selected to produce wetland hydrology at an estimated 90 percent of existing wetlands in the Poopenaut Valley. The third scenario proved to be the most effective at maintaining riparian wetland conditions, provided that repeated cycling of higher and lower river elevations is timed to benefit from the characteristic drainage behavior of the soils. This scenario would require only 28 percent of the water released in the actual pulse flows in 2009.

Relevance to WSIP

The PEIR (Vol. 3, Section 5.3, Impact 5.3.7-2) found that implementation of the proposed WSIP water supply and system operations could result in potentially significant impacts on terrestrial biological resources due to potential effects on riparian habitat and species of concern. Implementation of Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, would manage releases from Hetch Hetchy Reservoir to recharge riverside meadows, including the Poopenaut Valley, mitigating impacts to a less-than-significant level. The effects of the adopted Phased WSIP on biological resources in the upper Tuolumne River are expected to be less than those of the 2030 version of the WSIP, although still potentially significant, and Mitigation Measure 5.3.7-2 is required to be implemented.

Conclusion

Improving Riparian Wetland Conditions Based on Infiltration and Drainage Behavior During and After Controlled Flooding (Russo et al., 2012) provides useful and necessary information about soils, hydrology, drainage, and the modeled effects of controlled releases for maintaining wetland conditions in Poopenaut Valley. This report is fully consistent with implementation of Mitigation Measure 5.3.7-2 and will inform its implementation and increase the effectiveness of the measure in maintaining/enhancing sensitive habitat and species in the Poopenaut Valley. The results of the study do not indicate or suggest any new impacts, substantially increase the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger any new mitigation measures or alternatives not already identified in the PEIR. Rather, this study and other studies being conducted along the upper Tuolumne River provide important information necessary to inform the controlled releases that the SFPUC will implement in accordance with PEIR Mitigation Measure 5.3.7-2 to minimize potential effects of operational changes in release patterns on sensitive habitats and species below O'Shaughnessy Dam.

Ecological and Hydrologic Studies

Summary of Studies

The four *Looking Downstream* reports describe studies carried out between 2007 and 2010 by the NPS (Stock et al., 2009 to 2012) to investigate the current ecological conditions and the effects of experimental pulse flows in the Poopenaut Valley. The purpose of the reports is to provide information to assist in the development of dam release schedules that replicate natural physical processes and benefit ecosystems.

Observations were made regarding surface and groundwater hydrology, vegetation, vertebrate wildlife (primarily songbirds), and benthic macroinvertebrates.

The *Looking Downstream* reports summarize the controlled releases that took place in 2006 through 2010. The reports describe how small increases in river stage below O'Shaughnessy Dam cause relatively large increases in river stage in the Poopenaut Valley, largely because the narrow canyon just below the valley constricts flow, causing a backwater effect in the valley. Releases in 2006 peaked at 8,170 cubic feet per second (cfs) and inundated much of the Poopenaut Valley. Releases in 2007 peaked at 3,110 cfs and did not inundate meadows in the Poopenaut Valley or elevate water in the pond, but elevated local groundwater levels. Releases in 2008 peaked at 6,800 cfs and filled a seasonal pond, which took six weeks to drain. The report concluded that groundwater conditions were driven by the stage changes (i.e., rises and falls) in Tuolumne River stream flow rather than by hillslope hydrology. In 2009, the SFPUC conducted an experimental pulse release with a peak flow of 7,500 cfs to determine the flows needed to inundate the meadows and pond in the Poopenaut Valley, measure soil moisture and transmissivity, and measure the time needed to fully saturate soil and maintain saturation at rooting depth. This investigation is covered in detail in Russo et al. (2012), described above under the Hydrology Modeling Study. Experimental releases in 2010 consisted of several pulses, the largest over 7,000 cfs, designed to explore the effects of variable drawdowns on river and tributary bank stability.

Over the four-year period for which reports are available, NPS biologists mapped 11 vegetation types in the Poopenaut Valley, including four wetland (totaling 7.17 hectare [ha]), three riparian (totaling 4.62 ha), and four upland (totaling 12.87 ha) vegetation types. They also delineated wetlands, compiled a species list, conducted surveys for both special-status and invasive exotic plants, and carried out a three-year riparian tree seed dispersal study. They noted that some conifer encroachment into meadows had likely occurred since O'Shaughnessy Dam was constructed, and that some upland areas exhibited hydric soils and vegetation but not wetland hydrology, suggesting that some historical wetlands are transitioning to uplands. Quantitative sampling of each vegetation type was conducted, consisting of transects with nested-frequency plots. The seed dispersal study confirmed that different species release their seed when suitable germination substrate become available, as under a natural (unimpaired) hydrograph.

Vertebrate surveys consisted of passerine bird surveys for four years and acoustic detection surveys for bats in 2010. The passerine bird surveys found a considerable diversity of breeding birds and different breeding niches, with montane riparian habitat the most diverse and important habitat. Bat surveys found evidence of nine species present in the Poopenaut Valley, including three California Species of Special Concern. One conclusion was that bat species are an appropriate indicator species for managing Poopenaut Valley's seasonal pond because of their dependence on emergent aquatic insects.

Benthic macroinvertebrate surveys included an extensive inventory and monitoring of abundance and diversity of benthic macroinvertebrates before and after pulse flows. The inventory showed relatively high diversity and abundance, with many fauna that are intolerant of degraded habitat. After the 2009 pulse flows, a reduction in abundance but greater balance among taxa and increased proportional biodiversity was observed. After two months, most taxa had increased in abundance, though most did not reach the densities seen before the release. Similar results were found following subsequent pulse flows, although some variation was observed between years.

Relevance to WSIP

The PEIR noted that the NPS has designated the Poopenaut Valley as an "outstandingly remarkable value" of the Tuolumne Wild and Scenic River (Vol. 3, Section 5.3.7, p. 5.3-7-2). Remarkable features included the extensive complex of riparian, pond, wetland and meadow habitats found in the valley. Subsequent studies carried out in the *Looking Downstream* series quantified the extent and composition of these habitats but did not introduce information about previously-unknown resources. Similarly, rare plant surveys increased knowledge about botanical resources in the Poopenaut Valley but did not reveal new species requiring analysis under CEQA. Bird surveys confirmed the presence of two species of special concern identified in the PEIR as "potentially occurring" in the Poopenaut Valley, noting one as possibly breeding there. The seed dispersal study in the *Looking Downstream* reports largely replicated data cited in the PEIR. The benthic macroinvertebrate studies presented new information, not necessarily known specifically for the Poopenaut Valley at the time of the PEIR, but this information is not required for analysis under CEQA and would not have changed the analysis in the PEIR since it does not change the identification of sensitive habitats, common habitats, or key special-status species or other species of concern.

The PEIR (Vol. 3, Section 5.3, Impact 5.3.7-2, pp. 5.3.7-21 to 5.3.7-22) found that the WSIP would result in potentially significant impacts on sensitive habitats, key special-status species, species of concern, and common habitats and species in meadow and riparian along the Tuolumne River between O'Shaughnessy Dam and Don Pedro Reservoir due to delayed snowmelt releases, reduction in flows, and the associated reduction in meadow groundwater recharge. The effects of the adopted WSIP on biological resources in the upper Tuolumne River are expected to be similar, but less, than those of the 2030 version of the WSIP because the diversions would be much less, and these impacts were still considered potentially significant. Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 to 6-50) identified an approach that would reduce the potential impacts of WSIP-induced flow changes in the Poopenaut Valley to a less-than-significant level by shaping the late spring and early summer releases to benefit riparian and wetland habitats.

Conclusion

Although providing valuable detail, the four *Looking Downstream* NPS reports (Stock et al., 2009 to 2012) did not find substantially different biological resources in the Poopenaut Valley than those described in the WSIP PEIR. That is, the PEIR identified important riparian and wetland habitats as well as sensitive plant and vertebrate wildlife species in the Poopenaut Valley that are vulnerable to changes in water releases from O'Shaughnessy Dam. The *Looking Downstream* reports quantify the extent of these habitats and verify the presence of some, but not all, of the species identified as potentially occurring in Poopenaut Valley. This augmented information does not change the PEIR conclusion that impacts on these sensitive resources would be potentially significant. The benthic macroinvertebrate data were not known at the time of PEIR preparation; however, this information is not required for analysis under CEQA since it does not change the identification of sensitive habitats, common habitats, or key special-status species or other species of concern. Thus, the results of the study do not reveal that the WSIP, and specifically, the implementation of the planned 2 mgd water transfer, would cause any new impacts or substantial increases in the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger any new mitigation measures not already identified in the PEIR. Rather, this study and other studies being conducted along the upper Tuolumne River provide important information necessary to inform the controlled releases that the SFPUC will implement in

accordance with PEIR Mitigation Measure 5.3.7-2 to minimize potential effects of operational changes in release patterns on sensitive habitats and species below O'Shaughnessy Dam.

Geomorphology Studies

Summary of Studies

Preliminary Sediment Source and Sediment Transport Capacity Evaluation

The *Upper Tuolumne River Ecosystem Project: Preliminary Sediment Source and Sediment Transport Capacity Evaluation: O'Shaughnessy Dam to Poopenaut Valley Technical Memorandum* (McBain & Trush, 2008) evaluated sediment supply and sediment transport capacity along the 4-mile-long reach of the upper Tuolumne River between O'Shaughnessy Dam and the Poopenaut Valley to estimate how different dam release schedules affect sediment storage. Because sediment deposits typically provide the physical template for aquatic and riparian habitat in riverine ecosystems, understanding how flow affects sediment supply, transport, and storage is critical for the development of ecologically beneficial flow recommendations below O'Shaughnessy Dam. The evaluation builds on a 2007 reconnaissance-level geomorphic investigation performed by McBain & Trush[5] that indicated sediment storage (i.e., sediment deposits and aggradation in the channel) along the 4-mile reach remains relatively high, despite the presence of the dam.

The Tuolumne River channel below O'Shaughnessy Dam is comprised of stepped higher- and lower-gradient subreaches ranging from very steep and turbulent chutes to broad deep pools. The higher gradient subreaches are confined, have relatively low sediment storage, and are dominated by coarse sediments; lower-gradient subreaches have high sediment storage and are dominated by finer sediments, including fine gravel and sand. A sediment transport evaluation was conducted at two representative sites—at USGS gauge No. 11276500 located approximately 1 river mile downstream of the dam and in the Poopenaut Valley—to evaluate typical sediment transport conditions in the higher-gradient and lower-gradient subreach types, respectively. Sediment transport capacity rating curves were developed to estimate the sediment transport rate as a function of stream flow for any given flow at each study site. Annual sediment transport capacity was calculated for each water year of record and the results were grouped for three flow regimes: pre-dam, post-dam without Canyon Tunnel diversions, and post-dam with Canyon Tunnel diversions.

The study results indicate that although O'Shaughnessy Dam has reduced high flows and coarse sediment recruitment from the upper terraces, coarse sediments continue to be recruited from the hillslopes and tributaries below the dam. It was determined that the high fine sediment storage in the Poopenaut Valley is likely attributed to low transport rates, which despite the likely substantial reductions in fine sediment supply due to the dam, have allowed fine sediment storage to remain high in the Poopenaut Valley. The SFPUC will be able to use the sediment transport capacity curves developed as

[5] McBain and Trush and RMC Water and Environment, 2007. *Upper Tuolumne River: Description of River Ecosystem and Recommended Monitoring Actions, Final Report*. April. The report was referenced in the PEIR, Vol. 7a, Section 14.6, Master Response on Upper Tuolumne River Issues, pp. 14.6-1 to 14.6-13.

part of the evaluation to estimate potential changes in sediment storage under different flow management scenarios.

Streambank Stability Study for the Poopenaut Valley

The *Upper Tuolumne River Ecosystem Project: Streambank Stability Study in Poopenaut Valley, Yosemite National Park, California* (Stillwater Sciences, 2011) was prepared to investigate bank failure and channel incision along the main tributaries to the Tuolumne River that traverse the Poopenaut Valley floor below O'Shaughnessy Dam. One hypothesis on the potential cause of the observed bank failures was that dam-induced reductions in flow following springtime water releases from the dam may be so rapid that streambank instability is induced as water levels in the valley drop quickly. The hypothesis is based on previous studies conducted on other rivers in the U.S., which indicate that when water-surface levels in stream channels drop much faster than subsurface water levels within the adjacent streambank substrates (as expressed by the height of the groundwater table), the excess pore-water pressures acting within the slowly draining substrates often cause these materials to become structurally unstable, resulting in mass failure of the streambanks.

The objectives of the study were to: (1) investigate the effects of rapid changes in O'Shaughnessy Dam flow releases on bank stability along the tributaries in the Poopenaut Valley; and (2) assist in developing alternative release schedules that could reduce the risk of induced bank failure. To accomplish these tasks, pore-water pressures and other key channel and bank properties were continuously measured along a representative tributary channel to the Tuolumne River—the Southwest Tributary—during spring 2010 high-flow releases[6] from O'Shaughnessy Dam to see how the tributary responded to variations in stream flow and water levels. Pore-water pressure, bank profile, channel slope, tributary stage, and bank-material properties were monitored in the field during the releases. To augment the field observations, bank profile, channel slope, and bank-material data were input into computer models to estimate the degree of stability at various times during the spring 2010 high-flow releases. The models were also used to investigate specific factors that trigger bank failure during other drawdown scenarios that were not observed during the spring 2010 high-flow releases (e.g., more rapid drawdown rates, loss of vegetation cover).

No mass failures were observed in the field along the Southwest Tributary during the study period. NPS staff did not note any apparent bank failures along the other two tributaries to the Tuolumne River that cross the Poopenaut Valley. The results of the bank stability modeling indicates that the banks along the Southwest Tributary are stable during high releases such as those that occurred in spring 2010. Therefore, the study concluded that bank failures along the tributaries in the Poopenaut Valley do not appear to be adversely affected by the drawdown ramping rates controlled by O'Shaughnessy Dam.

Relevance to WSIP

These geomorphology studies provide additional, detailed information regarding the geomorphic processes in the upper Tuolumne River that augment information presented in the PEIR, but this level of detail was not required for the PEIR impact analysis or conclusion. The PEIR (Vol. 3, Section 5.3, Impact 5.3.2-1,

[6] The spring 2010 high-flow releases were composed of a series of three high-flow pulses released from O'Shaughnessy Dam between May and June for the purpose of facilitating the study.

pp. 5.3.2-6 to 5.3.2-7) found that the WSIP would have a less- than-significant impact on geomorphology along the Tuolumne River between O'Shaughnessy Dam and Don Pedro Reservoir because the WSIP would have little effect on the frequency or magnitude of large and infrequent floods that are most likely to influence sediment transport and stream channel characteristics. The WSIP would, therefore, not substantially change the topography or any unique geologic features of the site, nor would it substantially alter the existing drainage pattern of the site that would result in substantial erosion or siltation. The effects of the adopted Phased WSIP on geomorphology in the upper Tuolumne River are expected to be similar, if not less, than those of the 2030 version of the WSIP.

Conclusion

As part of the *Upper Tuolumne River Ecosystem Project: Preliminary Sediment Source and Sediment Transport Capacity Evaluation: O'Shaughnessy Dam to Poopenaut Valley Technical Memorandum* (McBain & Trush, 2008), sediment source and transport conditions in the 4-mile reach of the Tuolumne River downstream of the dam were evaluated and sediment transport capacity rating curves were developed to assist the SFPUC in estimating sediment transport capacity under future flow schedules. The *Upper Tuolumne River Ecosystem Project: Streambank Stability Study in Poopenaut Valley, Yosemite National Park, California* (Stillwater Sciences, 2011) did not find a direct correlation between releases from O'Shaughnessy Dam and bank instability along the tributaries to the Tuolumne River in the Poopenaut Valley. While this study examined alternative release schedules that could reduce the risk of induced bank failure and improve existing conditions, this additional information would not result in any new significant impacts associated with the WSIP compared to existing conditions. Thus, new information developed in these two geomorphology studies do not indicate any new impacts or substantially increases in the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger any new mitigation measures or alternatives not already identified in the PEIR. Rather, these studies provide important information on sediment transport processes that will further inform the controlled releases that the SFPUC will implement in accordance with PEIR Mitigation Measure 5.3.7-2 to minimize potential effects of operational changes in release patterns on sensitive habitats and species below O'Shaughnessy Dam.

Flow and Temperature Studies

Summary of Studies

Preliminary Analysis of Available Data for Temperature Modeling

The purpose of the *Upper Tuolumne River Ecosystem Project: Preliminary Analysis of Available Data for Modeling Temperature in the Hetch Hetchy Reach (O'Shaughnessy Dam to Cherry Creek) Technical Memorandum* (Merritt Smith Consulting, 2008) was to identify if adequate information exists to develop a dynamic flow and temperature model for the 13-mile-reach of the upper Tuolumne River between O'Shaughnessy Dam and the Cherry Creek confluence. The study determined meteorological data to be the constraining parameter but concluded that sufficient geometric, flow, temperature, and meteorology data exist for the successful implementation and calibration of such a model.

Flow and Temperature Modeling

The *Development of a Flow and Temperature Model for the Hetch Hetchy Reach of the Upper Tuolumne River* (Watercourse Engineering, Inc., 2010) report describes development of a flow and temperature model that will provide a better understanding of the relationship between releases from O'Shaughnessy Dam and downstream water temperature to inform how SFPUC reservoir operations can be improved to provide greater ecological benefits. The study focuses on the 13-mile-reach of the upper Tuolumne River between O'Shaughnessy Dam and Early Intake (Hetch Hetchy reach). As part of the study, a computer model was developed to simulate stream flow and water temperature under a range of flow and meteorological conditions. Development of the model entailed: (1) system conceptualization; (2) data assembly and organization; (3) model implementation; (4) model calibration; and (5) model application.

To identify the type of model that would best represent the system, a conceptual understanding of the Hetch Hetchy reach of the upper Tuolumne River was developed by analyzing data on channel geometry, hydrology, water temperature, and meteorological conditions. Data describing the geometry, hydrology, water temperature, and meteorology of the Hetch Hetchy reach were compiled for input into the model or to assist in model calibration and validation. The data were derived from various sources including the United States Geologic Service (USGS), the SFPUC, the California Data Exchange Center (CDEC), and California Irrigation Management Information System (CIMIS). Stream geometry data describing the longitudinal characteristics (longitudinal and planform) and cross-sectional characteristics (habitat types) of the Hetch Hetchy reach were collected and then refined to increase the stability of the model.

Daily flow data for the upper Tuolumne River were obtained from USGS for the Tuolumne River near Hetch Hetchy gauge (USGS gauge No. 11276500, the approximate upstream model boundary) and Tuolumne River above Early Intake gauge (USGS gauge No. 11276600, the downstream model boundary). Accretion between two gauges was computed by subtracting flows at Hetch Hetchy from those at Early Intake. Two years of flow data (2002 and 2006) that would encompass a wide range of flows were used for model implementation and calibration. Computed unimpaired flow data for the period from 1952 to 2007 provided by the SFPUC were examined for representative wet and dry years to ensure that the model was calibrated using an appropriate range of flows.

Measured temperature data were provided by the USGS. Mainstream flow temperatures were defined using USGS measured temperature data at the Tuolumne River near Hetch Hetchy gauging station (USGS 11276500). Tributary flow and accretion water temperatures were defined using measured data from the Tuolumne River above Hetch Hetchy gauging station (USGS 11274790), as well as short-term water temperature data in the three tributaries.

Data from several meteorological stations located near the Hetch Hetchy reach were used to construct a complete meteorological data set for atmospheric dust attenuation, cloudiness, dry bulb temperature, dewpoint temperature, atmospheric pressure, wind speed, wind direction, and solar radiation.

The computer model was calibrated for the Hetch Hetchy reach and tested for sensitivity to several parameters. The model was found to be more sensitive to bed temperature, evaporation coefficients, and

bed heat exchange coefficients; the model was found to be less sensitive to topographic shade, dead pool area, terrestrial long-wave radiation, and emissivity.

Once built, the model was used to predict water temperatures for alternative flow schedules ranging from 35 to 300 cfs for the 2000–2009 period based on Hetch Hetchy Reservoir conditions and outlet elevations. The model results indicate that the model accurately predicts thermal response at several downstream locations over a range of flow releases and meteorological conditions. The model can be used to evaluate different water release schedules under different meteorological conditions to evaluate ecological tradeoffs under different flow conditions.

The study provides recommendations for additional refinements to the model including: additional cross-section data to describe low-flow channel geometry; additional flow and temperature monitoring to refine inflow water temperature for accretions and depletions; installation of a local meteorological station in the vicinity of Early Intake; and identification of local shading elements that may reduce solar insulation that are too small to be detected by digital elevation modeling.

Relevance to WSIP

The PEIR (Vol. 3, Section 5.3.6, Impact 5.3.6-2, pp. 5.3.6-26 to 5.3.6-28) determined that under the 2030 version of the WSIP, potential changes in in-stream temperature between O'Shaughnessy Dam and Don Pedro Reservoir would be less than significant because during nearly all years, temperature conditions under the WSIP would be similar to existing conditions despite the delay and other minor changes in releases. During major droughts such as the 1976–1977 drought, extreme in-stream temperature changes of up to 8 °C could occur, albeit infrequently, but this worst-case increase would not result in temperatures outside of the suitable range for juvenile and adult trout. Of the fishery resources in the upper Tuolumne River, the PEIR determined that rainbow trout would be the most sensitive to temperature increases; however, the increase would occur during the adult and juvenile rearing period and not during the spawning period (see PEIR Vol. 3, pp. 5.3.6-26 to 5.3.6-28). Temperature effects would be substantially less severe under the adopted WSIP than those described in Impact 5.3-6 because of the substantial reduction in average annual diversions compared to the 2030 WSIP.

The PEIR (Vol. 3, Section 5.3.7, Impact 5.3.7-2, pp. 5.3.7-24 to 5.3.7-25) determined that SFPUC operation of O'Shaughnessy Dam under the adopted WSIP would result in potentially significant impacts on terrestrial biological resources due to potential effects on riparian habitat and species of concern in the Poopenaut Valley. However, these impacts could be reduced to less than significant with implementation of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits, which would require that the SFPUC manage releases from Hetch Hetchy Reservoir to recharge riverside meadows such as the Poopenaut Valley, thereby maintaining or improving meadow conditions and habitat for the identified species of concern.

Conclusion

The *Upper Tuolumne River Ecosystem Project: Preliminary Analysis of Available Data for Modeling Temperature in the Hetch Hetchy Reach (O'Shaughnessy Dam to Cherry Creek) Technical Memorandum* (Merritt Smith Consulting, 2008) provided input for subsequent modeling studies on flow and temperature. The SFPUC

intends to use the model described in the *Development of a Flow and Temperature Model for the Hetch Hetchy Reach of the Upper Tuolumne River* (Watercourse Engineering, Inc., 2010) study as a tool to evaluate the expected ecological benefit associated with their operational decisions for O'Shaughnessy Dam. The model will allow the SFPUC to assess short-term temperature variability, travel times for pulse flows and operational flow changes, impacts of seasonal inputs from tributaries, and the thermal effects of various dam operation options. The model also provides a tool for assessing the role of meteorological conditions on the thermal regime of the river. The model results did not reveal the potential for any new impacts or substantial increases in the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger any new mitigation measures or alternatives not already identified in the PEIR. Rather, the model will assist the SFPUC in implementing PEIR Mitigation Measure 5.3.7-2 and allow the SFPUC to more carefully consider the potential temperature effects associated with controlled releases.

Climate Change Study

Summary of Study

The SFPUC, in conjunction with TID, completed a study entitled *Sensitivity of Upper Tuolumne River Flow to Climate Change Scenarios* in January 2012 (Hydrocomp, et al., 2012); this study was summarized in a memo to the SFPUC commissioners (SFPUC, 2012a). The purpose of the study was to assess the sensitivity of runoff to Hetch Hetchy and Don Pedro Reservoirs[7] as a result of potential changes in temperature and precipitation in the years 2040, 2070, and 2100 as compared to 2010 conditions. The range of temperature and precipitation changes used in this study represent a plausible range of climate change scenarios obtained from the scientific literature and in consultation with climate science experts. The study did not assess the likelihood that any one of the selected scenarios represented expected future conditions. The report did not address potential water supply impacts of climate change. The study results are aimed to assist the SFPUC and TID water resource planners in understanding possible effects of flow into Hetch Hetchy and Don Pedro Reservoirs from temperature and precipitation changes.

A physically-based conceptual hydrology simulation model was developed specific to the upper Tuolumne River watershed and used to assess potential changes in the timing and volume of runoff for the years 2040, 2070, and 2100 as compared to 2010 conditions. Six future climate change scenarios were examined which included the following combinations of temperature and precipitation changes: (1) low temperature increase, no precipitation change; (2) moderate temperature increase, no precipitation change; (3) moderate temperature increase, precipitation decrease; (4) moderate temperature increase, precipitation increase; (5) high temperature increase, no precipitation change; and (6) high temperature increase, precipitation decrease. The climate change scenarios have broad ranges for projected future temperatures and precipitation (i.e., the temperature increases compared to 2010 ranged from 1.1 to 3.0 °F in 2040 and in 2100, the range increased from 3.6 to 9.7 °F compared to 2010 conditions; precipitation changes from 2010 conditions ranged from a 5 percent decrease to a 2 percent increase in 2040, and in

[7] The study also looked at changes in inflow to Cherry Reservoir (Lake Lloyd) and Lake Eleanor.

2100, a 15 percent decrease to a 6 percent increase.) A 34-year stationary meteorological database was developed and used to create the potential future conditions for each climate change scenario.

The study reviewed historical meteorological data spanning from 1930 to 2008, and the model was calibrated based on analysis of watershed topography, soils, vegetation and cover data as well as historical meteorological and stream gage and reservoir release records. The historical meteorological database for the Tuolumne watershed was found to exhibit long-term trends of increasing daily average temperature since 1960, but no trends were detected in precipitation, wind, solar radiation, or evaporation.

Modeling results indicated that increases in temperature with or without precipitation changes in the upper Tuolumne River watershed would be projected to affect snow accumulation and melt, soil moisture and forests, and reservoir inflows, thereby potentially affecting runoff to Hetch Hetchy and Don Pedro Reservoirs and associated water supply uses, but the study did not include any water supply modeling. In general, the model results for most scenarios indicate that winter snow is expected to decrease and melt earlier in the spring, increasing evapotranspiration and decreasing watershed runoff. Runoff reductions are greater in years with less than normal precipitation. Results for all but one scenarios indicate a range of decreased runoff volume (0.7 to 29.4 percent) to Hetch Hetchy Reservoir; the one exception is the scenario that projects an increase in precipitation along with moderate temperature increase, and the model results indicate a slight increase in median runoff volume to Hetch Hetchy Reservoir (1.4 to 2.4 percent).

Model results for runoff to Hetch Hetchy Reservoir (referred to as "O'Shaughnessy" in the study) for 2040 indicated that median runoff volume would decrease from 2.1 to 0.7 percent compared to 2010 conditions for the scenarios with a range of temperature increases but no precipitation change. Changes in temperature and precipitation would also change the seasonal timing of runoff; for most of the scenarios studied, there would be increased runoff in November through April and decreased runoff in May, and for all scenarios studied, there would be decreased runoff in June and July.

Thus, temperature increases due to climate change are expected to reduce snow accumulation and to shift runoff from the spring to the winter in the upper Tuolumne River watershed. With increased temperatures, fall and early winter runoff would increase, while late spring and summer runoff would decrease, and these changes would become more significant at the later time periods. Increased temperature effects are exacerbated in low runoff years because of increased evapotranspiration. In critically dry years, predicted reductions in annual runoff could be substantially greater, with runoff decreasing up to 46.5 percent from 2010 conditions by 2100 under one scenario. Model results for 2070 and 2100 indicate significant soil moisture reduction in summer, which would be expected to change vegetation distribution within the watershed, which in turn might cause a secondary change in the hydrologic response, but this effect was not modeled.

Total runoff is projected to decrease under most of the climate change scenarios evaluated, in some cases marginally and others significantly. Assuming a high temperature increase and precipitation decrease, reduction in median runoff to Hetch Hetchy Reservoir would be 7.6 percent in 2040, a relatively large reduction. However, assuming moderate temperature increase and no precipitation change, reduction in

median runoff (about 1.2 percent) and timing changes at Hetch Hetchy Reservoir would be insignificant in 2040, because changes would be small compared to the year-to-year variation that currently occurs.

Relevance to the WSIP

The PEIR addressed climate change effects on the SFPUC's water resources in Vol. 3, Section 5.7.6, pp. 5.7-92 to 5.7-96, and in Vol. 7, Section 14.11, pp. 14.11-1 to 14.11-33. These discussions focus on determining if and how climate change could affect the identified impacts of the WSIP. The PEIR climate change discussion included the following: literature review on climate change studies on water resources in California relevant to the WSIP; description of climate change regulatory framework; review of water agencies' water supply management approach to climate change (including a description of the preliminary analyses done for this study); description of SFPUC's studies on climate change effects; qualitative assessment of WSIP impacts with consideration of climate change effects; and the SFPUC's ongoing actions to address climate change. The qualitative assessment of WSIP impacts in the PEIR was based on the results of the literature review, which were used to establish a reasonably anticipated climate change scenario by 2030 (i.e., moderate to high temperature increase, no change in precipitation). This scenario is similar to two of the scenarios assessed in the climate change study referenced above, which attempted to identify a wider range of climate change scenarios, thus corroborating the reasonableness of the assumptions used in the WSIP PEIR climate change analysis. And, as stated above, the study did not assess the likelihood that any one of the selected scenarios represented expected future conditions.

The PEIR climate change discussion and analysis focused on WSIP effects through a planning horizon of 2030 and with full implementation of the WSIP with a regional water system delivery target of 300 mgd, rather than the planning horizon of 2018 and delivery target of 275 to 285 mgd under the adopted WSIP. With the more severe impacts associated with the 2030 version of the WSIP that was not adopted but upon which the PEIR analysis was based, the PEIR (Vol. 7a, p. 14.11-29) concluded that assuming the reasonably anticipated climate change scenario, identified impacts would be the same or less severe and mitigation measures identified in the PEIR would apply, whether or not climate change is considered. In most cases, when WSIP effects are considered in combination with a climate change scenario, the resulting impacts are either comparable to those described in the PEIR or possibly less severe due to an offsetting effect of the timing of snowmelt compared to the WSIP-induced changes in reservoir storage or releases. Thus, the impact analysis of WSIP water supply and system operations presented in the PEIR provides a reasonable, and sometimes conservative, assessment of environmental effects that accounts for potential climate change through the SFPUC planning horizon of 2030. With the foreshortened planning horizon of the 2018 for the adopted WSIP, which assumes a lower delivery target and, therefore, reduced diversions, the effects of climate change would be even less evident, and any changes would be within the interannual variation in runoff that occurs under existing conditions.

Conclusion

The conclusions of *Sensitivity of Upper Tuolumne River Flow to Climate Change Scenarios* (Hydrocomp, et al., 2012) are consistent with and corroborate information presented in the PEIR regarding effects of climate change on Hetch Hetchy Reservoir runoff. The PEIR (Vol. 7a, Section 14.11, pp. 14.11-15 and 14.11-30) describes the preliminary phases of this study, and this study now provides final results. Both the PEIR and

the study describe how within the planning horizon of the WSIP, possible climate change scenarios in the Tuolumne River watershed are expected to result in earlier snowmelt and a shift in the timing of spring runoff to the reservoir. Unlike the PEIR, the current climate change study only examined changes in inflow to Hetch Hetchy Reservoir and did not study the effect of flows below O'Shaughnessy Dam under any of the scenarios.

Two of the scenarios analyzed in this study (moderate to high temperature increase and no precipitation change) were similar to the reasonably anticipated climate change scenario used in the PEIR to assess WSIP effects. The quantitative results for 2040 for these scenarios regarding changes in runoff to Hetch Hetchy Reservoir were similar to the qualitative results presented in the PEIR for 2030—that is, changes would be small compared to the year-to-year variation that currently occurs in the watershed. While under another scenario (moderate temperature increase and precipitation decrease), the model results for 2040 indicate a relatively large reduction in runoff to Hetch Hetchy Reservoir, even under this scenario, the climate change effects of the adopted WSIP, with its reduced delivery goals through 2018, would be substantially reduced compared to the assumed effects from climate change in the PEIR which considered delivery goals through 2030.

Overall, the results of this climate change study do not conflict with the assumptions used in the PEIR for analyzing WSIP impacts with consideration of climate change effects, and do not provide substantial new information that would affect the analysis in the PEIR. As described in the PEIR, impacts of the adopted WSIP combined with climate change effects would be similar to those identified in the PEIR for the WSIP without climate change considerations. Although the study examined a wider range of future scenarios than the PEIR, the study included scenarios similar to the scenario upon which the PEIR based its analysis, showing the reasonableness of the PEIR scenario; and, the study did not provide any new information as to the likelihood that any one scenario would be more likely to occur than any other. The results of the study do not lead to the conclusion that the WSIP would result in any new impacts, substantially increase the severity of previously identified impacts, demonstrate the feasibility of previously identified mitigation measures or alternatives determined to be infeasible, nor trigger any new mitigation measures not already identified in the PEIR. The study reiterates conclusions that as additional data are collected in the watershed and as more detailed global climate change models become available, it will be possible to refine the future climate and watershed runoff projections for use in long-term water supply planning for climate change effects.

OTHER CONSIDERATIONS

Federal Energy Regulatory Commission Relicensing Process for the Don Pedro Project

The PEIR (Vol. 1, Section 2.5.2, pp. 2-37 to 2-39) describes the SFPUC's agreements with MID and TID with respect to development of Don Pedro Dam and Reservoir on the lower Tuolumne River under the New Don Pedro Project (now referred to simply as the Don Pedro Project) and how it affects the operations of Hetch Hetchy Reservoir. Since publication of the PEIR, no new information is available

regarding the operations of Hetch Hetchy Reservoir relative to the Don Pedro Project. However, as described below, the forthcoming relicensing process for the Don Pedro Project could affect Hetch Hetchy Reservoir operations.

On February 10, 2011, MID and TID (together referred to as the "Districts") filed a Notice of Intent and Pre-Application Document for the relicensing of the Don Pedro Project with the Federal Energy Regulatory Commission (FERC). Following the Integrated Licensing Process, the Districts will file their Final License Application (FLA) by April 30, 2014. The current Don Pedro FERC license expires on April 30, 2016. As part of the Integrated Licensing Process (ILP) for relicensing, the Districts filed a study plan on July 25, 2011 that proposed 30 studies on a range of resource areas including: water use and allocation, water quality, fish and other aquatic resources, terrestrial resources, threatened and endangered species, recreation, aesthetic resources, and cultural resources in support of its intent to relicense the Don Pedro project. After meetings with stakeholders and the receipt of comments on its proposed study plan, the Districts filed a revised study plan with 35 studies in November 2011. FERC received comments on the revised study plan from relicensing participants and issued a Study Plan Determination in December 2011. The study plan determination approved 14 of the studies as filed, 16 studies with modifications, 3 draft study plans and rejected 2 studies as not being necessary. FERC required one additional study as proposed by relicensing participants. National Marine Fisheries Service has filed a dispute on several proposed study plans that FERC did not determine were necessary. The dispute resolution process is underway and will culminate with a Study Dispute Determination on May 24, 2012. The studies will be implemented over the next two years to develop additional data deemed necessary for analyzing the effects of relicensing the Don Pedro project in FERC's Environmental Impact Statement (EIS). FERC's EIS will not begin until the Districts file their FLA in 2014. The effects of the relicensing project are not known at this time. The future conditions of the license and any flow requirements from San Francisco will not be known for years.

SFPUC Updated Water Demand and Water Supply Projections

The PEIR identified that the demand on the SFPUC regional water system was projected to be 285 mgd by 2018, consisting of 91 mgd for the retail customers and 194 mgd for the wholesale customers, based on the purchase requests developed by the wholesale customers as part of the WSIP planning process (Vol. 7a, Section 13.4, p. 13-9). The PEIR further states that in the years approaching 2018, the SFPUC would update demand projections for its retail and wholesale customers and reevaluate customer water delivery needs and water supply options.

With respect to water supply, the adopted WSIP includes water supply sources of 265 mgd average annual delivery from the combined SFPUC watersheds (i.e., Tuolumne, Alameda Creek, and Peninsula watersheds), 10 mgd of conservation/water reuse/ groundwater projects developed by the SFPUC within San Francisco, and up to an additional 10 mgd of conservation/water reuse/groundwater projects developed in conjunction with the wholesale customers and the Bay Area Water Supply and Conservation Agency. In addition, the adopted WSIP water supply program includes dry-year transfer from MID or TID coupled with the Regional Groundwater Storage and Recover project (formerly known as the Westside Groundwater Basin conjunctive-use project) (Vol. 7a, Section 13.4, pp. 13-9 to 13-10).

This section provides the current status of the updates to the water demand and water supply projects, and it describes how this updated information does not affect the impact analysis or conclusions presented in the PEIR.

Updated Water Demand

Since the certification of the PEIR and adoption of the WSIP in October 2008, the SFPUC published the 2010 Urban Water Management Plan (UWMP) (SFPUC, 2011). The 2010 UWMP contains demand projections through 2035 for the entire service area that are different from those projections contained in the PEIR, which was based on information in the 2005 UWMP. In the last few years, since certification of the PEIR, the SFPUC has been experiencing depressed demand in the entire service area not unlike other water utilities around the state. The depressed economy, drought in 2007–2009 followed by a wet and cool weather pattern, in addition to achievements in conservation, are considered to all contribute to the reduced demand. In 2010, water consumption in the SFPUC service area was 227.2 mgd.[8] The 2005 UWMP projected 2010 demand to be 281.3 mgd. The 2010 UWMP describes why the 2005 UWMP demand projections are different from the 2010 UWMP demand projections, and it also acknowledges several uncertainties related to water demand that the SFPUC is facing in the near future (see Sections 4.1.6 and 5.8 of the 2010 UWMP). Although recent events have dampened water demand and slowed the previously anticipated rate of increase in future demand, these events are not necessarily predictive of the long-term outlook for water demand and demand will likely accelerate as the economy recovers.

Attachment A to this memorandum is an updated summary of the SFPUC's projections for future water demand and potential sources of future water supply (SFPUC, 2012). Table 2 of the attachment presents the most recent water demand projections in the SFPUC service area through 2035, including updates since the 2010 UWMP was adopted.

Regardless of the actual demand in the SFPUC service area at this time and the changes in demand projections since certification of the PEIR, the SFPUC must continue to implement all of the components of the adopted WSIP to achieve the delivery and drought reliability goals, including the 2-mgd dry year transfer (see Attachment A). The WSIP level of service goals require that the SFPUC serve a demand of 265 mgd with no greater than 20 percent rationing in any one year of a drought through the year 2018. A 2-mgd transfer from MID and/or TID was adopted as part of the water supply program needed to achieve the WSIP water supply levels of service. The water supply program analyzed in the PEIR assumed that at a demand of 265 mgd, the SFPUC would be able to serve a minimum of 212 mgd (80 percent of 265 mgd). Under current demands for water year 2011–2012, the SFPUC would still be required to impose rationing of 10 percent over three years of the design drought or up to 20 percent in at least one year of the design drought. At a demand of 224 mgd[9], a 10 percent shortage would result in the SFPUC serving approximately 202 mgd, 10 mgd less than the minimum demand it adopted as part of the WSIP level of service goals. The dry-year transfer of 2 mgd would abate one year of 10 percent shortage over the design drought with a demand of 224 mgd. Therefore, implementation of the MID water transfer

[8] This demand number is taken from actual billing data for all customers and includes estimates for unaccounted-for-water in the retail service area and retail groundwater demands.

[9] Approximated projected average annual demand for the regional water system for water year 2011–2012.

is still necessary to meet the WSIP delivery and drought reliability goals. The updated water demand projections do not substantially affect the impact analysis or conclusions presented in the PEIR. This information would not result in new impacts or increase the severity of previously identified impacts.

Water Supply Projections

Attachment A describes the potential water supplies available to the SFPUC that are consistent with the WSIP water supplies through 2018 as identified in the PEIR. These include the following:

- 265 mgd from the Tuolumne River, Alameda Creek, and Peninsula watersheds

- 10 mgd of conservation/water reuse/groundwater projects within San Francisco, and up to an additional 10 mgd of conservation/water reuse/groundwater projects in conjunction with the wholesale customers

- Dry-year supplies from restoration of Calaveras Reservoir capacity, restoration of Crystal Springs Reservoir capacity, Regional Groundwater Storage and Recover project (formerly the Westside Groundwater Basin conjunctive-use project), and 2-mgd water transfer from MID

The SFPUC staff has been actively implementing and planning projects to meet the 10 mgd goal through conservation, recycled water, and groundwater by 2018, as well as investigating the feasibility of other water supply options and variants that were evaluated in the PEIR. Projects currently in implementation include: Sharp Park Recycled Water Project (0.08 mgd) and Harding Park Recycled Water Project (0.23 mgd), both scheduled for completion in 2012; and conservation programs (total savings potential of 5 mgd by 2018) such as free water audits, high-efficiency toilet replacement in low-income communities, water efficient irrigation installation in municipal parks, residential graywater system assistance, rebates for replacement of inefficient water appliances, free water saving devices, and public education/outreach. Projects currently in planning, either undergoing environmental review or waiting for approval, include: 2-mgd water transfer from MID (the subject of this memorandum); regional groundwater storage and recovery project (7.2 mgd for a 7.5-year dry period); San Francisco Groundwater Supply project (4 mgd of groundwater); and San Francisco Westside Recycled Water project (2 mgd, including 1.5 mgd to replace groundwater currently used for irrigation).

Projects undergoing feasibility analysis include: San Francisco Eastside Recycled Water project (2 mgd); Daly City Expansion Recycled Water project (1.3 mgd); South San Francisco Recycled Water project (0.6 mgd); Menlo Country Club Recycled Water project (0.22 mgd); regional desalination project (9 mgd); additional transfers from MID and/or TID; and onsite water treatment of alternative water supplies (e.g., rainwater, seepage water, graywater, and blackwater) for nonpotable uses and potable water offset investigation. Scheduling for this group of projects would extend beyond 2018, as described further in Attachment A.

This update of the status of the SFPUC's water supply projects is consistent with the information presented in the WSIP PEIR, and would not substantially alter the impact analysis or conclusions presented therein. This information would not result in new impacts or increase the severity of previously identified impacts.

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CONCLUSION

Based on the foregoing, the analyses conducted and the conclusions reached in the WSIP PEIR (certified on October 30, 2008) remain valid, and no supplemental environmental review is required for the MID transfer of 2 mgd to the SFPUC. The water transfer would neither cause new significant impacts nor result in the substantial increase in the severity of previously identified significant impacts, and no new mitigation measures would be necessary to reduce significant impacts. No changes have occurred with respect to circumstances surrounding the WSIP that would cause significant environmental impacts to which the water transfer would contribute considerably, and no new information has been put forward which shows that the water transfer would cause new significant environmental impacts, substantially increase the severity of previously identified environmental effects, or provide information demonstrating the feasibility of mitigation measures or alternatives previously rejected as infeasible or the feasibility of new mitigation measures or alternatives. Consequently, the water transfer does not require revision of the PEIR, and the SFPUC and MID may implement the water transfer without additional CEQA review, consistent with California Public Resources Code Section 21166 and CEQA Guidelines Section 15162.

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ATTACHMENT A

Memorandum to SFPUC Commissioners Anson B. Moran, Art Torres, Ann Moller Caen, Francesca Vietor, and Vince Courtney, through Ed Harrington, SFPUC General Manager, from Steven R. Ritchie, SFPUC Assistant General Manager, Water, regarding

Maintaining Water Supply Levels of Service

February 7, 2012

San Francisco Water Power Sewer
Services of the San Francisco Public Utilities Commission

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February 7, 2012

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

THROUGH: Ed Harrington, General Manager

FROM: Steven R. Ritchie, Assistant General Manager, Water

RE: Maintaining Water Supply Levels of Service

I. Introduction and Summary

The purpose of this memo is to provide the Commission with information to better understand SFPUC's contractual obligations and projections for future water demand and to provide tools to help weigh various potential sources of future water supply.

In summary, the SFPUC has a projected shortfall of available water supply to meet its Level of Service (LOS) goals and contractual obligations. Current decreased levels of demand keep this from being an immediate problem, but in the near future, the SFPUC must resolve these issues, particularly to meet the LOS goals by the WSIP completion date of July 2016. Various activities are underway to resolve the shortfall problem.

In this report, we have:

- Prepared a figure showing the decision and implementation schedules for each of the water supply projects showing that decisions are projected to be made primarily in the window between mid-2012 and late 2015 (Figure 1 on page 3),
- Provided a simplified table displaying the supply provided and the cost per acre-foot for each project (Table 1 on page 4),
- Incorporated updated demand projections from our Wholesale Customers (page 8, and Table 2 on page 9),
- Updated each of the project descriptions and schedules (pages 11 through 19),
- Included more information regarding the potential 2 mgd transfer from Modesto Irrigation District (page 12), and
- Presented additional information on the use of alternative water supplies for nonpotable uses, including the preliminary results of a Potable Offset Investigation indicating that 3.4 million gallons per day (mgd) is a likely upper bound for such uses (pages 17 and 18).

This report provides information to assist the Commission in making the following key decisions before 2018:

- Whether or not to make San Jose and Santa Clara permanent customers,
- Whether or not to supply the additional unmet needs of the Wholesale Customers beyond 2018, and
- Whether or not to increase the Supply Assurance above 184 mgd.

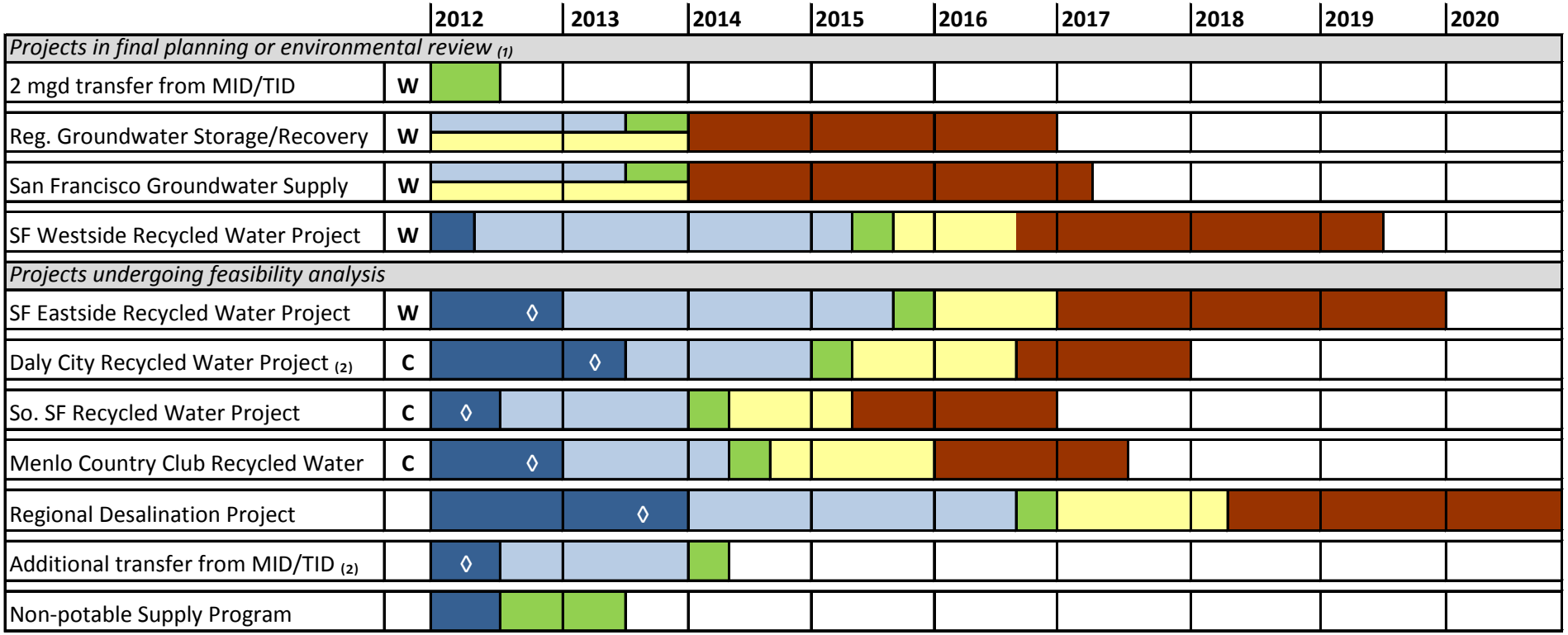
The updated demand projections included in Table 2 enable a more precise understanding of those decisions. Table 2 is followed by a description of additional evolving factors that may influence future demand, such as the results of SB 375 and upcoming State and Federal Regulatory Actions.

The report then describes the various water supply projects in development to meet that demand. To aggregate information on the SFPUC's various water supply options, we have developed the following figure and table.

Figure 1 displays the projected timelines for each of the water supply projects by year. These timelines are predicated on sufficient funding, Commission and partner approval, and additional factors, but represent our best current guess for when water from each supply project will be available for use. The decision to begin environmental review has already been made for the first four projects. The remaining projects are undergoing feasibility analysis. Some of them were included in the WSIP PEIR, or in the FY2012/13 CIP Budget, as marked in the second column of the figure.

Table 1 shows the cost per acre foot and mgd supplied for all of the water supply projects SFPUC is either currently implementing or is considering for implementation. Costs are normalized to 2018 dollars for all projects.

Figure 1: Water Supply Project Timeline by Year



(1) The decision to begin environmental review has already been made for the four projects in this category.

(2) Schedules for a potential transfer from MID/TID and the proposed Daly City Recycled Water Project are not finalized and depend on funding, Commission and partner approval, and other factors.

Key:

◊ = Approval to commence environmental review, including sufficient design work to complete environmental review

W = Included in WSIP/PEIR

C = Included in the FY2012/13 Water CIP Budget

Feasibility analysis / Preliminary planning

Environmental review

Project approval

Design

Construction

Table 1: SFPUC Water Supply Options - Cost and MGD Supplied

Current Water Supply		
	Cost per acre ft (in 2018 dollars)	mgd supplied (FY2010/11)
Regional Water System: Retail Water	$3,620	78.2 mgd (1)
Regional Water System: Wholesale Water	$1,518	143.7 mgd
mgd Subtotal - Current Water Supply:		**221.9 mgd**
Water Supply Projects in Implementation		
	Cost per acre ft (in 2018 dollars)	mgd supplied
Sharp Park Recycled Water	$4,906 (2)	0.08 mgd
Harding Park Recycled Water	$3,400	0.23 mgd
Water conservation	$1,089 (3)	5 mgd by 2018
mgd Subtotal - Water Supply Projects in Implementation:		**5.31 mgd**
Water Supply Projects in Planning and Environmental Review		
	Cost per acre ft (in 2018 dollars)	mgd supplied
2 mgd Transfer from MID/TID	$700	2 mgd
Regional Groundwater Storage & Recovery	$5,005	7.2 mgd
San Francisco Groundwater Supply	$1,338	4 mgd
SF Westside Recycled Water Project	$7,614	2 mgd
mgd Subtotal - Water Supply Projects in Planning and Environmental Review:		**15.2 mgd**
Water Supply Projects Undergoing Feasibility Analysis		
	Cost per acre ft (in 2018 dollars)	mgd supplied
SF Eastside Recycled Water Project	$5,320 - $8,103	2 mgd
Daly City Recycled Water Project	$3,908	1.3 mgd
So. SF Recycled Water Project	Not yet available	0.6 mgd
Menlo Country Club Recycled Water	$3,261 (4)	0.22 mgd
Regional Desalination Project	$1,914	9 mgd
Additional transfer from MID/TID	To be determined	Up to 21 mgd
mgd Subtotal - Water Supply Projects Undergoing Feasibility Analysis:		**Up to 34.12 mgd**

(1) FY2010/11 Retail Water Deliveries include 2 mgd groundwater

(2) The Sharp Park Recycled Water Project will result in reduced annual revenue of approximately $325,832.

(3) Cost figure reflects an average of all 33 programs from the 2011 Retail Conservation Plan. Figure could vary year to year depending on program type. Reduced annual revenue of approximately $93.7 Million results in need for commensurate rate increase.

(4) The Menlo Country Club Recycled Water Project will result in reduced annual revenue of approximately $749,414.

II. Background

In Resolution No. 10-0175 adopted by the Commission on October 15, 2010, staff was directed to provide information to the Commission and the public on how the SFPUC has the capability to attain its water supply levels of service and contractual obligations. This directive was in response to concerns expressed by the Commission and the Wholesale Customers regarding the effect on water supply of the instream flow releases required as a result of the Lower Crystal Springs Dam Improvement Project and the Calaveras Dam Replacement Project. At the same time, it is also necessary to begin preparing for the decisions that the Commission is obligated to make under the Water Supply Agreement by December 31, 2018. We reported to the Commission in a memo dated March 31, 2011 and again in a memo dated September 9, 2011. This is a follow up to the September 9th memo.

On August 9, 2011 the Commission held a strategic planning retreat where the topic of future water demand and supply was discussed. The primary conclusions of that discussion were:

1. The PUC should set out to be the regional water provider and carefully define what that means in the context of having a contractual relationship with its wholesale customers.
2. Priorities for making up for water supply shortfalls should be:
    a. Instream flow requirements
    b. Maintaining supply to meet the 184 million gallons per day (mgd) supply assurance
    c. Providing for increased wholesale customer demands in the future
    d. Making San Jose and Santa Clara permanent customers
3. The Commission needs to be presented with the widest array of options for water supply with well-supported information regarding costs and benefits in a triple bottom line format. A master schedule needs to be developed for when water supply options will be presented to the Commission for consideration.

In addition, as part of the FY 12-13/13-14 budget process the Commission briefly discussed the potential of further water supply policy development. In response to that we are developing a draft policy document and plan to share it with the Citizens Advisory Committee for feedback. Our expectation is to bring the policy to the Commission for review by July.

III. Water Supply Levels of Service & Contractual Obligations

WSIP Water Supply Objectives

As part of the Water System Improvement Program (WSIP), which will be completed by July, 2016, the SFPUC developed levels of service goals and system performance objectives to serve as policy guidance for WSIP and the Water Enterprise. The goals and objectives for water supply are:

Water Supply – *meet customer water needs in non-drought and drought periods*

- Meet average annual water demand of 265 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.

The SFPUC's obligations regarding water supply in the Water Supply Agreement are described in Article 3 of the Agreement. The Agreement requires the SFPUC to provide the supply assurance of 184 mgd to the wholesale customers collectively and the individual supply guarantees to wholesale customers individually; however, the SFPUC may reduce the amount of water available or interrupt water deliveries specific to geographical areas due to the following conditions (per Section 3.11):

- Emergencies;
- Installing, repairing, rehabilitating, replacing, investigating or inspecting equipment in the Regional Water System;
- Performing maintenance on the Regional Water System; or
- Shortages caused by drought.

Section 3.15 further addresses urgent and non-urgent circumstances that may diminish the SFPUC's ability to maintain the Supply Assurance and the ability of the SFPUC to engage in planning evaluation and implementation of replacement sources of supply when the need arises without the prior approval of the Wholesale Customers. Examples of urgent reductions include sudden events such as "drought, earthquakes, terrorist acts, catastrophic failures of facilities owned and operated by SFPUC and other natural or man-made events." Non-urgent reductions are described as "climate change, regulatory actions and other events that may impact SFPUC's ability to maintain the Supply Assurance from its existing surface water supplies, but on timescales long enough to permit SFPUC to collaborate with its Wholesale Customers on how best to address the possible impacts to water supply."

[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.

Decisions Required Under the Water Supply Agreement by December 31, 2018

The decisions that San Francisco is required to make by December 31, 2018 are described in Section 4.06 of the Agreement. They are:

A. "By December 31, 2018, San Francisco will have completed any necessary CEQA review pursuant to Section 4.07 that is relevant to making San Jose and Santa Clara permanent customers of the Regional Water System and will decide whether or not to make San Jose and Santa Clara permanent customers of the Regional Water System. San Francisco will make San Jose and Santa Clara permanent customers only if, and to the extent that, San Francisco determines that Regional Water System long term water supplies are available."

B. "By December 31, 2018, San Francisco will have completed any necessary CEQA review pursuant to Section 4.07 and will decide how much water if any, in excess of the Supply Assurance it will supply to Wholesale Customers from the Regional Water System to meet their projected future water demands until the year 2030, and whether to offer a corresponding increase in the Supply Assurance as a result of its determination."

IV. Current and Projected Demand

Demand projections for the Regional Water System are shown in Table 2. Demand in San Francisco and from the Wholesale Customers has been depressed in FY2010/11 and the first half of FY2011/12 due to a combination of conservation effectiveness, cooler weather in the last 2 to 3 years, and the state of the economy. Total Retail Demand for FY 2010/11 was 78.2 mgd. However, reduction in demand that is the result of economic or climatic conditions can rebound. For example, demand rose by 10% in December 2011, likely due to dry conditions. Retail Demand is anticipated to rebound in the future, and to reach 80.9 mgd by 2035.

As part of the development of the Long-Term Reliable Water Supply Strategy, BAWSCA has updated demand projections for each of the Wholesale Customers, which the organization included in its Draft Final report entitled "Updated Water Demand and Supply Need Projections for the Long-Term Reliable Water Supply Strategy," released January 26, 2012. The report projects the aggregate Wholesale Customers' purchases in 2018 to be 171.8 mgd. This projection is within the Wholesale Customers' collective allocation of 184 mgd under the Interim Supply Limitation.

Making San Jose and Santa Clara Permanent Customers

Converting San Jose and Santa Clara to permanent, non-interruptible customers would require the SFPUC to secure 9 mgd of additional water supply according to the analysis completed in SFPUC's 2010 Urban Water Management Plan. Currently, San Jose and Santa Clara are temporary customers with an interruptible status. The SFPUC will continue to meet the two cities' demands up to 9 mgd through 2018, but may issue a conditional five-year notice of termination or reduction in supply to San Jose and Santa Clara if water use by the Wholesale Customers is projected to exceed 184 mgd before June 30, 2018. Development of additional supplies would be necessary to offer San Jose and Santa Clara permanent status.

Resolving the additional unmet needs of the Wholesale Customers beyond 2018

Demand projections included in the draft final "Updated Water Demand and Supply Need Projections for the Long-Term Reliable Water Supply Strategy," indicate an unmet Wholesale Customer demand of 4.3 mgd in 2035 beyond the needs of San Jose and Santa Clara. Currently, the SFPUC is obligated to meet the Wholesale Customers' Supply Assurance of 184 mgd. The SFPUC has limited its deliveries from the watersheds to the Wholesale Customers collectively to 184 mgd through 2018. Development of additional supplies would be necessary to meet Wholesale Customer demands beyond 184 mgd.

Table 2: Demand Projections from the Regional Water System (mgd)

	2011	2018	2035
Restricted demand – extended 265 supply limitation through 2035			
Total Retail Demand [(1)]	78.2	79.7	81.0
Total Wholesale RWS Demand [(2)]	143.7	171.8	184.0
Total RWS Restricted Demand	**221.9**	**251.5**	**265.0**
Unrestricted demand			
Total Retail Demand [(1)]	78.2	79.7	80.9
Anticipated Wholesale RWS Purchases [(2)]	143.7	171.8	177.1
Making San Jose & Santa Clara permanent customers [(3)]			9
Additional Wholesale Unmet Demand [(4)]		1.9	4.3
Total RWS Unrestricted Demand	**221.9**	**253.4**	**271.3**

(1) Retail demand numbers include code-driven savings from changes in state and federal plumbing codes and regulations and active conservation expected from programs implemented by SFPUC. Source of numbers included in table: 2011 Water Supply Development Report.

(2) Source: 2011 Water Supply Development Report and BAWSCA January 2012 Draft Final Updated Water Demand and Supply Need Projections for the Long-Term Reliable Water Supply Strategy, Table 4.

(3) Anticipated Wholesale Regional Water System purchases include 9 mgd for San Jose and Santa Clara through 2018.

(4) Source: BAWSCA January 2012 Draft Final Updated Water Demand and Supply Need Projections for the Long-Term Reliable Water Supply Strategy, Table 4.

Instream Flow Release Requirements

As a result of regulatory actions, there are new instream flow release requirements in San Mateo Creek below Crystal Springs Dam and in Alameda Creek below Calaveras Dam and Alameda Creek Diversion Dam. These instream flow releases will be required at the completion of the Lower Crystal Springs Dam Improvements Project in 2013 and the completion of the Calaveras Dam Replacement Project in 2016. They represent a decrease in the available supply to meet projected Regional Water System demands.

The instream flow release requirements for Alameda Creek and San Mateo Creek represent a potential decrease in available water supply of an average annual 3.9 mgd and 3.5 mgd, respectively, for a total of 7.4 mgd average annually. This water supply decrease assumes the adopted WSIP program element of an average annual target delivery of 265 mgd. The analysis also assumes that all of the water supply components of the adopted WSIP are implemented and all WSIP projects are implemented, including the Upper Alameda Creek Filter Gallery Project, which in accordance with the Program Environmental Impact Report (PEIR) assumptions is estimated to recapture up to 6,300 acre-feet (AF) per year (5.4 mgd as a daily average). However, the Filter Gallery Project as currently envisioned is under review and may not be implementable, so the shortfall could be as much as 12.8 mgd.

V. Other Potential Demands and Effects on Supply

There are a number of upcoming actions that could affect the SFPUC's water supply and may increase SFPUC water demands. These actions include:

Incorporating the results of SB 375 in demand projections for the retail and wholesale customers

SB 375 requires ABAG and MTC to develop a Bay Area Sustainable Communities Strategy (SCS) which 1) achieves a greenhouse gas emissions reduction target set by the California Air Resources Board by reducing vehicle travel, and 2) identifies a strategy to meet the Bay Area's entire housing need by income level within the Bay Area. The SCS is scheduled to be adopted by April 2013. Results of the SCS planning effort to-date suggest an increase of 903,000 more housing units and 1,222,000 more jobs in the nine-county Bay Area by 2035 which is 269,000 more housing units and 92,900 more jobs than under ABAG Projections 2009. Of this total increase, the SCS currently proposes that San Francisco would accommodate 19,000 more housing units and 16,000 more jobs than were included in this UWMP's 2035 demand projections. Wholesale Customers in the SFPUC service area are expected to absorb much of this additional growth in housing and jobs under the SCS as well. If the adopted SCS places more growth in the SFPUC service area, water demand will likely increase.

Potential supply shortfalls attributed to State and Federal regulatory actions

The following actions or proceedings may affect SFPUC water supplies from the Tuolumne River and local watersheds:

- Federal Energy Regulatory Commission (FERC) relicensing of the Don Pedro Project
    - State Water Resources Control Board (SWRCB) 401 Certification of FERC relicense
    - Endangered Species Act (ESA) Section 7 consultation for FERC relicense
- Central Valley Total Maximum Daily Load regulations
- SWRCB proceedings
    - Delta outflow requirements
    - San Joaquin River flow requirements
- ESA Habitat Conservation Plans for SFPUC local watersheds

VI. Water Supply Options Available to the SFPUC

The WSIP program includes the following components for meeting water supply levels of service through 2018.

In all water year types, the SFPUC will continue to meet demand in its service area up to 265 mgd from its watersheds:

- Tuolumne River watershed
- Alameda Creek watershed
- San Mateo County watersheds

The WSIP includes the following water supply projects to meet dry-year demands with no greater than 20 percent system-wide rationing in any one year.

- Restoration of Calaveras Reservoir capacity
- Restoration of Crystal Springs Reservoir capacity
- Westside Basin Groundwater Conjunctive Use
- Water Transfer of 2 mgd from Modesto Irrigation District and/or Turlock Irrigation District (MID/TID)

The WSIP PEIR evaluated several water supply options in addition to those included in the adopted WSIP to meet future demand and dry-year water needs in the SFPUC service area. These options include:

- Additional diversions from the Tuolumne River using existing SFPUC water rights
- Lower Tuolumne River Diversion
- Additional conservation, recycled water and groundwater projects throughout the retail and wholesale service area
- Regional Desalination Project for dry-year needs
- Year-round Desalination Project at Oceanside in San Francisco

SFPUC staff has been investigating all of these options, variants of them, and other options to meet the adopted LOS goals and contractual obligations of the SFPUC, including the commitment to meet 10 mgd through conservation, recycled water, and groundwater by 2018. Current efforts regarding future water supply options are described below.

Projects Currently in Implementation
Projects in implementation are currently in construction, or in the case of conservation, activities such as fixture replacement are actively being implemented.

Sharp Park and Harding Park Recycled Water Projects
Two recycled water projects are currently under construction. The Sharp Park Recycled Water Project (0.08 mgd) and the Harding Park Recycled Water Project (0.23 mgd) are estimated to be complete in Spring 2012 and Summer 2012, respectively. The cost of the Sharp Park recycled water is $4,906 per AF and the Harding Park water is $3,400 per AF.

Conservation

The SFPUC remains committed to implementing conservation as an important component of its water supply portfolio. In 2010, the SFPUC conducted a detailed analysis on the effectiveness of its water conservation measures. The analysis projected a total savings potential of 5.0 mgd by 2018 and 6.0 mgd by 2035 from active conservation. We anticipate an additional 17 mgd of water savings through passive conservation (building codes and ordinances) by 2035. The reduction in demand resulting from passive conservation is included in the SFPUC's 2035 demand projections included in Table 2. Conservation programs include free on-site indoor and outdoor water audits; multiple incentive programs, including high-efficiency toilet replacement in low-income communities, water efficient irrigation installation in municipal parks and other large landscapes; residential graywater system assistance; rebates for replacement of inefficient toilets, urinals and clothes washers; free water saving devices; and public education and outreach.

Projects Currently in Planning

Projects in planning are undergoing environmental review or are otherwise awaiting Commission approval for implementation.

Transfer from MID

The adopted WSIP includes a 2 mgd transfer of water from MID/TID to meet dry-year needs in the service area. Last fall MID conducted a series of public meetings regarding the potential transfer, and the MID Board of Directors agreed to initiate negotiations for a 2 mgd transfer at their meeting on January 10, 2012. Environmental review of the proposed transfer was completed as part of the WSIP Program Environmental Impact Report.

Regional Groundwater Storage and Recovery

The proposed Regional Groundwater Storage and Recovery Project would balance the use of both groundwater and surface water to increase water supply reliability during dry years or in emergencies. The proposed project is located in San Mateo County and is sponsored by the San Francisco Public Utilities Commission in coordination with its partner agencies, California Water Service Company, the City of Daly City and the City of San Bruno.

The proposed Regional Groundwater Storage and Recovery Project would extract groundwater from the South Westside Basin groundwater aquifer in San Mateo County. The South Westside Basin is within the larger Westside Basin groundwater aquifer, which extends from Golden Gate Park in San Francisco south to Burlingame. The project would consist of installing up to 16 new recovery well facilities in northern San Mateo County to pump stored groundwater during a drought. During years of normal or heavy precipitation, the proposed project would provide surface water to the partner agencies in order to reduce the amount of groundwater pumped. Over time, the reduced pumping would result in the storage of approximately 61,000 acre-feet of water (more than the supply contained in the Crystal Springs Reservoir on our Peninsula Watershed.) This would allow recovery of the stored water at a rate of up to 7.2 million gallons per day for a 7.5-year dry period. The water would be in compliance with the California

Department of Public Health requirements for drinking water supplies. The proposed project would include construction of well pump stations, disinfection units, and piping.

The Project is currently undergoing environmental review.

San Francisco Groundwater Supply Project

The San Francisco Groundwater Supply Project proposes the construction of up to six wells and associated facilities in the western part of San Francisco to extract up to 4 mgd of groundwater from the northern Westside Basin for distribution in the City. Of the 4 mgd, 1.5 mgd is groundwater that is currently used for irrigation of Golden Gate Park that will be freed up for potable use as a result of the Westside Recycled Water Project. The extracted groundwater, which would be used both for regular and emergency water supply purposes, would be disinfected and blended with imported surface water before entering the municipal drinking water system.

Environmental review for this project began in December 2009. Construction is expected to be complete by 2017.

San Francisco Westside Recycled Water Project

The SFPUC's Westside Recycled Water Project is currently undergoing environmental review. The proposed project consists of an advanced treatment facility that would serve an average annual demand of up to 2 mgd mostly irrigation, with the primary uses being irrigation in Golden Gate Park (approximately 85% of the demand), and the Lincoln Park and Presidio Golf Courses. As a direct result of this Project, 1.5 mgd of groundwater currently used to irrigate Golden Gate Park will be freed up for potable use as part of the San Francisco Groundwater Supply Project.

A series of public workshops on the Westside Recycled Water Project was completed in February 2011. These workshops provided an opportunity for the public to suggest alternatives to the proposed project site in Golden Gate Park. The alternatives that were developed during that process have been forwarded to the City Planning Major Environmental Analysis Division for their consideration in the Environmental Impact Report. Additional work is also underway to further vet these alternatives, and develop preliminary conceptual layouts and facility descriptions that would provide necessary information for environmental review. The anticipated cost of water for this project is $7,614 per AF.

Several other recycled water projects are available to the SFPUC to serve customers recycled water to offset current potable water use. The SFPUC is beginning the process of considering these projects described below for further analysis and implementation.

Projects Undergoing Feasibility Analysis
Projects undergoing feasibility analysis are currently being studied, and are subject to change as the project further develops.

San Francisco Eastside Recycled Water Project
In 2009, the SFPUC completed two pre-planning studies to provide preliminary information for the proposed implementation of recycled water on the City's eastern side: the Eastside Recycled Water Market Assessment Update and the Eastside Non-Potable Water Use Study. The Market Assessment provided an updated estimate of potential recycled water demands on the eastside of the City. The Non-Potable Water Use Study considered alternatives for reducing potable demand (for non-potable uses such as irrigation and toilet flushing) with non-potable supplies — which included recycled water, graywater, and stormwater. The study recommended recycled water as the preferred water source to serve the major demands/customers.

It is anticipated that the proposed Eastside Recycled Water Project would serve an average annual recycled water demand of approximately 2 mgd at an estimated cost of $5,320 to $8,103 per AF. The project would serve recycled water for both outdoor and indoor uses, including irrigation, toilet flushing, cooling in commercial buildings, commercial laundries and heavy industrial processes such as concrete batching and/or gravel washing. Potential customers are located within the City and could include the following:

- Transbay Redevelopment Project
- Mission Bay
- Seawall Lot 337
- Hunters Point Shipyard Phase I (Parcel A)
- Hunters Point Shipyard Phase II
- McLaren Park (including Gleneagles Golf Course)
- Backlands at Pier 90 through 96
- Pier 70

Planning level work on the Eastside Recycled Water Project is underway, with the initiation of the Alternatives Analysis process. The Alternatives Analysis process will identify and evaluate the various alternatives for implementing recycled water on the City's eastern side; the goal of this process is to identify a preferred alternative to advance to environmental review and conceptual engineering. A public participation process is being conducted in parallel with the Alternatives Analysis, to provide opportunity for input during the project development process. A project Open House was held in mid-November, 2011, to provide the public with background on recycled water and the project planning process.

Daly City Expansion Recycled Water Project
The City of Daly City currently supplies recycled water to several golf course irrigation customers in Daly City and San Francisco from its tertiary facilities at the Daly City Wastewater Treatment Plant (WWTP). SFPUC is partnering with Daly City to expand

the recycled water system to serve recycled water to the Harding Park Golf Club (Harding Park) in San Francisco, which is expected to be completed in 2012.

The SFPUC has examined implementing a second phase which includes building new recycled water treatment facilities at the Daly City WWTP to produce additional recycled water. The proposed project could serve an average annual demand of 1.3 mgd. Potential customers include SFPUC customers in the Lake Merced Area (average annual demand of approximately 0.4 mgd), California Water Service Company (Cal Water) customers, and customers that own private wells in the town of Colma. The project would serve recycled water only for irrigation uses at an estimated cost of $3,908 per AF.

The estimated total capital cost of the project is $48 million (2010 dollars) based on the following capital components:

- New tertiary treatment facilities at Daly City WWTP;
- A pipeline to serve Lake Merced Area irrigation customers in San Francisco;
- A new pipeline to the south to supply Colma customers; and
- Recycled water storage facilities for Colma customers.

South San Francisco Recycled Water Project

The South San Francisco Recycled Water Facility Plan was jointly developed by the Cities of South San Francisco and San Bruno, the SFPUC and Cal Water in August 2009. The Plan proposes to produce recycled water at the South San Francisco/San Bruno Water Quality Control Plant and distribute recycled water to customers in the South San Francisco and San Bruno areas, and potentially in the Town of Colma.

The project was further refined in 2010. The recommended project includes serving an average annual demand of 0.6 mgd of recycled water to Golden Gate National Cemetery (GGNC), a SFPUC retail customer, along with Cal Water and San Bruno municipal customers. The project would serve recycled water only for irrigation needs.

The estimated total capital cost of the project is $20.5 million (2010 dollars) for the recycled water treatment, storage and delivery system. The study recommended the SFPUC share be $15.4 million for capital costs to serve GGNC (average annual demand of 0.3 mgd). The recommended project includes the following components:

- Construction of new tertiary treatment facilities at a South San Francisco water pollution control facility;
- New pipelines to supply recycled water to customers; and
- Recycled water storage facilities.

There is not yet an estimated cost per AF for this project.

Funds for this project are included in the proposed FY 12-13 Water Enterprise CIP budget.

Menlo Country Club Recycled Water Project

The SFPUC and Menlo Country Club (CC) recently completed a recycled water feasibility study. Currently, Menlo CC, located in Woodside, California, receives water from two retail providers. Domestic water is supplied by Cal Water and irrigation water is supplied by the SFPUC.

The City of Redwood City (Redwood City) is the water and recycled water purveyor within its City limits. Menlo CC is located adjacent to the Redwood City boundary within the City of Woodside. Redwood City recently completed its $72.4M Phase 1 Recycled Water Project that includes treatment, storage, pumping and pipeline facilities serving a variety of customer sites.

Recycled water is produced at the South Bayside System Authority (SBSA) Wastewater Treatment Facility in the Redwood Shores area. SBSA produces the Disinfected Tertiary Recycled Water suitable for "unrestricted use" under Title 22 of the California Code of Regulations. This is the highest classification of recycled water under this regulation and it may be used for golf course irrigation, and for storage in onsite impoundments at golf courses, where there is unrestricted public access.

The estimated total capital cost of the project is $9.3 million to serve Menlo CC the average annual 0.22 mgd of irrigation demand with the estimated cost of delivered water at $3,261 per AF. The proposed recycled water project includes the following capital components:

- Distribution pipeline from Redwood City's existing recycled water pipeline to Menlo CC;
- Pumping facility; and
- Recycled water storage facility.

Funds for this project are included in the proposed FY 12-13 Water Enterprise CIP budget.

Regional Desalination Project

The SFPUC is working with East Bay Municipal Utility District (EBMUD), Contra Costa Water District (CCWD), Santa Clara Valley Water District (SCVWD), and Zone 7 Water Agency to jointly develop a 10-20 mgd desalination facility in East Contra Costa County that would serve the combined water needs of each of the partner agencies with desalination and water transfers. The project would treat brackish water to produce potable water that would be delivered to EBMUD and CCWD transmission systems and includes subsequent water exchanges to serve the other partner needs, as required. For example, SFPUC would receive water from EBMUD through the EBMUD-Hayward-SFPUC intertie. The capital cost for the project (inflated to 2018 dollars) is estimated to be $193 million. Based on delivery of 9 mgd (10,080 AFY) of transfer water from EBMUD at Hayward, the SFPUC's proportionate share of capital costs is estimated to be $86.7 million. The SFPUC's share of annual operating and maintenance costs are anticipated to be an additional $16.5 million. The unit cost of water delivered to the SFPUC is expected to be $1,914 per acre foot.

Initial planning for the Regional Desalination Project began in 2003. Feasibility studies and pilot testing have been completed, both supported by grant funding through Proposition 50. Hydraulic modeling and investigation of water rights and other permitting requirements are currently underway. Depending on which partners choose to pursue a project, if any, it could be completed by 2020.

The current phase of work includes both hydrologic and hydraulic modeling as well as outreach to stakeholders including regulatory agencies. The estimated budget for this phase is a total of $1,000,000 or $200,000 per agency. The agreement among the partner agencies for this phase of work was approved by the Commission on September 27, 2011. It is anticipated that sufficient information to decide if the Project is worth pursuing will be available in 2013.

Transfers from MID/TID

In addition to the transfer of 2 mgd noted above, transfers could be negotiated to make up for losses in water supply due to instream flow releases and meet additional demands. The SFPUC is currently investigating the potential to obtain such a transfer from the Districts that would not result in any changes to flows on the Tuolumne River below La Grange dam.

Alternative Water Supplies

The SFPUC is committed to preserving its potable water resources through conservation and by using local alternative water supplies for nonpotable purposes. Currently, the state of California has regulations regarding two forms of non-potable water: recycled water supplied by a municipality and graywater generated and reused on a residential property for subsurface irrigation. The lack of clear regulations regarding other forms of alternative water treatment and use for non-potable purposes has been an impediment to developers and property owners.

To address this issue locally within San Francisco, the SFPUC is spearheading a program that would require onsite water treatment of alternative water sources for nonpotable use in new developments and commercial structures of a defined minimum size. The program focuses on the following four primary alternative water sources:

1. Rainwater - natural precipitation that falls on a property that has not yet entered a public stormwater system.
2. Seepage Water -groundwater that is dewatered to maintain a building's structural integrity and would otherwise be discharged to the sewer system.
3. Graywater - includes, but is not limited to, wastewater from bathtubs, showers, bathroom washbasins, clothes washing machines, and laundry tubs. This does not include wastewater from kitchen sinks, dishwashers, or toilets.
4. Blackwater - Wastewater containing bodily or other biological wastes, as from toilets, dishwashers, kitchen sinks and utility sinks.

The SFPUC is working in conjunction with San Francisco Dept. of Public Health and San Francisco Department of Building Inspection to develop this new program. The program elements as currently envisioned would include a new City ordinance, rules and

regulations for onsite treatment and water quality requirements and an appropriate permitting process. Drafting of the various program elements is underway and will be brought to the Commission for consideration in mid-2012.

The SFPUC is also undertaking a Potable Offset Investigation. The Potable Offset Investigation builds on the 2010 UWMP Update for San Francisco. The 2010 UWMP Update includes countywide water demand projections to the year 2035, compares available water supplies to meet demands and presents water demand management measures to reduce long-term water demand. The Potable Offset Investigation refines the San Francisco Retail demands presented in the 2010 UWMP Update by identifying opportunities to offset potable demands through the expanded use of on-site alternative supplies (including rainwater, seepage water, graywater, and blackwater) by customer class (single-family, multi-family, and non-residential) through 2035.

Based on the analysis completed, it is estimated that up to 3.4 mgd of onsite supply could be used in lieu of Hetch Hetchy Regional Water System supplies by the year 2035 in San Francisco if programs were implemented that both mandate and aggressively encourage the use of onsite supply to meet nonpotable demands in the single family residential, multi-family residential, non-residential and municipal open space sectors. The primary limiting factors are the nonpotable demands that could be met with alternative supplies and storage requirements for alternative supplies. As achieving this level of onsite supply use would require 100% participation in programs expected to provide maximum effectiveness, 3.4 mgd of potable offset should be considered an upper bound for potential future programs.

As the SFPUC continues to work toward development of an increasingly diverse water supply portfolio, the potential benefits of onsite reuse of alternative supplies should be considered. Findings of this study indicate that SFPUC should:

- Continue conservation programs and ordinances to lower water demand, especially in existing buildings that would not be retrofitted for dual plumbing.
- Continue the laundry-to-landscape and rain barrel programs for existing buildings.
- Continue recycled water development to meet City-wide nonpotable demands.
- Develop a program to target new developments that have the ability to implement dual plumbing systems at the time of construction. Due to the significant growth projected in the multi-family residential and non-residential sectors, the program should target these areas and explore the ways to best utilize onsite supplies within these sectors.
- Maintain sufficient supply to provide backup supply to onsite systems in the event of failure or inadequate supply availability.

The draft Potable Offset Investigation report is available at http://sfwater.org/index.aspx?page=75.

The draft report will be presented to the Citizens Advisory Committee for their consideration on February 13, 2012. Additionally, public comments will be accepted through March 15, 2012.

Bailey Formula

The SFPUC's relationship with Alameda County Water District (ACWD) regarding Alameda Creek water rights is defined by a December 28, 1920 State Water Commission arbitration award. The 1920 award required Spring Valley to release certain volumes of water into Alameda Creek to replace the volume of water that would have percolated to storage into the Niles Cone through the bed of Alameda Creek if Calaveras Dam had not been built. The 1920 award contains a formula devised by engineer Paul Bailey (the "Bailey Formula") that is maintained by the U.S. Geological Survey based on data provided by Spring Valley and the SFPUC after 1930. Over the ensuing decades, the SFPUC has made releases to Alameda Creek for the benefit of ACWD. The SFPUC and ACWD are currently in discussions regarding how the Bailey Formula approach should be implemented in the future and how to define and deal with the volume of water that ACWD currently owes the SFPUC.

VII. Other Considerations

Relationship with BAWSCA's Water Supply Strategy

In May 2010, BAWSCA released the Long-Term Reliable Water Supply Strategy Phase I Scoping Report which contained updated water demand in five-year increments through 2035 and SFPUC purchase projections for 2018 and 2035. As part of the development of the Long-Term Reliable Water Supply Strategy, BAWSCA has updated demand projections for each of the Wholesale Customers. Those updated demand projects are included in Table 2, above, and will assist SFPUC in determining how much additional supply will be needed if the Commission chooses to meet any unmet Wholesale Customer demand beyond 2018.

Financial Issue

A particular issue that needs to be discussed with BAWSCA and the Wholesale Customers is the matter of who pays for new water supplies in the future. For replacement of water supply lost to instream flows related to regional assets, it is clear that all customers should pay. For new supply in the future related to decisions that need to be made by December 31, 2018, the beneficiaries of that supply should pay. The questions of who the beneficiaries will be and when they should pay need to be answered. For example, if supplies are used to increase the supply assurance, it needs to be determined which customers would receive the additional assurance. It also needs to be determined how and when the development costs (planning, design, environmental review, etc.) of a given supply are allocated to those customers. SFPUC staff has initiated discussions with BAWSCA on these topics.

VIII. Conclusion

In summary, the SFPUC has a projected shortfall of available water supply to meet its LOS goals and contractual obligations. Current decreased levels of demand keep this from being an immediate problem, but in the near future, the SFPUC must resolve these issues, particularly to meet the LOS goals by the WSIP completion date of July 2016. Various activities are underway to resolve the shortfall problem.

Please contact me if you have any questions.

cc: Art Jensen, BAWSCA