Public Hearing (3/20/13)
Bay-Delta Plan SED
Deadline: 3/29/13 by 12 noon

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RESTORE HETCH HETCHY
YOSEMITE NATIONAL PARK

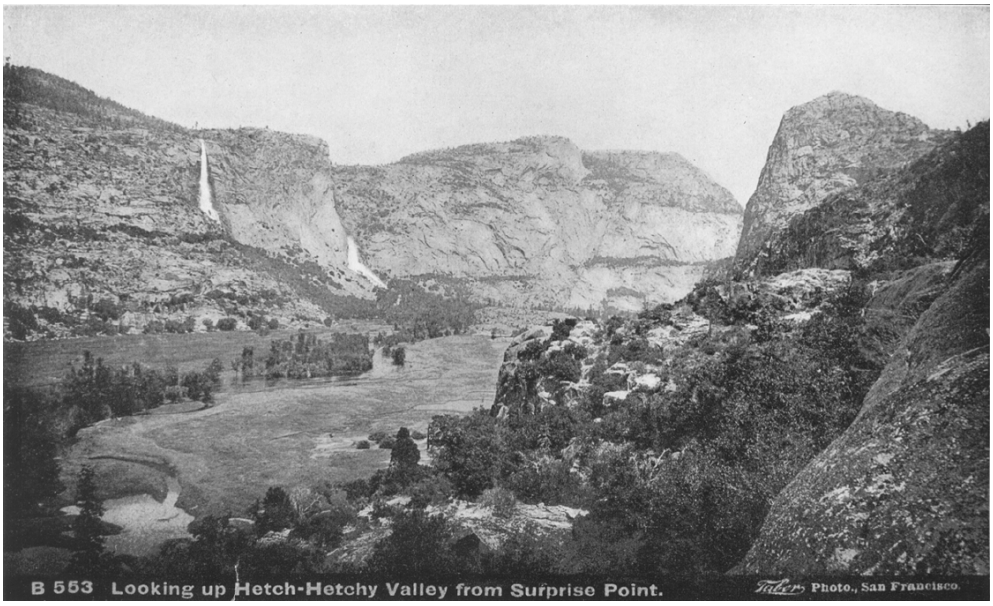
Comments of Restore Hetch Hetchy on the State Water Resources Control Board's Lower San Joaquin River Draft Substitute Environmental Document (SED):

POTENTIAL CHANGES TO THE WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY-SACRAMENTO/SAN JOAQUIN DELTA ESTUARY: SAN JOAQUIN RIVER FLOWS AND SOUTHERN DELTA WATER QUALITY

March 29, 2013

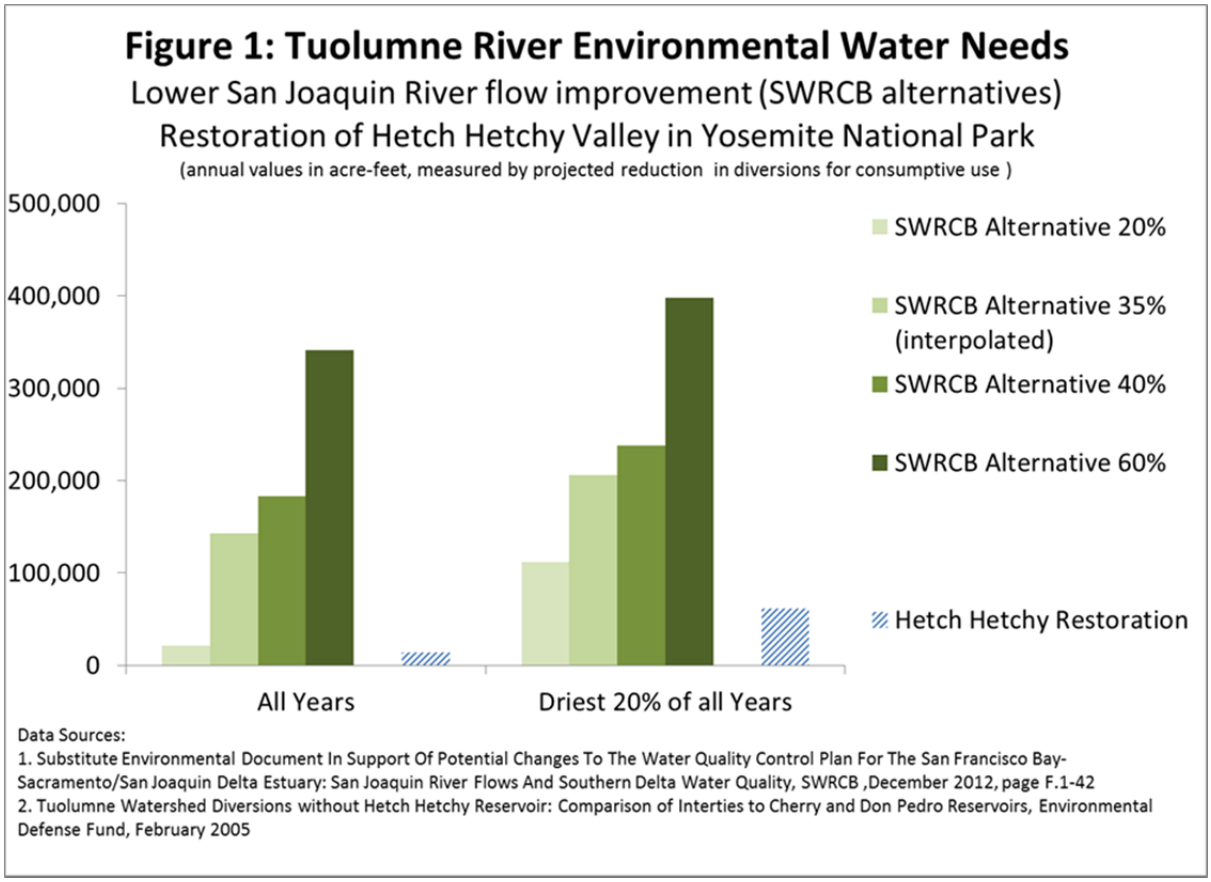
Summary

Restore Hetch Hetchy supports the State Water Resources Control Board (State Board) in its effort to amend the 2006 Water Quality Control Plan and to provide flows of suitable magnitude and timing on tributaries to the lower San Joaquin River and into the Bay-Delta. We take no specific position on the alternatives proposed. We do recommend, however, that the State Board extend the range of beneficial uses of water beyond those it has heretofore considered in the SED to include values associated with Yosemite National Park – in particular the opportunity to reclaim nine miles of the Tuolumne River by restoring Hetch Hetchy Valley (shown below).



Restore Hetch Hetchy urges the State Board, as it pursues adoption and implementation of these enhanced flows, to consider its broad and specific statutory responsibilities to balance water needs for all beneficial uses. These include not only the needs of downstream fisheries that are the subject of this process and the consumptive use objectives of agricultural and urban water districts, but also the water supply that will be necessary to accommodate the restoration of Hetch Hetchy Valley in Yosemite National Park.

Fortunately, the additional water supply needed to accommodate the restoration of Hetch Hetchy Valley is modest in comparison to needs in the Central Valley and Bay-Delta system, and is even modest in comparison to the water supply at stake in the Tuolumne River watershed under the State Board's alternatives (see Figure 1 below). Nevertheless consideration of future action to restore Hetch Hetchy Valley in Yosemite National Park at this juncture should be included in this process. As it considers appropriate flow criteria for the lower San Joaquin River, the Board should take no action that would hinder the opportunity to restore of Hetch Hetchy Valley in a future proceeding of the State Board or any other governmental body. In addition, Restore Hetch Hetchy asks the State Board to investigate the potential interaction between the restoration of Hetch Hetchy Valley and implementation of the State Board's proposed flow objectives on the lower San Joaquin River.



The average annual water supply replacement necessary to restore Hetch Hetchy Valley is modest about 13,370 acre-feet per year – only about 1/10 the volume of diversion reduction anticipated implementing the State Board's 35% alternative on the lower Tuolumne River. In the driest 20% of years, about 61,780 would need to be replaced[1] *– 30% of the volume of diversion reduction anticipated by the State Board's 35% alternative.*[2] *Analysis of the water supply required to accommodate restoration of Hetch Hetchy Valley by UC Davis (2006) and the U.S. Bureau of Reclamation (1988) found similar results - that water supply replacement requirements would be relatively modest.*

The State Board should also understand, as explained below, that San Francisco's system accounts for less than 20% of the diversions on the Tuolumne River. Moreover San Francisco's water rights are limited only to comparatively high flows which overlap very little with the State Board's flow objectives. According, assignment of responsibilities for meeting flow requirements in the lower Tuolumne River should be assigned in their entirety, or very nearly so, to the Turlock and Modesto Irrigation Districts (the Districts) and not to the San Francisco Public Utilities Commission (San Francisco).

In addition, the State Board should evaluate the prospective cooperation between water agencies that can help to facilitate environmental improvements, including both enhanced flows downstream of the terminal reservoirs and the restoration of Hetch Hetchy Valley. Such cooperation between agencies might encompass a range of mutually beneficial projects, including but not limited to water supply exchange or banking, investments in groundwater or surface storage development, and improved conveyance. In some cases, the State Board should consider whether the reasonable use provision in the California Constitution might in fact be construed to require a certain level of cooperation.

Finally, it is important to note that the economic impact of reduced diversions in urban or agricultural communities should never be greater than the cost of developing alternative supplies. Oral comments provided by San Francisco on March 21 appeared to violate this basic principle. Any assertions of impacts in the context of this proceeding should not be considered credible if they are greater than the cost of new supplies.

<u>The Mandate to Restore Yosemite's Hetch Hetchy Valley</u>

One hundred years ago, the proposal to build a dam and inundate the spectacular Hetch Hetchy Valley in Yosemite National Park drew unprecedented levels of protest across the United States.[3] While Congress did allow construction of the O'Shaughnessy Dam in Yosemite in 1913, it quickly reversed course, passing the National Park Service Act in 1916 in large part to ensure that no such violation of our national parks would ever again be permitted. This singular violation of our National Park System and the call for Hetch Hetchy's restoration continues to be an issue of interest, not only to the public and the media, but in film and in literature as well.[4]

In 2012, potential restoration of Hetch Hetchy was the subject of a ballot measure San Francisco. While the measure was unsuccessful, more than 75,000 city residents voted to consider developing a more sustainable water system that would allow for Yosemite National Park to be made whole once again. More recently a statewide poll indicates substantial support for restoration throughout California.[5]

The State Board should also anticipate that direct application of law may also warrant a mandate for restoration – indeed the State Board itself should consider whether the current existence and operation of Hetch Hetchy Reservoir is permissible under State law.[6] Application of the "reasonableness" clauses within Article X Section 2 of the California Constitution or of the Public Trust doctrine are two areas of State law which could well be interpreted to support

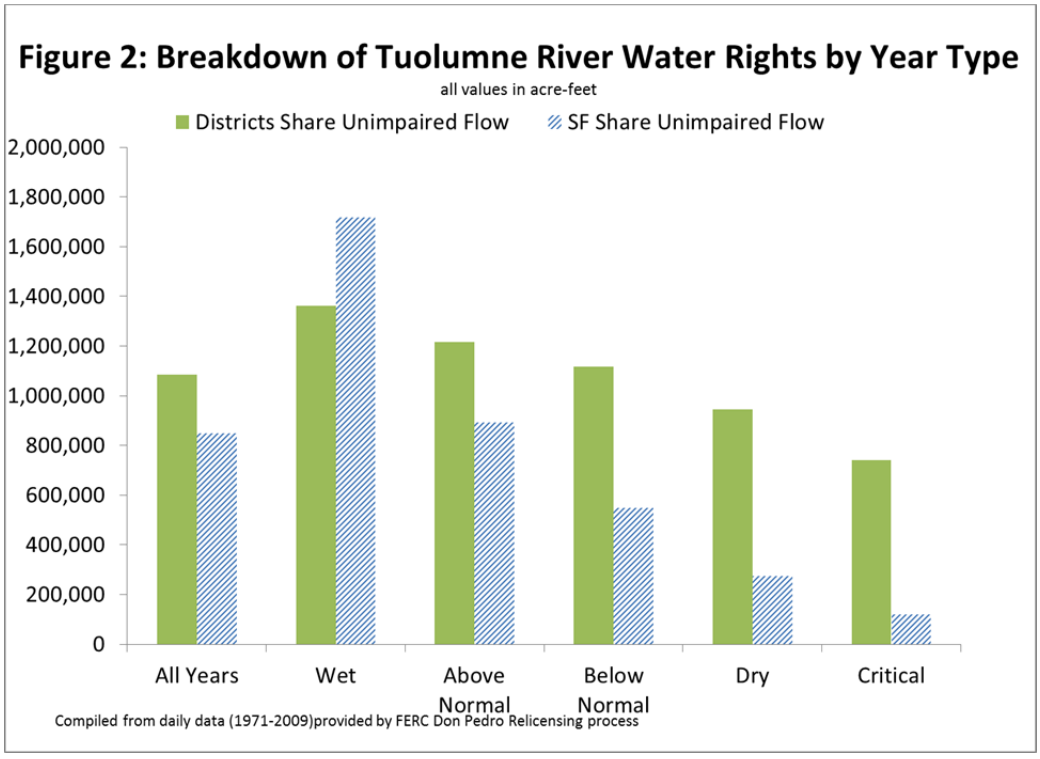
restoration, especially in California where so many urban agencies have reduced their reliance on imported water and are more effectively developing local supplies.[7]

The State Board should take no action in this proceeding that would make a future action to restore Hetch Hetchy Valley in Yosemite National Park more difficult. Restore Hetch Hetchy asks the State Board to include analysis in its Final SED that would provide guidance as to how the State Board's proposed flows on the lower Tuolumne River would perform under a scenario where Hetch Hetchy Valley in Yosemite National Park is restored. Further discussion, along with quantitative data to assist in modeling this scenario, is provided below.

Tuolumne River Water System

Water rights

As explained State Board's SED, the natural flow of the Tuolumne River is divided between the Turlock and Modesto Irrigation Districts (Districts) and San Francisco. The Districts are considered senior water rights holders, while San Francisco's water rights are subordinate to the Districts. The rights are determined by calculation of the daily unimpaired flow at La Grange on the Tuolumne River. The Districts are entitled to all flows below 2416 ft.^{3} per second for most of the year, with the San Francisco receiving any amount in excess of 2416 ft.^{3} per second. During the snow melt season from April 15th through June 13th, this threshold increases from 2416 ft.^{3} per second to 4066 ft.^{3} per second. This distribution of the natural flow of the Tuolumne River provides ample water supply to San Francisco in most years. In the driest years, however, San Francisco's rights yield very little supply – far less than their annual average diversion of about 230,000 acre-feet. Accordingly, San Francisco's system is vulnerable to extended drought.

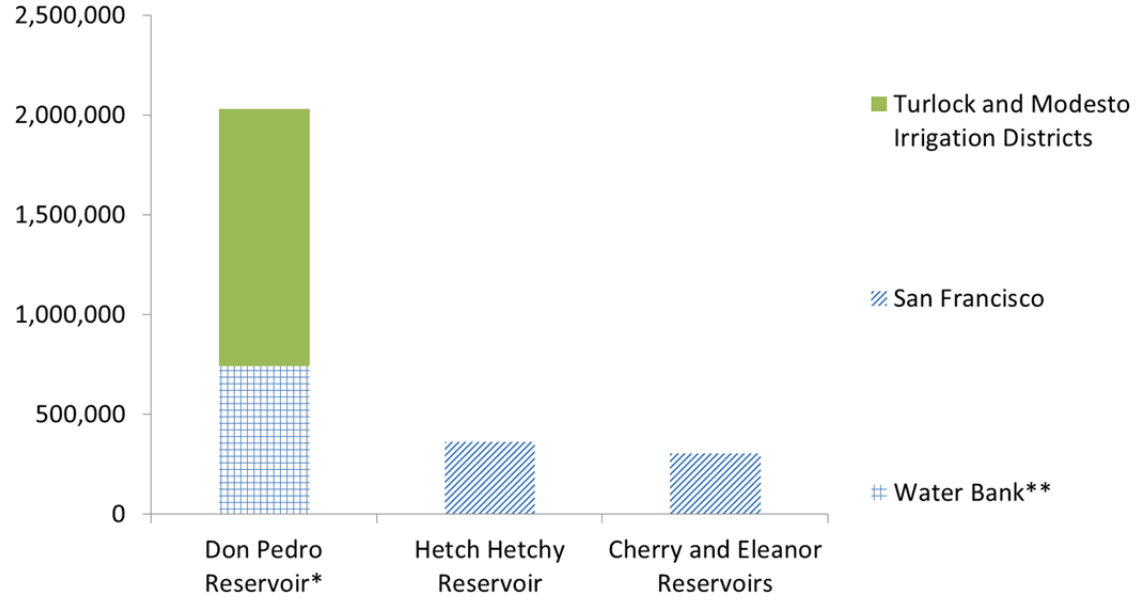


In response to its vulnerability to drought, San Francisco has invested heavily in storage in the Tuolumne watershed. San Francisco and many of its wholesale customers in the Bay Area, however, have done very little to develop or maintain local water supplies.

Tuolumne watershed storage
San Francisco has built three reservoirs in the upper Tuolumne River watershed - Hetch Hetchy reservoir (360,000 acre-feet) in Yosemite National Park, Eleanor Reservoir (27,000 acre-feet) (also in Yosemite), and Cherry Reservoir (270,000 acre-feet). In addition, San Francisco has invested in a water bank in Don Pedro Reservoir (740,000 acre-feet) – a key component of their water system.

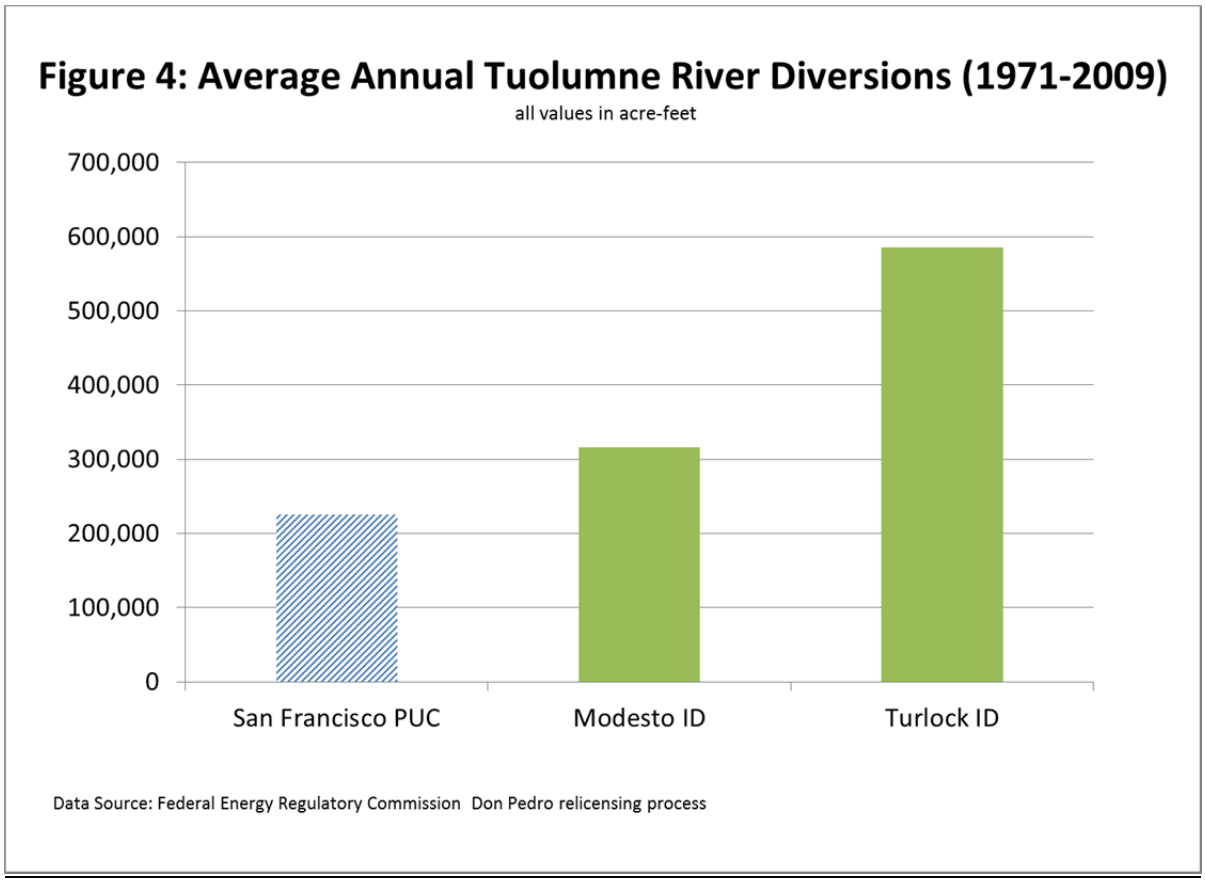
The Turlock and Modesto Irrigation Districts own and operate Don Pedro Reservoir, which holds 2,030,000 acre-feet, more than three times the size of the upstream reservoirs combined. San Francisco, however, paid one half of the cost of building Don Pedro Reservoir. While the water in San Francisco's bank in Don Pedro in fact belongs to Turlock and Modesto Irrigation Districts (these supplies are often described as having been "pre-delivered" from San Francisco to the Districts), it allows San Francisco to divert water upstream that would otherwise belong to the Districts. As such, it provides functional storage for San Francisco. The comparative sizes of these Tuolumne watershed reservoirs are shown below in Figure 3.

Figure 3: Principal Reservoirs in the Tuolumne River Watershed



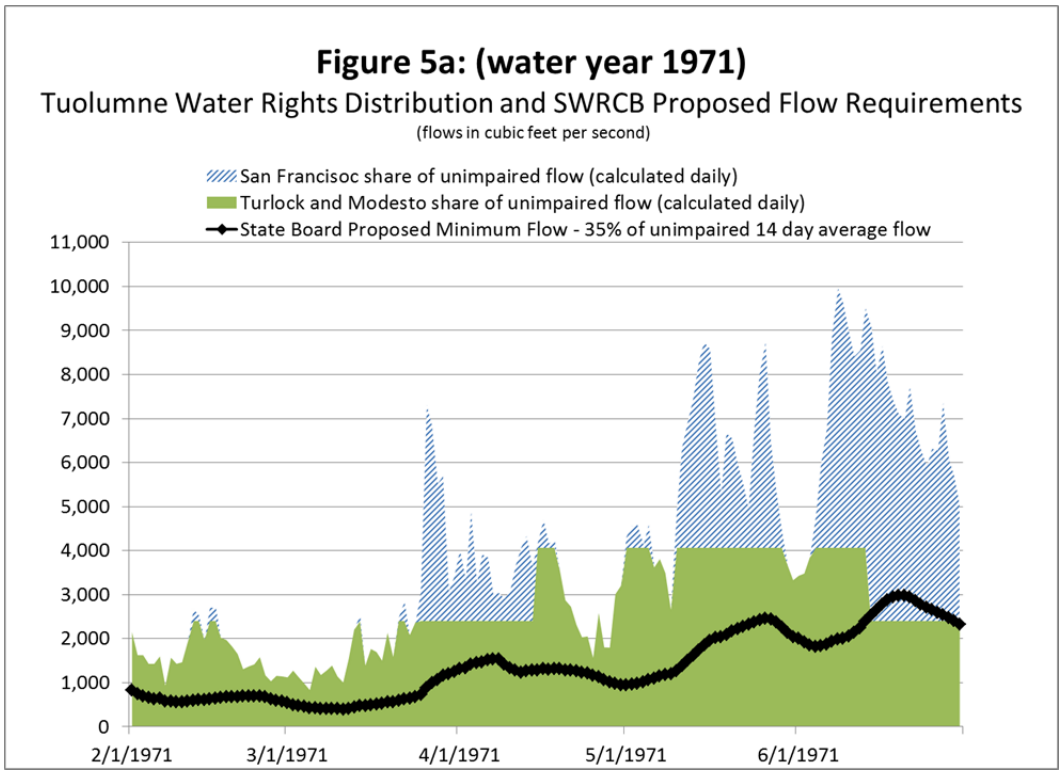
*Maximum storage capacity is 2,030,000 acre-feet, but is limited to 1,690,000 acre-feet during winter and spring for flood control.
** The water bank in Don Pedro holds supplies creditted to San Francisco, allowing it to divert Tuolumne River flows upstream that would otherwise belong to Turlock and Modesto.

Tuolumne watershed diversions
Diversions from the Tuolumne River and its principal storage reservoirs have averaged slightly over 1,100,000 acre-feet over the past 39 years. Only about 1/5 of this water has been diverted by San Francisco for use in the city itself and in other Bay Area communities. Figure 4 provides a breakdown of the distribution of diversions from the Tuolumne River and its reservoirs to San Francisco, Modesto ID and Turlock ID.

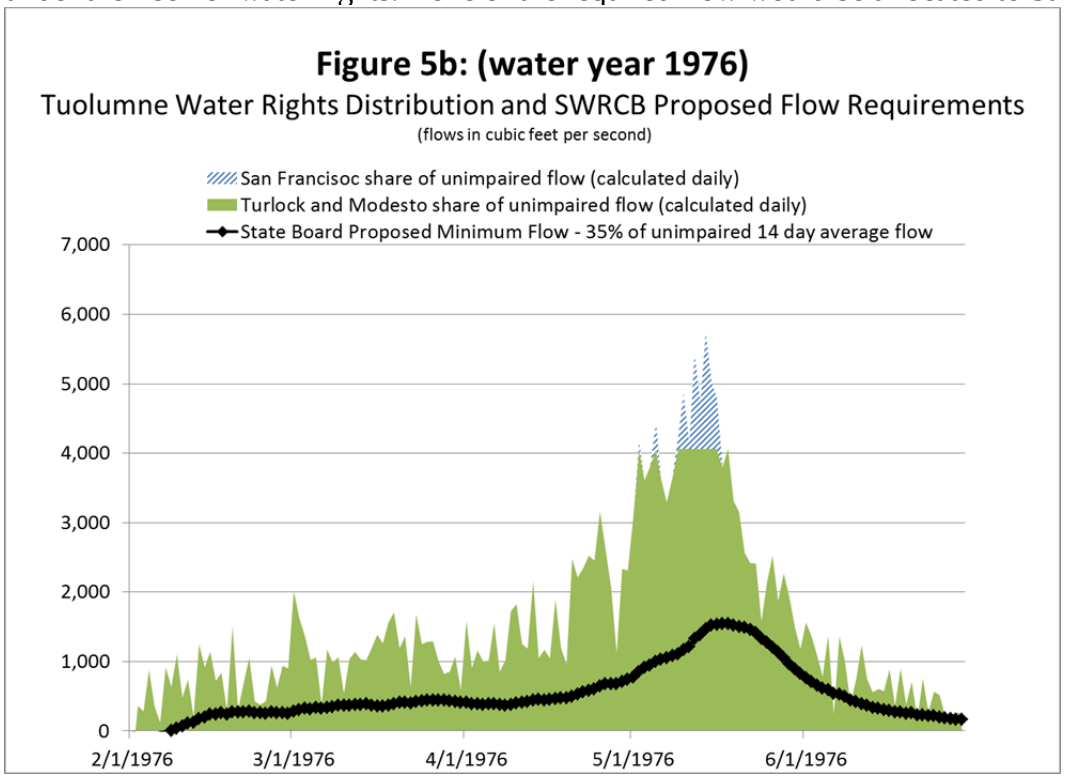


Providing Tuolumne River Water to Accommodate the State Board's Preferred Alternative
The State Board's preferred alternative specifies that 35% of the Tuolumne River's unimpaired flow from February through June, measured on a 14-day average basis, would remain in stream. These flows would not be allowed to be diverted to storage in Tuolumne watershed reservoirs or for consumptive use in the San Francisco Bay Area or in the Turlock and Modesto communities. Figures 5a and 5b illustrate how responsibility for the State Board's flow objectives would be divided between San Francisco and the Districts under the hydrologic conditions of a median year (1971) and a dry year (1976).

As shown in Figure 5a, under the hydrologic conditions of 1971 (a median year), almost the entire State Board flow objective would be contained by the base river flow that belongs to the Turlock and Modesto irrigation districts under their senior water rights. Only a small portion, in late June, would be allocated to San Francisco.



As shown in Figure 5b, under the hydrologic conditions of 1976 (a dry year), the entire State Board flow objective would be contained by the base river flow that belongs to the Districts under their senior water rights. None of the required flow would be allocated to San Francisco.



Figures 5a and 5b illustratively show how responsibility for meeting the State Board's flow criteria would be distributed between the Districts and San Francisco during a repeat of the unimpaired flow conditions of two specific water years – 1971 and 1976. Appendix A includes a complete set of such graphs for water years 1971-2009 – the hydrologic period for which the Don Pedro Reservoir relicensing process has provided daily data. Table 1 and Figure 6 summarize how the annual flows volumes (measured in acre-feet) proposed by the State Board would be distributed between the San Francisco Public Utilities Commission and the Turlock and Modesto Irrigation Districts for this period. In Dry and Critical years, the percent of the State Board objective that would be derived from San Francisco's share of the Tuolumne River water rights distribution is less than 1% - amounts that are imperceptible in Figure 6. Even in Above Normal and Below Normal years, San Francisco's share of the State Board objective does not rise above 2%. For these reasons, the State Board should allocate responsibility for meeting downstream flow objectives in their entirety, or very nearly so, to the senior water rights holders on the Tuolumne River.

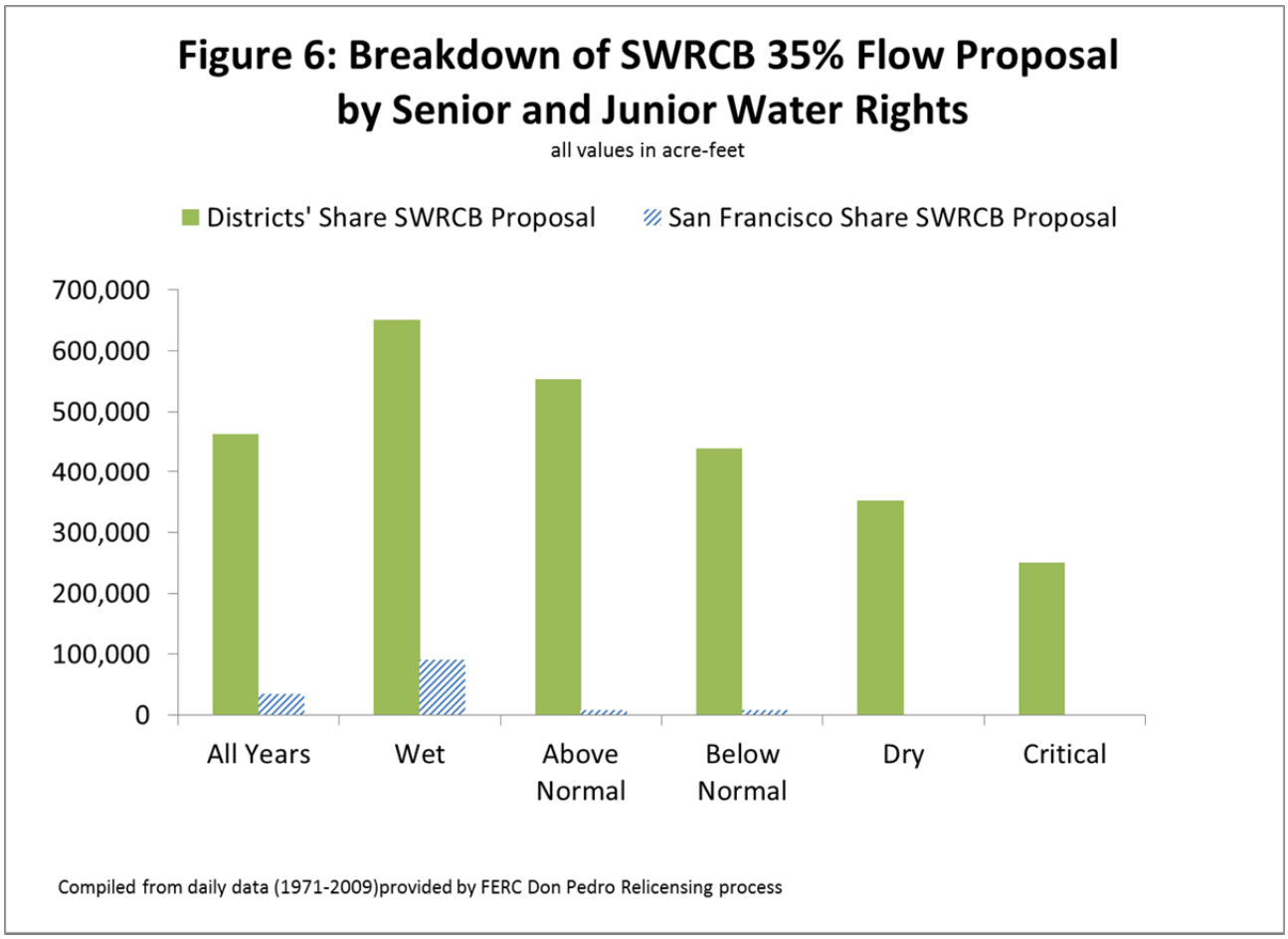


Table 1:
Breakdown of SWRCB 35% Flow Objective by Year Type
(acre-feet)

	State Board Flow Proposal	Districts' Share SWRCB Proposal	San Francisco Share SWRCB Proposal	San Francisco Percent of SWRCB Proposal
All Years	498,322	463,537	34,804	7%
Wet	742,300	651,232	91,068	12%
Above Normal	560,891	553,287	7,604	1%
Below Normal	447,955	439,238	8,717	2%
Dry	353,281	352,766	515	0%
Critical	252,215	250,905	1,379	1%

Economic Impacts Associated with Reductions in Diversions

There are several methodologies that may be appropriate for assessing economic impacts to communities which must reduce their diversion of flow from California's waterways in order to protect, restore or enhance the natural environment. But there is one simple guiding principle that should be used whenever necessary to limit unwarranted projected impacts: the impact of a water supply shortage should never be greater than the cost of acquiring additional supplies.

The principle seems obvious. If additional supplies can be acquired at a cost lower than the cost of a shortage, then the user should acquire additional supplies and obviate the shortage. This principle applies in the urban and agricultural sectors alike.

But in oral comments delivered on March 21, 2013 before the State Board, San Francisco asserted that a reduction in supply of 118,000 acre-feet would result in an average cost of $49,000,000,000 – an average cost of more than $450,000 per acre-foot!

Such a high unit cost estimate is wholly unreasonable. Recent estimates for the cost of recycled water in San Diego, for example, are only about $2000 per acre-foot.[8] If it is possible to recycle local supplies, no municipal agency should claim a potential impact that is greater than the cost of recycling. Note also that San Francisco has only just begun a minimal recycling program in 2012 and, as a group, its wholesale customers recycle very little water compared to other urban communities in California.

Analysis of how the state board flow proposal would perform if Hetch Hetchy Valley in Yosemite National Park stored

As stated above, restore Hetch Hetchy asks the State Board assess how its flow proposal would perform if Hetch Hetchy Valley in Yosemite National Park were restored, and no water was stored in Hetch Hetchy Reservoir. For this purpose, we suggest that the State Board consider an

alternative set of inflows to Don Pedro Reservoir - one that is consistent with the restoration of Hetch Hetchy. Specifically we suggest flow data, provided in Appendix B, extracted from the modeling studies that were performed in support of the aforementioned Environmental Defense Fund report: *Tuolumne Watershed Diversions without Hetch Hetchy Reservoir: Comparison of Interties to Cherry and Don Pedro Reservoirs*.

This Cherry Intertie report assumes that San Francisco would divert the natural flow of the river at Early Intake (the current site of its diversions) when available, and would divert from storage in Cherry Reservoir during dry times of the year when the Tuolumne River's natural flow does not support diversion. The alternative would require construction of a short pipeline from Holm Powerhouse below Cherry Reservoir to Early Intake – a facility previously considered by San Francisco.[9]

In most years, these Tuolumne River diversions are sufficient to fully satisfy San Francisco's demands of San Francisco and its wholesale customers. In the driest years, however, reductions in diversions of Tuolumne River of about 61,000 acre-feet would be expected to occur and replacement supplies (perhaps partially offset by conservation) would be required. The water supply findings of the Cherry Intertie report are similar to those of UC Davis[10] and the U.S. Bureau of Reclamation[11].

Appendix B includes two sets of monthly inflow data to Don Pedro from the Cherry Intertie report that could be simply used by the State as a way to evaluate the effect of restoring Hetch Hetchy Valley on the State Board's current proposal for flows in the lower Tuolumne River. One set includes current infrastructure and diversions (i.e. a base case) and one set includes diversion of Tuolumne River supplies to San Francisco as described above without Hetch Hetchy Reservoir. Restore Hetch Hetchy urges the State Board to undertake this small bit of additional analysis as it prepares its final document, and stands ready to assist State Board staff and/or its consultants in this effort.

Conclusions

As it determines appropriate flow criteria for the lower Tuolumne River, the State Board:

1. Should balance all beneficial uses, and consider the prospective water supply that will be required to accommodate the restoration of Hetch Hetchy Valley in Yosemite National Park as part of a future proceeding.

2. Should assign responsibility for meeting downstream flow objectives in their entirety, or very nearly so, to the Turlock and Modesto Irrigation Districts, because
    a. The San Francisco water system withdraws only about 20% of Tuolumne River water supplies that are diverted for consumptive use,
    b. San Francisco's water rights on the Tuolumne River are limited to those high flows that are almost always in excess of the State Board objective, and
    c. San Francisco will need modest additional supplies to replace a small portion of their Tuolumne River water when Hetch Hetchy Valley in Yosemite National Park is restored.

3. Assertions of economic impacts associated with water supply impacts should be carefully scrutinized. Indefensible assertions of impacts should be rejected.

4. Evaluate how an alternative set of inflows to Don Pedro reservoir, consistent with restoring Hetch Hetchy Valley in Yosemite National Park, would affect its proposal to enhance flows on the lower Tuolumne River.

[1] See Attachment 1: Tuolumne Watershed Diversions without Hetch Hetchy Reservoir: Comparison of Interties to Cherry and Don Pedro Reservoirs, Environmental Defense Fund, 2005 – available at http://hetchhetchy.org/images/Reports/edf_2005.pdf

[2] See State Board Lower San Joaquin SED, Appendix F (Hydrologic and Water Quality Modeling), Table F.1-8, Page F.1-42

[3] See Attachment 2: "Comments of the United States press on the invasion of the Yosemite National Park", National Committee for the Preservation of the Yosemite National Park, 1913

[4] See for example: *Discover Hetch Hetchy with Harrison Ford* (http://vimeo.com/26047094); N*ational Parks : America's Best Idea* , Ken Burns, 2009; *Yosemite: The Embattled Wilderness*, Alfred Runte, 1990; *Wilderness and the American Mind, Roderick Nash, 1967; The Battle over Hetch Hetchy: America's Most Controversial Dam and the Birth of Modern Environmentalism*, Robert Righter, 2006; *Dam!: Water, Power, Politics, and Preservation in Hetch Hetchy and Yosemite National Park,* John Simpson, 2005; and *Hetch Hetchy: Undoing a Great American Mistake*, Kenneth Brower, 2013

[5] See California Voter Survey, February 21, 2013, http://hetchhetchy.org/images/stories/feb_snap_poll.pdf?utm_source=Polling+Press+Release&utm_campaign=POLL+RESULTS&utm_medium=email

[6] Note that the federal Raker Act that authorized construction of Hetch Hetchy Reservoir does not supersede State law: "Sec. 11. That this act is a grant upon certain express conditions specifically set forth herein, and nothing herein contained shall be construed as affecting or intending to affect or in

any way to interfere with the laws of the State of California relating to the control, appropriation, use, or distribution of water used in irrigation or for municipal or other uses, or any vested right acquired thereunder, and the Secretary of the Interior, in carrying out the provisions of this act, shall proceed in conformity with the laws of said State."

[7] See Attachment 3: *Hetch Hetchy water and power issues legal memorandum,* Somach, 2004 – also available at http://hetchhetchy.org/images/Reports/somach_2004.pdf

[8] See *Water Purification Demonstration Project Report (Final Draft), Table F-5*, City of San Diego, March 2013

[9] See *Hetch Hetchy Water and Power: Systemwide Power Study*, Sverdrup & Parcel and Associates, et al., 1981

[10] See REASSEMBLING HETCH HETCHY: WATER SUPPLY WITHOUT O'SHAUGHNESSY DAM, Sarah Null and Jay Lund, 2006

[11] See *Hetch Hetchy: Water and Power Replacement Concepts*, United State Bureau of Reclamation, 1988

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ENVIRONMENTAL DEFENSE

finding the ways that work

Tuolumne Watershed Diversions without Hetch Hetchy Reservoir: Comparison of Interties to Cherry and Don Pedro Reservoirs

February 2005

Abstract

Without storing water in Hetch Hetchy Valley, additional conveyance facilities could allow the San Francisco Public Utilities Commission to divert supplies from storage in other Tuolumne River watershed reservoirs. The most obvious potential locations for additional conveyance are at Don Pedro Reservoir or at Holm Powerplant below Cherry Reservoir. Computer modeling, using a 73 year hydrologic record, indicates that either a Don Pedro Intertie or a Cherry Intertie would allow the SFPUC to deliver more than 95 percent of customer demand without diminishing system reliability. Some additional supplies would be needed in dry years to replace the loss of Hetch Hetchy Reservoir.

Overview

Hetch Hetchy Reservoir is the best-known component of the San Francisco Public Utilities Commission's system that provides water to 2.4 million people in San Francisco and other Bay Area communities. Hetch Hetchy Reservoir holds up to 360,000 acre-feet of water, 23 percent of the SFPUC's system total and less than 13 percent of the total in the storage-rich Tuolumne watershed. Under the SFPUC's current system configuration, 85 percent of the water delivered to San Francisco and other Bay Area customers is diverted from Hetch Hetchy Reservoir. Under a water system alternative that allows for restoration of Hetch Hetchy Valley, the SFPUC could construct facilities to divert supplies from other reservoirs in the Tuolumne watershed. Releases from other reservoirs could replace the releases from storage at Hetch Hetchy Reservoir that are currently necessary during summer and fall months when the river's natural flow is insufficient for diversion.

Paradise Regained: Solutions for Restoring Yosemite's Hetch Hetchy Valley (Environmental Defense, September 2004)[1], includes analysis of the potential use of a Don Pedro Intertie, physically linking the SFPUC system to Don Pedro Reservoir. That analysis, produced by Environmental Defense's TREWSSIM[2] model, shows the frequency with which the SFPUC could meet either current or projected future water supply objectives with a combination of its local reservoirs, run-of-river diversions[3], and diversions from San Francisco's Water Bank in Don Pedro Reservoir. TREWSSIM model results show that full system deliveries could be met in most years while retaining significant carryover storage. Under critically dry conditions, which occur in approximately 1 out of 5 years,

additional supplies would be needed.[4] With a Don Pedro Intertie, on average, 96 percent of system deliveries could be met.

Construction and use of a Don Pedro Intertie is institutionally complex. Don Pedro Reservoir is owned and operated by the Turlock and Modesto Irrigation Districts (Districts). While the SFPUC paid for one-half the cost of building the reservoir and approximately one third of its storage is dedicated to holding water that accrues to the SFPUC under its junior water rights[5], the projects' participants are not comfortable identifying the stored water as belonging to the SFPUC. Presently, the storage functions as a "water bank" for the SFPUC, and is used as an accounting device that allows the SFPUC to divert supplies upstream that would otherwise belong to the Districts. The bank is a supply that is often described as water that the SFPUC has "pre-delivered" to the Districts.

A Don Pedro Intertie, providing direct physical access to its Don Pedro Water Bank, would offer the SFPUC the greatest flexibility in accessing Tuolumne River supplies, assuming arrangements could be negotiated with the Districts that would assure that their interests in the reservoir would be protected. A Cherry Intertie, located at Holm Powerplant outfall below Cherry and Eleanor Reservoirs, could provide nearly the same water supplies and also some additional hydropower benefits. In addition, a Cherry Intertie might avoid some of the institutional controversy with the Districts that surrounds a Don Pedro Intertie.

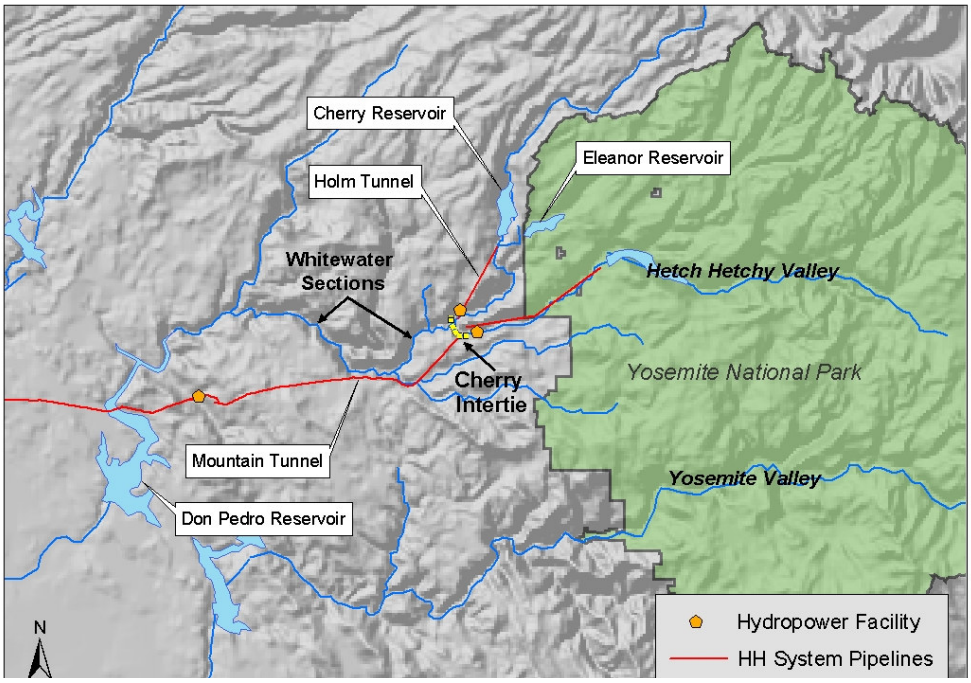
The analysis presented below describes the potential use of a Cherry Intertie, and compares it to a Don Pedro Intertie as presented in *Paradise Regained*. From a water supply perspective there are three possible scenarios that might make a Cherry Intertie less reliable than a Don Pedro Intertie:

- Cherry and Eleanor Reservoirs have a limited supply and could be fully drained, even at a time when there is ample supply in the SFPUC's Don Pedro Water Bank;
- Reoperation of the system with reduced flexibility could cause increased "spills" from Don Pedro Reservoir, even at a time when storage space is available at Cherry and Eleanor Reservoirs;
- Reoperation of the system with reduced flexibility could cause increased "spills" from the SFPUC's Don Pedro Water Bank, reducing its own storage account and providing additional water supply to the Districts.

The Cherry Intertie: Connecting Holm Powerhouse to Mountain Tunnel

The idea of conveying water from Cherry and Eleanor Reservoirs to the San Francisco Bay Area is not new. In the early 20th century, City Engineer Carl Ewald Grunsky investigated the concept when it appeared that it might not be permissible to submerge Hetch Hetchy Valley. Connecting Holm Powerplant to Mountain Tunnel was subsequently proposed as part of a broader plan to increase power generation in *Hetch Hetchy Water and*

Figure 1
Cherry Intertie Location



Power: Systemwide Power Study, Sverdrup & Parcel and Associates, et al., 1981.

The Sverdrup proposal includes a pumping plant at Holm Powerhouse outfall, a pipeline to a site near Early Intake Reservoir, a second Mountain Tunnel to Moccasin, and an additional Moccasin Powerhouse. If Hetch Hetchy Valley is to be restored and a Cherry Intertie built for water supply conveyance, it is assumed that only the pumping plant and pipeline would be built, as a redundant Mountain Tunnel and Moccasin Powerplant would be of limited use. During winter and spring, run-of-river diversions along the Tuolumne River would be diverted into the Mountain Tunnel. During summer and fall, storage releases from the Cherry-Eleanor system would be diverted to the Mountain Tunnel to supplement run-of-river diversions.

Sverdrup estimates the cost, in 1988 dollars, to be $23.2 million for the pumping plant and pipeline. Escalating the cost to 2004 dollars, and incorporating estimates for engineering, legal and administrative costs, and a standard range for the uncertainty of construction costs indicates that the total cost would range from $29.2 million to $64.1 million[6]. This cost is slightly higher than the estimated cost of a Don Pedro Intertie, which ranges from $25 million to $53.5 million.

Modeling Methodology

The TREWSSIM model was modified to include an intertie from Holm Powerhouse to the Mountain Tunnel (see Figure 1). Simulations using this modified version of TREWSSIM indicate that, even with additional provisions to protect and enhance flows for whitewater recreation on the

Tuolumne River, an intertie at Holm Powerhouse would provide nearly all of the water provided by an intertie to Don Pedro Reservoir and would slightly increase hydropower production.

Combined, Cherry and Eleanor Reservoirs can store up to 300,000 acre-feet of water and have an average annual inflow of 433,000 acre-feet. The two reservoirs are connected by a tunnel that is generally used to move water from Eleanor, which has significantly less storage capacity, to Cherry. The inflow and storage of the two reservoirs is less than that of Hetch Hetchy Reservoir but, of course, river flows that pass through the Hetch Hetchy Valley would still be available for diversion.

With a Cherry Intertie, water supplies diverted directly from Tuolumne River flows at Early Intake could be supplemented by diversions from storage at Cherry and Eleanor Reservoirs.[7] Because this storage is a subset of the SFPUC's total Tuolumne supply that includes its Don Pedro Water Bank, a conservative approach was taken with respect to TREWSSIM's ability to capture run-of-river flows at Early Intake[8]. It is important that supplies in Cherry and Eleanor Reservoirs be sufficient under all hydrologic conditions to allow diversion of stored water to the San Francisco Bay Area.

As with a Don Pedro Intertie, diversions using a Cherry Intertie would occur mostly in summer and fall, when run-of-river diversions are not possible. Through the intertie at Holm Powerplant, water would be pumped a short distance – less than 1 mile – to Early Intake Reservoir, where it would enter the existing SFPUC conveyance system at the Mountain Tunnel.[9] These diversions would produce power at both Holm and Moccasin Powerhouses. Some energy would be required, however, to pump the water from Holm to Early Intake. Also, using Cherry and Eleanor Reservoirs for water delivery would diminish the flexibility to schedule releases through Holm Powerhouse to maximize power benefits.

Under the current system, in addition to generating hydropower, summertime releases from Cherry Reservoir extend the season for whitewater recreation on two celebrated reaches of the Tuolumne River upstream of Don Pedro Reservoir. Any diversions through a Cherry Intertie for water supply could not also be used for recreation. TREWSSIM modeling of a Cherry Intertie used flow targets of 1200 cubic feet per second (CFS) for 6 hours per day, 7 days per week, in simulations with a Cherry Intertie. This amount of flow, slightly higher in both rate and duration than currently provided, is incorporated to ensure that diverting from Cherry and Eleanor Reservoirs for water supply would not preclude maintaining or even enhancing the world-class whitewater resources on the middle section of the Tuolumne River. Current releases for whitewater recreation during late summer are generally limited to about 1060 CFS, reflecting the sum of the capacity of the Holm Power Tunnel plus instream flow requirements below Cherry, Eleanor and Hetch Hetchy Reservoirs. Releasing water from Cherry Reservoir to meet a total flow of 1200 CFS would slightly increase the amount of reservoir releases

that would not be available for hydropower generation.

Modeling Results

TREWSSIM analysis indicates that water deliveries with a Cherry Intertie are only about 1 percent less than with a Don Pedro Intertie, under both current and projected future demands. Hydropower production at Moccasin Powerplant would be greater than with a Don Pedro Intertie, though system hydropower production would still be significantly lower than it is under the current configuration with Hetch Hetchy Reservoir. The two interties would accomplish the same general purpose, though each would offer slight advantages under certain circumstances. Depending on further analysis and a final restoration plan, it might ultimately be optimal to construct both interties for increased operational flexibility.

Water Supply

Water supply reliability is determined by how well a system can weather drought. For the SFPUC system, the worst historical conditions occurred during the 6-year drought from 1987-1992.[10] Under scenarios modeled without Hetch Hetchy Reservoir, water deliveries are reduced in all critically dry years so that total SFPUC system storage at the end of the 1987-1992 drought is higher than under scenarios with Hetch Hetchy Reservoir. The magnitude of these reduced deliveries represents the additional water supplies that would be needed to replace the loss of Hetch Hetchy Reservoir.

As reported in *Paradise Regained*, without Hetch Hetchy Reservoir and using an intertie to Don Pedro would allow the SFPUC to make full deliveries of 291,000 acre-feet at the current level of demand in most years. In critically dry years, an average of 19 percent of system demand would be needed to make up for the loss of Hetch Hetchy Reservoir. With a Cherry Intertie, the current system could meet full demands in most years but in critically dry years an additional 22 percent of annual supply would be needed to make up for the loss of Hetch Hetchy Reservoir.

The decrease in reliability is not that water is spilled from the network of reservoirs into the lower Tuolumne River, but that additional spills from San Francisco's Don Pedro Water Bank would occur, providing additional supply to the Turlock and Modesto Irrigation Districts. For example, TREWSSIM modeling shows these increased spills occurring during the summer of 1986, when the Don Pedro Water Bank was full just prior to the six-year drought.

Similarly, under potential future conditions, with demand increased to 339,000 acre-feet and an expanded Calaveras Reservoir, TREWSSIM shows full deliveries would be met with an intertie, either to Don Pedro Reservoir or Cherry Reservoir in most years. In critically dry years, an additional 14 percent of total supply would be needed with a Don Pedro Intertie and an additional 17 percent of new supply would be needed with a Cherry Intertie. As in the scenario under the current level of demand, projected additional spills from the SFPUC's Don Pedro Water Bank with a Cherry Intertie are the cause of the decreased reliability.

Overall, without Hetch Hetchy Reservoir, using a Cherry Intertie would allow 95-96 percent of supplies to be delivered, compared to 96-97 percent using a Don Pedro Intertie. Tables 1 and 2 summarize the results of these simulations from a water supply perspective.

Table 1
SFPUC Delivery Capability without Replacement Supplies
Current Delivery Objective

	Annual Average (1922-1994)		Critically Dry Year Average		Drought Period (1987-1992)
Water Supply Alternative	SFPUC Deliveries (TAF)	Reduction from Base	SFPUC Deliveries (TAF)	Reduction from Base	SFPUC Storage (TAF)
With Hetch Hetchy Reservoir	288	---------	275	---------	559
Don Pedro Intertie	276	4%	222	19%	556
Cherry Intertie	274	5%	214	22%	558

Table 2
SFPUC Delivery Capability without Replacement Supplies
Future Delivery Objective

	Annual Average (1922-1994)		Critically Dry Year Average		Drought Period (1987-1992)
Water Supply Alternative	SFPUC Deliveries (TAF)	Reduction from Base	SFPUC Storage (TAF)	Reduction from Base	SFPUC Storage (TAF)
With Hetch Hetchy Reservoir	339	---------	339	---------	331
Don Pedro Intertie	329	3%	292	14%	380
Cherry Intertie	327	4%	283	17%	377

Hydropower

With a Cherry Intertie, overall hydropower production would be slightly increased compared to that with a Don Pedro Intertie. Operating Cherry and Eleanor as water supply reservoirs, as well as making additional dedicated releases for whitewater, would diminish generation slightly at Holm Powerplant. Supplies would also need to be pumped from Holm to Mountain Tunnel, requiring energy. Increased generation at Moccasin would more than offset these losses, however, making a Cherry Intertie slightly preferable to a Don Pedro Intertie from an energy perspective.

With either a Don Pedro or a Cherry Intertie, operating the SFPUC system without water storage in Hetch Hetchy Reservoir would result in a reduction of between 19 percent and 40 percent of the total current production from its three major power plants. If the Canyon Tunnel were modified to accommodate run-of-river diversions to the Kirkwood Powerplant, power production would be reduced by only 19-20 percent. If no generation at Kirkwood Powerplant were possible, power production would be reduced by 39-40 percent. At $55/MWh, replacing hydropower losses would cost between $18 million and $38 million annually.

Table 3
Average Annual Hydropower Generation under Current Delivery Objective

	Kirkwood	Moccasin	Holm	Holm Pumping	SFPUC Total		
Water Supply Alternative	GWH	GWH	GWH	GWH	GWH	Min. Loss	Max. Loss
With Hetch Hetchy Reservoir	549	427	732	0	1708		
Don Pedro Intertie	352	286	732	0	1369	338	690
Cherry Intertie	352	402	658	-30	1381	326	678

Table 4
Average Annual Hydropower Generation under Future Delivery Objective

	Kirkwood	Moccasin	Holm	Holm Pumping	SFPUC Total		
	GWH	GWH	GWH	GWH	GWH	Min. Loss	Max. Loss
With Hetch Hetchy Reservoir	555	427	731	0	1713		
Don Pedro Intertie	352	286	731	0	1369	345	696
Cherry Intertie	352	422	653	-35	1392	322	673

Minimum Loss assumes run-of-river diversions to Kirkwood Powerhouse

Maximum Loss assumes no generation at Kirkwood Powerhouse

Whitewater Recreation

Under the assumptions incorporated in TREWSSIM, whitewater recreation for both commercial and private rafters, as well as for kayakers, would be improved. Figure 2 shows the frequency of average daily flows on the Tuolumne River just below its confluence with Cherry Creek[11], sorted from highest to lowest, for August and May during the 73-year hydrologic record. During summer months, the average monthly flows do not reflect the daily fluctuations that typically occur, where releases are made for a few hours each day to provide flows for whitewater recreation. Under the

Figure 2
Flows for Whitewater Recreation in August and May

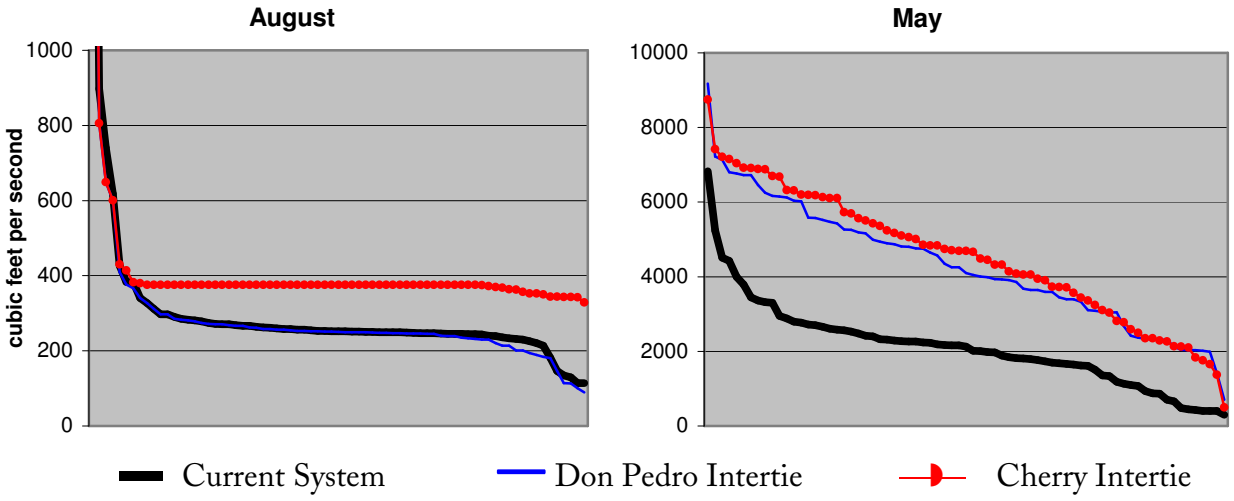


Table 5
Don Pedro Water Bank Spills
(All values in TAF)

	With Hetch Hetchy Reservoir	Don Pedro Intertie	Cherry Intertie (additional whitewater releases)	Cherry Intertie (existing whitewater releases)
June-86	224	222	224	224
July-86	41	43	43	42
August-86	60	44	66	58
September-86	49	25	45	36
October-86	14	25	37	37
Total	**388**	**359**	**414**	**396**

Cherry Intertie scenario, for example, releases of 1200 CFS for 6 hours of the day and much lower stream flows for the rest of the day result in average daily flows of about 375 CFS under most conditions in August.

Figure 2 also shows the cumulative frequency of average daily flows for May during the 73-year hydrologic record. In most years, May is the peak snowmelt month and has the highest flows. These average daily flows have few fluctuations and would be the result of uncontrolled flows passing through Hetch Hetchy Valley. The flows would reach 4000 CFS or more about half of the time during May, providing thrills to those who run the river at that time but also encouraging many would-be boaters to stay home and wait for flows to subside to safer levels.

As mentioned above, some of the projected spills from the Don Pedro Water Bank would be a result of dedicated releases for whitewater. This extra water supply would be held by the Districts in Don Pedro Reservoir, assuming the reservoir itself does not spill. For example, modeling indicates that the hydrology experienced in 1986, immediately prior to the 1987-1992 drought, is one of those times. Of the total increase of 55,000 acre-feet in spills from the Don Pedro Water Bank as a result of using a Cherry Intertie, the increased whitewater flows account for 18,000 acre-feet (see Table 5).

Conclusion

An intertie from either Cherry or Don Pedro Reservoir to the SFPUC conveyance system could allow the SFPUC to meet almost all its water delivery needs. Replacement supplies of between 14 and 22 percent of total system demand would be needed in critically dry years. Opportunities to use transfers, groundwater exchange or expanded local storage to meet these dry year needs are explored in *Paradise Regained*. Other opportunities, including conservation, reclamation and desalination could be pursued as well.

With either intertie, power system impacts would remain significant – between 20 and 40 percent of the system total. *Paradise Regained* describes the cost of replacing the forgone hydropower in ways that would not contribute to increased emissions.

Further analysis is needed to determine which intertie is preferable, or whether both might be constructed, as water and power alternatives are developed that would allow Hetch Hetchy Valley in Yosemite National Park to be restored. That analysis should take place in a public forum that includes all communities that rely on the Tuolumne River for water and power.

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[1] *Paradise Regained* is available online at www.discoverhetchhetchy.org. For a printed copy, call Environmental Defense at (510) 658-8008.

[2] TREWSSIM - Tuolumne River Equivalent Water Supply Simulation – was created by Environmental Defense to investigate alternatives to Hetch Hetchy Reservoir.

[3] Run-of-river diversions would take place either at the current head of the Canyon Tunnel or at Early Intake. The principal difference would be that diverting into the Canyon Tunnel would require a diversion structure within Hetch Hetchy Valley and retrofit of the tunnel, but would still allow much of the current generation of hydropower at Kirkwood to take place.

[4] Critically dry years are determined by the San Joaquin 60-20-20 index, calculated by the California Department of Water Resources.

[5] The Turlock and Modesto Irrigation Districts are, by contrast, 'senior" water rights holders, and are entitled to the majority of the Tuolumne River's flow.

[6] Escalation based on "Civil Works Construction Cost Index System (CWCCIS)", September 2004. Total cost assumes a 20 percent premium for engineering legal and administrative costs and a range of –30 percent to +50 percent for the uncertainty of construction costs.

[7] An intertie to Don Pedro would provide more flexibility. With a Don Pedro intertie, water supplies that could not be diverted as run-of-river at Early Intake could simply be diverted further downstream. With an intertie at Holm, these supplementary supplies would be limited to that water that physically flows through Cherry and Eleanor – a lesser amount.

[8] Analysis of pre-dam daily Tuolumne River flows at Hetch Hetchy (1911-1922) suggests that a monthly model may overpredict the run-of-river supply that can be diverted at Early Intake. With a Don Pedro Intertie, these uncaptured flows could simply be diverted downstream at Don Pedro. With a Cherry Intertie, however, the water would flow into the SFPUC's Don Pedro Water Bank, but not be actually usable. An adjustment was made to TREWSSIM that slightly reduces the amount of "run-of-river" flow that can be diverted.

[9] TREWSSIM uses the value of 660 CFS for the capacity of the Mountain Tunnel as stipulated by the SFPUC, though some sources suggest that the capacity of the Mountain Tunnel is 730 CFS or more. The capacity of the Cherry Intertie is also assumed to be 660 CFS.

[10] TREWSSIM modeling uses historic hydrologic conditions from 1922-1994, but simulations are constrained to include significant carryover storage in case future droughts, caused by global warming or other factors, are worse than historical droughts. This method is slightly different from the SFPUC's methodology, which uses a drought scenario worse than has occurred historically, but assumes that reservoirs will be fully drained by the end of the period.

[11] Other tributaries, including the North, South and Middle Forks of the Tuolumne, and the Clavey River, provide additional flow at various locations along the two whitewater stretches. Theses additional flows can be significant in spring but are quite low by late summer.

COMMENTS OF THE UNITED STATES PRESS
ON THE
INVASION OF THE YOSEMITE NATIONAL PARK
AS PROPOSED IN THE HETCH-HETCHY BILL, WHICH HAS PASSED THE HOUSE OF REPRESENTATIVES AND COMES BEFORE THE SENATE DECEMBER 1st TO 6th.

These Editorial Comments Are Entirely Spontaneous Expressions of National Opinion on a Thoroughly Dishonest Bill. They Are Inspired Also by a Strong and Almost Universal Sentiment as to the Danger of Invading Our National Parks.

Enormous Power of Precedent

Boston Post.—The day is coming when, if this impudent attempt to destroy a lovely natural valley, one of the finest in the world, succeeds, there will be set in motion the same sort of machinery that has worked the Hetch-Hetchy grab through the National House, and it will be against other cherished possessions of the people. Few realize the enormous power of precedent with Congress.

The "Beautiful Lake" Delusion

The New York Times.—A prominent advocate of the project has confessed privately that "there are bad things in the bill, but they were put there to get votes." The House debate gives reason for thinking that the measure is a clumsy and probably unworkable attempt to partition the flow of the Hetch-Hetchy watershed between the city and such of the San Joaquin Valley farmers as could thus be bribed to forego their opposition.

The act creating the Yosemite National Park sets forth the importance and duty of reserving these wonders "in their original state," and the world has a moral right to demand that this purpose shall be adhered to. The "beautiful lake" theory deceives nobody. An artificial lake and dam are not a substitute for the unique beauty of the valley.

Project Has a Bad Look

Cleveland Plaindealer.—The whole project has a bad look. Let San Francisco go elsewhere for her water; engineers agree that other sources are available.

In the opinion of the Plaindealer, the best sentiment of the American people, could it be ascertained, would be overwhelmingly against the Hetch-Hetchy proposal.

The name is about all the water grabbers propose to leave ungrabbed.

No Time to Give Away Park Property

Syracuse Post Standard.—We don't believe that the time has come for giving away a national park for any purpose; nor do we admire the spirit which seems to animate San Francisco in this matter.

The Redwoods Will Go Next

Atlanta Morning Journal.—If San Francisco succeeds in stealing the Hetch-Hetchy Valley no doubt she will next want to cut down the redwood trees to obtain timber with which to dam it up.

Irremediable Destruction

Milwaukee Journal.—One fact alone should weigh enough to decide the issue. The cost of another site for waterworks for the city of San Francisco, no matter how great, would some time be paid off. Never will the beauty of the Hetch-Hetchy Valley be regained. With all the natural beauties of a rich nation, one little spot of rare beauty that was the common heritage of all will have been forever blotted out. And for the sake of saving money to a single city.

Almost a Crime

Memphis Appeal.—To any one who has stood in this wonderful valley and has gazed in awe upon the beautiful handiwork of God, it seems almost a crime to consider such a commercial proposition as the one offered by San Francisco.

It has been fully appreciated by sane participants in the general conservation movement that sentiment must not be allowed to run away with common sense, but here is required a wholly unnecessary surrender of a wonderful heritage of Nature, and to grant the request of San Francisco would be a lasting reflection on the national idealism and an ominous sign.

A Sordid Scheme

Outdoor World and Recreation.—Stripped of specious argument and sentimental enthusiasm, the naked, sordid fact stands revealed that San Francisco seeks to utterly destroy a precious wonderland because it offers cheaper water than can be had elsewhere. . . .

In a word, they want the lovely Hetch-Hetchy Valley together with 500 square miles or *half* of the Yosemite National Park, which Congress in 1890 dedicated forever to public use!

Too Few Public Parks

Rochester Union-Advertiser.—Not many of those who are interested in seeing this big steal defeated believe that President Wilson will sign the measure. San Francisco is abundantly able to pay for her own water supply. There are at least two other sources open to her that will not rob the whole people for the benefit of the comparatively few people of San Francisco. The people of this country have too few great public parks and outing places and none of them should be alienated.

Let us keep Hetch-Hetchy. Let San Francisco go to some other of her many sources of water supply. Congress must not give the property of all away to a few.

The President to the Rescue

Troy Record.—While the legislators appear to be in league with the promoters who desire to convert a great natural feature into a water service for San Francisco, there is a hope that in the event of senators passing the bill, some one higher up will obey the opposition which will save the valley for the enjoyment of future generations.

Remarkable Protest of the Press

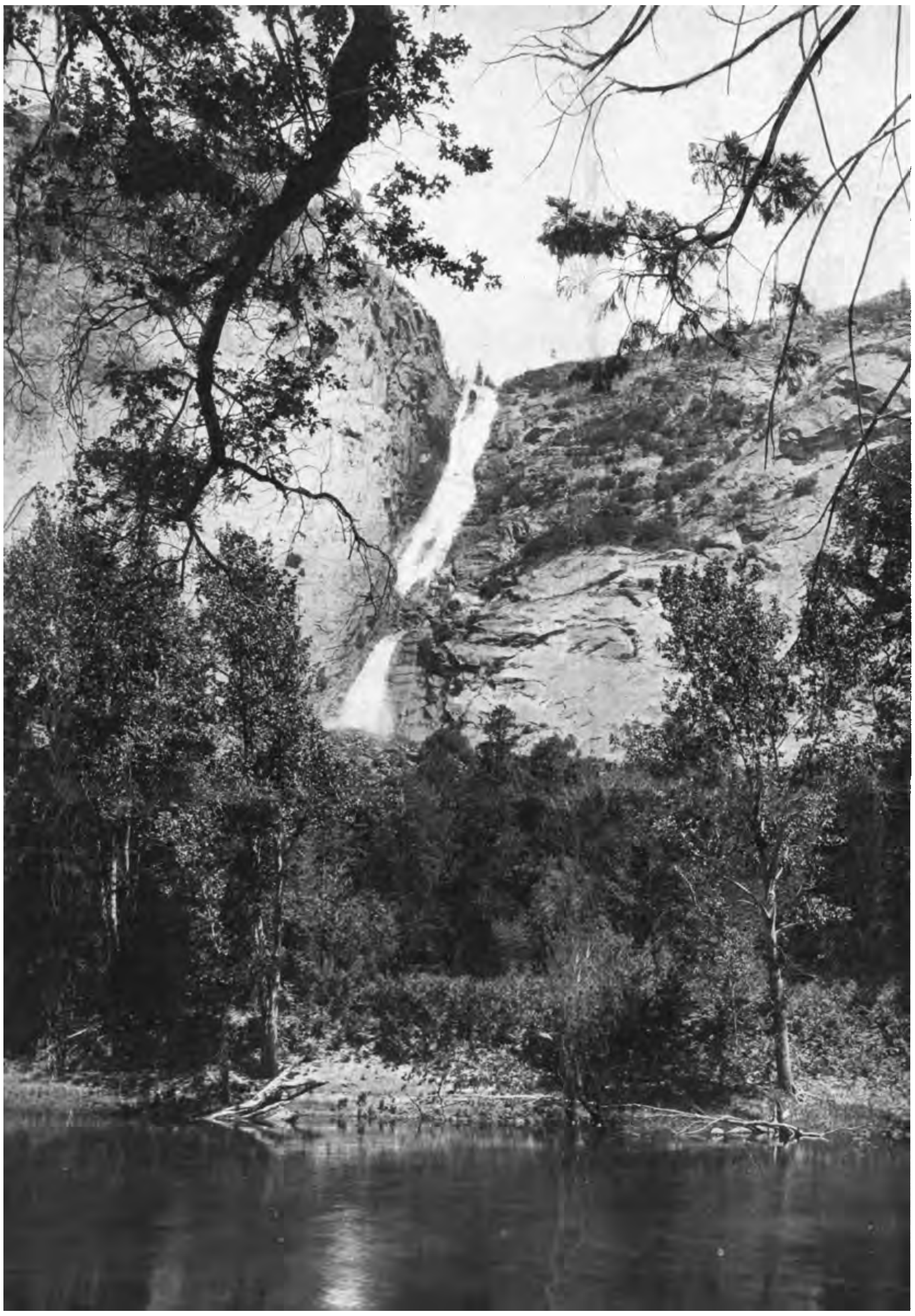
Lowell Citizen.—In view of the almost universal protest of the press of the United States against the grant of a part of the wonderful Hetch-Hetchy Valley to the city of San Francisco for use as a reservoir of water, it is surprising that the two branches of the Congress have accorded such a degree of favor to the scheme.

A Priceless Valley

Philadelphia Telegraph.—Why should the people of the United States make a present of one of their rarest natural treasures to the city of San Francisco? If Uncle Sam means to give away this priceless valley of Hetch-Hetchy to become a reservoir for one city, does he propose to do something equally handsome for all the other cities of the nation?

Wake Up and Protest

Baltimore American.—Let everybody east of the Rockies wake up and send in a protest against the Hetch-Hetchy grab game.



Photograph by J. N. LeConte

WAPAMA FALLS, ONE OF THE HETCH-HETCHY CASCADES

"It is the counterpart of the Yosemite Fall, but has a much greater volume of water, and is about 1,700 feet in height. Every tree shown would be destroyed by the San Francisco reservoir, and the cliffs would be flooded to a hight of 200 feet.

Thrifty City Authorities

Providence Journal.—San Francisco just now is biting off about as much as she will be able to chew comfortably for some time—seventy-seven millions for waterworks, more millions for a world's fair, more to run parallel and competing municipally owned street cars, and what not. She is enterprising, and she was ever a glorious spender. She is willing to save some millions if allowed a free swing in one of the nation's great scenic reservations.

The politicians of San Francisco care nothing for matters of natural beauty and taste. They have an eye only for utility, a utility that flows their way. The chief newspapers and organs of public opinion throughout the country have spoken in opposition to this "grab." We trust that the Senate will heed their expression of public sentiment, and, failing that, that President Wilson will veto the measure.

This iniquitous scheme purposes to take a valuable domain away from the nation and give it to a corporation solely for the latter's pecuniary profit. The whole nation is to be robbed for the sake of a single municipality.

A Free Gift to a City

Springfield Union.—The fight on the Hetch-Hetchy bill has resolved itself into a question of whether or not the Government should permit the destruction of one of the most beautiful portions of the Yosemite National Park in order to make the city of San Francisco a practically free gift of a $45,000,000 water power in the guise of a water supply.

An Astounding Project

"Viewpoint" Dallas, Texas.—That Washington should even consider the $45,000,000 hydro-electric gift to San Francisco, is astounding. If such a valuable right should be taken from our National Park and given away, it would be a matter that would some day call for a strict accounting. In return for the grant, the city gives a few promises it would never fulfil, and in time, no special year set, pay annually $30,000!

A Call to the Colors

Inter-Ocean, Chicago.—It looks as if every good American who thinks our national parks are worth while should bestir himself in defense of the Hetch-Hetchy.

Incredible Complaisance

Milwaukee Press.—Entirely apart from the desirability of retaining this unique wonderland for the people's uplift and enjoyment, it is incredible that Congress should be complaisant in the matter of this contemplated water-power grab.

The Project an Official Blunder

San Francisco News Letter.—Why is Mayor Rolph, and the gentlemen associated with him, not willing to put the water question on a practical business basis? Why do they persist in attempting to force upon the taxpayers every possible burden which a gang of petty politicians or incompetent business men can devise? Why do not the newspapers of the city assert themselves, instead of passing over the blunder of the officials who went to Washington to present the claims in favor of Hetch-Hetchy?

An Economic Folly

The Wasp, San Francisco.—It is astounding how little the public of San Francisco knows about the water question. And yet City Attorney Long and officials working with him on water schemes are planning to pledge the credit of our city to undertake and complete a project which may cost $100,000,000.

A Trespass on National Rights

Rochester Union-Advertiser.—San Francisco has several other sources of water supply that are practicable, available and not too costly, and the taking of which will not trespass upon the rights of the people of the United States. The people should be at pains to let their senators know that they are against this grab by San Francisco.

A National Scandal

The Standard Union, Brooklyn.—The Hetch-Hetchy matter at Washington has become a national issue and the manner of its handling almost a national scandal. Any citizen, indifferent to either aspect, thinking that it is only of local concern to San Franciscans, or that it is a fair example of parliamentary practice and precedents, greatly errs, and neglects incidents fraught with much significance and portending grave consequences. If the San Francisco "combine" breaks down the guards which the nation has placed around its Yosemite reserves and preserves, all others are in peril, and the whole conservation policy, which has gained its place fighting every step of the advance, goes by the board.

An Outrage and a Crime

Philadelphia Record.—At the hearing before the Public Lands Committee, the most conspicuous advocate of the scheme was asked whether he could not "go out overnight anywhere along the Sierra and get an abundant supply of pure water for the city?" His answer was: "Yes, by paying for it." . . .

The pressing necessity of robbing the American people of a glorious possession evidently does not exist. . . .

The sacrifice of a veritable temple of Nature to commercial greed would not be merely an inexcusable act of folly; it would be an outrage and a crime.

A Crisis

Boston Post.—Washington ought to sit upon this scheme hard. Congress should say once and for all that the great Federal [park] reserves are to be kept intact for the delight of posterity and the admiration of the world.

Irremediable Mischief

New York Evening Post.—The thing proposed in the bill is that the nation shall give up, for the economic advantage of a municipality, one of its most wonderful scenic possessions. Once done, the mischief can never be undone.

An Anti-Conservation Raid

Boston Transcript.—If this measure passes the Senate it will mark the beginning of an anti-conservation raid which has long been planned by those who thirst not for the water, but for its power, and who hunger mightily for the return of the good old days when the resources of the public domain were open to the exploitation of the man who was wily enough to get there first. If Congress surrenders the Hetch-Hetchy it will mean that in its eyes the $42,000,000 worth of water power that it can produce is more valuable than the life-giving refreshment of its unique scenery. It will mean that in this case political sophistry has triumphed over the public interest.

An Attempted Steal

Springfield Republican.—The evidence increases that San Francisco's attempted steal of the Hetch-Hetchy Valley is largely motived by the hope of obtaining not merely its water for ordinary purposes, but its immensely valuable power rights—estimated to be worth $45,000,000—free of cost.

Altogether Reprehensible

Boston Record.—The fight on the mischievous and altogether reprehensible Hetch-Hetchy bill in the Senate is on again today. This bill aims baldly and boldly to rob the public, whose possession the Yosemite National Park is, to pander to the greed of San Francisco, which wants a water supply cheap.

Cannot Justify the Spoliation

Brooklyn Daily Eagle.—Only the most urgent necessity could excuse the destruction of Yosemite Park. San Francisco has not proved either an immediate or ultimate necessity for taking water from the Hetch-Hetchy Valley. Competent authorities aver that she can obtain it more quickly and more cheaply elsewhere. But even if this were not so, it is obvious that neither convenience nor economy can justify the spoliation of a national asset to serve a municipal need.

Develop the Parks, Not Destroy Them

Denver Republican.—There is a very strong public feeling in favor of keeping the nation's parks intact, as heritage of pleasure. This feeling will grow stronger with the years and as the public makes a more general use of the parks. The cheapening of transportation, and the building of good automobile roads to the national parks are the elements that are going to make those places increase steadily in public favor.

Water Power of Great Value

Bangor Commercial.—The effort of San Francisco to obtain control of the water and water power of the Hetch-Hetchy continues regardless of the storm of opposition in the press. . . .

All the argument, including the reports of the Government experts, seem to be against the giving over to San Francisco for practically nothing water powers that are estimated to be worth at least $45,000,000.

Senators Should Consider Higher Aspects

New York Times.—The plain fact is that mid-Western, Southern and Eastern senators have been culpably inclined to leave to the determination of some of their Far-Western colleagues a measure involving millions upon millions of dollars, grave constitutional questions, revolutionary policies concerning franchises and conservation, and the higher interests of a people proud of our noble scenery. They cannot too promptly set themselves at work to study the question in its broadest and highest aspects; the immense value of great natural wonders, the folly of giving away national resources.

Nation vs. City

Times, Scranton, Pa.—The whole nation is to be robbed for the sake of a single municipality. There is no pretense that the spoliation of Hetch-Hetchy is necesary to San Francisco. It is convenient, that is all. An ample supply of water can be got elsewhere, but it would cost something. If such a scheme can succeed, what public property will be safe from private grabbers?

The City Not Frank

Boston Transcript.—The city has practiced a policy of deception in order to play upon the sympathies of the country. It has been detected in its trickery. It has known that there were other sources of supply equally available with the one upon which it had fixed its insistent and insidious purpose, but it has tried unsuccessfully to keep that vital fact from Congress and the public.

COMMENTS OF THE UNITED STATES PRESS

Conservation Menaced

Christian Endeavor World, Boston.—Such a course would menace our whole system of conservation of natural beauties and resources, besides depriving us forever of the enjoyment of attractions that will be more prized every year. Those that feel that a protest ought to be made against the threatened robbery should use all possible influence with senators and congressmen.

Every Reserve in Danger

Minneapolis Journal.—The effect of this alliance reaches farther than California. It encourages attack on every coveted national reserve from the White to the Olympic Mountains. This local antagonism to conservation of public land to protect forest and natural wealth was dangerous enough without having it organized into a log-rolling combination.

Looking to the President

Boston Post.—The attitude of President Wilson toward this enterprise of greed has not been clearly indicated. It is to be hoped that he has a firm grasp upon the veto pen.

Electric Energy the Object

Mobile Register.—An investigation was made recently into the situation to discover other sources of supply, and twelve adequate sources were found and named, but all in private hands and would have to be bought. Very significant of the report that any of these sources would be more costly to San Francisco than Hetch-Hetchy, "without opportunity of Hetch-Hetchy's return in the shape of electric energy."

The "Humanity" Pretense

Pasadena, Cal., News.—How like an old story were the arguments used to convince the House that San Fransico is in dire necessity for water and that unless the Hetch-Hetchy bill was passed our northern compatriots must perish from thirst.

Letting the Cat Out of the Bag

Boston Herald.—At last the San Francisco *Chronicle* has unmasked the Hetch-Hetchy case. Having succeeded in putting through the national House the bill to surrender that notable feature of the Yosemite National Park to San Francisco for a reservoir, and feeling confident that the Senate can be depended upon to clinch the deal, the city's mouthpiece now brazenly declares, in effect, that this bill will serve to test the right of the nation to lord it over the States in matters of public domain.

Why Not Subsidize All the Cities.

Philadelphia Telegraph.—Why should the people of the United States make a present of one of their rarest natural treasures to the city of San Francisco? If Uncle Sam means to give away this priceless valley of Hetch-Hetchy to become a reservoir for one city, does he propose to do something equally handsome for all the other cities of the nation?

An Economic Blunder

San Francisco News Letter.—For a long time the *News Letter* has asserted that the Hetch-Hetchy matter has been mishandled. We have asserted that it was wrong in inception and wrong in every way, both as concerns the solution of the water problem and from the standpoint of cost to the city as compared with a far better, more economical and efficient source in the Sierras, which could be developed in a little over half the time it would take to bring water here from Hetch-Hetchy.

We repeat the question we have asked on more than one occasion: *Why this haste in regard to Hetch-Hetchy? Why are its proponents so anxious to have the bill now before Congress rushed, when they know just what a foolish and utterly vicious bill it is?*

A Bad Precedent

Milwaukee News.—The national parks are the property of all the people. Their integrity should be preserved. If San Francisco is permitted to invade the Yosemite Park a bad precedent will have been established and a beautiful valley will virtually have been destroyed. The value of the parks will be greater with the growth of population and the pasing of time. . . .

San Francisco should secure her water elsewhere and the Yosemite Park should be preserved intact for the benefit of future generations.—Louisville Courier-Journal.

Argument for Beauty Pertinent

Minneapolis Journal.—When it is made known that San Francisco can get water elsewhere, then there is no reason why the esthetic argument should not have its full weight.

Confiscation

The Outlook.—It belongs to the nation. Its value will increase each year. The attempt to divert it from its use and to destroy its beauty is really a confiscation of a very valuable possession of the whole country.

The Real Object

Philadelphia Bulletin.—There is no denial that San Francisco can get its water supply elsewhere, at a nearer point, and probably with less expense, although possibly with less profitable development of water power.

Giving Away National Property

Milwaukee News.—It is the property of all the people now, and there is no good reason why they should hand a fortune maker over to any one city situated in solving the matter by other means as is San Francisco.

A National Issue

Newburyport News.—Possibly by December the Senate may find out that the issue is of interest to the whole nation also, and that there are aspects to this question of the giving away of valuable national resources which they have not yet adequately considered.

The "Sentimental Lobby"

The Outlook.—"Sentimental lobby" is a valuable addition to the political phraseology of the country. It means those people who stand for the rights of a nation against the impatience of a city anxious at once to secure additional water resources without paying for them, or the greed of selfish interests of one kind or another.

A Menace to the National Domain

New York Tribune.—The Hetch-Hetchy grab, conceived in greed and promoted through misrepresentation, is a deadly menace not only to that one valley, "last, loveliest, exquisite, alone," but also to every inch of the national domain. It has been repulsed before. It should this time be defeated so thoroughly as to give it no chance ever to appear again.

Something for Nothing

Philadelphia Telegraph.—San Francisco is not going to let go its helf-hodl os the Hetch-Hetchy Valley without a big struggle. Here is a chance to get from the National Government a water source which would cost it several millions in the "open market." Of course, the fact that there are several other water sites for sale and that the use of Hetch-Hetchy will destroy a beautiful section of the Yosemite National Park does not deter the city fathers of San Francisco.

A Barefaced Raid

Denver News.—The Senate's postponement of the Hetch-Hetchy bill should be made indefinite. It is a barefaced raid on the part of the city of San Francisco, which would result, if successful, in ruining the natural beauty of one of the greatest of the nation's parks.

A Mysterious "Pull"

Manchester, N. H., Mirror.—What is the mysterious pull that has made the Hetch-Hetchy proposition slide along so easily? Does the "new freedom" provide free use of the nation's valuable water power?

A Perilous Precedent

Portland, Me., Press.—Merely to be accommodating to the citizens of a single American city, therefore, it is proposed to establish the precedent of allowing a national park to be taken for private purposes. If this is to be permitted in one case there is no knowing where or when it will not be undertaken next, or with what result.

Revolutionary Legislation

Dayton News.—There is one of the most beautiful valleys in the world at stake, one of the most valuable sources of water for irrigation about to be stolen uselessly, some of the most important conservation policies of the Government to be reversed, if this grant is made.

The Consequences

New York Evening Post.—But if the people of the United States cherish the policy of jealously guarding every such national possession; if they do not regard a little easing of the San Franciscans' "tax burden" as sufficient ground for departing from that policy; if they do not wish lightly to set a precedent which may return to plague them, which may endanger many another scene of beauty whose sacrifice is demanded upon similar pleas and with equal pertinacity; then there is no excuse for giving up the Hetch-Hetchy unless a case is made out far stronger and far more convincing than that which has actually been presented.

An Unwise Precedent

Lexington, Kentucky, Leader.—The passage of the bill would eventually exclude the public from the valley, asd inasmuch as the water situation may be relieved in San Francisco by other arrangements it would appear that the Government would be establishing an unwise precedent by acceding to the city's wishes.

Subsidize All or None

Jackson, Miss., Ledger.—"Real Progressive conservationists" endorse the claim of San Francisco to the Hetch-Hetchy Valley which belongs to the United States Then why should not the national treasury pay for a water supply needed by other cities? In the case of New York this is to cost $200,000,000.

A Deadly Parallel

Brooklyn Standard Union.—What would be thought of New York if it assaulted Congress with a demand to appropriate, without compensation, Niagara, because it wanted it to operate the subway and its electric light and power plants, or if it had gone up to the Catskills and taken all their waters by main force, upon the plea of municipal necessity?

Some men and things in San Francisco will not look well on exhibition to the world in 1915.

The City's Effrontery

New Bedford Standard.—Entirely apart from whether this plan is not a piece of vandalism, the cool effrontery of San Francisco is sufficient for unmitigated condemnation. And considering that the water is not needed so much for domestic supply as it is wanted for the promotion of manufacturing concerns, no good reason whatever exists why San Francisco should not buy its water man-fashion.

Attempted Theft

Springfield Republican.—Persistent efforts have apparently been successful in arousing a hopeful degree of public interest in San Francisco's attempted theft of the beautiful Hetch-Hetchy Valley, or a portion of it, for a municipal reservoir.

New England Against It

New Bedford Mercury.—Certainly no New England congressman will sanction such an outrage as is proposed in a day when conservation is a policy that is coming to be highly regarded. The Hetch-Hetchy Valley is a touch of nature that should be saved from everlasting to everlasting.

First Breach in Conservation

Boston Transcript.—The first breach in the Federal wall of conservation is imminent. With this precedent in hand there is good reason to believe that we shall see a bold frontal assault on the national forests at next winter's session. And the sad feature of it is that some of the most conspicuous members of the conservation hosts, both in and out of Congress, do not see it.

Kill the Bill

South Bend, Ind., Tribune.—The Senate has delayed action on the Hetch-Hetchy Valley bill until December 1. The longer it is postponed, the better pleased will be the people. They will not protest if it is never reported out.

"Improving" the Valley Ridiculous

Pasadena, Cal., News.—Among the opponents of the Hetch-Hetchy bill in the House was Representative Steenerson, of Minnesota, who argued that it was absurd to regard the proposal as an emergency measure when it would take tea years to construct the waterworks system. He intimated strongly that it was more of a project to develop electric power for the benefit of the grantee at the expense of the Government. As to the valley being improved by the reservoir he properly held that argument as ridiculous.

Valuable Water Power at Stake

York, Pa., Gazette.—The city of San Francisco does not need the Hetch-Hetchy Valley for its water supply; this can be had at less cost elsewhere. But the water-power concessions have stupendous value, and upon this it appears that rival interests in that city are dickering.

Precedent the Quick Way to Destroy the Park System

Newark Star.—Not only will the Hetch-Hetchy bill, passed by the House, spoil the beauty of a wonderful national park, but it will put in jeopardy other great natural pleasure grounds, the heritage of the whole American people. Not the least outrageous feature of this grab is the dangerous precedent that it sets up. Other cities will say to Congress: "You turned over the best part of the Yosemite reservation to San Francisco for a water supply; now we want leave to build a plant in this or that national reserve."

Friends of conservation are used to sitting up nights watching corporate would-be grabbers of the public domain, but it is shameful to see a great city scheming to save money by desecrating a temple of nature belonging to the nation.

"Turn It Down Hard"

Poughkeepsie Eagle.—Our representatives at Washington should turn their proposition down hard.

Economic Folly

San Francisco News Letter.—Men who have been most actively engaged in an endeavor to cause the bill to fail are strongly in their assertions that the city of San Francisco is not only in no need of an immediate additional supply of water, but that they have within their reach a better supply, which can be obtained at far less expense and in a much shorter time.

The False Utility Plea

Milwaukee Press.—The issue is clear: Which is of greater importance, the preservation of what is next to Yosemite Valley "the greatest natural cathedral on the Pacific Coast," or its release to San Francisco as her cheapest and most remunerative source of water supply?

It is the old, familiar conflict: The demand of the body vs. the demand of the spirit, the clash of the utilitarian with the ideal.

Obliterating Great Beauty

Albany Journal.—Passed by the Senate and signed by the President, the bill will give up 500 miles of Government lands to a corporation which will profit at the expense of the American people, and commercialize and obliterate one of the spots of striking natural beauty of the country.

A Water Deal

New Haven Register.—It's no surprise that the Senate Public Lands Committee pushes along the Hetch-Hetchy water deal with a favorable report—such things have a way of happening. Is the Senate going to be too busy to take notice of this thing on the floor? And is it possible that the President will not know the truth, if the thing comes up to him?

A Bold Grab

Memphis Appeal.—This is one of the boldest grabs engineered on the Pacific Coast since the timber thieves were run to earth.

To think that half of the wonderful Yosemite reservation is to be sacrificed is a matter of national regret.

Stand Fast and Fight Hard!

New York Evening Post.—It is gratifying to note the emphatic stand which the influential press of the country is taking on the subject. To its protest, and that of a few individual workers, must be ascribed the success thus far attained in resisting the scheme of spoliation. If all who are in their hearts opposed to it stand fast and fight hard, it will be defeated for good and all.

Pure Commercialism

The Independent.—Thus the question is reduced to one of pure commercialism—whether the National Government, in order to save San Francisco additional expense, will sacrifice to it a phenomenal natural treasure house undoubtedly one of the wonders of the world. It must be borne in mind that a difference of utility exists between the forest reserves and the national parks. The former are created for the purpose of preserving waters and forests for the good of the surrounding public. The national parks, on the contrary, are scenic marvels, of which the United States is properly the trustee for civilization and the future.

Let the City Pay for Its Water

New York World.—The Hetch-Hetchy grab goes over until the regular session. While defeat would have been preferable, delay at least is safe. San Francisco can get a water supply "by paying for it"—as New York and other cities do.

The Yosemite is one of the world's wonders. After all the toil and agitation it took to save it for the public, a bitter end would it be to throw it so lightly away. San Francisco does not need the Hetch-Hetchy. The Senate should save it.

Despoiling the People

Fort Wayne News.—Our reform Congress has voted favorably upon the Hetch-Hetchy bill by which the city of San Francisco is given from the public domain a water right worth many millions of dollars. Thus are all the people despoiled for the benefit of a single municipal corporation.

Just to Save the City Money

Boston Record.—Perhaps the Senate will also help hand to San Francisco some 500 miles of magnificent scenery from the public domain, just to save the city money in a water supply it can get somewhere else.

Spoils a Beautiful Park

New York Call.—The Hetch-Hetchy bill, which provides a right of way for San Francisco's $77,000,000 water supply project and spoils a beautiful national park.

Valuable Public Property

Worcester Gazette.—The House has shown a surprising willingness to aid and abet San Francisco and the purely private interests which are behind the scheme in the grab for this valuable piece of public property. Fortunately, the act must yet go before the Senate. It is to be hoped that the latter body will fail to support this very complacent scheme of San Francisco's to keep itself at the public expense.

Most Beautiful Woodland Valley

Jersey City Journal.—The passage by the lower House of Congress of a bill authorizing San Francisco to flood the Hetch-Hetchy Valley in Yosemite Park is cause for regret to all visitors who have seen that most beautiful woodland valley in the world. . . .

San Francisco should own its water supply, but it is hardly necessary that it should go 140 miles to get water or that it should damage a national park. An abundant supply could be obtained much nearer home without doing any mischief.

What Is the Will of the People?

Lowell Citizen.—The Hetch-Hetchy Valley belongs to the people of the United States, who should therefore be considered in the matter of its disposition. Has Congress any doubt whatever as to what the people of the United States want done about it?

The Pecuniary Profit

Providence Tribune.—Even if it should be, however, more costly or less convenient to go elsewhere they would not excuse the turning over of this beautiful public domain to be exploited for anybody's pecuniary profit.

A Form of Privilege

Milwaukee Journal.—Commercial civic greed is balanced against 500 miles of the most beautiful scenery in the United States, and it behooves public-spirited citizens to write their representatives immediately in an effort to stop this useless destruction of Hetch-Hetchy Valley.

In the people's view, graft is rapidly coming to mean every form of privilege which taxes the many to enrich the few.

The Old, Old Story

Newburyport News.—The one reason why San Francisco is making the Hetch-Hetchy grab is because it can get a grant from the Government for nothing. For any other concession, looking to a good water supply, it would have to pay good money. The poor old Government is being worked still all along the line.

Refuse the Request

Springfield Union.—The city of San Francisco can obtain all the water it will ever need from other sources, but it wants the Government to hand it a free site along with a power privilege that the army engineers estimate to be worth $45,000,000. This request should be refused.

An Inalienable Possession

Rochester Chronicle.—This great valley is, as a national preserve, now as much the possession of all of the American people as is the Yellowstone Park, or as the park system of the city of Rochester is an inalienable possession of all the people of this city. It is conceded that San Francisco must obtain an adequate source of water supply, and that the Hetch-Hetchy Valley would afford such supply. But it has been shown by the Board of Army Engineers that the needs of the city can be abundantly supplied from any one of a number of available sources other than this cherished national park.

An Assault on the National Park System

Springfield Union.—It matters not that the corporation thus seeking to appropriate a national possession is municipal rather than private; the fact remains that it is sought to give over to a special interest a property of rare interest and value that after much effort has been acquired by the American people to be preserved permanently as a part of our national system of parks for the uplift and enjoyment of any and all who may care to visit the locality. . . .

The Senate should reject the bill.

More Grabs to Follow

Rochester Times.—If a San Francisco concern on one excuse is permitted to destroy one of our national parks, it will not be long before some other interest will try to seize some other park.

Our Progress in Conserving Beauty

Hartford Times.—We are appreciating the value of parks and the tremendous possibilities of properly safeguarded public domains. We have been most ruthless in our sacrifice of scenic beauty for commercial purposes, but we are taking considerably less pride in the ruthlessness than was formerly the case.

The Milk in the Cocoanut

Lincoln, Neb., Journal.—A representative of the city was asked at Washington if they could not get abundant and pure water in some other part of the Sierra range than the Hetch-Hetchy Valley. "Yes," he said, "by paying for it." There we have the milk in the cocoanut. And Congress seems determined to give the wild part of the Yosemite away just because a rich and influential city wants it.

Unpopular Legislation

Denver Republican.—The people need their national playgrounds in the West, and this need will increase as the population increases and the public turns more and more to such outdoor haunts for recreation. Any legislation that will tend to lessen the scenic attractiveness of the Government's parks will not be popular.

Breaking Down Conservation

Indianapolis News.—Genuine conservationists who are not influenced by local selfishness regret the passage by the House of representatives of the Hetch-Hetchy Valley bill. . . .

The Hetch-Hetchy scheme is a conscienceless attempt to break down the policy of conservation for the profit of one municipality. . . .

The preservation of the Hetch-Hetchy Valley as a part of the magnificent Yosemite reservation is national conservation—for the park is the property of the nation. The people of the nation should not permit it to be sacrificed to the economy of San Francisco, for that city can obtain a water supply elsewhere.

An Outrageous Proceeding

Flint, Michigan, Journal.—If San Francisco takes the water of the Hetch-Hetchy, the greatest, most beautiful and picturesque valley in California, the San Joaquin will be left without water and literally turned into a desert. If this were necessary to the health and welfare of San Francisco the organizations fighting the bill and the people of the country would submit placidly, but it is not. There are other and sufficient supplies of water that the city might secure, but for some reasons not explained, but surmised, San Francisco, or its politicians, at least, insist upon the Hetch-Hetchy supply.

In granting this privilege Congress will open the way for the despoliation of other national parks of the country and this is indeed an outrageous proceeding.

Uncompensated Privilege

Milwaukee Journal.—The big fact is that one city is asking leave to take away from the whole country an invaluable possession which cannot be restored. Even granting the necessity that San Francisco is claiming, which is most doubtful, we have heard no argument against her reimbursing the public treasury.

A Greedy Demand

Nashville Democrat.—San Francisco's greedy demand for the Hetch-Hetchy Valley passed the House by an overwhelming majority. If there is any particular reason why 500 square miles of a National Park should be donated to that city, we have never seen it.

TELEGRAM FROM SENATOR JOHN D. WORKS, OF CALIFORNIA

HON. REED SMOOT,
United States Senate, Washington, D. C.

Coronado, Cal., October 2, 1913.

I have sent the following telegram to Senator Myers. I have satisfied myself that the Hetch-Hetchy bill should not pass without further investigation. Ninety-nine per cent of water users in the irrigation districts are strongly opposed to it and claim that they were betrayed by those who consented to the compromise measure. They claim that thousands of acres of lands in their districts and outside of them will be deprived of water to which they are entitled, and that they can show that this sacrifice of the best and most fertile lands in the State is not necessary in the interest of San Francisco. Because of this compromise, that they indignantly repudiate, this phase of the question has not been investigated. The bill should not be rushed through this session under such circumstances. It is too serious not only to the parties directly interested but to the whole State.

JOHN D. WORKS.

Originally printed in 1913
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Platform of the National Committee

NO PRECEDENT MUST BE ADMITTED FOR THE INVASION OF OTHER PARKS. Every square foot of our noble American reserves must be defended against commercialism and false utility.

CONSERVATION IS CONSERVATION WHEN IT CONSERVES, NOT WHEN IT DESTROYS. Everything must be conserved for its appropriate use. Magnificent scenery reserved for the enjoyment of the whole people must not be destroyed.

THE NATIONAL PARKS MUST NOT BE GIVEN UP EXCEPT FOR DIRE NECESSITY. The invasion of this park is acknowledged to be *unnecessary* to supply San Francisco with an abundant supply of good water.

NATIONAL FRANCHISES MUST NOT BE GIVEN AWAY TO MUNICIPALITIES ANY MORE THAN TO OTHER CORPORATIONS. Cities may fall into the hands of grafters hereafter as they have in the past. The bill provides for work involving $122,000,000, and offers immense opportunity for jobbery.

MUNICIPAL POLITICIANS AND ENGINEERS MUST NOT BE ALLOWED TO DESTROY THE MASTERPIECES OF OUR NATURAL SCENERY. The plea that an artificial lake will improve the handiwork of the Creator is untrue. What chiefly makes the valley beautiful will be destroyed by flooding.

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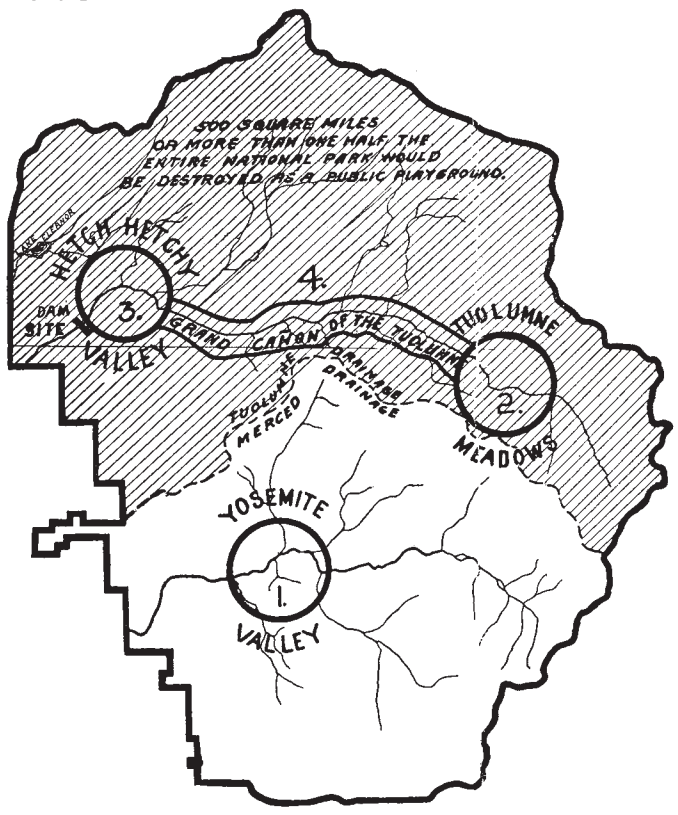
DIAGRAM OF YOSEMITE NATIONAL PARK.



The *shaded* northern portion of the Yosemite Park is that which would be invaded by the passage of the Hetch-Hetchy bill. This bill involves the closing up of the entrance to the Grand Cañon, it provides a dam and large electric power plant, it keeps camping parties 300 feet away from all the other water courses as well as from the rivulets and streams, it diverts the water supply, after issuing from the Park, from the arid valley of the San Joaquin to the city of San Francisco, which may equally well obtain its water from several other sites.

Why the Yosemite Park Was Established

This Park was established in 1890. In reporting this bill the committee said:

"The preservation by the Government in all its original beauty of a region like this seems to the committee to be a duty to the present and future generations. The rapid increase of population and the resulting destruction of natural objects make it incumbent upon the Government, in so far as may be, *to preserve the wonders and beauties of our country from injury and destruction, in order that they may afford pleasure as well as instruction to the people.*"

Condemnation of the Hetch-Hetchy Invasion by Successive Governments

The project was condemned by Secretary Hitchcock in 1903 and later by Ex-Secretary Noble.

It was condemned by a unanimous vote of the House Committee on Public Lands of 1905.

It was condemned by the Committee on Public Lands in 1909.

In 1910 the Board of Army Engineers to whom the matter had been referred by Secretary Ballinger reported that there were other sources of supply available, namely: 1. McCloud River. 2. Sacramento River. 3. Lake Eleanor. 4. American River.

"Adequate for all present and reasonably prospective needs of the city without the inclusion of the Hetch-Hetchy Valley."

In 1910 George Otis Smith, director of the United States Geological Survey, reported to the Secretary of the Interior, after careful examination by engineers:

"The Lake Eleanor project is amply sufficient to meet the present and prospective needs of the city, and it is not necessary that the Hetch-Hetchy Valley should be available to San Francisco for the purpose of a municipal water supply."

Gifford Pinchot Revives the Project

Owing to repeated rejection by the Government, the Hetch-Hetchy project was abandoned by the City of San Francisco until it was revived by Mr. Gifford Pinchot during the administration of President Roosevelt and Secretary Garfield as expressed in the following letter:

November 15, 1906.

Mr. Marsden Manson,
2010 Gough Street,
San Francisco, California.

MY DEAR MR. MANSON—I cannot, of course, attempt to forecast the action of the new Secretary of the Interior [Garfield] on the San Francisco watershed question, but my advice to you is to assume that his attitude will be favorable, and to make the necesary preparations to set the case before him. I had supposed from an item in the paper that the city had definitely given up the Lake Eleanor [Yosemite National Park] plan and had purchased one of the other water systems. If the possibility of a supply from the Sierras is still open, you should, I think, by all means go ahead with the idea of getting it.

Very sincerely yours,
(Signed) GIFFORD PINCHOT, Forester.

The motives for this letter are believed to have been opportunist, namely, that by delivering the northern half of the Yosemite Park to the City of San Francisco, political support and the necessary appropriations could be secured for the various forestry measures in which Mr. Pinchot was interested.

Hetch-Hetchy Not Needed by the City of San Francisco

"The Board [of United States Army Engineers] is of the opinion that there are several sources of water supply that could be obtained and used by the city of San Francisco and adjacent communities to supplement the nearby supplies as the necessity develops. From any one of these sources the water is sufficient in quantity and is, or can be made, suitable in quality. While the engineering difficulties are not insurmountable, the determining factor is one of cost."—*Official Report of the Advisory Board of Army Engineers.*

Mr. Phelan, who conceived the Hetch-Hetchy project, admitted in 1910 that the city could get water anywhere along the Sierra "by paying for it."

Shall the Nation Hand Over to San Francisco a Franchise Worth $45,000,000?

The bald question is: Shall the nation, in order to save San Francisco an assumed difference of cost between the Hetch-Hetchy and any one of several other supplies spoken of by the Army Board in its report, make the city a present of a franchise worth forty-five millions of dollars and destroy the unique beauty of the Valley, called by Mr. Pinchot "one of the great wonders of the world"? If the Hetch-Hetchy is not worth saving, what else in the national park system can be defended against the demands of commercial greed?

President Cleveland said: "It is the duty of the people to support the Government, not the duty of the Government to support the people." This is emphatically true of municipalities, which often are in the hands of political grafters. Why should the nation make this phenomenal contribution to San Francisco's budget?

The Beauty of the Valley will be Destroyed

The rare beauty of Hetch-Hetchy, as the elder Frederick Law Olmsted said, consists in the contrast between the rugged cliffs and the exquisite floor. Destroy the latter and you destroy the "original beauty" which Congress determined to preserve by the act creating the Yosemite National Park. A city park is beautiful in its place, a natural lake in its place, but what is desirable in the Hetch-Hetchy is the delightful charm of its lovely wildness, for which a dam and an artificial reservoir rapidly drained to the bottom in the dry season would be no substitute. If such a lake is more beautiful, shall we make reservoirs of Yosemite Valley and all other wonderful valleys in the National Parks? The mismanagement of the Yosemite Valley by California was a scandal until the valley was retroceded to the United States.

"Taunted, for years and everywhere, usually by nations envious of our prosperity, as worshippers of the almighty dollar, as ready to sacrifice everything to money profit and hopelessly commercialized, here is opportunity to answer and refute the charge; to demonstrate that there are some things even in America which money cannot buy, and that when the people have reserved to themselves, for their use and enjoyment a beauty spot of Nature, a masterpiece of Nature's God, they will preserve and defend it."—*Brooklyn (N. Y.) Standard Union (Editorial).*

A Backward Step in Conservation

The Boston Transcript calls the project "the first breach in the conservation wall." Forest reserves are conserved for the purpose of saving for contiguous communities water and timber under proper regulations. True conservation will save the National Parks as treasurers of scenic beauty, and health and pleasure resorts for the whole people.

Hetch-Hetchy a Pleasure-Ground of the People—Develop It, Not Destroy It

Hundreds of visitors to the Valley pronounce it a gem of rare beauty. Among these are John Muir, Edmund A. Whitman, J. Horace MacFarland, Harriet Monroe, Hon. Herbert Parsons, Hon. Henry L. Stimson, Alden Sampson, E. T. Parsons, the late Joseph Le Conte, Herbert W. Gleason, Frederick Swartz. A roadway would make it easily accessible! The farmers of the San Joaquin Valley go much to the Park in the stifling summer.

Some of Those Who Oppose the Bill

Four Secretaries of the Interior: Noble, Hitchcock, Ballinger and Fisher. An overwhelming majority of the press (see extracts from editorials herewith). Many national conservationists such as John Muir, B. E. Frenow, E. A. Bowers, Ex-President Eliot, Horace MacFarland, Frederick Law Olmsted, Professor Henry Fairfield Osborn, A. F. Hawes, State Forester of Vermont, Charles S. Sargent, R. U. Johnson, Samuel Parsons, Dr. George Frederick Kunz, George Bird Grinnell, Austin F. Wadsworth, F. S. Dellenbough, Director William T. Hornaday, Mrs. Emmons Crocker (chairman of the Conservation Committee of the General Federation of Women's Clubs).

NATIONAL PARK, OR MUNICIPAL RESERVOIR A MUD-FLAT IN THE DRY SEASON

The fate of this wonderful valley, threatened by municipal greed, is in the hands of the American people. The United States Senate will act during the first week in December upon the bill permitting San Francisco to turn Hetch-Hetchy Valley into a reservoir.

From The Independent, New York, October 30, 1913.

APPENDIX C

Memorandum: Hetch Hetchy water and power issues

Prepared by Somach, Simmons & Dunn for Environmental Defense

SOMACH, SIMMONS & DUNN
A Professional Corporation
813 Sixth St., Third Floor
Sacramento, CA 95814
Telephone: (916) 446-7979
Facsimile: (916) 446-8199

M E M O R A N D U M

To: Environmental Defense*

From: Stuart L. Somach**

Subject: Hetch Hetchy Water and Power Issues

Date: July, 2004

INTRODUCTION

I have reviewed materials available to me with respect to various questions that you have posed concerning the general water rights and entitlements of the City and County of San Francisco ("CCSF"). This review has been exclusive to CCSF's Tuolumne River water rights as they may derive from California law and the Raker Act.[1] It is my understanding that this information will be utilized by Environmental Defense, and perhaps others, in an analysis of water supply options and alternatives that CCSF may have available to it in lieu of its current storage of water in Hetch Hetchy Valley. As you are aware, I am a proponent of surface water storage as an essential element of what is needed to resolve California's water supply shortages and, in general, consider Hetch Hetchy a component in that overall water storage/supply picture. In this context, other than the legal opinions provided for herein, I offer no opinion with respect to options or alternatives to the storage of water in Hetch Hetchy Valley.

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* As you are aware, Somach, Simmons & Dunn represents the Turlock Irrigation District. At its request, I have provided this identical opinion to it pursuant to our attorney-client relationship.

** I have been assisted in the preparation of this Memorandum by Elizabeth W. Johnson, of the firm Wilkins, Underwood, Omstead & Johnson; and Nicholas A. Jacobs, an associate attorney with Somach, Simmons & Dunn.

1 Pub. L. No. 63-41 (Dec. 19, 1913) 38 Stats. 242.

QUESTIONS PRESENTED

1. Assuming that reasonable, feasible alternatives to utilizing existing or expanded Raker Act water supply facilities in the Hetch Hetchy Valley are available to CCSF, what legal considerations may require or encourage CCSF to consider such alternatives?

2. What legal factors affect the role Modesto Irrigation District and Turlock Irrigation District will have in CCSF's consideration of alternatives?

3. What legal factors affect the role of other agencies in CCSF's consideration of alternatives?

4. What legal requirements regarding hydroelectric power production may affect CCSF's decisions with respect to expansion and/or continued use of the facilities in the Hetch Hetchy Valley authorized by the Raker Act?

BRIEF ANSWERS

1. The California Water Plan assumes that water conservation and recycling, additional surface water storage in the greater Bay Area, desalinization, and reconfigured conveyance from the lower Tuolumne River and the San Francisco Bay-Delta may make water available to serve the region.[2] Assuming such alternatives are practical and available in the foreseeable future, and based on our research of this matter, the following legal considerations may require CCSF to consider diversions of Tuolumne River water elsewhere than from Hetch Hetchy Valley:

- CCSF has perfected water rights to about 300 million gallons per day ("mgd") from the Tuolumne River. Although CCSF has historically claimed a right as large as 400 mgd, these claims are undermined by the due diligence requirements of California water law, as well as by the effect of various terms or conditions in the Raker Act.

- CCSF's right to Tuolumne River water is a relative right. In this context, and by way of example, the Raker Act is very protective of the rights of the Turlock Irrigation District ("TID") and Modesto Irrigation District ("MID"). (TID and MID are referred to collectively as the "Districts.") The Raker Act protections, however, are limited to the Districts and may not be exercised by others. Further, California law prohibits exercise of CCSF's rights, existing or expanded, in a manner that injures the Districts or other senior water right holders.

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[2] California Water Plan, DWR Bulletin 160-04 (Draft), Vol. 3, Ch. 3.

- The Raker Act required CCSF to fully develop its other water resources before taking additional water from Hetch Hetchy. Today this may include greater use of recycled water and other alternative local sources.

2. The Districts hold water rights that are senior to CCSF's. Further, CCSF's rights and obligations with respect to "storage" in New Don Pedro Reservoir are governed by its agreement with the Districts. Without that agreement and its integration into various water rights and the Districts' Federal Energy Regulatory Commission ("FERC") licenses, CCSF would have no rights in New Don Pedro Reservoir. The Raker Act protections identified above give the Districts additional power to restrict CCSF's expansion of its Hetch Hetchy facilities.

3. The discretionary expansion of CCSF's system, or changes in the current diversion levels using existing facilities, would require an analysis of alternatives pursuant to the National Environmental Policy Act ("NEPA") and the California Environmental Quality Act ("CEQA"). It would, however, also require an analysis of the appropriateness of an upstream diversion within Yosemite National Park in light of the California public trust doctrine and of California's constitutional mandate to maximize the reasonable, beneficial use of water. Various agencies and the courts may assert oversight under these doctrines and environmental protection statutes. Public trust interests and the constitutional obligation to maximize the reasonable, beneficial use of California water are presumably constant limitations on CCSF's use of Tuolumne River water, whether existing or expanded.

4. The Raker Act explicitly requires CCSF to "develop and use hydroelectric power for the use of its people …." The Raker Act specifies the following priority of use of Hetch Hetchy power: (i) first, for CCSF's "actual municipal purposes;" (ii) second, to the Districts for "pumping subsurface water for drainage or irrigation" or for "actual municipal purposes;" and (iii) third, for commercial purposes, including sales to CCSF's residents and to "a municipality or a municipal water district or irrigation district" for resale but not to any corporation or individual for resale. CCSF's requirement to produce power for public purposes is a condition of the right-of-way granted by the Raker Act; accordingly, if it desires to continue to utilize those rights-of-way, it must continue to produce such power from facilities remaining in the Park.

DISCUSSION

Water rights are relative rights with their value, at least in part, dependent upon their relative priority with respect to those who also claim rights to divert and use water within the same river or stream system. As a consequence, it is both accurate to state that an individual or entity has a right to X million gallons per day or acre feet annually and also state that the exercise of that right to X million gallons per day or acre feet annually is conditioned on not injuring or impairing a more senior water right holder's ability to first divert and use its entitlement.

In this context, CCSF's right to water is and always has been tied to the rights of TID and MID and, to a lesser degree, others on the Tuolumne River. It is almost impossible to evaluate CCSF's water rights without reference to the water rights of the Districts. As a consequence, those references exist in the discussion that follows. Moreover, as a general comment, and consistent with this concept, modification of points of storage and diversion and storage for the exercise of CCSF's water rights would need to contemplate the rights of others, and modifications that injure or impair the rights of third parties would not be permitted absent compensation or mitigation. Accordingly, following is an analysis of CCSF's Hetch Hetchy water rights, including CCSF's claims regarding the scope of its rights and possible restrictions on those claims.

I.
THE INFRASTRUCTURE OF THE TUOLUMNE RIVER DEVELOPMENT

CCSF holds its water rights pursuant to California law. However, authorization to build its reservoirs on federal land and to obtain federal rights-of-way required an act of Congress, the Raker Act, passed in 1913.[3] Pursuant to this authority, CCSF constructed three storage reservoirs: O'Shaughnessy (capacity 360,400 acre feet) (1923 and enlarged in 1938) and Eleanor (capacity 27,100 acre feet) (1917) in Yosemite National Park; and Cherry Valley (capacity 268,800 acre feet) (1956) in Stanislaus National Forest. These reservoirs are the heart of the CCSF system[4] and are located on or tributary to the Tuolumne River. Releases from these facilities are the only source of water in the Tuolumne River upstream of the South Fork, and CCSF is solely responsible for maintaining flows in this stretch of the river.

According to the SWRCB, based on a firm yield study performed by CCSF, normal operations of the Hetch Hetchy system are as follows:

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[3] 38 Stat. 242.

[4] According to a memorandum by State Water Resources Control Board ("SWRCB") staff (Fuller and Stretars, SWRCB File No. 262.0 (55-07), Statement S-2635 (1982), p. 2), setting forth the findings and conclusions from their research in response to a 1982 complaint of excessive diversions, CCSF's development of the Tuolumne River for water and power upstream of the Oakdale Portal on the Foothill Tunnel consists of the following facilities:

Hetch Hetchy Reservoir ... .capacity 380,080 acre feet
Canyon Power Tunnel..... .....capacity 1,100 second feet
Early Intake Reservoir ....capacity 155 acre feet
Lake Eleanor Reservoir.... .....capacity 27,100 acre feet
Lake Lloyd Reservoir..... .....capacity 268,800 acre feet
Eleanor-Cherry Diversion Tunnel...capacity 1,140 second feet
Cherry Power Tunnel..... .....capacity 830 second feet
Lower Cherry Aqueduct... .....capacity 250 second feet
Mountain Tunnel..... .....capacity 730 second feet
Priest Reservoir..... .....capacity 1,055 acre feet
Moccasin Reservoir..... .....capacity 505 acre feet
Foothill Tunnel..... .....capacity 620 acre feet

> Water from the Hetch Hetchy Aqueduct is normally released from Hetch Hetchy Reservoir through the Canyon Tunnel and Kirkwood Power House where, for quality control, it is diverted around Early Intake Diversion Dam into Mountain Tunnel. Water can also be diverted into Mountain Tunnel from the Early Intake Reservoir. From Early Intake water is conveyed to Priest Regulating Reservoir and through Moccasin Power House and then into the Foothill Tunnel and pipelines across the San Joaquin Valley.
>
> Water released from Lake Lloyd through the Cherry Power Tunnel and Holm Power House is discharged into the Cherry River at an elevation below Early Intake Diversion Dam. However, water from Lake Lloyd and Lake Eleanor can be conveyed to Early Intake Diversion Dam and into Mountain Tunnel in natural channels and diverted into the Lower Cherry Aqueduct upstream from Holm Power House.[5]

Modesto Irrigation District and Turlock Irrigation District developed reservoirs and extensive canals downstream of Hetch Hetchy, but substantially earlier in time. The La Grange Dam (capacity 500 acre feet) (1894), Modesto Reservoir (capacity 28,000 acre feet) (1911) and Turlock's Davis-Owen Lake (capacity 48,740 acre feet) (1914), together with canals and headgates for delivery to the respective Districts and a power plant at La Grange, were begun before 1910, and enlarged before 1914. The original Don Pedro Reservoir (290,200 acre feet) was completed in 1923. By agreement, the Districts divide the water diverted at La Grange with about one-third going to MID and two-thirds to TID.

CCSF and the U.S. Army Corps of Engineers joined with the Districts in the construction of "New" Don Pedro Reservoir (capacity 2,030,000 acre feet), which became operational in 1971. In exchange for CCSF's financial participation, CCSF obtained (among other things) relief from flood control responsibility on the Tuolumne River plus up to 740,000 acre feet of exchange storage rights in the reservoir.[6] The Districts are the owners of New Don Pedro and TID is the Don Pedro Project Manager. Under the exchange agreement, increased diversions to the CCSF water system are not made physically from the New Don Pedro Reservoir. Instead, CCSF's exchange storage space in the reservoir is operated to store water that is credited to CCSF, and CCSF is allowed to make additional diversions upstream to the extent that a credit exists in the reservoir, thus permitting its use by CCSF when the Raker Act would otherwise obligate it to release water for the benefit of the

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[5] Fuller and Stretars, *supra*, at pp. 3-4.

[6] CCSF's financial contribution obtained for it a right to 570,000 acre feet of storage in New Don Pedro called "exchange storage," and a seasonal encroachment right to up to half of the reservoir's 340,000 acre-foot reserve capacity for flood control. (*In re The Matter of Turlock Irrigation District and Modesto Irrigation District Project No. 2299* (1963) 31 F.P.C. 535, 1963 F.P.C. LEXIS 316 (LEXIS pagination used herein) ("Initial Decision").)

Districts. This exchange storage and credit system is known as the "water bank" in New Don Pedro. The Districts own and have the exclusive control and use of all water stored in Don Pedro Reservoir, including all water in the water bank. Therefore, the water bank should be more realistically viewed as being "paper water" or accounting storage as far as CCSF's "storage" rights are concerned.

The physical and legal relationship of CCSF to the Districts is that of an upstream, junior rights holder. The Raker Act, in addition to granting San Francisco authority to build on federal land, obligated CCSF to make releases to satisfy the Districts' prior rights. All releases from CCSF's facilities upstream flow into New Don Pedro. Releases from New Don Pedro are under the exclusive control of the Districts, with minimum flows set pursuant to the terms of their FERC license. No further development of the water supply system on the Tuolumne River has occurred since 1965.[7] However, in 1967, CCSF completed Canyon Power Tunnel and the Robert C. Kirkwood Powerhouse. At that time, diversion of water changed from Early Intake Dam to Hetch Hetchy Reservoir, upstream, evidently to capitalize on additional hydroelectric development capability.[8]

The capacity of CCSF's three pipelines that convey Tuolumne River water across the San Joaquin Valley to the Bay Area is 295 mgd.[9] The tunnel at Tesla Portal can carry 300 mgd. According to testimony in Examiner Hall's proceedings on the Districts' 1963 applications for a FERC license for New Don Pedro, prior to the construction of New Don Pedro, CCSF then needed an additional 674,000 acre feet of storage to yield its full claimed water right of 400 mgd. Because CCSF obtained a greater storage capacity than that in many years, it is reasonable to conclude that presently, the principle part of CCSF's infrastructure that constrains its full development of Tuolumne River rights for water supply remains in the conveyance facilities, i.e., the pipelines and tunnels carrying the water from the Sierras to the Bay Area.

II.
THE PARTIES, THE PRINCIPALS, AND THEIR RELATIONSHIP TO EACH OTHER, AND TO THE TUOLUMNE RIVER

CCSF has vested water rights to the Tuolumne River and owns real property and facilities in Hetch Hetchy Valley and in the surrounding watersheds of the Tuolumne River and Cherry River. CCSF's water department service area includes all the northern end of the San Francisco peninsula, extends south along the shores of the San Francisco Bay to include the cities of Mountain View and Sunnyvale, easterly to include the city of Milpitas, and

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[7] However, in 1969 CCSF added the New Moccasin Powerhouse, a two-generator 45,000 KW capacity plant, directly adjacent to the old unit.

[8] Fuller and Stretars, *supra*, at p. 17.

[9] A schematic drawing showing the placement of the CCSF water supply infrastructure is attached as Exhibit A.

northerly along the eastern shores of the Bay to include the city of Hayward. More than 40 other cities, districts and agencies are supplied with water from the San Francisco system.

The Districts have vested water rights to the Tuolumne River and own real property and facilities in the foothills of that watershed and in the valley below. The Districts are two of the largest irrigation districts in the state, and have been engaged in the irrigation business since 1894 and the power business since 1924. They own and operate extensive facilities for the distribution of irrigation water and electric power in Stanislaus and Merced counties. As discussed more fully below, the Districts are intimately tied to one another and to CCSF through a long history of shared, and mostly cooperative, reliance on the Tuolumne River.

Other potential principals in the unfolding history of Hetch Hetchy and the Tuolumne River are the regulatory agencies and the courts. California's State Water Resources Control Board was asked, in complaints filed by representatives of the Sierra Club, in 1977 and 1982, to investigate whether CCSF had exceeded the scope of its appropriations. The complaints asserted that CCSF's diversions from Cherry Creek were unauthorized, and that construction of a low-head hydroelectric power plant below Moccasin Reservoir was not within the scope of the original CCSF appropriations. Although these complaints did not result in enforcement action, the SWRCB could respond to such complaints in the future, and could investigate and initiate court action to restrict unauthorized CCSF diversions if it were to substantiate the allegations.[10]

The California Department of Fish and Game ("CDFG") has statutory responsibilities for maintenance and preservation of fisheries and fish habitat. The public trust extends to fish.[11] As such, CDFG may have the authority to initiate actions to protect the fishery resource from CCSF diversions endangering fish in the upper Tuolumne River. Such actions could include engaging the SWRCB or the courts.[12]

In addition to CDFG, federal fish and wildlife agencies may have a significant role to play, particularly in evaluating and perhaps applying limitations imposed by the Federal Endangered Species Act.[13] These agencies include the Fish and Wildlife Service and NOAA Fisheries.

The Federal Energy Regulatory Commission controls licensing and a licensee's compliance with the FERC license for most large hydroelectric facilities. As part of its authority, and subject to NEPA, FERC must protect fisheries and other species reliant on the waterway's habitat. The District-owned New Don Pedro dam and hydroelectric powerplant

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10 Water Code sections 274, 1051-1052.

11 *California Trout, Inc. v. State Water Resources Control Bd.* (1989) 207 Cal.App.3d 585, 631 ("*Cal-Trout*").

12 See, e.g., *id*., at p. 631 [relative to post-1914 water right permits].

13 16 U.S.C. § 1531 et seq.

are licensed by FERC. To the extent CCSF's diversions affect compliance with the Districts' FERC license, FERC may indirectly shape CCSF's decisionmaking with respect to the alternatives that are available to it. In addition, CCSF's water bank storage credits in New Don Pedro are subject to reduction if, in further proceedings before the FERC, the FERC increases the water release requirements for fish that impair the Districts' water entitlements.

The courts are charged with defining the validity and scope of water rights of pre-1914 appropriators when the extent of such rights or claims is in dispute. The parties themselves may initiate court action for this purpose, through a complaint for injunction, declaratory relief, or other remedy. Other water rights holders on the same stream may seek an adjudication. Citizen groups with standing to raise public trust concerns, or to assert violations of environmental protections statutes such as CEQA or NEPA, may also engage the courts and thereby affect CCSF's decisions with respect to Hetch Hetchy.

III.
THE LAW THAT APPLIES

A. Water Law

1. Pre-1914 Appropriations, Defined

Before the California Legislature adopted the Water Commission Act in 1913,[14] a right to appropriate water could have been obtained in one of two ways. Either the individual could have simply diverted water from a stream and put it to a beneficial use immediately, whereupon the person would acquire the right to use indefinitely a similar amount of water from that diversion for use on the same lands. Alternatively, after 1872, an individual might choose the "notice" method of appropriation prescribed by Civil Code sections 1410a-1422.[15] Under this second method, if the construction of the diversion works was begun within 60 days of the posting of notice, and thereafter pursued "diligently" and "uninterruptedly" to completion, the right of appropriation would relate back in time to the date the notice was posted. Eventually, important amendments were added to the notice method so that municipal appropriators would be excused from the penalty of loss of priority if their progress was interrupted by failure to develop more than the current needs of the community, provided surveys associated with future use were done within 60 days, or bonds for water facilities were authorized within six months of the date of the original notice.[16]

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[14] See Water Code section 1250 et seq. and historical annotations.

[15] Specifically, Civil Code section 1415 provides that the appropriator must post the notice at the point of diversion stating the extent of flow (measured under 4-inch pressure), the purpose and place of use, and the means and capacity of the diversion works, which notice must be recorded within 10 days in the county where the diversion is located. Change of place of use or diversion was permitted provided no injury to others occurred.

[16] Civil Code section 1416; Stats. 1911, c. 730, p. 1419, § 1.

The primary features of this code method of appropriation were notice, diligence and "relation-back." Like the non-statutory method, code appropriations depended on actually putting the water to beneficial use, after uninterrupted efforts, to perfect the right.[17] Posting a notice was not conclusive evidence of actual possession of the watercourse by which appropriative rights were acquired.[18]

A code appropriator whose notice of appropriation did not comply with the requirements of the Civil Code could not claim the benefits of relation-back.[19] However, until December 19, 1914,[20] an attempted code appropriator whose notice or recording efforts did not conform to the statute might still obtain a valid non-statutory appropriative right with a priority dating from the time it was *perfected*, by actually putting the water to a useful purpose.

The significance of this legal background becomes obvious when viewed against the factual backdrop of CCSF's and the Districts' code appropriations. The potential consequences for defective notice or recording, or for lack of diligence, are loss of priority and loss of the unexercised portion of appropriation. In a stream like the Tuolumne River, where flow is seasonal and runoff entering the waterway is at times virtually nonexistent,[21] unless one's right has a very senior status it may be ephemeral. Loss of priority may literally be fatal.

2. Validity and Scope of CCSF's Pre-1914 Appropriations

a. The Notices

The Recorder of Tuolumne County received 67 notices regarding water of the upper watershed of the Tuolumne River between 1901 and 1911 which were the genesis of CCSF's water rights. Of these, 54 were for appropriation of water, and the remainder were for rights-of-way for canals or ditches, inundation for power generation, or other water related purposes.[22] In the 1934 lawsuit filed by the Districts against CCSF, the answer filed by CCSF relied on 47 of these appropriations. In the later *Meridian* lawsuit,[23] CCSF presented evidence of 47 notices of appropriation that were owned by San Francisco at that time. A

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17 *Utt v. Frey* (1895) 106 Cal. 392, 395; *Sierra Land & Water Co. v. Cain Irrigation Co*. (1933) 219 Cal. 82, 84.

18 *Thompson v. Lee* (1857) 8 Cal. 275.

19 *Taylor v. Abbott* (1894) 103 Cal. 421, 423-424.

20 This was the effective date of the Water Commission Act, which made application to the state the sole means of acquiring an appropriative right. (Wat. Code, § 1200 et seq.)

21 See *State of California v. Federal Power Commission* (1965) 345 F.2d 917.

22 Report by Paul Bailey to Modesto Irrigation District and Turlock Irrigation District ("Bailey Report") (1934) at pp. 49-50. Bailey was formerly the California State Engineer who served as the Districts' consultant during the litigation in the early 1930's.

23 *Meridian, Ltd. v. San Francisco* (1939) 13 Cal.2d 424.

cursory review of these notices indicates they total about 817,000 miner's inches[24] on paper, far more than the amount of CCSF's actual claimed water rights today.

In his 1934 report to the Districts, prepared during litigation with CCSF that led to the first of four agreements (see Part III.D., *infra*), former California State Engineer Paul Bailey examined each of the 67 notices of appropriation in scrupulous detail.[25] Bailey believed CCSF acquired only 14 noticed appropriations which fully conform to the Civil Code requirements, yielding on their face approximately 5,780 cfs.[26] However, after analyzing the limited ability of CCSF in 1934 to store and convey the Hetch Hetchy water in a manner consistent with Raker Act and pre-1914 California law, Bailey concluded that even the validly noticed CCSF water rights would yield only approximately 200 mgd.[27]

Bailey listed several reasons for his conclusion; however, his analysis was eclipsed by the California Supreme Court opinion in *Meridian, Ltd. v. San Francisco* (1939) 13 Cal. 2d 424.

b. The *Meridian* Decision

In *Meridian*, a farming corporation with riparian rights to the Tuolumne River sued CCSF, the Districts and others, to enjoin illegal or injurious diversion, and to quiet title to its own water rights. CCSF responded by claiming it possessed valid appropriations yielding up to 400 mgd in diversions, as well as prescriptive rights to store surplus high waters in its Hetch Hetchy and Lake Eleanor reservoirs. The trial court considered the validity and scope of each of the 47 notices of appropriation on which CCSF relied, evaluated CCSF's historical and projected use of the water for power and domestic uses, and concluded that CCSF was entitled to only 142 mgd.[28]

The Supreme Court partially reversed the trial court.[29] It found that CCSF held prescriptive storage rights for surplus waters in Hetch Hetchy and Lake Eleanor reservoirs of up to 235,465 acre feet, which rights were superior to the plaintiff's riparian rights.[30] It also held that even if the notices were defective for failing to specify the storage use, a liberal construction of the notices, as compelled by *Osgood v. El Dorado Water & Deep Gravel*

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[24] The notices are expressed in miner's inches, which convert 50:1 to cubic feet per second ("cfs"). Cubic feet per second refers to a rate of flow. Thus a total of 817,000 miner's inches (plus "all water" in Eleanor Creek) equals at least 16,340 cfs, or more than 10,000 mgd - three times CCSF's current diversion.

[25] Bailey Report, *supra*, at pp. 52-157.

[26] Compare to CCSF's current claim of 400 mgd, which converts to 619 cfs, or 448,000 acre feet 365 days per year. (Initial Decision, *supra*, 31 F.P.C. at *29, n. 23.)

[27] Bailey Report, *supra*, at p. 156.

[28] *Meridian, Ltd., supra,* 13 Cal.2d at p. 442.

[29] *Id*., at p. 451.

[30] *Id*., at p. 495.

Mining Co. (1880) 56 Cal. 571, 579, necessitated a result in favor of CCSF's right to store enough water to yield the noticed 400 mgd.[31]

In sum, the *Meridian* decision solidified, but did not determine, CCSF's claim to appropriative rights yielding 400 mgd. It also gave CCSF a prescriptive right to store over 235,000 acre feet which was superior to downstream riparians as well as subsequent appropriators on the Tuolumne. Arguably the *Meridian* court's statement that CCSF's rights were sufficient to yield 400 mgd is dicta, in that the court never fully analyzed the trial court's detailed evaluation of the notices of appropriation, instead resolving the larger question by finding in favor of prescription.

c. Other References to the Scope of CCSF's Appropriative Rights

The record is muddled regarding the extent of CCSF's appropriations. In numerous later actions and fora, the 400 mgd figure has been anecdotally referenced as the extent of CCSF's appropriative water rights in the Tuolumne River. The Districts asserted 400 mgd was the legitimate scope of CCSF's water rights in their license proceedings for the New Don Pedro project before the Federal Power Commission in 1961-1963.[32] The SWRCB has concluded that something close to the 400 mgd figure represents the extent of CCSF's pre-1914 appropriations out of the Tuolumne.[33] CCSF has relied on the 400 mgd figure in protecting its own interests before the Federal Energy Regulatory Commission.[34]

However, in its testimony before the SWRCB during the interim water rights phase of the Bay-Delta hearings in July 1992, CCSF cautiously indicated it had historically relied on

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[31] *Meridian, Ltd.*, *supra*, 13 Cal.2d at p. 455. A problematical but unanswered question is whether CCSF's prescriptive storage right, which the court specified was superior to the plaintiff's riparian rights and code appropriations, would also be superior to the rights of the Districts. A prescriptive water right in California, being acquired outside the scheme of prior appropriation, is similar to a riparian right. Ordinarily, riparian rights are superior to appropriations. Similarly, prescriptive rights yielded title that was good not only as against the former holder, but against all the world. However, the courts viewed a prescriptive right as similar in character to the right acquired by appropriation, because both engender a trespass against the water otherwise flowing to the riparian. As a result, the concept of "first in time, first in right" was incorporated into prescriptive rights that were acquired by diversion. Since CCSF acquired the prescriptive right in 1939 with the *Meridian* decision, it appears the Districts' older appropriations are senior and, therefore, superior to CCSF's prescriptive storage rights. The so-called Fourth Agreement between the Districts and CCSF, discussed in detail below, may render this question moot.

[32] In these proceedings the Districts applied for and received the right to develop a greater storage and power generator facility on the site of the old Don Pedro dam. CCSF, which paid for a substantial portion of the construction cost, was not a party to the proceeding. (Initial Decision*, supra*, 31 F.P.C. at p. 547.)

[33] Although the SWRCB has no jurisdiction to bestow or revoke pre-1914 appropriations, it may nevertheless enforce the laws against unlawful diversions. (Wat. Code, §§ 1051-1052.) On occasion it has considered complaints of CCSF's excess diversion and decided not to enforce these after concluding CCSF's diversions were within their permissible scope. (See, e.g., Complaint of Robert Hackamack, Summary of SWRCB Investigation (6/15/83, and SWRCB internal memorandum of May 14, 1982, discussed *ante,* at n. 3).

[34] Response to Data Request Concerning FERC Opinion 420 (June 8, 1993) at p. 41.

projected yields of "more than 300 mgd," consistent with the maximum capacity of the present Hetch Hetchy water and power conveyance infrastructure, in its long range planning.[35] In the same testimony, CCSF offered that the present annual demand of CCSF and its wholesale Bay Area customers is only 285 mgd.[36] With strict rationing, as was undertaken during the 1987-1992 drought, CCSF has successfully reduced its demand to 240 mgd.[37]

Although the consensus over time appears to be that CCSF holds pre-1914 water rights to the extent of 400 mgd, this may ultimately prove to be without foundation. CCSF has never developed the capability of diverting 400 mgd, nor has its demand even remotely approached that amount. Even the California Water Plan assumed less than 300 mgd will be consumed by the San Francisco Bay Area until the year 2020.[38]

As stated at the outset, the heart of the system of prior appropriation is diligently putting the water resource to beneficial use. "Diligence is the essence of priority" under the Civil Code.[39] There is some question about how long CCSF may continue to claim the future right to divert 30 percent more than it has been able to use in the past 100 years. Such a right is, at best, inchoate, and may well prove illusory upon closer scrutiny. The law favors reasonable *use* of water,[40] not nursing a priority which has never been exercised.

B. The Raker Act

In special session in 1913, Congress passed legislation introduced by Manteca Congressman John Raker, and sponsored by CCSF. The bill's principal purpose was to provide CCSF a right-of-way within Yosemite National Park for access to build its proposed Hetch Hetchy project, and to convey water to its power plants located outside the Park's borders, and thence to the Bay Area. As part of the conditions for the grant of right-of-way, Congress specifically recognized the Districts' prior rights to water and required CCSF to protect those rights. Further, Congress mandated that any hydroelectric power generated by CCSF pursuant to the right-of-way be used for public purpose and not for profit. Because the Raker Act allowed CCSF to build the hydroelectric facilities independent of and prior to enactment of the Federal Power Act, FERC does not have licensing authority over the Hetch Hetchy facilities.

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35 SWRCB transcript of testimony submitted by San Francisco in 1992 hearings on Interim Decision D-1630 water rights proceeding, catalogued as WRINT S-FRISCO, Exh. No. 1, p. 10.

36 *Ibid.*

37 *Ibid.*

38 California Water Plan, DWR Bulletin 160-98, assumed a maximum transfer of 330,000 acre feet, or roughly 300 mgd to CCSF from the Tuolumne River Basin. (DWR Bulletin 160-98, p. 3-40.)

39 *Sierra Land & Water Co. v. Cain Irr. Co.* (1933) 219 Cal. 82, 84.

40 *Joslin v. Marin Mun. Water Dist*. (1967) 67 Cal.2d 132; Cal. Const., art. 10, § 2.

1. The Garfield Permit

James R. Garfield was Secretary of the Interior in 1907. In 1905, CCSF had applied to the Interior Department for access right-of-way permits in Yosemite National Park to develop the Hetch Hetchy project, including Lake Eleanor. Garfield's predecessor had turned down the application based partly on President Roosevelt's belief that Congress needed to authorize such a grant.[41] Though the case appeared closed, and the intervening 1906 fire and earthquake destroyed CCSF's records, nevertheless, in 1907 the application was resurrected. Garfield granted reconsideration of CCSF's request.[42]

The Districts claimed a superior right to divert Tuolumne River water, and that CCSF's proposal could not be satisfied without injuring the Districts.[43] This claim probably amounted to an assertion of the right to divert as much water as would ultimately be needed to irrigate the Districts.[44]

Garfield compromised by granting the rights-of-way to CCSF provided the Districts' right to 1,500 cfs (Turlock) and 850 cfs (Modesto) would not be interfered with by CCSF's diversion and storage in Lake Eleanor and Hetch Hetchy Reservoir. In addition, Garfield insisted that CCSF sell its excess electrical power to the Districts, at cost.[45] Finally, the Garfield permit included a provision requiring CCSF to return to the river surplus stored water that could be used for power.[46]

With a change in Administration came a new Secretary of Interior who was not friendly to the Hetch Hetchy Project. Consequently, an order to show cause was issued by the Secretary of the Interior, R.A. Ballinger, requiring CCSF to support retaining the Hetch Hetchy reservoir in the plan of development and to establish why the Garfield Permit should not be revoked.[47] Nevertheless, it is apparent from the extensive similarity that the original Garfield Permit is the genesis of the Raker Act and, as such, is a significant resource on matters of legislative intent.

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41 Picker, et al., *The Raker Act: Legal Implications of Damming and Undamming Hetch Hetchy Valley* (1988) 21 U.C. Davis L.Rev. at p. 1313, citing J. Clark, *Life and Adventures of John Muir* (1979) at p. 279.

42 Picker, et al., *supra,* at p. 1314.

43 Picker, et al., *supra,* at p. 1311, n. 24.

44 The Districts stated: "We are entitled to the water to the amount of our original appropriations, provided we can make use of the same and in that event, we contend that there will not be water for San Francisco and its neighboring cities sufficient to meet with the least of their demands." (Picker, et al., *supra,* at pp. 1311-1312, n. 24.)

45 The Garfield Permit, par. 6 (reprinted in Hetch Hetchy Valley, Report of Advisory Bd. of Army Engineers to Sec'ty of the Interior (1913) at p. 8).

46 The Garfield Permit, *supra*, par. 5.

47 Picker, et al., *supra,* at p. 1315; Report of Advisory Bd. of Army Engineers, *supra,* at p. 8.

2. The Freeman Report

CCSF responded to the order to show cause why Hetch Hetchy should not be eliminated from the permit by hiring John R. Freeman, a consulting engineer. Instead, Freeman prepared a report to the Secretary of Interior that completely redesigned the project and proposed the permit be modified. His proposal contained a series of dams, canals and tunnels that could deliver up to 400 mgd to the Bay Area as well as producing power, and which made Hetch Hetchy the indispensable hub of the system.[48] In one stroke, Freeman rendered the Garfield Permit an anachronism and put CCSF back on the offensive, with plans to divert 70 percent more water than anyone had considered possible before.

Freeman's recommendations were received by the Interior Department, which attempted to incorporate certain of his changes into the revised Garfield Permit. These failed, whereupon CCSF appealed to Congress.

3. The Legislation

The final product of this six-year effort was the Raker Act, a coalescence of the Garfield Permit and the Freeman plan. It granted to CCSF the crucial rights-of-way needed to develop a dam in Yosemite National Park on certain conditions.[49] The primary condition was that CCSF recognize the Districts' "prior rights . . . [to the extent of 2,350 cfs of the Tuolumne's natural flow.]."[50] In addition, when the amount of water released from Hetch Hetchy is lower than 2,350 cfs, CCSF must release water bringing the flow of the Tuolumne at La Grange Reservoir up to that amount if necessary for Districts' beneficial use.[51] Finally, for 60 days from April 15 each year CCSF must release up to 4,000 cfs of the Tuolumne's natural flow for the Districts to store in their reservoirs below Jawbone Creek.[52] When the natural flow is less than Districts can beneficially use, and less than 2,350 cfs, CCSF must release the entire natural flow.[53] CCSF may not export from beyond the San Joaquin Valley any more water of the Tuolumne watershed "than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."[54]

In sum, the Raker Act affects the water rights of the parties in the following ways: (a) it establishes that the Districts have rights of *at least* 2,350 cfs or (seasonal) 4,000 cfs, that are prior to CCSF's water rights; (b) it imposes a binding obligation on CCSF to protect

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48 Report of Advisory Bd. of Army Engineers, *supra,* at pp. 7-8, 19, 39.
49 38 Stat. 242.
50 38 Stat. 246, § 9(b).
51 38 Stat. 246, § 9(c).
52 *Ibid.*
53 The Act also provides for sale of water from CCSF's storage to the Districts at cost (38 Stat. 246, § 9(d)), and permits CCSF to use its power for at-cost municipal sales only. (38 Stat. 248, § 9(l).)
54 38 Stat. 247, § 9(h).

the Districts' prior rights to that extent, and (c) it requires CCSF to use its own resources before exporting Tuolumne River supplies. Nowhere does the Raker Act mention CCSF's rights to 400 mgd, nor does it grant or formalize such a right. The Raker Act specifically provides that it will not affect, in any way, the laws of the State of California regarding water rights.[55] Fundamentally, the Raker Act is only a conditional grant of right-of-way to CCSF.[56]

4. Compliance by CCSF

CCSF accepted the terms and conditions of the Act in accordance with section 9(s), within 24 days of the date the Raker Act was passed.[57] In addition CCSF filed the maps required by section 2 of the Raker Act within the three-year deadline imposed by Congress.[58] No maps were filed thereafter, nor did Congress make any provision for subsequent filings.

The rights-of-way secured by CCSF's maps filed with the Secretary of Interior included only Lake Eleanor, Hetch Hetchy and Cherry Valley Reservoirs and the lower Cherry River and Early Intake diversion sites.[59] The maps state the capacity of Lake Eleanor as 289,862.9 acre feet, Hetch Hetchy as 345,000 acre feet, and Cherry Valley as 62,408 acre feet, totaling 697,270.9 acre feet.[60] CCSF offered these maps into evidence during the *Meridian* trial. The disparity in size between Cherry Valley (Lake Lloyd) at the present time and at the time the maps presented to the *Meridian* court were drawn raises interesting questions concerning whether CCSF is already exceeding the scope of the original plan of development set forth in the Freeman Report. Nonetheless, even though the present configuration of these reservoirs is different than at the time of the legislation, the total amount of water stored in the Hetch Hetchy system does not exceed the overall capacity contemplated by the CCSF submittals to the Secretary of Interior in 1914-15.

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55 38 Stat. 250-251, § 11.
56 38 Stat. 242 and 245, §§ 8 and 9.
57 Bailey Report, *supra*, at p. 34.
58 *Ibid.*
59 Bailey Report, *supra*, at p. 35.
60 The capacity given for these same facilities today is different: Hetch Hetchy (now called O'Shaughnessy) holds 360,400 acre feet, Lake Eleanor 27,100 acre feet, and Cherry Valley Reservoir 268,800 acre feet, totaling 657,000. (WRINT - S FRISCO-1, p. 7.)

Enforcement of the Raker Act's provisions is provided for in the Act itself.[61] CCSF has previously been forced to defend in court its power sales practices alleged to be in violation of the Raker Act.[62] CCSF also lost a lawsuit by the government to enforce CCSF's road building and road maintenance obligations under the Raker Act, in Yosemite Park.[63]

"Congress may constitutionally limit the disposition of the public domain in a manner consistent with its views of public policy."[64] Just as Congress "clearly intended to require - as a condition of its grant" that San Francisco sell its power solely to municipal agencies,[65] or that CCSF honor the Districts' water rights under California law, it is reasonable to conclude that Congress also intended for CCSF to rely on Tuolumne River water only to the extent it had fully developed its other resources. Nothing in the language of the statute fixes this limitation as of a particular time; accordingly, CCSF is arguably under a continuing obligation to develop its own resources, as by recycling, conservation, desalinization, and other available means, in order to relieve the pressure of its exports from the Tuolumne River and the Hetch Hetchy Valley. The Raker Act bestows no water rights on CCSF that are independent of state law. The congressional authorization was limited, both by the conditions of the grant and by the scale of the facilities that were proposed to Congress in 1913.[66] Thus, any future expansion of CCSF's water development on the Tuolumne which intrudes on federal lands may not rely on the Raker Act authorization.

C. Federal Power Act – FERC Decision

In 1963, Francis L. Hall, the presiding examiner for the Federal Power Commission (now FERC), rendered his Initial Decision Upon the Application for License by Modesto Irrigation District and Turlock Irrigation District ("Initial Decision"). The Districts had applied for a major license to build, operate and maintain a hydroelectric facility and dam known as the New Don Pedro project, to replace their existing Don Pedro project on the

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61 "[I]n the exercise of the rights granted by this Act, the grantee shall at all times comply with the regulations herein authorized, and in the event of any material departure therefrom the Secretary of the Interior or the Secretary of Agriculture, respectively, may take such action as may be necessary in the courts or otherwise to enforce such regulations." (38 Stat. 245, § 5.)

62 See, e.g., *United States v. City and County of San Francisco* (1940) 310 U.S. 16, 26-30 [right-of-way grant is conditional on use of power for municipal purposes only; resale to private corporation found to violate the Act].

63 *United States v. City and County of San Francisco* (N.D. Cal. 1953) 112 F.Supp. 451.

64 *United States v. City and County of San Francisco, supra*, 310 U.S. at p. 30.

65 *Id*. at p. 26.

66 Congress never intended the Raker Act, which contains many limitations, to be a grant without limitation, nor did it anticipate that the diversion of water to San Francisco would ever exceed the capacity of the reservoir facilities it authorized to be constructed, that is, the capacity of those facilities after providing for the water rights of the lower appropriators . . . . Under no circumstances can San Francisco's planning for an ultimate diversion in excess of 400 [mgd] be construed as Congressional authorization therefor. (Initial Decision, *supra*, 31 F.P.C. at **33-34.)

Tuolumne River. In describing the purposes of the project, Examiner Hall observed that the Districts were "pioneers" of irrigation through use of the La Grange Dam, completed in 1894, and through provision of low cost power to the Districts' service areas. New Don Pedro, by "making much more of the Tuolumne River water usable, will improve the base of this economy in a real and important way. It will, in short, better rearrange and retime nature to more adequately meet the water needs of those served by the Districts." However, not only the Districts were to benefit. Examiner Hall noted as well, that the project was designed to "enable San Francisco to meet its estimated water needs and to provide for flood control. In fact it clearly appears that San Francisco's desire to have the project constructed is a dominant, if not the dominant, purpose for its construction."[67] In this regard, Examiner Hall observed that San Francisco was providing about half of the financing with which the project would be constructed.[68]

In evaluating whether to grant the license and on what terms, Examiner Hall reviewed the Districts' and CCSF's water rights, and the authorizations granted to CCSF by the Raker Act. The Initial Decision stated that the license request "presents not only the question of fact as to the benefits to be derived from the construction of New Don Pedro, but also the legal question of whether what is proposed conforms with the rights, duties and responsibilities arising by virtue of the Raker Act."[69] In this regard, Examiner Hall noted that the Raker Act required CCSF to recognize the rights of the Districts to 2,350 cfs measured at La Grange diversion dam, to release the necessary amount of water to assure the flow of 2,350 cfs, and to sell additional amounts of stored water as needed for the Districts' beneficial use at actual cost, and that the Districts had the right to take free of charge 2,000 cfs of the natural flow of the Tuolumne River during the 60 day period beginning April 15th each year.[70]

The evidence placed before the Commission emphasized that CCSF urgently needed more storage space to provide for CCSF's increasing municipal water requirements, which were then becoming a matter of urgency, until the year 2015.[71] The New Don Pedro water bank, as proposed by agreement of the Districts and CCSF, would allow CCSF to store up to 740,000 acre feet in New Don Pedro, consisting of exchange credit and half of the reservoir's flood storage during the non-flood season. Examiner Hall concluded that the Raker Act requirements would be "superimposed upon any license issued by the Commission for New Don Pedro."[72] Further, Examiner Hall stated that "What San Francisco was authorized to do in the way of construction, the volume of water Congress intended it to divert, the disposition

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67 Initial Decision, *supra*, 31 F.P.C. at *3.

68 *Id.* at *12, n. 10. The federal government, through a contract between the Districts, CCSF and the U.S. Army Corps of Engineers, would provide an additional payment of over $14 million for purchase of flood control capacity in the New Don Pedro project. (*Id*. at *14.)

69 *Id.* at *6.

70 *Id.* at *5, n. 5.

71 *Ibid.*

72 *Id*. at *10.

it makes of its power, and its obligations to the Districts and others are matters governed by the provisions of the Raker Act to the extent it is applicable – not the terms of private contracts between the Districts and San Francisco. Moreover, insofar as the issuance of a license for New Don Pedro is concerned, such private contracts must yield to regulatory authority and can be given only force and effect as sanctioned by the Commission."[73] Accordingly, and as a condition of issuance of the license, CCSF and the Districts were required to enter into an agreement that was subject to the Commission's approval, requiring, among other things, that CCSF pay its fair share of the cost. Examiner Hall found that CCSF's capability for delivering water to its service area was, at that time, fixed at 210 mgd.[74] Examiner Hall explained:

> It is not the extent of the State water rights San Francisco acquired but rather the capacity of the facilities Congress authorized that is controlling. Moreover, one will search in vain for any reference in the Raker Act to an ultimate diversion of 400 mgd by San Francisco. Under no circumstances can San Francisco's planning for an ultimate diversion in excess of 400 [mgd] be construed as Congressional authorization therefor. . . . What San Francisco is here seeking is a right it does not now possess, namely, the right to divert all the water it stores in the Tuolumne River headwaters - - to the extent it is needed and possible to do so. . . . It is the ceiling imposed by the Raker Act that is wholly responsible for San Francisco's present problem which it seeks to overcome through the contribution of millions of dollars to the New Don Pedro construction cost. Stated another way, the Congressional concept embraced in the Raker Act, to which San Francisco acceded, placed the water rights of the Districts and others on San Francisco's back and this, together with the limited capacity of San Francisco's reservoirs, has led San Francisco to a dead-end. . . . [It] confronts San Francisco with the realization that it must embark upon a considerably different and better approach. But any reorientation to meet its ever-changing requirements must take into account the hard facts of the Raker Act and the Commission's regulatory power.[75]

In addition to the foregoing capacity limitations and requirements to store and bypass water for the benefit of the Districts, Examiner Hall found another limitation imposed by the Raker Act precluded CCSF from utilizing power produced by the Tuolumne River development in Yosemite Park for sale to private entities for resale. Examiner Hall found that a similar ceiling operated by virtue of the Raker Act on the ultimate development of CCSF's hydroelectric capacity. Examiner Hall questioned whether CCSF had the authority under the Raker Act to develop its Canyon power plant and other new facilities that tripled the output of the development from what was the system's capacity as proposed at the time

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73 *Id*. at **15-16.
74 *Id*. at *32.
75 *Id*. at **34-35.

the Raker Act was passed, but because CCSF was not technically a party to the licensing proceedings, did not go so far as to demand additional evidence or render a ruling in this regard.[76]

Examiner Hall's position throughout the Initial Decision was that the Raker Act was consistent with, and even the "mould" in which the later Federal Power Act was cast, and that therefore, any interpretation of the Commission's authority and responsibility should properly be guided by the Raker Act's provisions.[77] Accordingly, the fact that CCSF could under California law claim a municipal preference vis a vis irrigation purposes was irrelevant. Because the Raker Act specified that the Districts' water rights were subject to protection under the Raker Act, the Commission must afford that same protection. In effect, the Raker Act "modified the State water permits San Francisco had obtained," according to Examiner Hall, and as a result, CCSF could not interfere with the Districts' rights.[78] Examiner Hall avoided the potential conflict by distinguishing between water rights the Districts and CCSF had already perfected and used from water rights proposed to be used for irrigation and municipal purposes. Increases in storage by the Districts, or over the 210 mgd capacity of CCSF's then maximum diversions, were subject to limitation by the Federal Power Commission.[79]

The decision to grant a license also required the Commission to implement the Federal Power Act's provisions for protecting fisheries affected by the proposal. Examiner Hall was reluctant to force the Districts alone to bear the entire burden of fish releases from New Don Pedro. Thus, although maintenance of minimum stream flows in the Tuolumne River was required at the La Grange Bridge, Examiner Hall required CCSF and the Districts to enter into an agreement that would apportion the burden between them, both in water and economic costs, subject to the Commission's approval, and subject to reopening in the future.[80]

Finally, Examiner Hall determined that California's needs for recreational facilities were "far greater" than in 1913, and that the Districts and CCSF should therefore be required to construct and maintain such facilities as a condition of the license. The Raker Act was explicit, and legislative history supports congressional intent to insure that recreational opportunities would remain available and accessible in the Park, which would be displaced

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[76] *Id*. at **5, 36-37, 47. Examiner Hall did go so far as to suggest that further investigation might be warranted whether San Francisco's development and recent construction of additional facilities was in conformity with the Raker Act authorization. (*Id*. at *47.)

[77] *Id*. at *53.

[78] *Id.* at *56.

[79] *Id.* at *62. For this, Examiner Hall relied on the authority contained in Section 10(a) of the Federal Power Act, authorizing the Commission to approve plans for hydroelectric projects in a waterway for improvement of fish and wildlife enhancement and other beneficial public uses and to modify such proposals before approving them. (*Id*. at **60-61.)

[80] *Id*. at **79-80.

by Hetch Hetchy reservoir.[81] Accordingly, Examiner Hall required the Districts to develop a master plan, subject to the Commission's approval, for recreational use of the New Don Pedro reservoir and to acquire additional lands for recreation, fish and wildlife purposes, and that CCSF should share in paying for these facilities.[82]

The examiner's Initial Decision was submitted to the Commission. The Districts, the State of California, the Secretary of the Interior and the Commission staff filed exceptions.[83] The license was issued and further disputes were carried forward into the courts. By the time the Ninth Circuit Court of Appeals reviewed the matter, in 1965, the issues had been winnowed down to whether the license requirement for maintaining certain minimum stream flows in the Tuolumne River at La Grange Bridge for fish run purposes was a proper condition.[84] The Court held that it was. In so holding, the Court of Appeals rejected the Districts' argument that nothing in the Federal Power Act should be construed to modify or repeal any Raker Act provisions, and that the fish flow requirement would impermissibly impair their irrigation water rights protected by the Raker Act. The Court said that the Districts could continue to receive their Raker Act flows "as long as they are content with their present facilities. That act did not give them the right to use the public lands they now wish to utilize in connection with the New Don Pedro project. With regard to those public lands, the districts are in the same position as any other applicant for a license -- if they are to use those lands they must accept the reasonable restrictions and obligations attached thereto."[85] At the time the Commission must reevaluate the fish releases, the Court held that the Commission could impose "burdens upon the districts warranted by the benefits derived by San Francisco on the assumption that the latter will reimburse the districts for any such expenditures."[86] Consistent with the examiner's Initial Decision, the Court required CCSF and the Districts to enter into an agreement making clear their respective rights and obligations and further, that the Districts would be entitled to reimbursement from CCSF for the burden of any fish releases the Commission would require in the future.[87]

D. Contract Law - The Four Agreements

In the period following passage of the Raker Act, the Districts and CCSF found it generally possible to "live together in a common sense way."[88] By coordinating their activities, the parties were able to "maximize the quantity of water each [was] able to appropriate."[89]

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81 *Id*. at **88-89.
82 *Id*. at *113.
83 *State of California v. Federal Power Commission* (1965) 345 F.2d 917, 921.
84 *Ibid.*
85 *State of California v. Federal Power Commission, supra*, 345 F.2d at p. 924.
86 *Id*. at p. 930.
87 *Id*. at p. 929.
88 Initial Decision, *supra*, 31 F.P.C. at p. 548.
89 *Ibid.*

1. First Agreement

Nevertheless, in 1933 the Districts became so concerned with the possibility that CCSF's water exports from the Tuolumne River watershed would harm their interests that they filed suit to quiet title to the waters of the Tuolumne River in themselves, and to enjoin the construction of CCSF's "tunnels, pipe-lines and conduits and from carrying away the waters of the Tuolumne."[90] CCSF answered the Districts' Complaint. Following more than six years of negotiations, a settlement was reached when the parties, in February 1940, entered into the "First Cooperative Agreement Between T.I.D., M.I.D. and City and County of San Francisco." The First Agreement, a remarkably simple document, is mainly a truce, or an agreement to agree. Importantly, it also recognizes CCSF's expectations of eventually needing 400 mgd.[91] Additionally, the agreement "recommends" proper conservation of the Tuolumne waters, continued cooperation, and recognition of the Raker Act's applicability.

2. Second Agreement

The Second Agreement (November 1943) referred to the First Agreement, and adopted its twin goals of conservation and cooperation. It set forth the parties' plan to continue developing the Tuolumne River, specifically by building the "Cherry River Project" and the New Don Pedro Project. Additionally, in the final paragraph, the parties agreed to operate "any additional storage"[92] to meet the requirements of domestic water supply, irrigation, power and flood control, "and according to the agreement" of 1940.

3. Third Agreement

With the signing of the Third Agreement six years later, the 400 mgd demand figure was adopted outright. The express purpose of this agreement was "to provide for the storage, management and control of the waters of the Tuolumne River Watershed in such a manner as to assure that water will be available in sufficient quantity to meet the estimated ultimate irrigation requirements of one million one hundred thousand acre feet annually for use by the Districts and the estimated ultimate requirements of City for the diversion of four hundred million gallons daily to the Bay Area . . . ."[93]

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[90] Complaint, Bailey Report, *supra*, Appendix A.

[91] Paragraph Four of the First Agreement states, in part: "Extensive hydrographic studies . . . indicate that there is sufficient water available from the Tuolumne River watershed *when properly conserved* to meet the ultimate irrigation demands of the Districts as well as the City's estimated demand of 400 million gallons daily for domestic purposes." (Emphasis added.)

[92] See Second Agreement, paragraph 4. "Additional storage" probably was limited to the expressly contemplated Cherry Valley Reservoir and New Don Pedro Project.

[93] Third Agreement, art. 2.

The Third Agreement adopts the Second Agreement's choice of means for assuring the respective anticipated demands of the Districts and CCSF, that is, to build New Don Pedro and Cherry Valley Dams.[94] The Third Agreement gave to CCSF "the right to intercept, divert and use District Raker Act water in an amount equal to and in exchange for the water actually in storage in New Don Pedro Reservoir for the City's credit."[95] In addition, flood control storage space not required for actual flood control was allocated to the Districts and CCSF on a 50-50 basis.[96] CCSF would pay the primary costs of building New Don Pedro as consideration for the additional exchange storage space it acquired, but the project was to be owned, maintained and operated by the Districts at their expense.[97] The Third Agreement was executed June 30, 1949.

4. Fourth Agreement

Fifteen years later, after lengthy and complex licensing proceedings for the New Don Pedro Dam, and ten years after completion of Cherry Valley/Lake Lloyd, the parties entered into the Fourth Agreement. The Fourth Agreement was required by the Federal Power Commission as a condition of the license for New Don Pedro, a requirement that was confirmed by the Ninth Circuit Court of Appeals.[98] This last agreement expresses that it was intended to "set forth the respective responsibilities of the Districts and the City in the New Don Pedro Project . . . ."[99] It specifically was not "intended to affect, alter, or impair in any manner" the rights of the parties to the Tuolumne River "acquired or existing" under California law.[100] Additionally, the parties agreed to "recognize and abide by" the Raker Act's provisions.[101]

A main purpose of the Fourth Agreement was to allocate the burden of license requirements affecting operation of New Don Pedro in such a way that the Districts' water rights would continue to be protected, as well as assuring that CCSF would receive the benefit of additional storage space in the reservoir.[102] To this end, a "Water Bank Account" was

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94 *Id*. arts. 3-9.
95 *Id*. art. 14.
96 *Id*. art. 13.
97 *Id*. art. 17.
98 *State of California v. Federal Power Commission, supra*, 345 F.2d at p. 929.
99 Fourth Agreement, par. 11.
100 *Id*. art. 2.
101 *Ibid.*
102 *Id*. arts. 5-9.

established.[103] In addition, a formula was created for sharing the responsibilities for water release license conditions for fish purposes below Don Pedro. Those responsibilities may be changed, pursuant to further proceedings before the FERC, where the releases adversely affect the Districts' water entitlements.[104] In such case, the storage credits in New Don Pedro would be recomputed to apportion the burden of the water releases 51.7121 percent to CCSF, and 48.2879 percent to the Districts.[105]

Legally, the Fourth Agreement can be understood as a contractual overlay that enhances full use and enjoyment of their water rights. Developed by CCSF and the Districts to maximize the yield of their respective right to Tuolumne River water, the Fourth Agreement, through the Water Bank mechanism, provides an agreed method for rescheduling releases to and from storage that disregards their relative legal priorities (at times and under agreed specific circumstances). This contractual overlay is not by any means an abandonment of the priority system that is imposed by state law and recognized by the Raker Act and the license for New Don Pedro. Rather, it is a cooperative solution developed in response to the challenges imposed by these laws in combination with such additional constraints as severe fluctuations in Tuolumne River flow and the high cost of new infrastructure.

The New Don Pedro FERC license required reexamination of the minimum fish flow releases after the first twenty years of project operation. Under a 1995 FERC-mediated settlement agreement ("1995 Settlement Agreement") among the Districts, CCSF, Federal and State fish agencies, and environmental groups, the Districts agreed to provide higher minimum fish flows below New Don Pedro. The settlement agreement was made possible because the Districts and CCSF entered into a separate settlement agreement to share the

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[103] The Water Bank Account functions as follows:

> CCSF contributed capital to the construction of New Don Pedro for the right to pre-release and subsequently hold back up to 570,000 AF of the District's entitlement between elevations 6000.0' and 801.9' In addition they could store water in the Flood Control Space up to one-half of the 340,000 AF.
>
> CCSF receives a credit to their water bank account when the inflow into Don Pedro exceeds the District entitlement. Since the inflow to Don Pedro is dominated by releases from the Hetch Hetchy Project, CCSF can obtain a credit by releasing a volume of water greater than the natural flow or the entitlement amounts, whichever is less . . . .
>
> CCSF receives a debt to their water bank account when the inflow into Don Pedro is less than the District's entitlement. This occurs when CCSF releases less than the natural flow or the District's entitlement whichever is less.
>
> A maximum of 570,000 AF can be credited by the CCSF in Don Pedro when the reservoir storage is below 1,690,000 AF (elevation 801.9') . . . .
>
> When the reservoir storage is greater than 1,690,000 AF then CCSF can credit their account an additional amount up to one half the difference between the total storage and 1,690,000 . . . . Any credits beyond this total would not be added to the CCSF account . . . .

(TID, Summary of Don Pedro Water Bank Accounting, October 16, 1987.)

[104] *Id*. art. 8.

[105] *Id*. art. 8(b).

burdens of increased fishery releases from New Don Pedro. This agreement was a further outgrowth of the continued process over the years wherein the Districts and CCSF struggled for control of the resource and ultimately agreed to resolve their differences by agreement. A second Districts-CCSF settlement agreement was entered into to cover the funding of various measures specified in the 1995 Settlement Agreement. These costs were split 51.7121 percent for CCSF, and 48.2879 percent for the Districts, consistent with article 10(c)(2) of the Fourth Agreement.[106]

The First through Fourth Agreements have been a fairly successful attempt to work out means of coexisting and sharing the Tuolumne River. However, predictably, the Districts and CCSF do not always agree on what the agreements say or mean. In California law, the interpretation of contracts is to give effect to the intent of the parties. Discerning this intent requires a ready knowledge of the history of their development of the resource, some of which is set forth above. It is an open question whether there is sufficient flexibility in the agreements to accommodate unanticipated changes such as the future population growth that is projected for both CCSF's and the Districts' service areas in northern California, or consideration of the restoration of Hetch Hetchy Valley. However, the history of their relationship does provide evidence that CCSF and the Districts can work together, as they have in the past, to address changing demands and competing interests.

E. Public Trust Doctrine and the Constitutional Requirement of Reasonable Use

1. Public Trust Doctrine

The public trust doctrine provides that certain natural resources are held in trust by the state for the benefit of the public. Originally a concept from Roman law, the public trust doctrine evolved in English common law to confer upon the sovereign ownership of "all of its navigable waterways and the lands lying beneath them 'as trustee of a public trust for the benefit of the people.'"[107] Upon its admission to the United States, California obtained title to its navigable waters and underlying lands to be held in trust.[108]

The public trust doctrine has been traditionally applied to protect public uses related to navigation, commerce and fisheries.[109] In two seminal cases, the California Supreme Court extended the public trust purposes to include environmental preservation and aesthetics.[110] Although English common law and early American cases assumed that the public trust extended

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[106] Agreement on Allocation of Certain FERC Costs Between CCSF and [Districts]; TID Resolution No. 96-12, MID Resolution No. 96-13.

[107] *Colberg, Inc. v. State of California ex rel. Dept. Pub. Wks.* (1967) 67 Cal.2d 408, 416, citations omitted.

[108] *National Audubon Society v. Superior* Court ("*National Audubon*") (1983) 33 Cal.3d 419, 434, citing *City of Berkeley v. Superior Court* (1980) 26 Cal.3d 515, 521.

[109] *Marks v. Whitney* (1971) 6 Cal.3d 251, 259.

[110] *Marks v. Whitney, supra,* 6 Cal.3d at pp. 259-260; *National Audubon, supra,* 33 Cal.3d at p. 437.

only to tidal lands, California courts have extended the scope of the public trust resource to all navigable waters and even to nonnavigable waters that affect navigable waters.[111] The California Supreme Court also held that water rights are subject to the public trust doctrine.[112] Moreover, the public trust doctrine implies a duty of continuing supervision and the state is empowered to re-analyze water right allocations.[113]

In the past, California courts have applied the public trust doctrine in ways that significantly affected California's economy and property rights. For instance, it was a public trust doctrine decision of the California Supreme Court in 1884 that ended the California gold rush – a phenomenon that had driven California's economy for the prior forty years.[114] In *Gold Run*, hydraulic miners were diverting the waters of the American River to create high-powered water cannons used to wash away entire hillsides for gold mining purposes. The tailings from these operations went into the American River and were causing several problems, including increased flooding due to the raised riverbed; impairment of navigation, and impacts to water quality to the extent that American River water was no longer fit for domestic consumption.[115] The *Gold Run* court found that these mining operations impaired the public trust values of the American River and, on that basis, banned hydraulic mining. The court's ruling effectively prohibited large-scale gold mining in California. The result of this ruling was the cessation of the Gold Rush and the beginning of California's transformation from a mining economy to an agricultural economy.

One century later, the California Supreme Court again invoked the public trust doctrine in the context of water rights for diversions from non-navigable tributaries to Mono Lake.[116] In *National Audubon*, the court held that water rights were subject to ongoing review under the public trust doctrine. The *National Audubon* decision did not determine whether the Los Angeles Department of Water and Power's ("LADWP") diversions should be reduced. Instead, subsequent proceedings before the State Water Resources Control Board resulted in amendments to LADWP's licenses that significantly reduced the amount of water that may be lawfully diverted from the streams tributary to Mono Lake.

There is no doubt, therefore, that the public trust doctrine must be considered in adopting the Capital Improvement Program ("CIP") and, independent of the CIP, in evaluating the continued use of the Hetch Hetchy Valley as a water impoundment for the benefit of San Francisco.[117] The public trust does not trump other water uses, however, and the State may

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111 *Marks v. Whitney*; *National Audubon*.
112 *National Audubon, supra,* 33 Cal.3d at p. 426.
113 *Id*. at p. 447.
114 See *People v. Gold Run Ditch & Mining Co.* ("*Gold Run*") (1884) 66 Cal. 138.
115 *Gold Run*, *supra,* 66 Cal. at p. 152.
116 *National Audubon, supra,* 33 Cal.3d at pp. 446-447.
117 Significantly, the land beneath Hetch Hetchy Reservoir is patented land that is owned in fee by CCSF. (Garfield Permit, ¶ 1.)

dispose of public trust resources when it serves the public good.[118] Whether the Raker Act validly disposed of the public trust resources of the Hetch Hetchy Valley is an open question.[119] Separate and apart from the Raker Act provisions, San Francisco's appropriative water rights must also be analyzed through the lens of the public trust doctrine. This analysis should be independent of the analysis of whether the Raker Act contains evidence of the federal government's intent to dispose of the public trust resources within the Hetch Hetchy Valley.

As described above, application of the public trust doctrine to California water rights or other resources involves a balancing of interests and uses.[120] San Francisco and others have long held interests in the waters stored in the Hetch Hetchy Valley and the hydroelectric power generated therefrom. It seems unlikely that any court would interpret the public trust doctrine to require removal of O'Shaughnessy Dam and restoration of the valley if doing so resulted in the unmitigated loss of stored water and power generation for San Francisco. Instead, the balance of interests swings in favor of restoring the Hetch Hetchy Valley only when San Francisco and other interested water and/or power users can be made whole or mostly whole in the process.

2. Article X, Section 2

Article X, Section 2 is an amendment to California's Constitution that applies a reasonableness standard to all California water use, regardless of the nature of the water right. The California Legislature amended the Constitution in 1928 in response to a Supreme Court decision holding that a riparian diverter owed no duty of reasonableness in water use to an upstream appropriator. Subsequent caselaw interpreting Article X, section 2 established that the reasonableness of the water use is evaluated based not only on local competing uses, but also on statewide water conditions.[121] Moreover, reasonableness of a particular use may change over time – what was once a reasonable use of water may become unreasonable at a later date.[122]

The reasonableness requirement of Article X, section 2 applies to the CIP and San Francisco's continued diversion and storage of Tuolumne River water at Hetch Hetchy. In general, diversion and storage of water is not an unreasonable use. Article X, section 2 compels an analysis, however, of the reasonableness of the particular diversion and storage.[123] A party

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[118] *Eldridge v. Cowell* (1854) 4 Cal. 80.

[119] See *People v. California Fish Co.* ("*California Fish*") (1913) 166 Cal. 576, 597 [where California Supreme Court held that statutes purporting to dispose of a trust resource will be "carefully scanned" for the requisite intent, either clearly expressed or necessarily implied]. Of note, the *California Fish* holding applies to state statutes, not federal statutes like the Raker Act. Nevertheless, federal law also recognizes the public trust doctrine and *California Fish* is likely to be persuasive authority regarding the intent expressed in the Raker Act.

[120] See *City of Berkeley v. Superior Court* (1980) 26 Cal.3d 515, 534.

[121] See *Tulare Irrigation District v. Lindsey-Strathmore Irrigation District* ("*Tulare Irrigation*") (1935) 3 Cal.2d 489, 524-525; *Joslin v. Marin Municipal Water District* (1967) 67 Cal.2d 132, 140.

[122] *Tulare Irrigation, supra,* 3 Cal.2d at p. 567.

[123] See *Tulare Irrigation, supra,* 3 Cal.2d at pp. 524-525.

deemed to be diverting, using or storing water in an unreasonable manner can be required to alter its practices and face "some inconvenience or to incur reasonable expenses."[124]

Significant issues surround the reasonableness of continued use of the Hetch Hetchy Valley for water impoundment. Whether San Francisco even needs Hetch Hetchy is probably the most pressing issue. Expanded use of New Don Pedro Reservoir in cooperation with the Turlock Irrigation District and Modesto Irrigation District is a concept that must be analyzed in determining whether San Francisco's continued flooding of Hetch Hetchy Valley remains reasonable, particularly in light of the potential to divert Tuolumne River water downstream, at or near the Delta. Significant issues are also raised by the hydroelectric power generation that may be forfeited if O'Shaughnessy is removed and the valley drained. The impacts to the environment, downstream water users, and the restored Hetch Hetchy Valley also must be considered. Finally, the dollar cost to San Francisco of removing O'Shaughnessy and restoring the valley must be weighed.

IV.
LIMITATIONS ON CCSF'S EXERCISE OF WATER RIGHTS

A. The Physical Limitations – Demand and Supply

1. Demand

Historically, beginning with the Freeman Report, CCSF has clung to its reliance on the Tuolumne River appropriations to meet its projected demand for the larger Bay Area population. CCSF has rarely wavered in its projected demands. This CCSF position, anchored in the Freeman Report's assumption, is maintained by CCSF despite the fact that the East Bay Municipal Utility District, considered within the Freeman Report as part of CCSF's service demand, has developed a separate Mokelumne River supply to meet its demand, and even though the state and federal governments have developed additional storage sites as potential alternatives to the Tuolomne River resource.

A demand of 400 mgd converts to 448 thousand acre feet ("TAF") per year. Combined with the Districts' ultimate demand of 1.1 million acre feet ("MAF"), the Tuolumne must produce 1.5 MAF just to supply these three water users. As the *Meridian* lawsuit attests, there are others reliant on the Tuolumne watershed as well, not including fishery and water quality requirements.[125]

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[124] *People ex rel. State Water Resources Control Board v. Forni* (1976) 54 Cal.App.3d 743, 751-752.

[125] The SWRCB's computer printouts show some 111 additional water right holders, claiming the right to divert another 478 TAF for the Tuolumne River.

2. Supply

The total present developed supply, gleaned from CCSF and the Districts' combined efforts, yields roughly 1.3 MAF a year for storage and diversion. CCSF estimates that the Hetch Hetchy project yields about 240 mgd or 268.8 TAF annually.[126] The Districts' estimates indicate that CCSF produces between 302 and 317 TAF.[127]

The Districts divert roughly 1 million acre feet per year. In dry years, the Districts have had to rely on carryover storage in Don Pedro, including the water bank water, as well as draw from the groundwater resources. When fishery releases are subtracted, the Districts' supply is severely constrained.[128] The highest storage yield at Don Pedro in one year was 1.3 MAF in 1978, but this was uniquely the result of two critically dry years (1976-1977) followed by a record wet year (1978).

There is not enough developed supply to meet the projected demands of CCSF and the Districts, not to mention others who are reliant on the watershed. If the parties, particularly CCSF, continue to press for their maximum "entitlement," it is apparent that injury to these water rights holders, including riparians, will result, and that litigation will follow. In view of the legal uncertainty of application of principles such as prescription on existing priorities, diligence, and the public trust doctrine, as well as expanding environmental protections, neither CCSF nor the Districts can rest assured that the Tuolumne River will be able to meet their needs in full indefinitely.

B. CCSF's Diligence Requirement

Perfection of an appropriative water right requires that water be actually put to reasonable beneficial use with the exercise of due diligence. While CCSF may claim a right of up to 400 mgd, it may not have maintained that right if it does not have the current capacity to divert this quantity or if it has not, in fact, done so in the past. This argument, if pursued, would become more potent over time. In essence, it is that CCSF cannot expand its current exports, or perhaps even continue its current diversions from Hetch Hetchy, because it failed diligently to bring to completion facilities needed to fully protect the right. There are statutory and judicial exemptions from the diligence requirement. Cities could postpone development of water and power that was not immediately needed.[129] Also, an appropriator

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126 SWRCB D-1630 Transcript, WRINT, S FRISCO, Exh. No. 1.

127 See R. W. Beck's April 1992 analysis, "Don Pedro Project - Reservoir Operations report - FERC Article 39, Project 2299" at pp. 4-9, 10.

128 The settlement agreement between the Districts and CDFG assigns 15-16 percent of the current year's inflow to the Tuolumne River's minimum instream flows. (Testimony of Ernest Geddes before SWRCB, Interim Water Rights Phase of Bay-Delta Hearings, D-1630 Transcript, WRINT-TID/MID 2, at p. 9; 1992 Settlement Agreement, App. A, at pp. 12-17.)

129 Civil Code section 1416.

who steadily pursued a long-term plan of development could be protected from the requirement to immediately put the full claimed quantity of water to beneficial use.[130]

The courts today are inclined to take a less tolerant view of cities that fail diligently to put their appropriations to beneficial use. In *Cal-Trout, supra*, 207 Cal.App.3d 585, the Third District Court of Appeal had to decide whether the City of Los Angeles, through its Department of Water & Power, could expand its water exports from Inyo and Mono counties by "extensions" of its permits to appropriate water obtained in 1953. Although the *Cal-Trout* opinion is factually distinguishable because it does not involve pre-1914 rights, the policy on which the decision is grounded is just as applicable to the case against CCSF's expansion.

Los Angeles sought to excuse its failure promptly to develop and use its full appropriation, and thereby escape the liability for releasing fishery flows that would accompany a later-acquired permit, by arguing that it could not have diverted more when the appropriation was initiated.[131] The court rejected Los Angeles' argument, saying "[t]he logical extension of L.A. Water and Power's legal theory would permit an appropriator of water from a complex of sources to lock up artificially high 'vested' water rights from each of the sources by manipulating the sources from which it elected to draw its water levels despite the inability to apply such waters to beneficial use. *Such cold storage is not permitted by law.*"[132] The court went on to observe that if Los Angeles had simply constructed its first phase of the diversion under a permit issued in the 1950's, and then returned to the SWRCB for a new permit in the 1980's to construct the next phase, there would have been "no plausible claim of retroactivity" to support its argument in favor of its vested right for an increased diversion. The court stated that Los Angeles' conduct had allowed the original permit process "to tarry interminably and then [be] improperly employed to authorize a new project, which required a new permit, under the guise of 'extending' the original project."[133] Finally, the court noted that the "extensions" were unjustified under the pertinent statutes "calling for diligence in the completion of water projects."[134] Thus, the expansion would undermine the priority system and contravene diligence requirements.

The similarities between *Cal-Trout* and CCSF's potential expansion of its diversions from the Tuolumne River are striking. CCSF's apparent inability to divert more than 300 mgd is unrelated to the variant flow of the Tuolumne River. Instead, it is purely the result of CCSF's failure initially to develop more capacity for transporting water across the San Joaquin Valley. CCSF, like Los Angeles, is a municipality, yet the court found Los Angeles was not excused from the statutory diligence requirements. While CCSF's appropriations are

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130 *Haight v. Costanich* (1920) 184 Cal. 426, 432.
131 *Cal-Trout, supra,* 207 Cal.App.3d at p. 618.
132 *Ibid*., emphasis added.
133 *Ibid.*
134 *Ibid.*

pre-1914 appropriations and Los Angeles derived its right from a state-issued permit, this distinction could well not make any difference. Both appropriations are required to be completed with diligence, and the pertinent municipal exemptions from diligence are substantially similar.

Additional support for holding CCSF to its current level of diversions on the basis of failure to diligently develop the Hetch Hetchy project to completion can be found in the Raker Act. This requirement, imposed by Congress, is independent of and in addition to California law. The Raker Act imposes a forfeiture provision that would apply if CCSF lapsed in constructing the project for more than three years, unless the lapse were due to reasons beyond CCSF's control.[135]

In summary, it appears that the diligence requirement could interfere with CCSF's attempt to expand diversions from the upper Tuolumne River beyond the current rate of 300 mgd. It is uncertain whether the bar would extend to existing diversions from Hetch Hetchy that have been undertaken by CCSF over the years, with delays in development that exceeded the three years allowed by the Raker Act. This consideration is, of course, further complicated by various water quality requirements imposed over time, including those associated with South Delta salinity, dissolved oxygen, TMDLs, salt, boron and others.

C. Change Point of Diversion

California's system of prior appropriations dictates that the oldest right on the river (along with riparians) has the right to the first portion of the available water, with what remains being available to the junior appropriators in order of their notice or permit. Both CCSF and the Districts rely on pre-1914 appropriations for their water rights. The Districts' Tuolumne River rights are senior to CCSF's. The priority system allows the Districts to divert their entire appropriation before San Francisco may take even one drop of water from its appropriation.

The Raker Act also requires CCSF to operate its Hetch Hetchy system in a manner that recognizes the Districts' prior rights. Section 9 of the Raker Act imposes a duty on San Francisco to protect the Districts' "prior rights . . . [to the extent of 2,350 cfs of the Tuolumne's natural flow] . . . as now constituted under the laws of the State of California, or as . . . may be hereafter enlarged."[136] CCSF must also release an additional quantity of water from April 15 through June 15 annually (up to 4,000 cfs of the Tuolumne's natural flow) for the Districts to store in their reservoirs below Jawbone Creek.[137]

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135 38 Stat. 244-245, § 5.
136 38 Stat. 246, § 9(b).
137 38 Stat. 246, § 9(c).

Presently, San Francisco obtains nearly 300 mgd from the upper Tuolumne River. An expansion of this to 400 mgd presumably would injure the Districts (or perhaps others) in many years. Application of the priority rules may restrict CCSF's diversions from the upper Tuolumne to their present diversion rate of about 300 mgd. If the Districts suffered injury by CCSF's *existing* diversions, as in periods of drought, either the Raker Act or California's priority system could restrict CCSF diversions. Such constraints might be avoided if CCSF were to change its point of diversion to a location downstream of the Districts and other senior water rights holders. Likewise, if CCSF constructed an intertie to divert water from New Don Pedro to the conveyance facilities that run beneath the reservoir, this change in place of diversion could add flexibility to operations that would avoid similar constraints. Such a facility would, of course, need to be approved by the Districts, who are the sole owners of the New Don Pedro facilities and of all water stored therein. This approach avoids injuring others while still allowing CCSF to obtain its full claimed entitlement.

Changing the point of diversion has always been permitted in the appropriation system. The earliest authority is *Kidd v. Laird* (1860) 15 Cal. 161. *Kidd* held that a change in "mode and objects of use" is justifiable, so long as alterations "shall not be injurious to those whose interests are involved."[138] Civil Code section 1412 (now Water Code section 1706) codifies the rule announced in *Kidd*. Later judicial refinements have clarified that either a change in point of diversion or means of diversion is allowed for pre-1914 appropriations, provided that no injury is dealt to others with vested water rights.[139] Thus, CCSF is plainly entitled to alter its point of diversion for any portion of its pre-1914 entitlement to 400 mgd, or all of it, so long as there is no injury to senior water rights holders, including the Districts.

D. The Raker Act Conditions Development of Available Supplies

The Raker Act requires San Francisco to first develop and use its own resources before exporting Tuolumne River supplies. It states that CCSF may not export from beyond the San Joaquin Valley any more water of the Tuolumne watershed "than, together with the waters which it now has or may hereafter acquire, shall be necessary for its beneficial use for domestic and other municipal purposes."[140] This Raker Act condition may effectively bar expansion of CCSF's exports, and may require CCSF to curtail its current diversions until it can demonstrate that it has developed such local resources. As stated previously, nothing in the Raker Act indicates that the duty to develop such available resources was fixed to end at a definite time.

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138 *Id.* at pp. 180-181.

139 *Byers v. Colonial Irrigation Co.* (1901) 134 Cal. 553, 554-555; *Craig v. Crafton Water Co.* (1903) 141 Cal. 178, 183; *Hand v. Cleese* (1927) 202 Cal. 36, 45.

140 38 Stat. 247, § 9(h).

In the past, it had been argued that alternative sources, such as the State Water Project or the Central Valley Project, were infeasible for CCSF to rely on due to the constraints of capacity in various elements of the systems, including the South Bay Aqueduct. This may not hold true today. Today, feasibility analysis must take into account the environmental impacts that require mitigation in designing an expansion or otherwise modifying or updating the conveyance system for exporting Hetch Hetchy supplies. These environmental considerations may weight the feasibility analysis against expansion, modification or updating, and in favor of other alternatives. Furthermore, recycling, desalinization and wastewater recovery are increasingly available today, are independent of the Tuolumne River supply altogether and, therefore, must also be evaluated as elements to the expansion, modification or updating of CCSF Hetch Hetchy facilities. Thus, alternatives may exist that were perceived to be unavailable previously.

The Raker Act authorizes enforcement of its provisions by federal agencies. It provides: "[I]n the exercise of the rights granted by this Act, the grantee [CCSF] shall at all times comply with the regulations herein authorized, and in the event of any material departure therefrom the Secretary of the Interior or the Secretary of Agriculture, respectively, may take such action as may be necessary in the courts or otherwise to enforce such regulations."[141] Thus, unless CCSF were able to demonstrate that it had fully developed local resources, it could be prevented from diverting existing or expanded water supplies from Hetch Hetchy by the agencies having such enforcement power under the Raker Act.

CCSF has had to defend its actions against Raker Act violations in the past.[142] CCSF also received a clear warning in the Federal Power Commission Examiner's Initial Decision, 31 F.P.C. at page 547, where Examiner Hall observed, "Congress never intended the Raker Act . . . to be a grant without limitation."[143]

E. Storage in Don Pedro

CCSF's right to exchange storage in Don Pedro Reservoir derives from contract. (See Fourth Agreement Between the City and County of San Francisco and the Turlock Irrigation District and the Modesto Irrigation District, dated 1966 ("Fourth Agreement.") In some respects the provisions of this Fourth Agreement have been incorporated into relevant District water rights before the SWRCB and FERC. Obligations with respect to some of its provisions have been modified pursuant to subsequent agreements and regulatory agency actions.

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141 38 Stat. 244-245, § 5.

142 See *United States v. City and County of San Francisco, supra,* 310 U.S. 16 [the right of way grant was conditional use of power for municipal purposes].

143 Initial Decision at p. 547.

Under Article 7 of the Fourth Agreement, CCSF releases water from its upstream facilities at times when, pursuant to its water rights, it is not obligated to make releases. An accounting record is kept of the quantities of waters released and subsequently stored within Don Pedro Reservoir. These quantities are "deposited" in CCSF's "bank account" within Don Pedro.

CCSF has absolutely no right to physically withdraw water from Don Pedro Reservoir. CCSF "withdraws" water from this bank account by diverting water upstream that otherwise would flow to the Districts under their senior water rights. CCSF may withhold these flows in quantities not to exceed CCSF's storage credit in Don Pedro Reservoir. The Districts, in turn, use the CCSF stored water in Don Pedro Reservoir to replace water that CCSF would otherwise be obligated to release to meet the Districts' senior water rights.

The Fourth Agreement thus allows CCSF to maximize its operational flexibility with respect to diversion and conveyance of water from the upper Tuolumne River. At the foundation, however, is the assumption that Hetch Hetchy is being operated as the major CCSF storage facility on the upper Tuolumne River. If Hetch Hetchy Reservoir no longer existed and CCSF wanted rights to divert water or physically store water in Don Pedro Reservoir, then CCSF would need to renegotiate the Fourth Agreement or negotiate a new agreement with the Districts. Likewise, because the Fourth Agreement was submitted to the FERC for approval as part of the hydroelectric licensing process for New Don Pedro, corresponding amendments may have to be made to the FERC license.

The water bank, utilizing releases from O'Shaughnessy Dam, also creates flexibility and reliability for the Districts and CCSF. Without Hetch Hetchy Reservoir, there would be a reduction of flexibility in the Hetch Hetchy system. According to a recent study, if an intertie were added to connect the lower Hetch Hetchy Aqueduct with New Don Pedro, additional conveyance capacity could be added to the system to bring the lower aqueduct to capacity and reduce the impact on water supply. Remaining storage in the upper Tuolumne River facilities would remain unchanged. [144]

V.
CEQA AND NEPA: THE ANALYSIS OF ALTERNATIVES

CCSF acknowledges that the existing conveyance facilities are not sufficient to contain increased flows from expanded exports of water from Hetch Hetchy. It will have to expand its pipeline system across the San Joaquin Valley if it is to deliver a greater quantity of water from the Hetch Hetchy system. Even a capital improvement program relative to existing facilities may result in increased availability of water to the Bay Area, with attendant

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[144] Null, *Re-Assembling Hetch Hetchy: Water Supply Implications of Removing O'Shaughnessy Dam* (2003) U.C. Davis MA Thesis at p. 29.

growth inducing and cumulative impacts. Such actions, being discretionary, will necessitate environmental documentation prepared in accordance with the requirements of CEQA[145], and NEPA[146].

The desire to expand, improve or otherwise update or modify CCSF's facilities for export of Tuolumne River water raises a number of other issues. Such activities might injure public trust and/or environmental resources. CCSF must consider alternatives to its existing upstream diversions, such as the diversion of water downstream within the system (the Delta). A diversion at a downstream location would avoid any upstream harm to public trust values and environmental resources while still allowing water to be put to reasonable beneficial use by CCSF. Proceeding in this manner would also maximize the reasonable beneficial use of water as required by Article X, Section 2 of the California Constitution by allowing water to flow through the entire Tuolumne and San Joaquin River systems to serve public trust and environmental purposes and still be diverted for CCSF's purposes.

This result would seem to be compelled by *National Audubon, supra*, dealing with Mono Lake, and the Lower American River trial court decision in *Environmental Defense Fund, Inc. v. East Bay Municipal Utility Dist*., Alameda County Superior Court, No. 425,955. If the public trust and environmental values of Mono Lake and the Lower American River would justify this result, the benefit associated with Hetch Hetchy Valley, within a National Park, would seem to compel, at the very least, an analysis of this alternative.

VI.
RAKER ACT PUBLIC POWER REQUIREMENTS

A. Sale to San Francisco

The Raker Act explicitly requires CCSF to "develop and use hydroelectric power for the use of its people . . . ."[147] Further, the Raker Act prohibits CCSF from selling Hetch Hetchy electricity to a corporation or individual for resale.[148] The CCSF power supply requirements have been the source of significant political and legal conflict since their

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145 Public Resources Code section 21000 et seq.

146 42 U.S.C. § 4231 et seq.

147 38 Stat. 248, § 9(m).

148 The Raker Act provides, in section 6, that CCSF is prevented "from ever selling or letting to any corporation or individual, except a municipality or a municipal water district or irrigation district, the right to sell or sublet the water or electric energy sold or given to it or him by the said grantee; *provided*, That the rights hereby granted shall not be sold, assigned, or transferred to any private person, corporation or association, and in case of any attempt to so sell, assign, transfer, or convey, this grant shall revert to the Government of the United States." (38 Stat. 245, § 6.)

inception.[149] This conflict generally focuses on the fact that CCSF has never developed its own infrastructure to directly deliver power to its residents.

Despite Congress' intent that CCSF would supply publicly generated power directly to the citizens of San Francisco and areas within the Districts, CCSF voters, over the years, rejected six separate bond measures that would have financed construction of the power infrastructure necessary for CCSF to directly supply electricity. After initially and unsuccessfully attempting to sell power to PG&E,[150] and after the six rejected infrastructure bond measures, CCSF now "wheels" power through PG&E facilities to CCSF's customers. Due to the Ninth Circuit's ruling in *Starbuck*, the wheeling agreement may only be challenged by a small number of parties, including the Secretary of Interior and, potentially, the Districts.[151]

The Raker Act gives the Secretary of the Interior the authority to require additional power production and supply by CCSF.[152] This decision is in the sole discretion of the Secretary of Interior.[153] CCSF's failure to comply with a request from the Secretary of the Interior to increase power production would empower the Secretary to revoke the right-of-way underlying the Hetch Hetchy system.[154]

B. Sale to Districts

The Raker Act also provides that CCSF must "sell or supply" electricity to the Districts or any municipality within the Districts on two conditions: (i) CCSF has electricity in excess of its demand for "actual municipal purposes"; and (ii) the electricity sold or supplied is used for "pumping subsurface water for drainage or irrigation" or for "actual municipal public purposes."[155] [156] Congress intended that the revenues generated from the sales of power would help to defray the costs of constructing the Hetch Hetchy project.

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[149] See, e.g., *United States v. City and County of San Francisco, supra,* 310 U.S. at p. 28 [where the court found that CCSF's sale of electricity to PG&E violated the Raker Act]; *Starbuck v. City and County of San Francisco* (9th Cir. 1977) 556 F.2d 450 [where San Francisco residents unsuccessfully challenged CCSF's electricity "wheeling" agreement with PG&E].

[150] In 1940 this arrangement was rejected by the court in *United States v. City and County of San Francisco, supra,* 310 U.S. at p. 28.

[151] See *Starbuck, supra,* 556 F.2d at p. 457.

[152] 38 Stat. 249, § 9(n).

[153] *Ibid.*; see also *United States v. City and County of San Francisco, supra,* 310 U.S. at pp. 29-30.

[154] See *id*. at p. 30.

[155] 38 Stat. 248, § 9(l). TID, at least, asserts strongly that electricity in "excess" of San Francisco's needs is to be sold to TID, MID and municipalities within the two Districts, and that determining what is excess to the "actual municipal public purposes" of the "grantee" does *not* include electricity required for those purposes by CCSF's wholesale water supply customers.

[156] The Raker Act states, in pertinent part:

> That the said grantee shall, upon request, sell or supply to said irrigation districts, and also to the municipalities within either or both said irrigation districts, for the use of any land owner

Footnote continued on following page.

C. Raker Act Requirements for Power Production

The Raker Act is fundamentally a public power act, as recognized in the FERC Examiner's Initial Decision on the New Don Pedro hydroelectric license, which characterized the Raker Act as the precursor of the Federal Power Act. The Raker Act's requirement for CCSF to develop power out of the Hetch Hetchy facilities that is purely public in character was a key justification for the congressional authorization of the right-of-way grant within Yosemite National Park. Although in the aftermath of the 1906 San Francisco earthquake CCSF itself was moved to pursue the Hetch Hetchy project to secure a more stable water supply, Congress, in 1914, saw the right-of-way grant as an opportunity for introducing cheap public power into the California market.[157] As a consequence, the act requires CCSF to produce power as a condition of the right-of-way grant.

The Raker Act imposes as a legal condition of the right-of-way a requirement that CCSF will develop hydroelectric power and make it available to the public, utilizing the Hetch Hetchy Project facilities. If CCSF elected to restore the Hetch Hetchy Valley, it would still be required to produce power from the Tuolumne River and sell it to municipal customers or the Districts to the extent its facilities still occupied other lands within the Park boundaries. Without releases from Hetch Hetchy Reservoir to be turned into the Kirkwood Powerhouse, CCSF would have to rely on the other reservoirs and powerhouses in its upper Tuolumne River development to meet the Raker Act's public power requirement, or else withdraw entirely from the Park, based on the reversion contained in section 6 of the Raker Act.

In sum, the public power conditions that Congress imposed in making its Yosemite Park right-of-way grant are significant constraints on CCSF's operation of the Hetch Hetchy project. Thus, even though the need for water was CCSF's initial purpose behind developing the Hetch Hetchy project, as part of the bargain that water supply now depends on its ability to continue to generate power for its citizens and municipal uses in San Francisco, as well as

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> or owners therein for pumping subsurface water for drainage or irrigation, or for the actual municipal public purposes of said municipalities (which purposes shall not include sale to private persons or corporations) any excess of electrical energy which may be generated, and which may be so beneficially used by said irrigation districts or municipalities, when any such excess of electric energy may not be required for pumping the water supply for said grantee and for the actual municipal public purposes of the said grantee (which purposes shall not include sale to private person or corporation) at such price as will actually reimburse the said grantee for developing and maintaining and transmitting the surplus electrical energy thus sold; . . .

38 Stat. 248, § 9(l).

[157] Picker, et al., *supra,* at pp. 1313-1314, citing H. Schussler, *The Water Supply of San Francisco, California, Before, During and After the Earthquake of April 18th* (1908) at p. 14.

in the Districts. CCSF must carefully balance any decision to remove its facilities from Hetch Hetchy Valley against this requirement.

VII.
CONCLUSIONS

A. Water

The rights and interests of CCSF and the Districts are intertwined, and probably impossible to separate. Together the Districts and CCSF have been through nearly a century of competition, of mutual reliance and agreements, of challenge and accommodation, of facing common threats, and of meeting new demands. The legal battles that have been endured have created a platform or foundation of expectations and promises that will continue to guide future responses to challenges that emerge. The long history of conflicts, culminating in agreements and compromises, provides a basis for continuing to work toward a common goal. If it is successfully asserted that Hetch Hetchy Valley should be restored, then CCSF and the Districts will be faced with the development of new means of meeting this challenge to CCSF's water rights and power producing capability. Alternatives may well exist, both physical and legal, and may be developed with enlightened guidance and historical perspective.

B. Power

The Raker Act requires CCSF to develop public hydroelectric power as a condition of the right-of-way Congress granted for the Hetch Hetchy project. Congress intended that the public should benefit from the right of way in this specific way. In the decades following the Raker Act, both the Districts and CCSF have enjoyed benefits from having power available from Hetch Hetchy.

But a great deal has changed in California's current electricity market and regulatory environment, much of which Congress could not have anticipated when it enacted the Raker Act or granted the license for New Don Pedro. Transmission wheeling and direct sales in a competitive commodities-style market were unheard of then, and their entry into the modern legal landscape may need to be considered. In any case, it is clear from the background of legislation, licensing and agreements regarding these matters that the public power conditions imposed on the right-of-way have been a guiding principle for CCSF. Future development of Hetch Hetchy hydroelectric facilities, or removal of them from Hetch Hetchy Valley, must be undertaken consistent with that historical commitment.

SLS:sb
Atch.

Restore Hetch Hetchy Comments on SWRCB Lower San Joaquin River SED
March 29, 2013
Appendix A

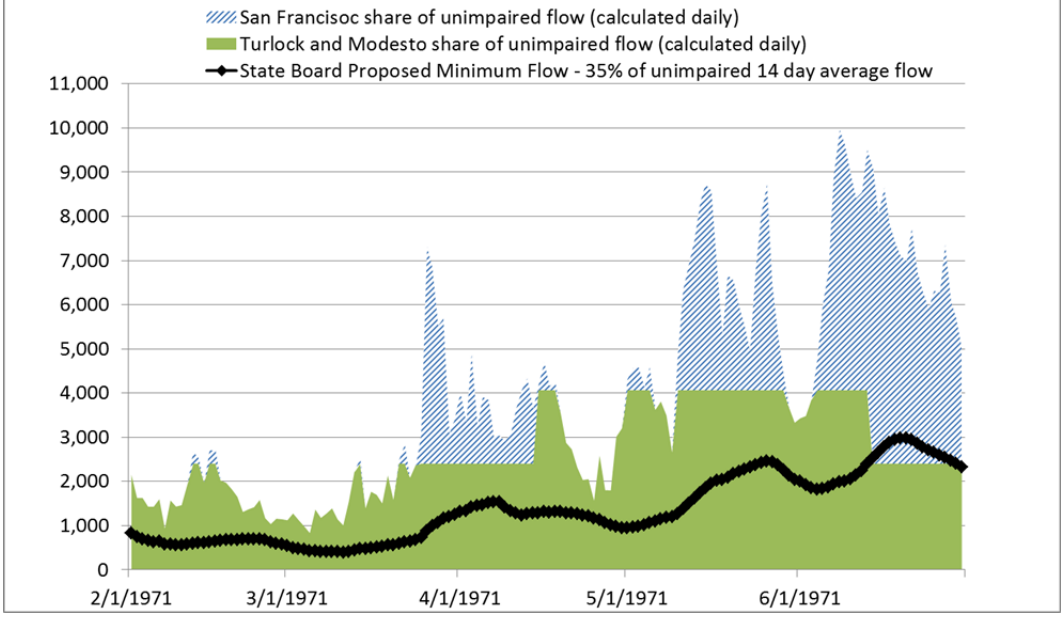
Charts below show (note changes in scale):

1. Daily unimpaired Tuolumne River flows, February-June, 1971-2009,
2. Water rights allocation between San Francisco and the Turlock and Modesto Irrigation Districts, and
3. State Board proposed instream flow requirements: 35% of 14-day average unimpaired flow.

Table 1:
Breakdown of SWRCB 35% Flow Objective by Year Type
(acre-feet)

	State Board Flow Proposal	Districts' Share SWRCB Proposal	San Francisco Share SWRCB Proposal	San Francisco Percent of SWRCB Proposal
All Years	498,322	463,537	34,804	7%
Wet	742,300	651,232	91,068	12%
Above Normal	560,891	553,287	7,604	1%
Below Normal	447,955	439,238	8,717	2%
Dry	353,281	352,766	515	0%
Critical	252,215	250,905	1,379	1%

Figure A-1: (water year 1971)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)



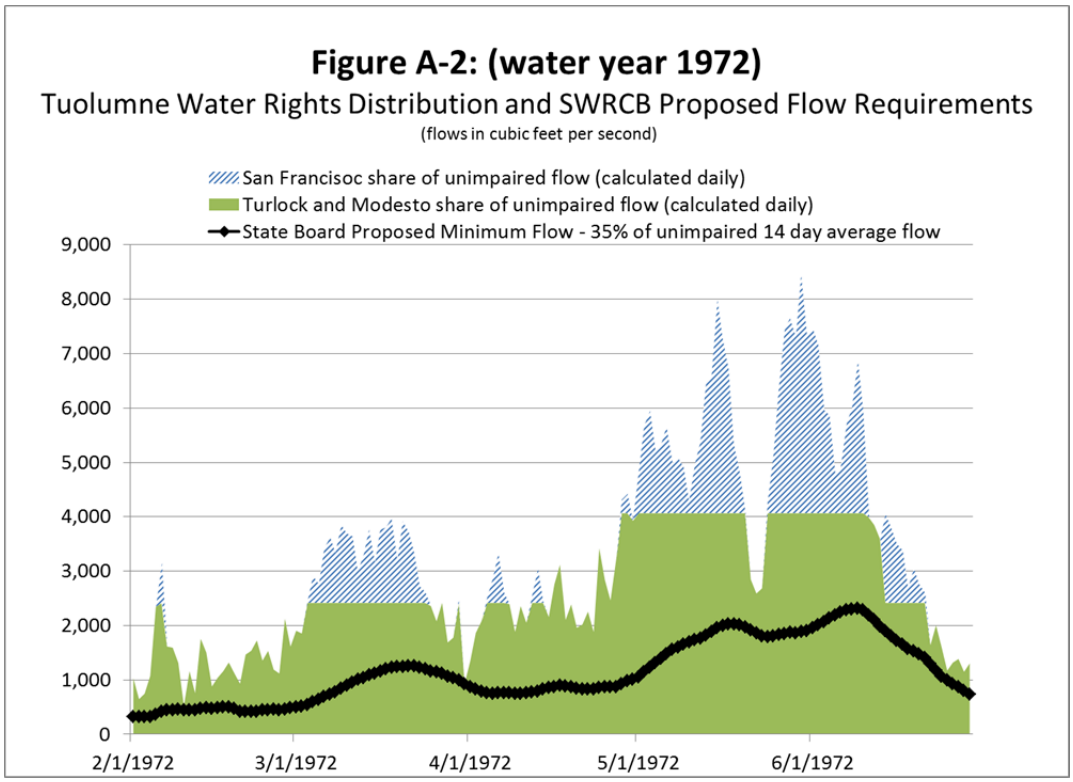


Figure A-2: (water year 1972)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1972
3/1/1972
4/1/1972
5/1/1972
6/1/1972

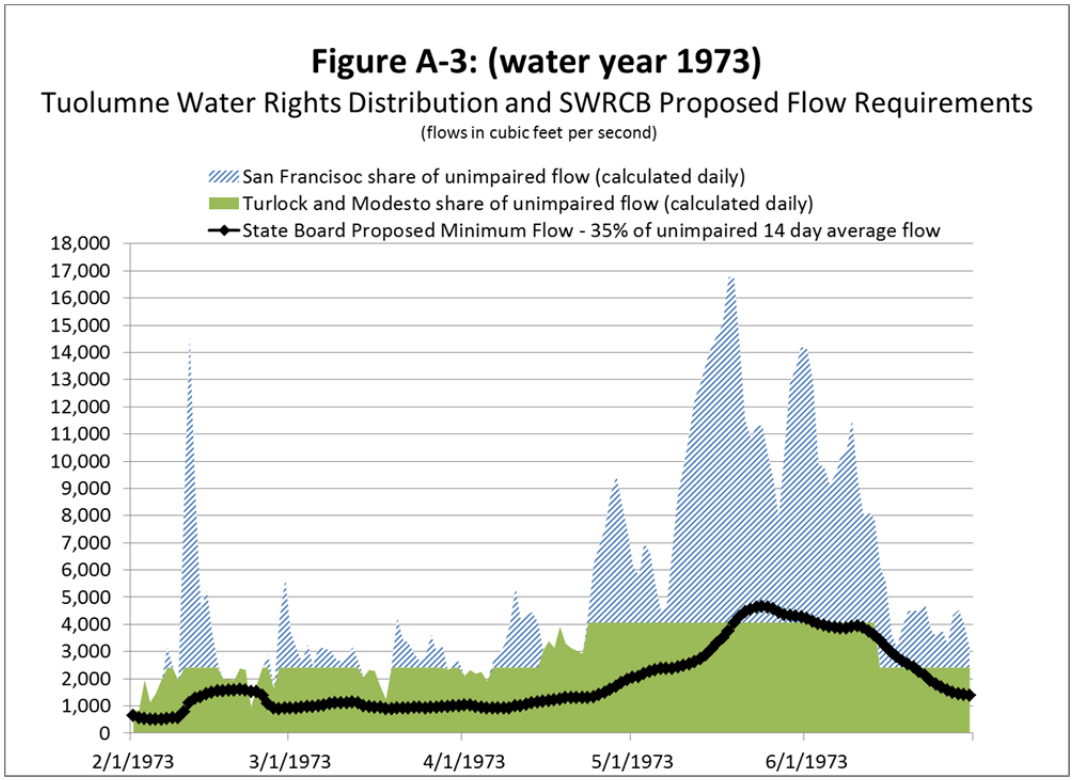


Figure A-3: (water year 1973)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1973
3/1/1973
4/1/1973
5/1/1973
6/1/1973

Figure A-4: (water year 1974)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

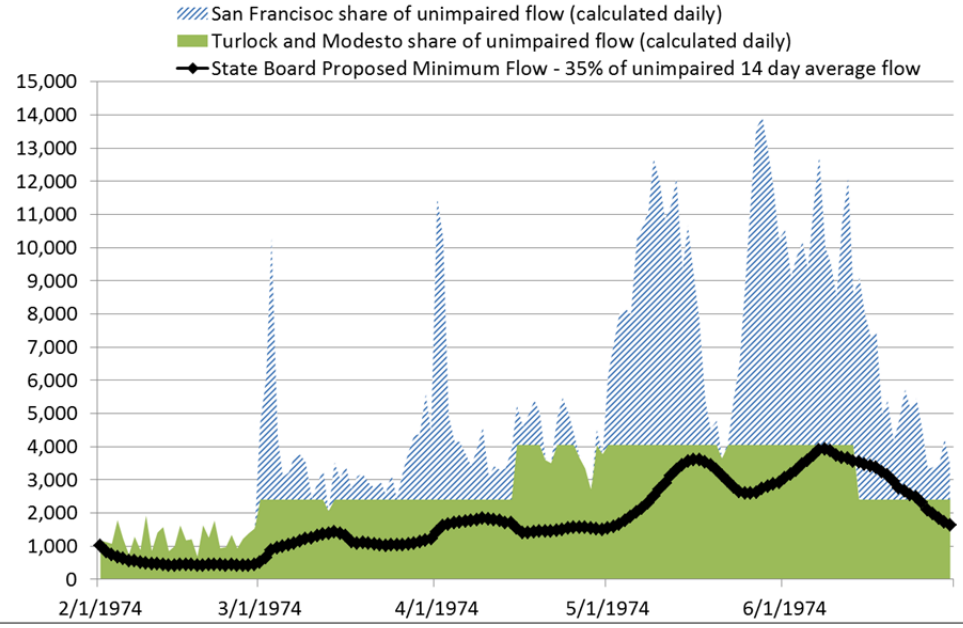


Figure A-5: (water year 1975)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

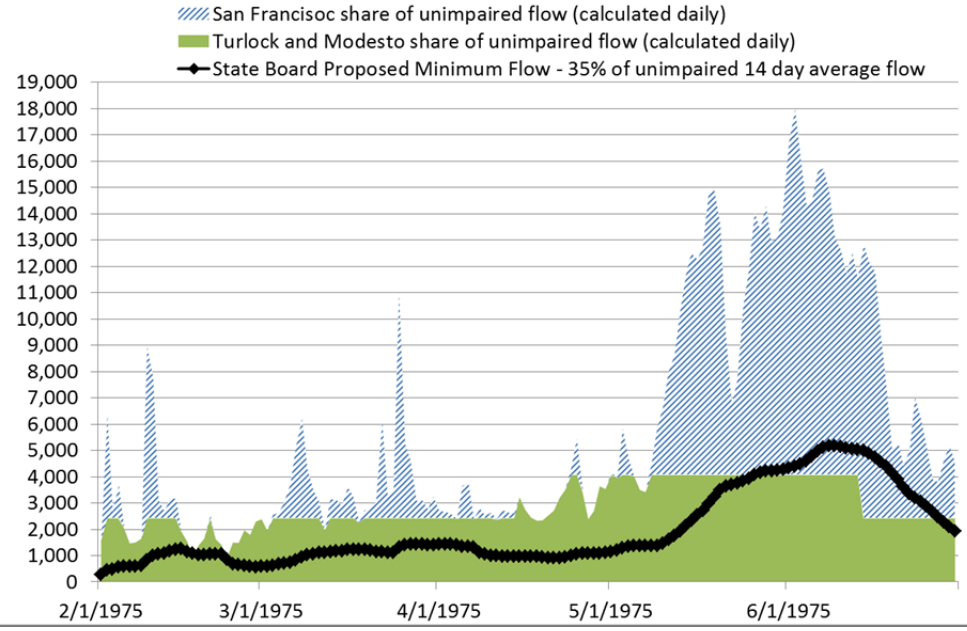


Figure A-6: (water year 1976)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

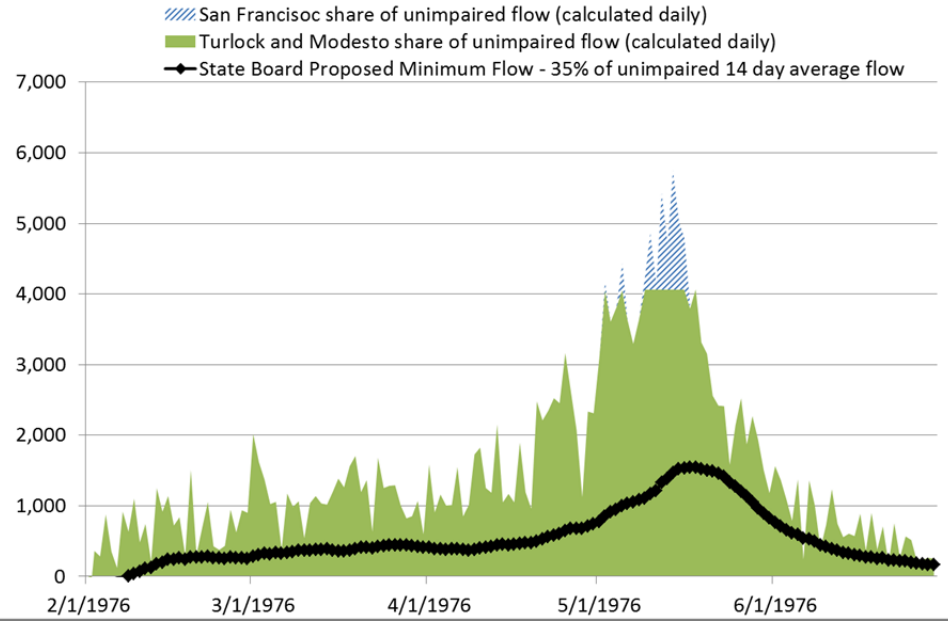


Figure A-7: (water year 1977)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

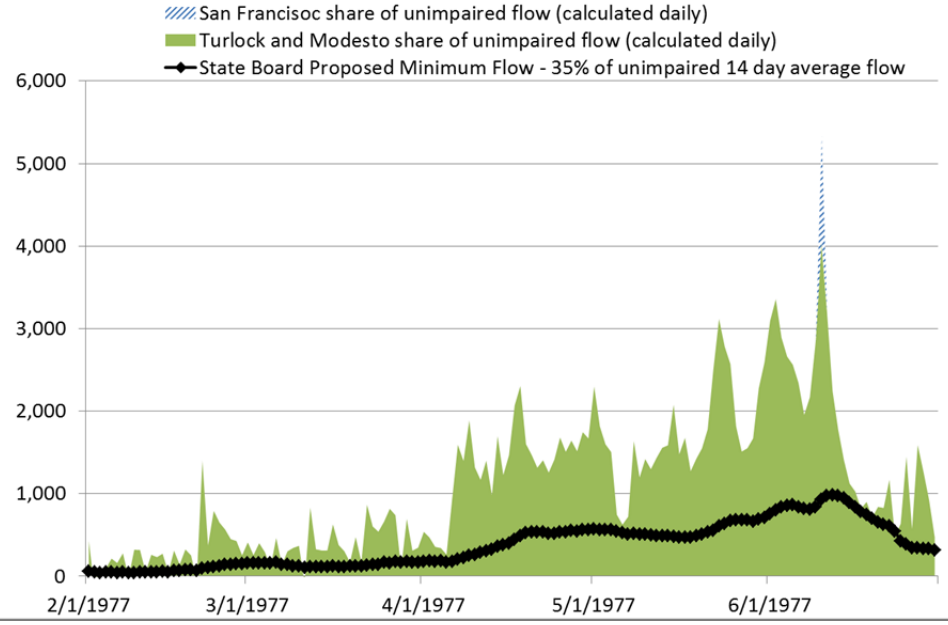


Figure A-8: (water year 1978)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

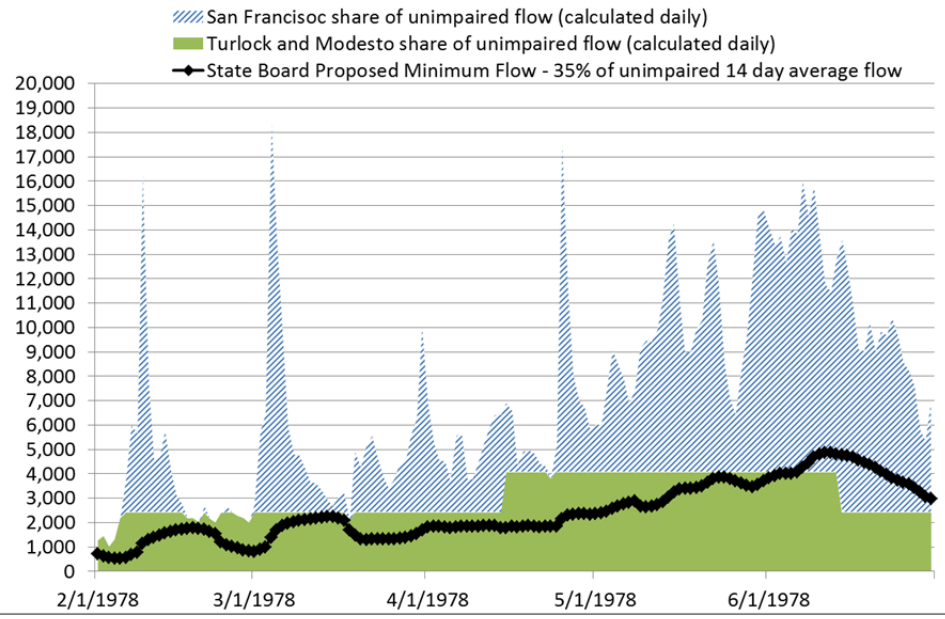
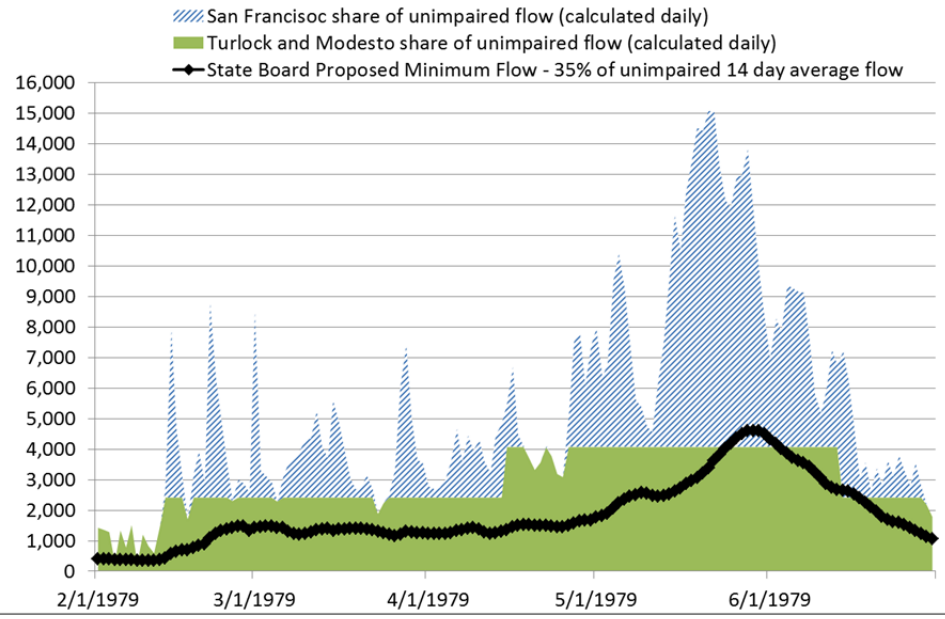


Figure A-9: (water year 1979)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)



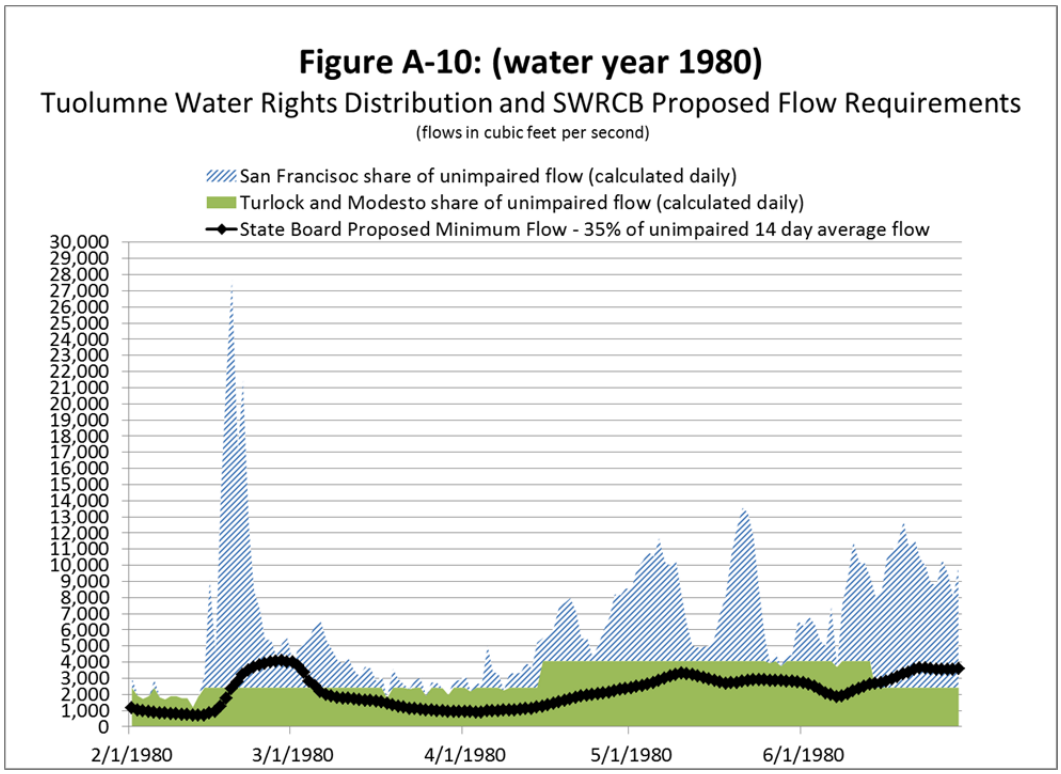


Figure A-10: (water year 1980)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
30,000
29,000
28,000
27,000
26,000
25,000
24,000
23,000
22,000
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
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2,000
1,000
0
2/1/1980
3/1/1980
4/1/1980
5/1/1980
6/1/1980

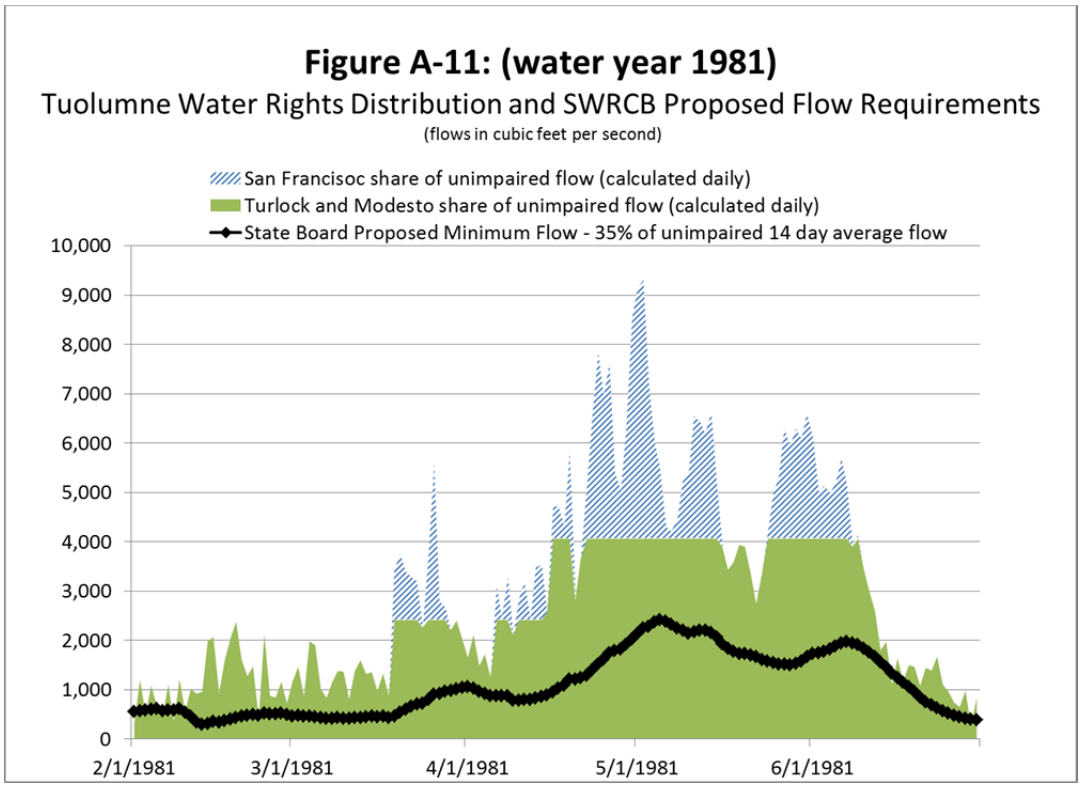


Figure A-11: (water year 1981)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1981
3/1/1981
4/1/1981
5/1/1981
6/1/1981

Figure A-12: (water year 1982)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

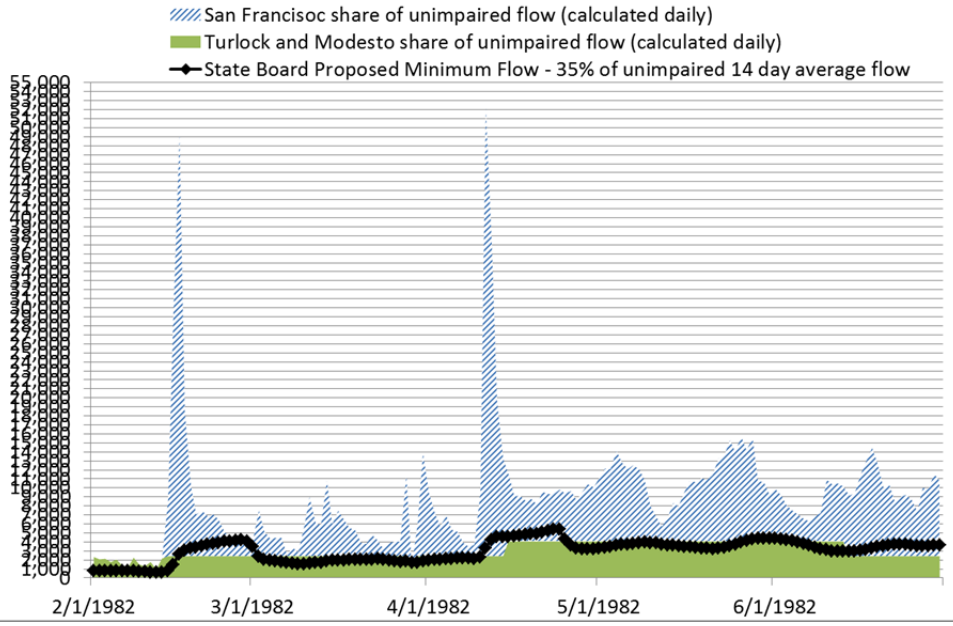
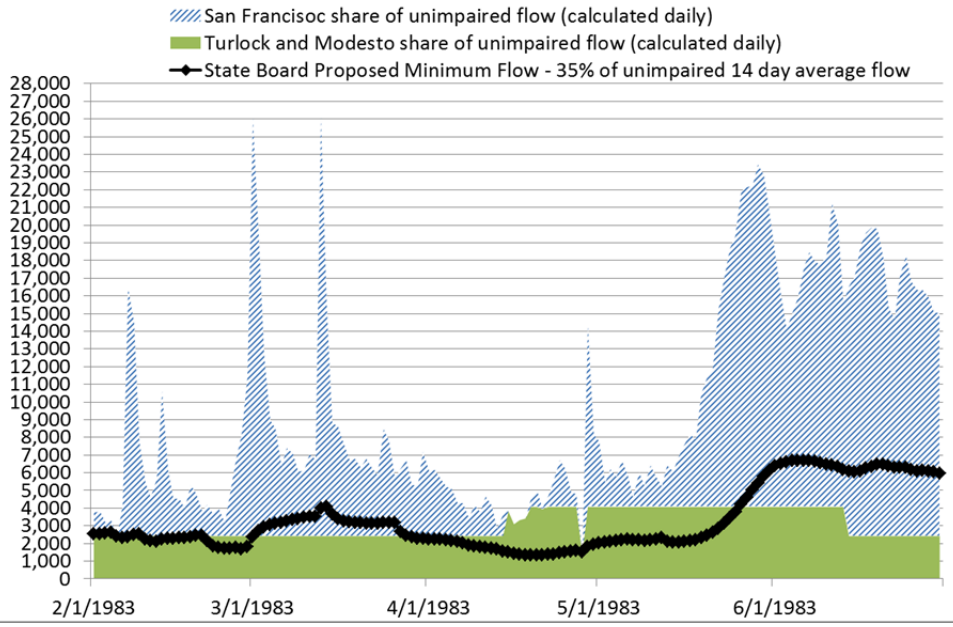


Figure A-13: (water year 1983)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)



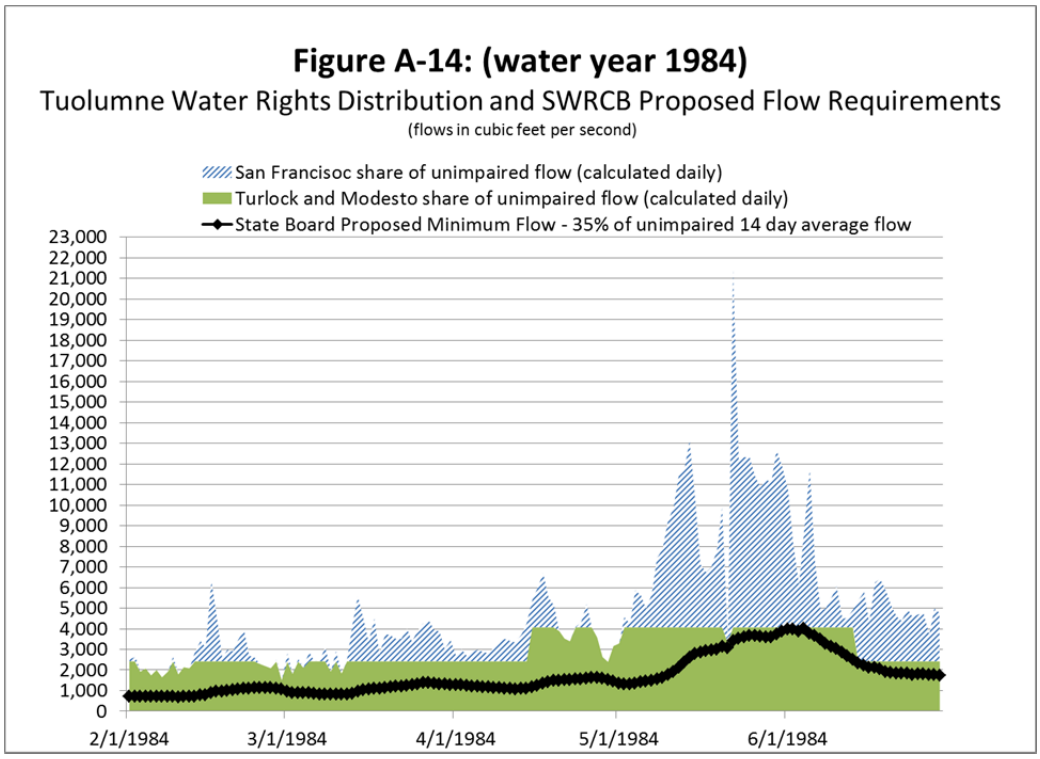


Figure A-14: (water year 1984)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
23,000
22,000
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
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2,000
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3/1/1984
4/1/1984
5/1/1984
6/1/1984

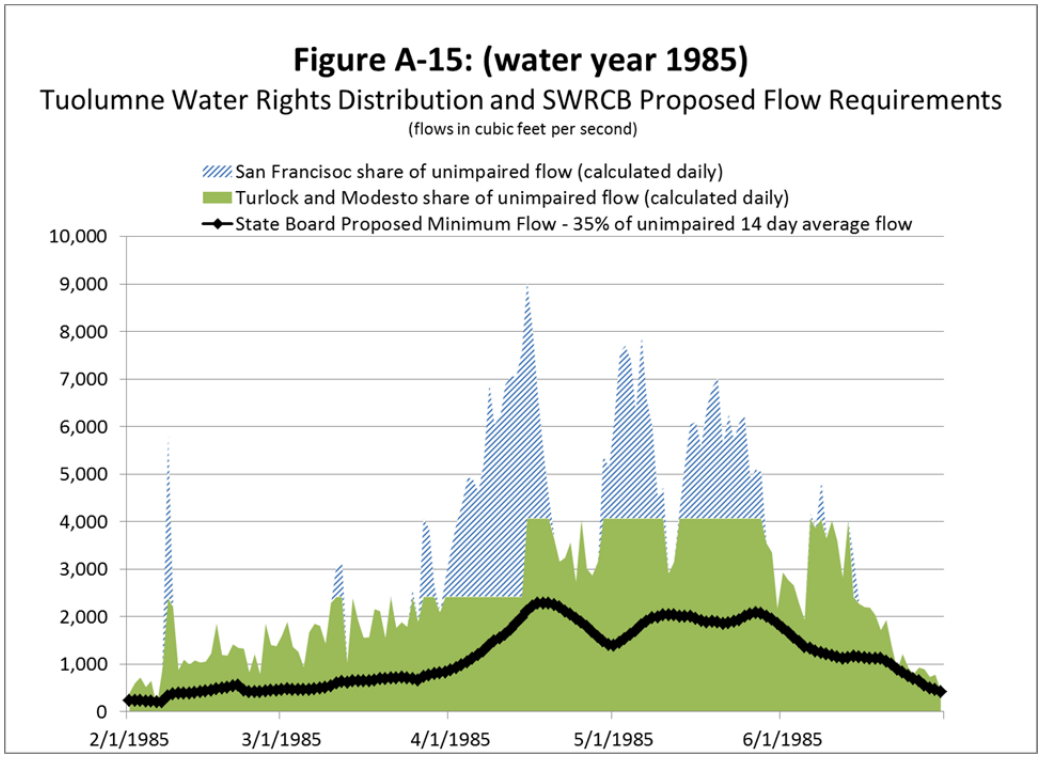


Figure A-15: (water year 1985)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1985
3/1/1985
4/1/1985
5/1/1985
6/1/1985

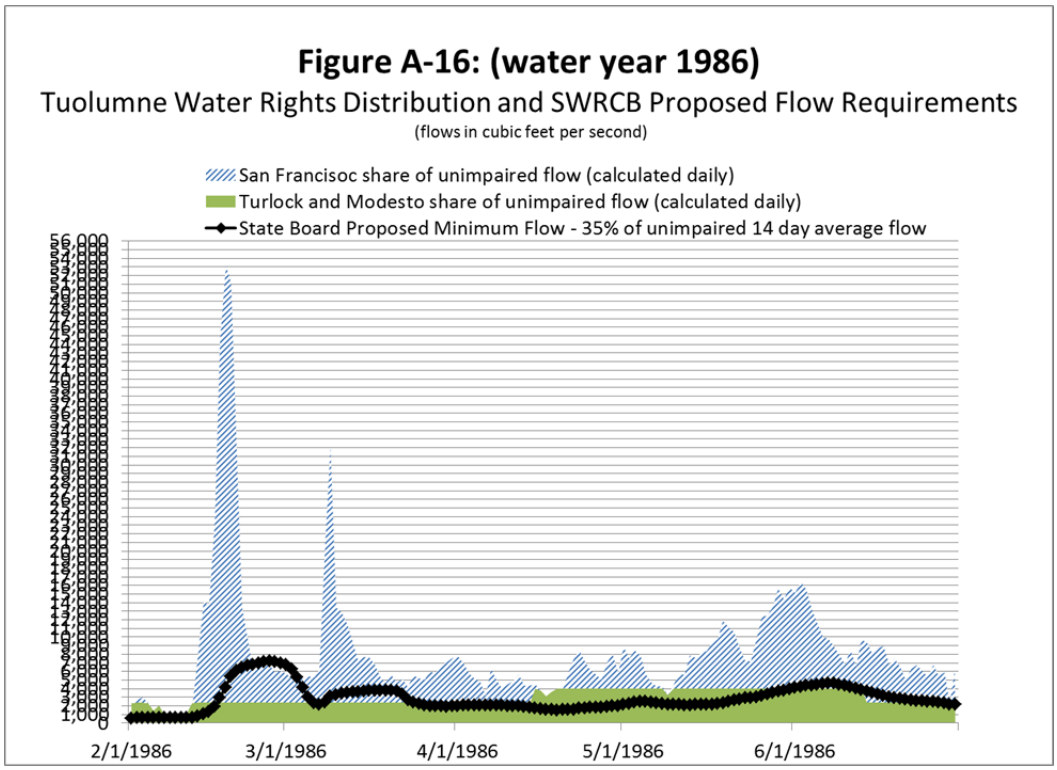


Figure A-16: (water year 1986)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
2/1/1986
3/1/1986
4/1/1986
5/1/1986
6/1/1986

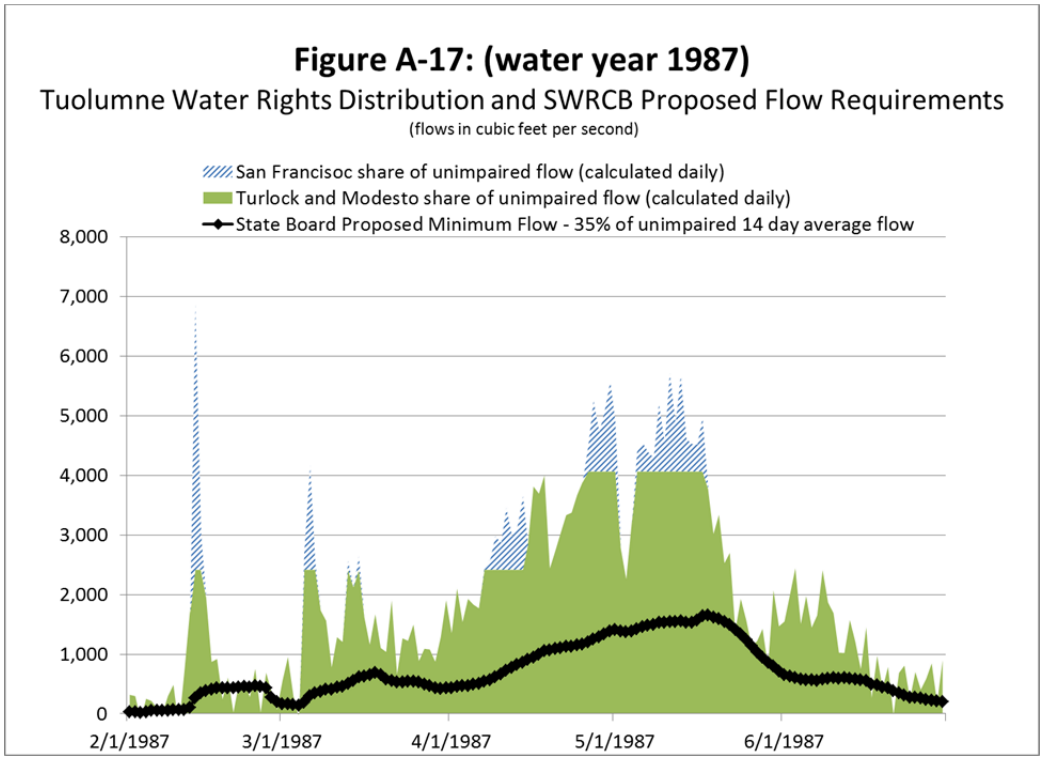


Figure A-17: (water year 1987)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1987
3/1/1987
4/1/1987
5/1/1987
6/1/1987

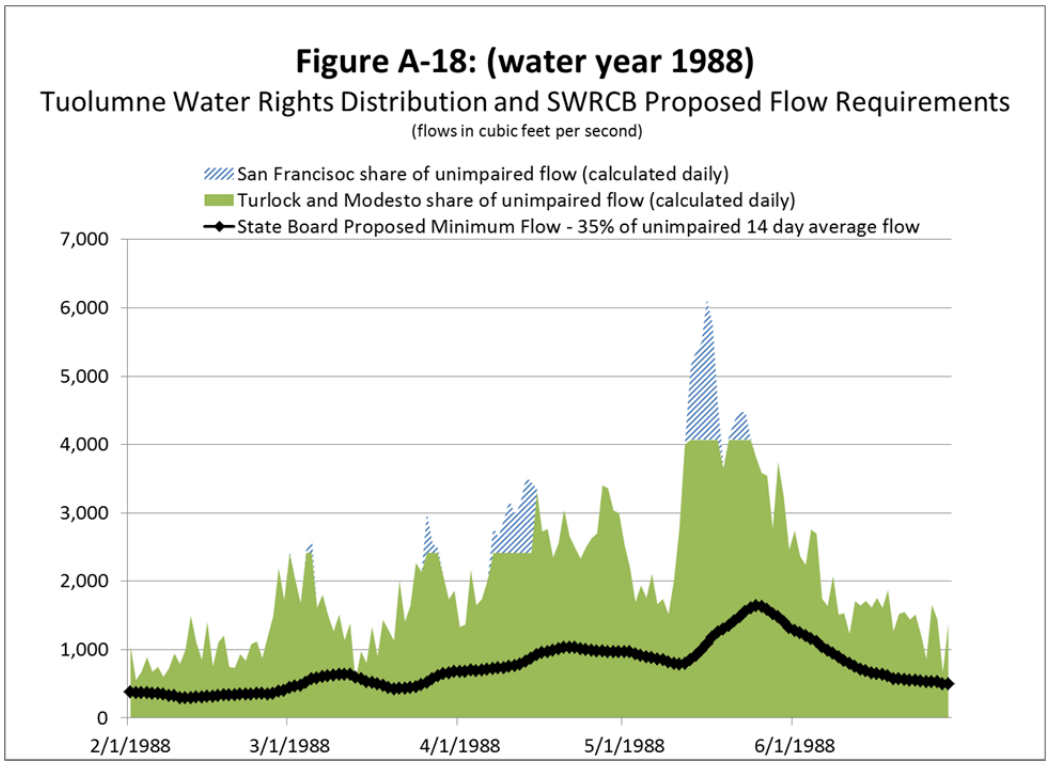


Figure A-18: (water year 1988)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1988
3/1/1988
4/1/1988
5/1/1988
6/1/1988

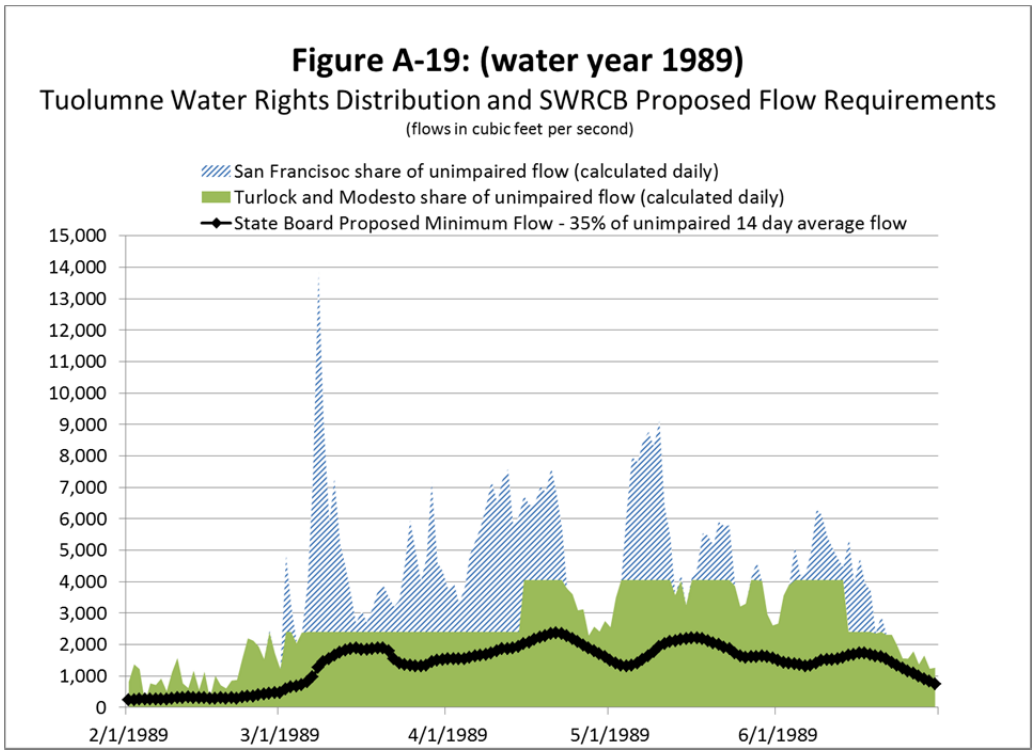


Figure A-19: (water year 1989)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1989
3/1/1989
4/1/1989
5/1/1989
6/1/1989

Figure A-20: (water year 1990)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

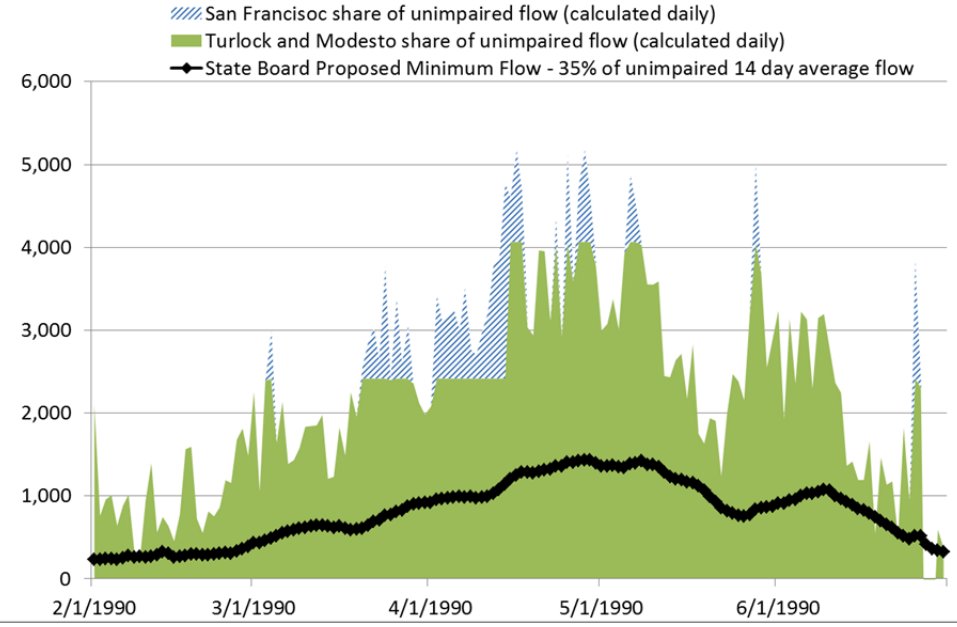


Figure A-21: (water year 1991)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

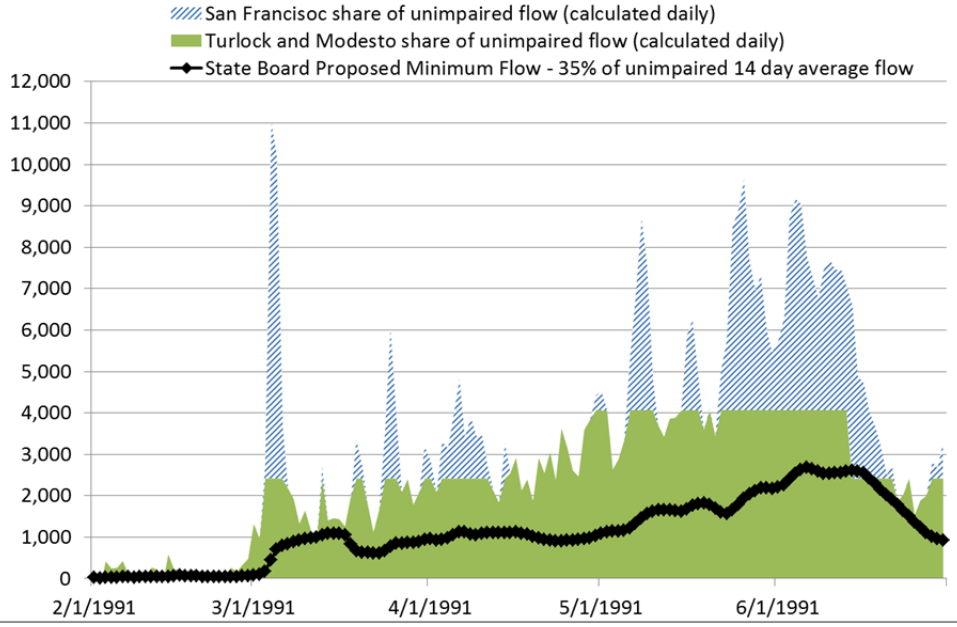


Figure A-22: (water year 1992)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

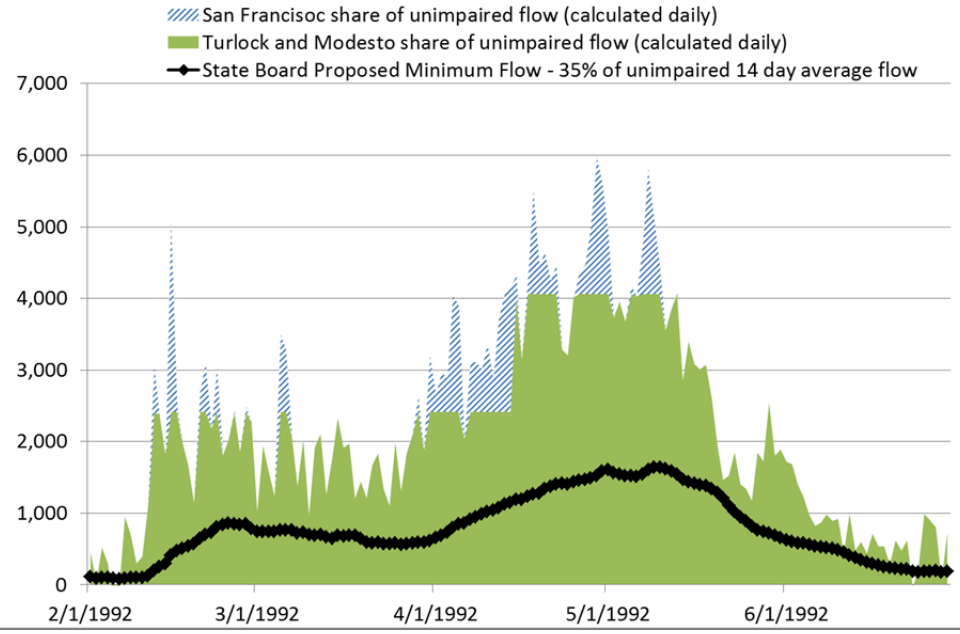


Figure A-23: (water year 1993)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

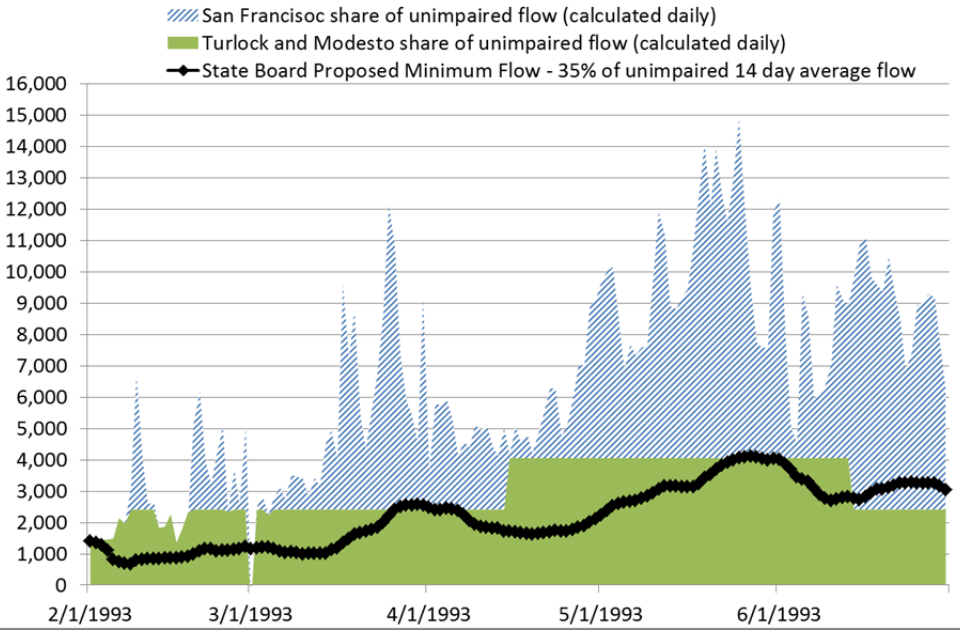


Figure A-24: (water year 1994)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

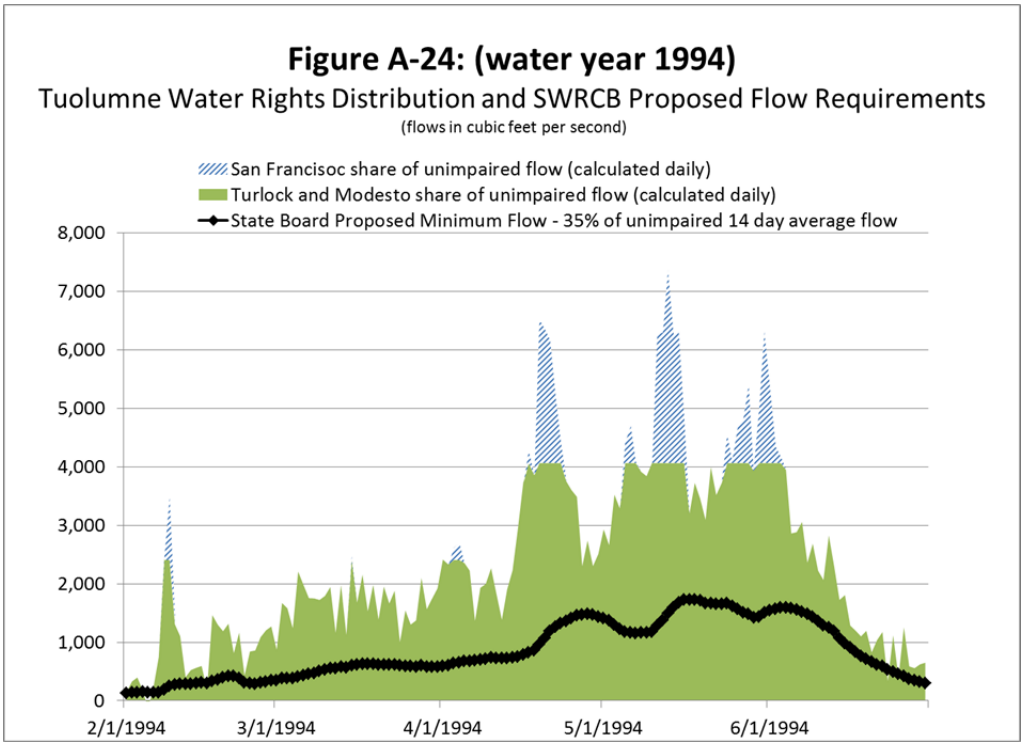


Figure A-25: (water year 1995)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

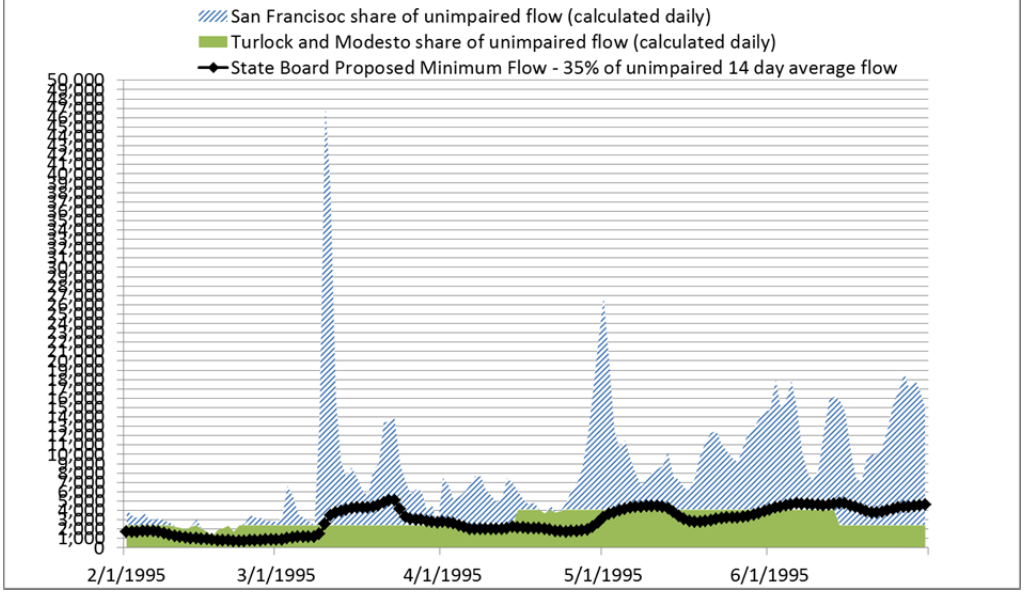


Figure A-26: (water year 1996)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

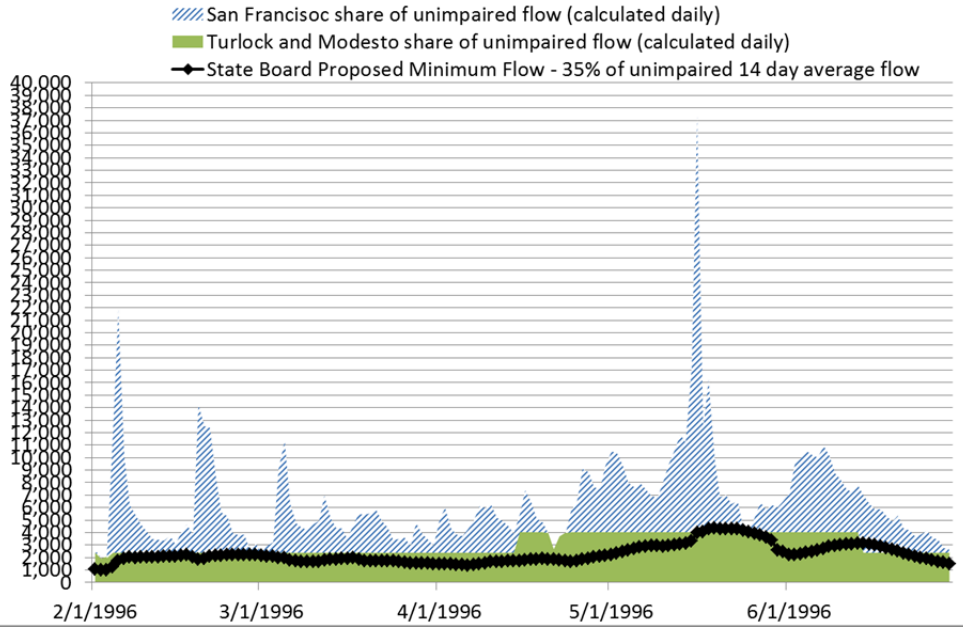
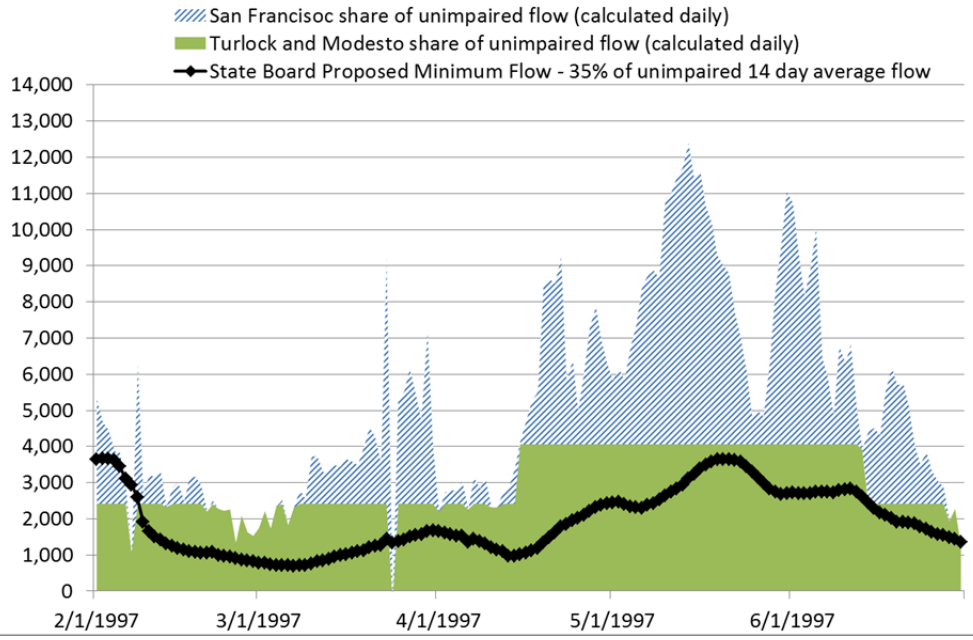


Figure A-27: (water year 1997)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)



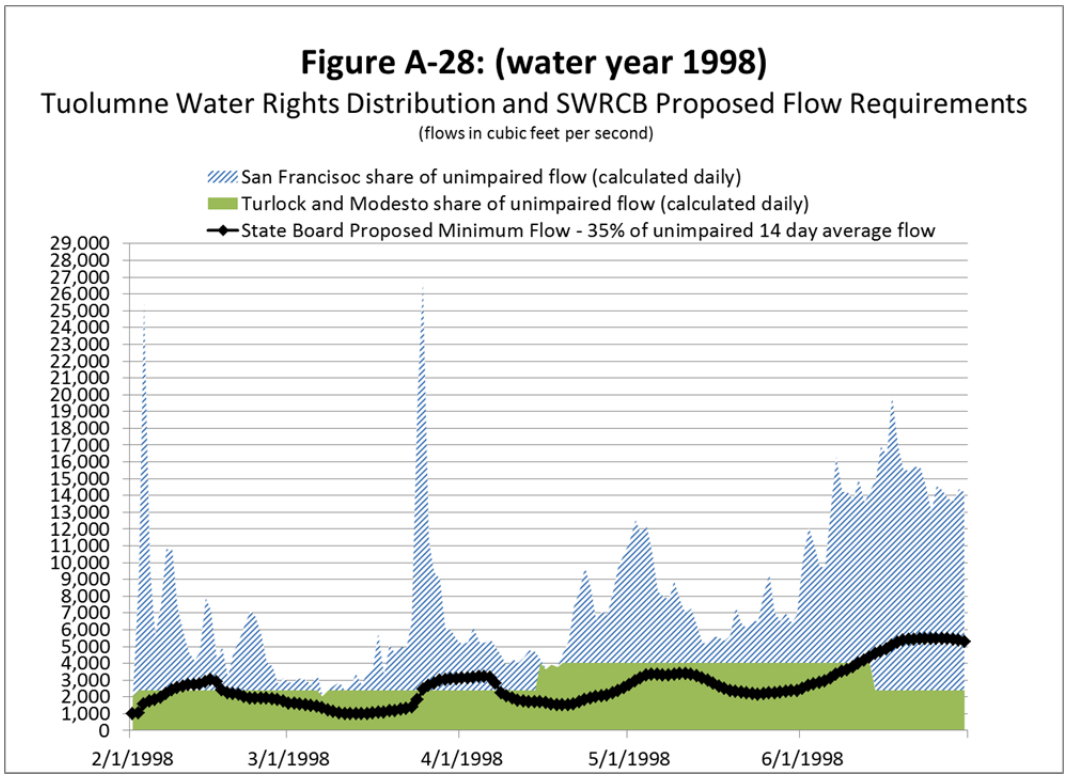


Figure A-28: (water year 1998)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
29,000
28,000
27,000
26,000
25,000
24,000
23,000
22,000
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1998
3/1/1998
4/1/1998
5/1/1998
6/1/1998

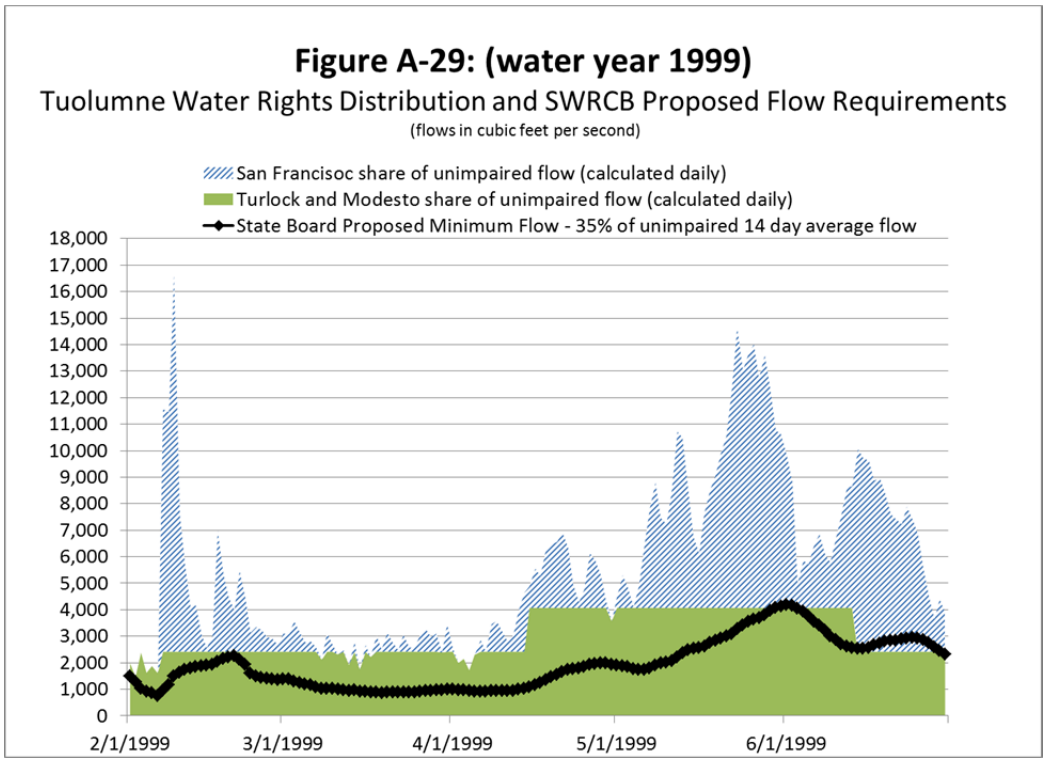


Figure A-29: (water year 1999)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/1999
3/1/1999
4/1/1999
5/1/1999
6/1/1999

Figure A-30: (water year 2000)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

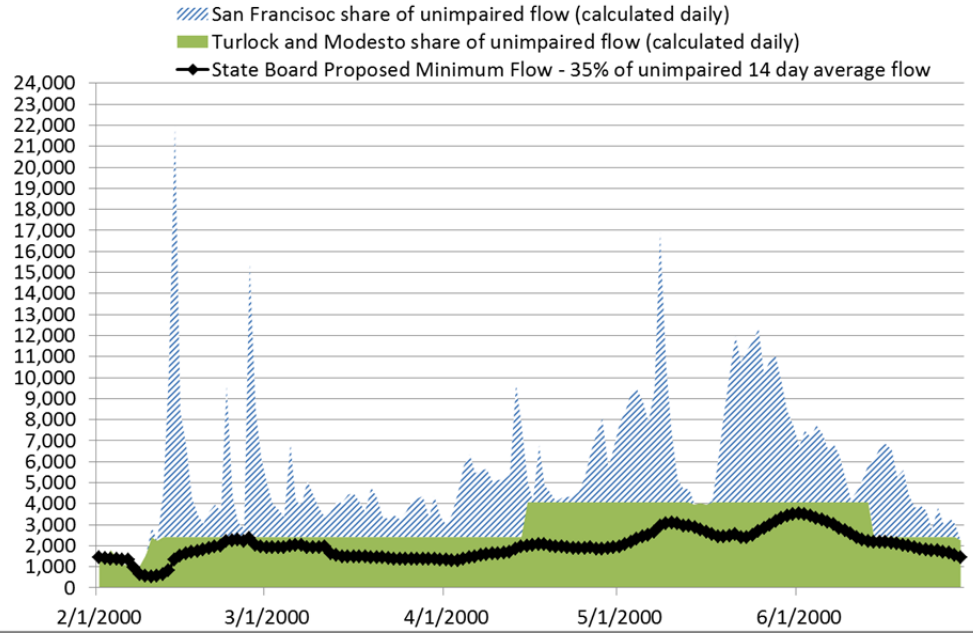


Figure A-31: (water year 2001)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

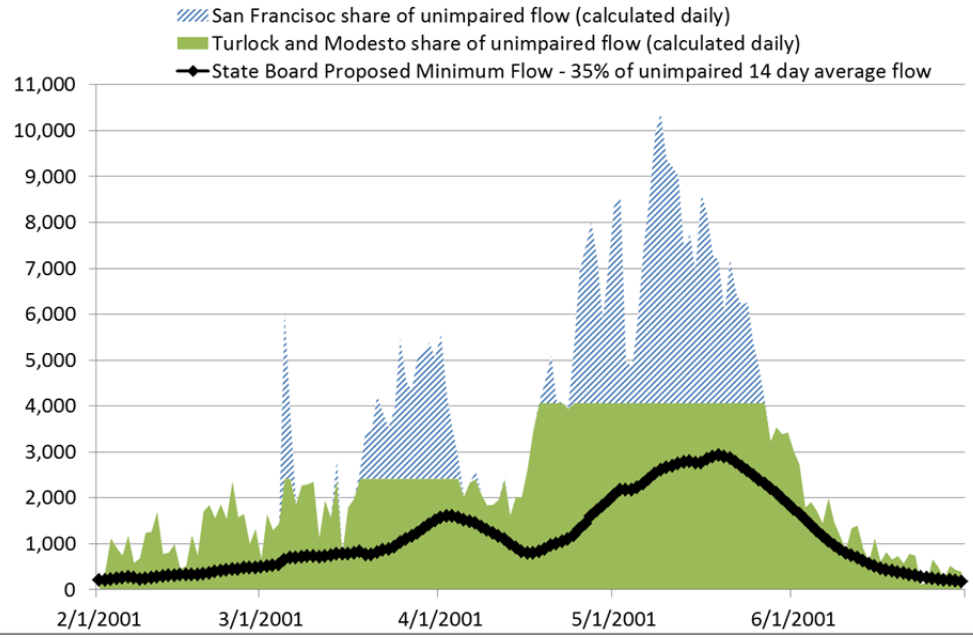


Figure A-32: (water year 2002)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

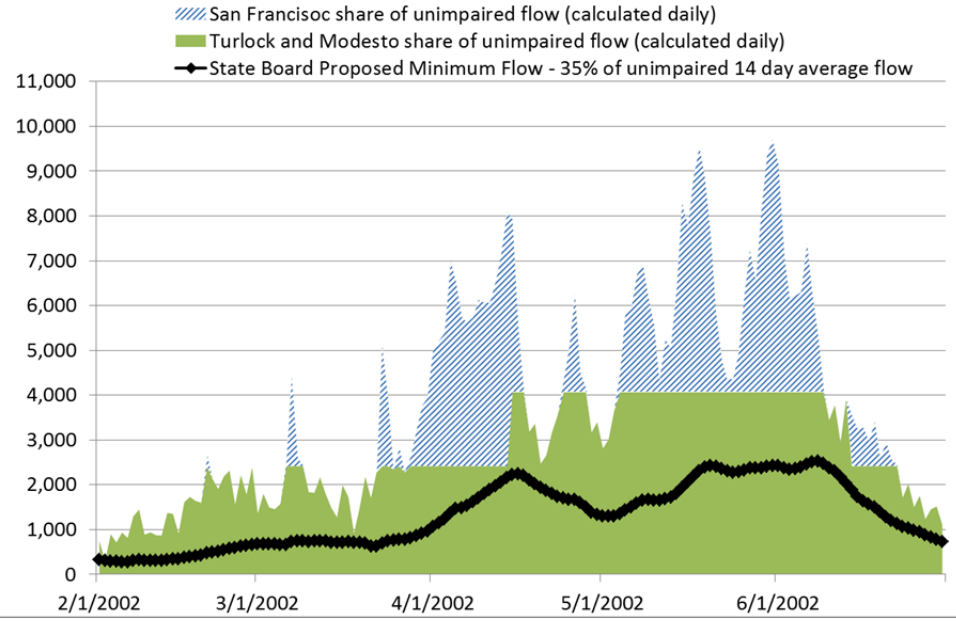


Figure A-33: (water year 2003)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

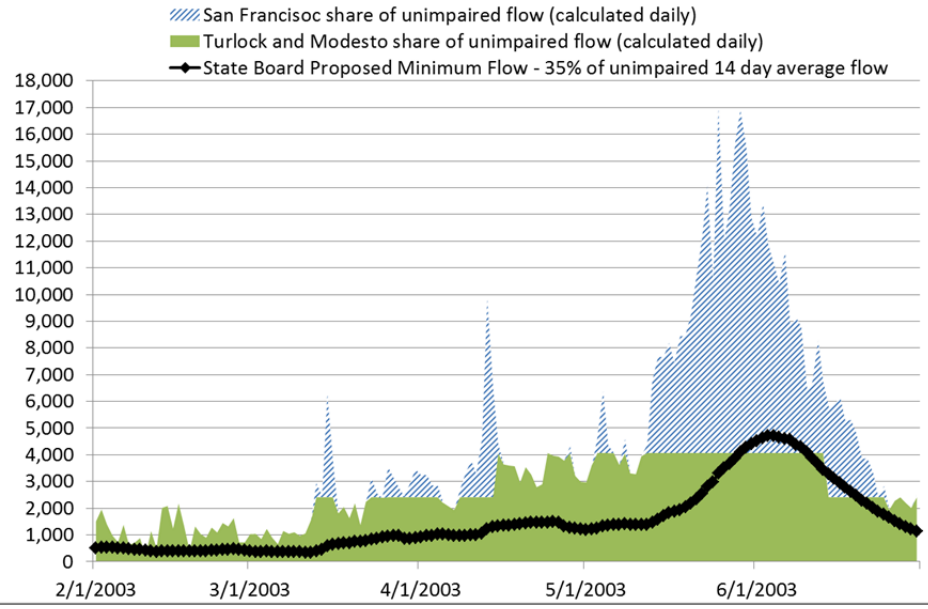


Figure A-34: (water year 2004)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

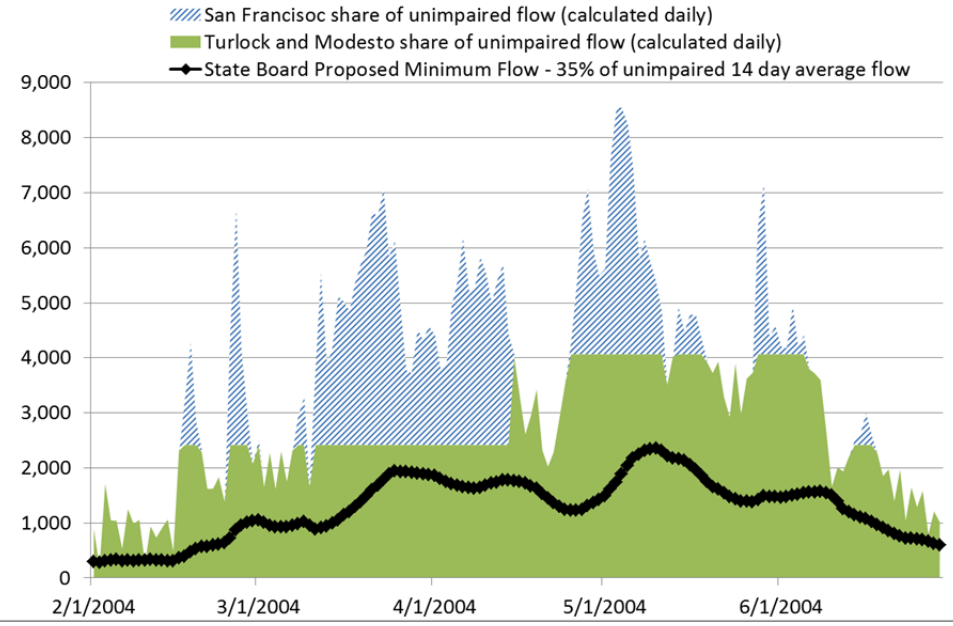
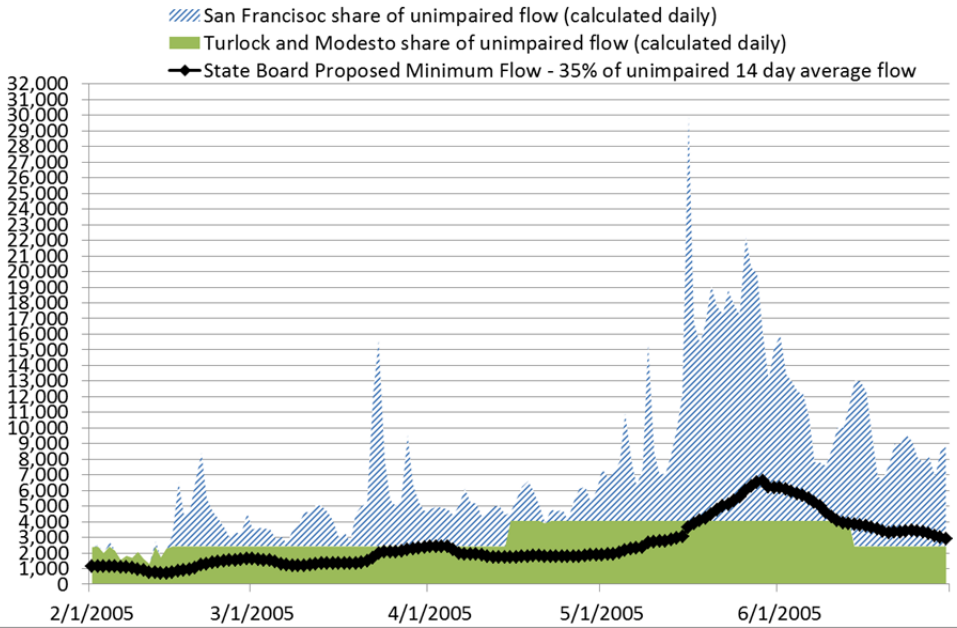


Figure A-35: (water year 2005)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)



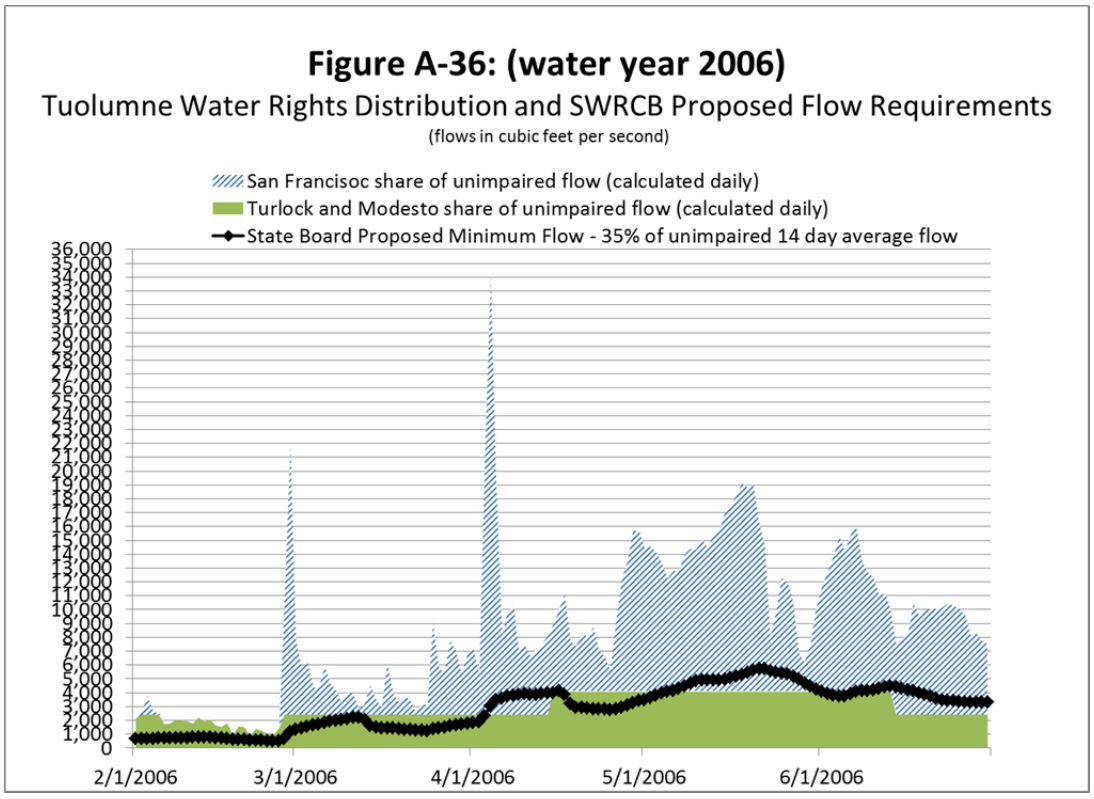


Figure A-36: (water year 2006)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
36,000
35,000
34,000
33,000
32,000
31,000
30,000
29,000
28,000
27,000
26,000
25,000
24,000
23,000
22,000
21,000
20,000
19,000
18,000
17,000
16,000
15,000
14,000
13,000
12,000
11,000
10,000
9,000
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/2006
3/1/2006
4/1/2006
5/1/2006
6/1/2006

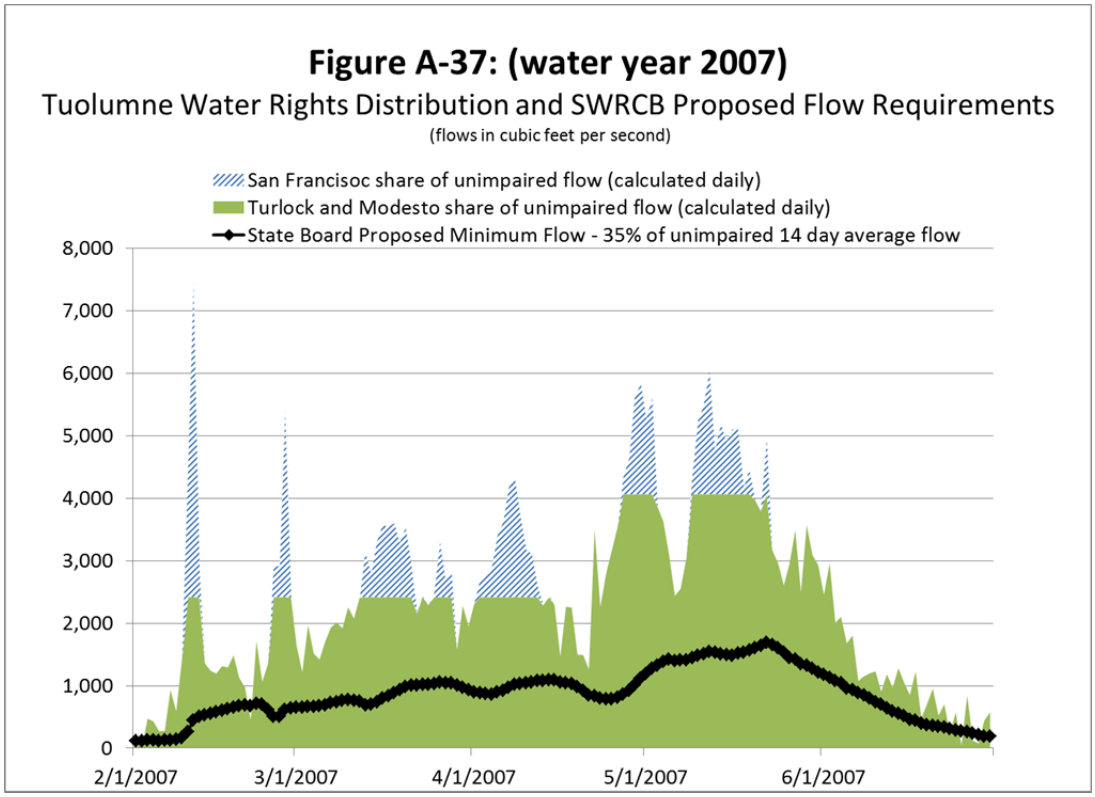


Figure A-37: (water year 2007)
Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements
(flows in cubic feet per second)
San Francisoc share of unimpaired flow (calculated daily)
Turlock and Modesto share of unimpaired flow (calculated daily)
State Board Proposed Minimum Flow - 35% of unimpaired 14 day average flow
8,000
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2/1/2007
3/1/2007
4/1/2007
5/1/2007
6/1/2007

Figure A-38: (water year 2008)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)

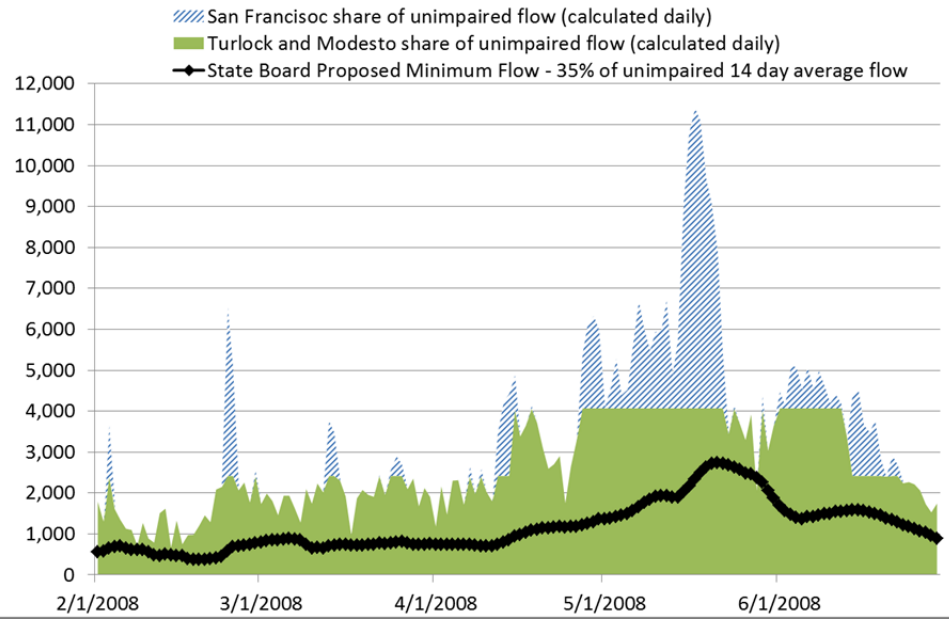
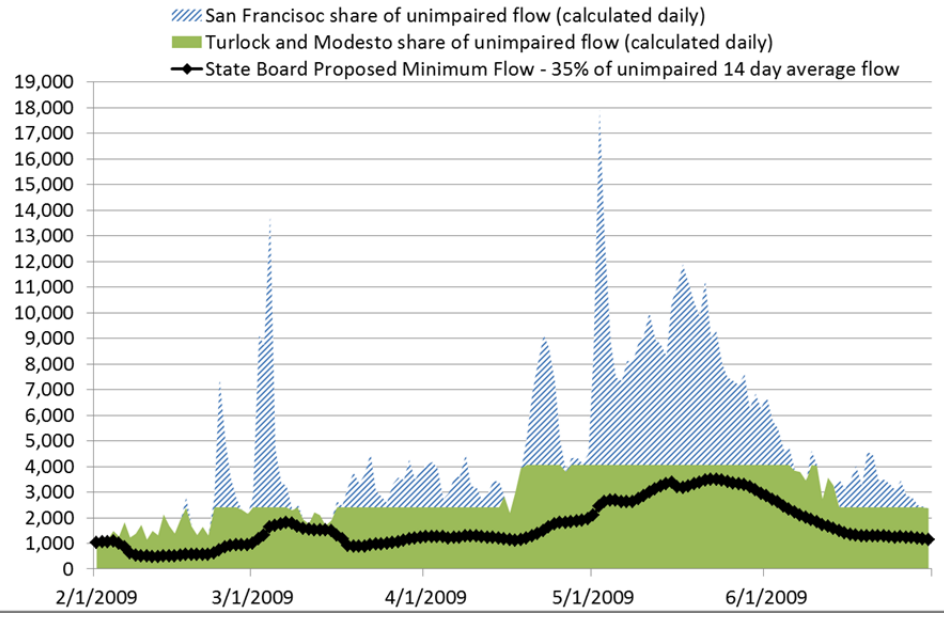


Figure A-39: (water year 2009)

Tuolumne Water Rights Distribution and SWRCB Proposed Flow Requirements

(flows in cubic feet per second)



Data for Hetch Hetchy restoration scenario w

			Don Pedro			
Year Type (not really known until Spring)			Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
Average	73	Average	1537	622	330	585
Maximum		Maximum	4419	1959	967	1492
Minimum		Minimum	261	62	69	130
Wet	20	Wet	2604	1128	539	938
Above Normal	14	Above Normal	1835	756	402	677
Below Normal	12	Below Normal	1243	457	276	510
Dry	11	Dry	855	308	197	350
Critical	16	Critical	632	211	140	280
5		1922	2277	975	506	796
4		1923	1534	655	355	524
1		1924	373	118	82	173
3		1925	1557	589	298	670
2		1926	886	295	199	392
4		1927	1749	668	369	711
3		1928	1301	535	297	468
1		1929	711	234	125	352
1		1930	943	295	213	435
1		1931	432	122	101	209
4		1932	1819	752	365	702
2		1933	817	286	127	404
1		1934	584	218	126	240
4		1935	1799	713	400	685
4		1936	1895	776	389	730
5		1937	1735	751	318	667
5		1938	3159	1429	619	1111
2		1939	776	299	199	279

4		1940	1930	842	390	699
5		1941	2242	930	447	864
5		1942	2125	765	502	858
5		1943	2123	899	465	760
3		1944	1038	375	229	434
4		1945	1802	688	415	700
4		1946	1636	595	420	621
2		1947	829	272	192	365
3		1948	1076	366	205	505
3		1949	990	350	184	456
3		1950	1245	421	271	553
4		1951	2229	907	491	831
5		1952	2698	1192	546	961
3		1953	1311	448	336	527
3		1954	1179	457	262	460
2		1955	833	307	158	368
5		1956	2855	1199	568	1087
3		1957	1192	387	315	490
5		1958	2339	1044	458	837
2		1959	770	269	207	294
1		1960	818	293	161	363
1		1961	510	155	80	275
3		1962	1485	537	307	641
4		1963	1792	759	327	706
2		1964	882	319	235	328
5		1965	2420	1046	505	870
3		1966	1120	460	280	379
5		1967	2783	1272	548	962
2		1968	826	289	213	323
5		1969	3529	1704	653	1172
4		1970	1743	791	399	554
3		1971	1419	559	328	532
2		1972	947	373	204	370
4		1973	1754	783	327	644
5		1974	1986	766	464	756
5		1975	1791	784	356	650
1		1976	475	180	129	165
1		1977	261	62	69	130
5		1978	2465	1076	430	958
4		1979	1720	739	402	578
5		1980	2740	1131	641	968
2		1981	859	315	201	343
5		1982	3465	1633	710	1122
5		1983	4419	1959	967	1492
4		1984	2282	911	576	796

2		1985	981	368	234	379
5		1986	2671	1092	592	987
1		1987	472	150	105	217
1		1988	588	222	102	264
1		1989	1082	282	283	518
1		1990	657	184	206	266
1		1991	895	325	189	381
1		1992	648	234	154	261
5		1993	2263	908	476	879
1		1994	663	304	122	236

			Don Pedro			
Year Type (not really known until Spring)	Month	Year and Month	Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
	10	October	11	6	2	4
	11	November	30	18	3	9
	12	December	65	44	5	15
	1	January	91	67	10	15
	2	February	121	92	11	18
	3	March	151	104	24	23
	4	April	210	110	35	65
	5	May	380	102	86	193
	6	June	313	49	83	180
	7	July	104	18	33	53
	8	August	32	7	19	7
	9	September	27	4	20	4

Data for Hetch Hetchy restoration scenario w

			Don Pedro

Year Type (not really known until Spring)	Month	Year and Month	Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
5	10	October-21	7	5	1	1
5	11	November-21	7	5	1	1
5	12	December-21	50	45	1	5
5	1	January-22	49	43	1	5
5	2	February-22	206	162	32	12
5	3	March-22	204	132	59	12
5	4	April-22	231	144	49	37
5	5	May-22	613	235	109	268
5	6	June-22	684	157	163	363
5	7	July-22	170	33	54	84
5	8	August-22	31	8	18	5
5	9	September-22	28	6	19	4
4	10	October-22	10	7	1	2
4	11	November-22	24	19	1	4
4	12	December-22	93	81	1	11
4	1	January-23	92	80	1	11
4	2	February-23	59	50	1	9
4	3	March-23	68	56	5	7
4	4	April-23	217	134	47	35
4	5	May-23	485	132	136	217
4	6	8582.00	289	56	87	146
4	7	July-23	133	21	41	72
4	8	August-23	34	11	18	5
4	9	September-23	32	8	19	5
1	10	October-23	10	4	1	5
1	11	November-23	9	6	1	2
1	12	December-23	10	6	1	4
1	1	January-24	18	12	1	5
1	2	February-24	23	15	1	7
1	3	March-24	21	13	1	7
1	4	April-24	66	35	1	30
1	5	May-24	129	28	2	100
1	6	June-24	24	0	17	6
1	7	July-24	31	7	19	5
1	8	August-24	17	-4	19	2
1	9	September-24	16	-3	20	-1
3	10	October-24	7	3	1	3

3	11	November-24	18	12	1	4
3	12	December-24	22	16	1	5
3	1	January-25	25	19	1	5
3	2	February-25	177	144	1	33
3	3	March-25	99	78	1	21
3	4	April-25	258	160	20	79
3	5	May-25	498	110	127	261
3	6	June-25	322	35	86	201
3	7	July-25	87	14	24	50
3	8	August-25	21	-2	18	5
3	9	September-25	23	0	19	4
2	10	October-25	5	-1	1	5
2	11	November-25	7	2	1	4
2	12	December-25	12	7	1	5
2	1	January-26	12	7	1	5
2	2	February-26	80	68	1	11
2	3	March-26	67	42	1	24
2	4	April-26	296	105	49	143
2	5	May-26	278	50	74	154
2	6	June-26	59	14	15	30
2	7	July-26	28	4	19	5
2	8	August-26	21	-2	18	4
2	9	September-26	20	-1	19	2
4	10	October-26	6	3	1	3
4	11	November-26	37	32	1	4
4	12	December-26	29	23	1	6
4	1	January-27	40	34	1	5
4	2	February-27	178	145	1	32
4	3	March-27	132	83	25	24
4	4	April-27	301	190	51	60
4	5	May-27	398	100	88	210
4	6	June-27	446	26	130	290
4	7	July-27	122	18	35	68
4	8	August-27	30	7	18	5
4	9	September-27	30	7	19	4
3	10	October-27	7	1	1	5
3	11	November-27	35	23	1	11
3	12	December-27	27	22	1	5
3	1	January-28	28	23	1	5
3	2	February-28	60	52	1	7
3	3	March-28	314	185	71	58
3	4	April-28	208	125	31	52
3	5	May-28	422	72	108	242
3	6	June-28	123	25	27	71
3	7	July-28	30	6	19	5

3	8	August-28	25	2	18	5
3	9	September-28	22	0	19	3
1	10	October-28	-1	-4	1	2
1	11	November-28	4	2	1	1
1	12	December-28	13	8	1	5
1	1	January-29	14	9	1	4
1	2	February-29	32	24	1	7
1	3	March-29	47	36	1	10
1	4	April-29	81	56	1	24
1	5	May-29	261	75	6	180
1	6	June-29	198	35	57	107
1	7	July-29	31	7	19	5
1	8	August-29	21	-2	18	5
1	9	September-29	10	-12	19	3
1	10	October-29	3	-2	1	3
1	11	November-29	1	0	1	1
1	12	December-29	10	4	1	5
1	1	January-30	24	18	1	5
1	2	February-30	39	30	1	9
1	3	March-30	103	73	1	30
1	4	April-30	158	74	9	75
1	5	May-30	257	58	78	122
1	6	June-30	265	31	67	167
1	7	July-30	40	11	17	12
1	8	August-30	26	3	18	5
1	9	September-30	17	-5	19	2
1	10	October-30	8	2	1	5
1	11	November-30	13	8	1	4
1	12	December-30	8	4	1	4
1	1	January-31	18	12	1	5
1	2	February-31	29	21	1	7
1	3	March-31	27	19	1	7
1	4	April-31	76	25	1	50
1	5	May-31	155	26	22	107
1	6	June-31	32	4	16	12
1	7	July-31	25	1	19	5
1	8	August-31	20	-2	19	2
1	9	September-31	21	1	20	1
4	10	October-31	2	0	1	1
4	11	November-31	5	2	1	2
4	12	December-31	82	76	1	5
4	1	January-32	58	49	1	8
4	2	February-32	202	175	1	27
4	3	March-32	104	84	1	18
4	4	April-32	197	99	50	48

4	5	May-32	447	148	92	206
4	6	June-32	503	64	141	298
4	7	July-32	151	32	40	79
4	8	August-32	39	16	18	5
4	9	September-32	29	7	19	4
2	10	October-32	6	2	1	3
2	11	November-32	3	0	1	3
2	12	December-32	10	6	1	3
2	1	January-33	23	18	1	5
2	2	February-33	26	19	1	7
2	3	March-33	49	41	1	7
2	4	April-33	83	49	1	33
2	5	May-33	146	62	2	82
2	6	June-33	361	58	65	238
2	7	July-33	55	22	18	15
2	8	August-33	31	8	18	5
2	9	September-33	22	1	19	3
1	10	October-33	-1	-5	1	3
1	11	November-33	7	3	1	3
1	12	December-33	24	18	1	5
1	1	January-34	41	36	1	5
1	2	February-34	63	51	1	11
1	3	March-34	78	48	1	29
1	4	April-34	108	37	5	66
1	5	May-34	127	19	40	68
1	6	June-34	69	11	21	36
1	7	July-34	23	-1	19	5
1	8	August-34	23	0	18	5
1	9	September-34	23	0	19	4
4	10	October-34	9	4	1	4
4	11	November-34	16	11	1	4
4	12	December-34	24	19	1	5
4	1	January-35	80	64	1	15
4	2	February-35	66	52	1	14
4	3	March-35	121	78	31	12
4	4	April-35	403	261	55	87
4	5	May-35	461	149	101	210
4	6	June-35	482	50	142	289
4	7	July-35	85	19	31	35
4	8	August-35	30	7	18	5
4	9	September-35	22	-1	19	4
4	10	October-35	9	5	1	4
4	11	November-35	14	9	1	4
4	12	December-35	14	10	1	4
4	1	January-36	71	66	1	5

4	2	February-36	315	282	1	33
4	3	March-36	169	108	27	35
4	4	April-36	329	150	69	110
4	5	May-36	466	85	122	258
4	6	June-36	360	40	105	215
4	7	July-36	98	20	25	54
4	8	August-36	28	5	18	5
4	9	September-36	21	-1	19	3
5	10	October-36	4	0	1	3
5	11	November-36	8	4	1	3
5	12	December-36	16	10	1	5
5	1	January-37	23	18	1	5
5	2	February-37	229	196	1	32
5	3	March-37	168	147	1	21
5	4	April-37	223	151	22	50
5	5	May-37	573	129	144	300
5	6	June-37	369	64	95	211
5	7	July-37	67	21	15	30
5	8	August-37	31	8	18	5
5	9	September-37	23	2	19	2
5	10	October-37	9	6	1	2
5	11	November-37	14	9	1	4
5	12	December-37	210	114	12	84
5	1	January-38	124	63	48	13
5	2	February-38	350	270	53	27
5	3	March-38	428	332	59	37
5	4	April-38	378	227	62	89
5	5	May-38	616	236	103	277
5	6	June-38	676	99	175	401
5	7	July-38	281	47	67	168
5	8	August-38	42	19	18	5
5	9	September-38	33	9	19	5
2	10	October-38	19	13	1	5
2	11	November-38	20	15	1	4
2	12	December-38	22	16	1	5
2	1	January-39	29	23	1	5
2	2	February-39	43	35	1	7
2	3	March-39	98	60	17	21
2	4	April-39	223	70	54	99
2	5	May-39	190	37	55	99
2	6	June-39	48	16	15	18
2	7	July-39	29	5	19	5
2	8	August-39	24	1	18	5
2	9	September-39	31	7	19	5
4	10	October-39	14	8	1	5

4	11	November-39	13	8	1	4
4	12	December-39	14	10	1	3
4	1	January-40	165	135	1	30
4	2	February-40	211	182	1	28
4	3	March-40	319	212	60	47
4	4	April-40	283	142	58	83
4	5	May-40	508	96	125	287
4	6	June-40	318	34	87	197
4	7	July-40	37	12	19	6
4	8	August-40	27	4	18	5
4	9	September-40	21	-1	19	3
5	10	October-40	12	8	1	3
5	11	November-40	12	8	1	4
5	12	December-40	92	72	1	19
5	1	January-41	92	72	1	19
5	2	February-41	184	157	1	26
5	3	March-41	265	176	59	30
5	4	April-41	267	162	58	47
5	5	May-41	558	170	106	282
5	6	June-41	505	70	133	301
5	7	July-41	200	27	50	123
5	8	August-41	30	7	18	5
5	9	September-41	26	3	19	5
5	10	October-41	7	1	1	4
5	11	November-41	11	6	1	4
5	12	December-41	100	55	1	45
5	1	January-42	148	92	22	33
5	2	February-42	140	98	23	19
5	3	March-42	165	84	59	21
5	4	April-42	298	168	56	75
5	5	May-42	410	155	83	172
5	6	June-42	565	73	157	335
5	7	July-42	229	27	61	141
5	8	August-42	31	8	18	5
5	9	September-42	22	-1	19	4
5	10	October-42	5	1	1	3
5	11	November-42	36	27	1	8
5	12	December-42	51	39	1	11
5	1	January-43	228	169	30	29
5	2	February-43	155	108	28	19
5	3	March-43	358	255	60	43
5	4	April-43	326	142	76	107
5	5	May-43	470	88	125	256
5	6	June-43	323	43	80	200
5	7	July-43	117	17	26	73

5	8	August-43	32	8	18	5
5	9	September-43	23	0	19	5
3	10	October-43	11	5	1	5
3	11	November-43	12	7	1	4
3	12	December-43	15	9	1	5
3	1	January-44	24	19	1	5
3	2	February-44	59	51	1	8
3	3	March-44	88	69	1	18
3	4	April-44	91	63	1	27
3	5	May-44	392	103	99	190
3	6	June-44	237	37	69	131
3	7	July-44	63	12	19	32
3	8	August-44	25	2	18	5
3	9	September-44	21	-2	19	4
4	10	October-44	7	3	1	4
4	11	November-44	43	38	1	4
4	12	December-44	39	34	1	5
4	1	January-45	32	26	1	5
4	2	February-45	266	206	20	40
4	3	March-45	186	111	59	15
4	4	April-45	223	114	42	67
4	5	May-45	397	110	96	190
4	6	June-45	432	38	121	273
4	7	July-45	139	15	36	87
4	8	August-45	23	0	18	5
4	9	September-45	16	-7	19	5
4	10	October-45	17	11	1	5
4	11	November-45	45	25	1	19
4	12	December-45	197	125	32	40
4	1	January-46	112	68	22	22
4	2	February-46	62	39	15	8
4	3	March-46	144	78	45	22
4	4	April-46	281	118	51	111
4	5	May-46	463	88	137	239
4	6	June-46	235	35	63	136
4	7	July-46	38	11	18	9
4	8	August-46	21	-2	18	5
4	9	September-46	21	-2	19	4
2	10	October-46	9	3	1	5
2	11	November-46	31	26	1	4
2	12	December-46	39	33	1	5
2	1	January-47	24	18	1	5
2	2	February-47	48	40	1	7
2	3	March-47	77	58	1	19
2	4	April-47	128	51	19	57

2	5	May-47	327	38	89	199
2	6	June-47	81	7	24	50
2	7	July-47	26	3	19	5
2	8	August-47	18	-5	18	5
2	9	September-47	22	0	19	3
3	10	October-47	10	4	1	5
3	11	November-47	9	4	1	4
3	12	December-47	10	5	1	5
3	1	January-48	15	10	1	5
3	2	February-48	17	9	1	7
3	3	March-48	49	41	1	7
3	4	April-48	138	105	1	32
3	5	May-48	318	111	32	175
3	6	June-48	404	62	111	231
3	7	July-48	63	17	19	27
3	8	August-48	21	-2	18	5
3	9	September-48	21	0	19	2
3	10	October-48	5	2	1	2
3	11	November-48	7	3	1	3
3	12	December-48	14	8	1	5
3	1	January-49	14	8	1	5
3	2	February-49	29	21	1	7
3	3	March-49	99	87	1	11
3	4	April-49	196	96	8	92
3	5	May-49	343	92	58	193
3	6	June-49	210	28	58	125
3	7	July-49	30	6	19	5
3	8	August-49	21	-2	18	5
3	9	September-49	22	1	19	3
3	10	October-49	5	2	1	2
3	11	November-49	9	4	1	4
3	12	December-49	10	5	1	5
3	1	January-50	46	37	1	9
3	2	February-50	93	73	1	19
3	3	March-50	73	63	1	9
3	4	April-50	216	116	5	94
3	5	May-50	423	89	116	218
3	6	June-50	289	27	89	173
3	7	July-50	40	9	19	12
3	8	August-50	23	0	18	5
3	9	September-50	18	-4	19	3
4	10	October-50	12	6	1	5
4	11	November-50	418	187	64	167
4	12	December-50	507	285	98	123
4	1	January-51	153	102	25	27

4	2	February-51	131	84	24	23
4	3	March-51	153	93	35	25
4	4	April-51	195	64	44	87
4	5	May-51	348	59	94	195
4	6	June-51	227	19	53	155
4	7	July-51	42	10	16	16
4	8	August-51	25	2	18	5
4	9	September-51	19	-3	19	3
5	10	October-51	9	6	1	2
5	11	November-51	16	11	1	4
5	12	December-51	91	76	1	15
5	1	January-52	197	178	1	19
5	2	February-52	148	101	28	18
5	3	March-52	257	173	59	25
5	4	April-52	409	236	68	105
5	5	May-52	670	244	114	312
5	6	June-52	564	119	156	289
5	7	July-52	268	25	81	161
5	8	August-52	39	15	19	5
5	9	September-52	31	7	19	5
3	10	October-52	9	5	1	3
3	11	November-52	10	7	1	3
3	12	December-52	38	32	1	5
3	1	January-53	104	78	1	25
3	2	February-53	39	31	1	7
3	3	March-53	83	49	21	13
3	4	April-53	211	86	53	71
3	5	May-53	235	75	73	86
3	6	June-53	384	58	107	220
3	7	July-53	145	19	42	84
3	8	August-53	29	6	18	5
3	9	September-53	23	1	19	4
3	10	October-53	7	5	1	2
3	11	November-53	14	10	1	3
3	12	December-53	18	12	1	5
3	1	January-54	32	27	1	5
3	2	February-54	69	54	1	14
3	3	March-54	139	110	1	28
3	4	April-54	250	124	28	98
3	5	May-54	422	84	123	216
3	6	June-54	155	26	50	79
3	7	July-54	33	9	19	5
3	8	August-54	21	-2	18	5
3	9	September-54	20	-1	19	2
2	10	October-54	5	2	1	2

2	11	November-54	11	8	1	3
2	12	December-54	26	21	1	5
2	1	January-55	48	42	1	5
2	2	February-55	38	30	1	7
2	3	March-55	47	39	1	7
2	4	April-55	72	49	1	21
2	5	May-55	256	83	25	148
2	6	June-55	262	32	71	159
2	7	July-55	29	5	19	5
2	8	August-55	19	-4	18	5
2	9	September-55	21	0	20	1
5	10	October-55	5	3	1	1
5	11	November-55	9	5	1	4
5	12	December-55	515	359	27	130
5	1	January-56	425	308	56	61
5	2	February-56	172	107	45	19
5	3	March-56	184	89	59	36
5	4	April-56	240	106	58	75
5	5	May-56	476	147	90	240
5	6	June-56	552	48	142	362
5	7	July-56	220	17	53	150
5	8	August-56	29	6	18	5
5	9	September-56	28	4	19	5
3	10	October-56	15	9	1	5
3	11	November-56	9	4	1	4
3	12	December-56	15	9	1	5
3	1	January-57	24	19	1	5
3	2	February-57	78	57	1	21
3	3	March-57	105	81	11	13
3	4	April-57	130	48	44	38
3	5	May-57	339	99	96	144
3	6	June-57	375	38	103	234
3	7	July-57	46	12	19	15
3	8	August-57	35	12	18	5
3	9	September-57	21	0	19	2
5	10	October-57	10	5	1	4
5	11	November-57	9	4	1	4
5	12	December-57	23	17	1	5
5	1	January-58	38	33	1	5
5	2	February-58	141	116	1	25
5	3	March-58	261	199	45	18
5	4	April-58	387	271	44	72
5	5	May-58	648	225	113	310
5	6	June-58	544	114	157	273
5	7	July-58	208	38	59	110

5	8	August-58	35	12	18	5
5	9	September-58	33	9	19	5
2	10	October-58	9	6	1	2
2	11	November-58	5	2	1	2
2	12	December-58	5	1	1	3
2	1	January-59	43	38	1	5
2	2	February-59	88	72	1	16
2	3	March-59	60	45	1	13
2	4	April-59	165	50	41	74
2	5	May-59	206	35	67	104
2	6	June-59	109	9	39	61
2	7	July-59	29	5	19	5
2	8	August-59	20	-2	19	3
2	9	September-59	31	7	19	5
1	10	October-59	5	-1	1	5
1	11	November-59	9	5	1	3
1	12	December-59	11	8	1	3
1	1	January-60	20	14	1	5
1	2	February-60	82	73	1	8
1	3	March-60	78	54	1	23
1	4	April-60	139	62	1	75
1	5	May-60	265	54	66	145
1	6	June-60	136	18	33	84
1	7	July-60	26	2	19	5
1	8	August-60	24	1	18	4
1	9	September-60	24	3	19	1
1	10	October-60	6	3	1	2
1	11	November-60	10	5	1	4
1	12	December-60	19	13	1	5
1	1	January-61	14	8	1	5
1	2	February-61	25	17	1	7
1	3	March-61	33	25	1	7
1	4	April-61	88	29	1	57
1	5	May-61	144	31	2	111
1	6	June-61	92	12	17	63
1	7	July-61	29	6	19	5
1	8	August-61	27	4	18	5
1	9	September-61	23	2	19	2
3	10	October-61	5	1	1	3
3	11	November-61	7	3	1	3
3	12	December-61	12	7	1	5
3	1	January-62	12	7	1	5
3	2	February-62	191	163	1	28
3	3	March-62	102	86	1	15
3	4	April-62	269	115	28	126

3	5	May-62	326	83	97	145
3	6	June-62	416	47	115	253
3	7	July-62	92	17	25	50
3	8	August-62	27	4	18	5
3	9	September-62	25	4	19	3
4	10	October-62	13	7	1	5
4	11	November-62	12	8	1	3
4	12	December-62	23	17	1	5
4	1	January-63	65	52	1	12
4	2	February-63	227	147	17	63
4	3	March-63	79	64	1	14
4	4	April-63	224	153	38	33
4	5	May-63	484	161	107	216
4	6	June-63	434	83	96	255
4	7	July-63	155	35	28	92
4	8	August-63	41	18	18	5
4	9	September-63	37	13	19	5
2	10	October-63	14	9	1	4
2	11	November-63	47	31	1	16
2	12	December-63	23	18	1	5
2	1	January-64	36	31	1	5
2	2	February-64	34	26	1	7
2	3	March-64	41	33	1	7
2	4	April-64	107	53	21	33
2	5	May-64	292	63	93	136
2	6	June-64	195	31	62	102
2	7	July-64	35	12	19	5
2	8	August-64	30	7	18	5
2	9	September-64	27	6	19	2
5	10	October-64	9	7	1	1
5	11	November-64	28	23	1	4
5	12	December-64	403	227	31	145
5	1	January-65	280	195	36	49
5	2	February-65	134	87	24	23
5	3	March-65	147	77	52	19
5	4	April-65	277	168	45	64
5	5	May-65	393	127	89	177
5	6	June-65	447	78	126	243
5	7	July-65	203	29	57	116
5	8	August-65	67	17	24	25
5	9	September-65	33	9	19	5
3	10	October-65	8	4	1	3
3	11	November-65	81	69	1	11
3	12	December-65	67	56	2	9
3	1	January-66	67	51	12	5

3	2	February-66	64	53	3	7
3	3	March-66	122	60	43	19
3	4	April-66	239	81	54	104
3	5	May-66	329	53	91	185
3	6	June-66	56	15	17	24
3	7	July-66	34	10	19	5
3	8	August-66	25	1	18	5
3	9	September-66	28	6	19	3
5	10	October-66	10	8	1	2
5	11	November-66	29	24	1	4
5	12	December-66	143	108	1	35
5	1	January-67	109	87	1	22
5	2	February-67	120	67	34	19
5	3	March-67	290	188	61	41
5	4	April-67	305	221	58	26
5	5	May-67	562	244	87	231
5	6	June-67	678	202	153	322
5	7	July-67	448	95	113	240
5	8	August-67	57	20	21	16
5	9	September-67	32	8	19	5
2	10	October-67	12	7	1	4
2	11	November-67	10	5	1	4
2	12	December-67	18	13	1	5
2	1	January-68	29	23	1	5
2	2	February-68	84	59	1	25
2	3	March-68	87	58	17	12
2	4	April-68	129	51	28	49
2	5	May-68	262	43	80	139
2	6	June-68	111	16	29	66
2	7	July-68	28	4	19	5
2	8	August-68	28	5	18	5
2	9	September-68	27	4	19	3
5	10	October-68	7	1	1	5
5	11	November-68	27	14	1	13
5	12	December-68	48	42	1	5
5	1	January-69	545	423	58	64
5	2	February-69	313	236	53	24
5	3	March-69	275	188	59	27
5	4	April-69	435	270	65	100
5	5	May-69	824	285	135	403
5	6	June-69	687	166	170	351
5	7	July-69	292	47	74	171
5	8	August-69	45	22	18	5
5	9	September-69	31	8	19	5
4	10	October-69	22	16	1	5

4	11	November-69	24	19	1	4
4	12	December-69	52	43	1	9
4	1	January-70	402	248	88	67
4	2	February-70	126	86	23	18
4	3	March-70	179	115	36	28
4	4	April-70	105	69	12	24
4	5	May-70	383	85	108	190
4	6	June-70	306	52	78	176
4	7	July-70	71	31	15	25
4	8	August-70	41	18	18	5
4	9	September-70	32	11	19	2
3	10	October-70	12	11	1	0
3	11	November-70	45	40	1	4
3	12	December-70	92	70	1	22
3	1	January-71	85	61	1	22
3	2	February-71	61	45	1	16
3	3	March-71	126	76	37	13
3	4	April-71	145	80	30	35
3	5	May-71	315	85	88	141
3	6	June-71	388	54	106	228
3	7	July-71	86	18	27	42
3	8	August-71	34	11	18	5
3	9	September-71	30	7	19	3
2	10	October-71	10	7	1	2
2	11	November-71	19	14	1	4
2	12	December-71	49	43	1	5
2	1	January-72	40	35	1	5
2	2	February-72	54	46	1	7
2	3	March-72	100	64	1	35
2	4	April-72	82	53	1	28
2	5	May-72	307	58	86	163
2	6	June-72	189	25	56	108
2	7	July-72	35	11	19	5
2	8	August-72	32	11	19	2
2	9	September-72	30	7	19	5
4	10	October-72	10	4	1	5
4	11	November-72	23	18	1	4
4	12	December-72	41	35	1	5
4	1	January-73	114	93	1	21
4	2	February-73	165	147	1	17
4	3	March-73	138	127	1	11
4	4	April-73	203	109	38	56
4	5	May-73	583	143	137	303
4	6	June-73	370	68	92	211
4	7	July-73	43	18	19	6

4	8	August-73	35	12	18	5
4	9	September-73	29	9	20	0
5	10	October-73	15	12	1	2
5	11	November-73	87	42	1	44
5	12	December-73	103	73	1	29
5	1	January-74	169	98	37	33
5	2	February-74	62	37	17	8
5	3	March-74	226	135	59	31
5	4	April-74	250	141	58	51
5	5	May-74	496	121	115	260
5	6	June-74	412	58	108	246
5	7	July-74	98	24	30	44
5	8	August-74	35	12	18	5
5	9	September-74	33	12	20	0
5	10	October-74	18	16	1	1
5	11	November-74	12	11	1	1
5	12	December-74	24	18	1	5
5	1	January-75	33	28	1	5
5	2	February-75	122	106	1	15
5	3	March-75	183	157	4	22
5	4	April-75	171	108	47	16
5	5	May-75	479	171	92	216
5	6	June-75	549	117	133	299
5	7	July-75	127	25	40	62
5	8	August-75	40	17	18	5
5	9	September-75	32	10	19	3
1	10	October-75	24	18	1	6
1	11	November-75	30	20	1	10
1	12	December-75	21	15	1	5
1	1	January-76	5	-1	1	5
1	2	February-76	24	16	1	7
1	3	March-76	35	27	1	7
1	4	April-76	40	28	1	10
1	5	May-76	172	28	50	94
1	6	June-76	32	8	17	6
1	7	July-76	30	6	19	5
1	8	August-76	32	9	18	5
1	9	September-76	30	6	19	5
1	10	October-76	9	3	1	5
1	11	November-76	8	5	1	2
1	12	December-76	4	2	1	1
1	1	January-77	8	6	1	2
1	2	February-77	10	6	1	4
1	3	March-77	14	6	1	7
1	4	April-77	25	9	1	14

1	5	May-77	46	15	2	29
1	6	June-77	68	7	5	56
1	7	July-77	24	0	19	5
1	8	August-77	23	2	19	2
1	9	September-77	22	1	19	2
5	10	October-77	4	2	1	1
5	11	November-77	8	4	1	3
5	12	December-77	40	35	1	5
5	1	January-78	153	121	1	31
5	2	February-78	165	135	1	30
5	3	March-78	259	202	3	55
5	4	April-78	316	205	55	57
5	5	May-78	502	188	91	223
5	6	June-78	618	115	154	350
5	7	July-78	285	30	68	188
5	8	August-78	42	15	17	9
5	9	September-78	72	25	41	7
4	10	October-78	11	5	1	4
4	11	November-78	24	19	1	4
4	12	December-78	20	14	1	5
4	1	January-79	112	92	1	19
4	2	February-79	139	110	12	16
4	3	March-79	243	153	59	31
4	4	April-79	211	112	51	48
4	5	May-79	574	151	144	278
4	6	June-79	285	49	77	159
4	7	July-79	46	19	18	8
4	8	August-79	31	8	18	5
4	9	September-79	26	6	20	0
5	10	October-79	14	8	1	5
5	11	November-79	15	10	1	4
5	12	December-79	22	16	1	5
5	1	January-80	462	283	77	103
5	2	February-80	403	280	72	51
5	3	March-80	229	144	59	26
5	4	April-80	253	114	60	79
5	5	May-80	432	140	96	196
5	6	June-80	509	76	146	287
5	7	July-80	322	30	89	204
5	8	August-80	41	16	21	5
5	9	September-80	37	14	19	5
2	10	October-80	13	11	1	1
2	11	November-80	6	3	1	2
2	12	December-80	20	14	1	5
2	1	January-81	41	36	1	5

2	2	February-81	30	22	1	7
2	3	March-81	86	71	1	14
2	4	April-81	149	60	18	71
2	5	May-81	303	54	91	159
2	6	June-81	121	19	30	72
2	7	July-81	32	8	19	5
2	8	August-81	33	12	19	2
2	9	September-81	25	5	20	1
5	10	October-81	16	10	1	5
5	11	November-81	81	53	1	27
5	12	December-81	162	100	25	38
5	1	January-82	255	166	59	30
5	2	February-82	364	234	64	66
5	3	March-82	330	245	59	26
5	4	April-82	595	391	80	124
5	5	May-82	673	216	164	292
5	6	June-82	537	103	129	305
5	7	July-82	298	68	67	163
5	8	August-82	60	20	16	24
5	9	September-82	94	26	45	23
5	10	October-82	132	39	62	31
5	11	November-82	157	90	29	38
5	12	December-82	237	160	37	40
5	1	January-83	287	199	59	29
5	2	February-83	344	259	53	32
5	3	March-83	555	444	59	52
5	4	April-83	299	214	58	28
5	5	May-83	597	254	94	248
5	6	June-83	973	193	265	515
5	7	July-83	605	77	171	358
5	8	August-83	185	16	53	116
5	9	September-83	47	15	27	5
4	10	October-83	26	16	5	5
4	11	November-83	293	143	91	59
4	12	December-83	397	256	81	60
4	1	January-84	166	111	31	24
4	2	February-84	142	101	22	18
4	3	March-84	183	102	47	34
4	4	April-84	157	58	40	60
4	5	May-84	498	65	127	305
4	6	June-84	300	41	76	182
4	7	July-84	69	10	18	40
4	8	August-84	30	7	18	5
4	9	September-84	24	1	19	4
2	10	October-84	15	9	1	5

2	11	November-84	37	32	1	4
2	12	December-84	25	20	1	5
2	1	January-85	21	16	1	5
2	2	February-85	47	39	1	7
2	3	March-85	80	72	1	7
2	4	April-85	236	87	55	94
2	5	May-85	316	50	92	174
2	6	June-85	105	15	26	64
2	7	July-85	33	9	19	5
2	8	August-85	32	11	19	3
2	9	September-85	33	10	19	5
5	10	October-85	11	6	1	5
5	11	November-85	27	22	1	4
5	12	December-85	39	33	1	5
5	1	January-86	83	51	19	13
5	2	February-86	596	427	85	84
5	3	March-86	472	284	100	88
5	4	April-86	274	104	61	109
5	5	May-86	511	86	138	287
5	6	June-86	471	37	119	315
5	7	July-86	122	23	31	68
5	8	August-86	32	9	18	5
5	9	September-86	33	10	19	4
1	10	October-86	13	7	1	5
1	11	November-86	6	3	1	2
1	12	December-86	6	5	1	1
1	1	January-87	2	-1	1	3
1	2	February-87	27	19	1	7
1	3	March-87	54	45	1	7
1	4	April-87	93	31	1	61
1	5	May-87	153	22	27	104
1	6	June-87	45	11	14	20
1	7	July-87	28	4	19	5
1	8	August-87	24	4	19	1
1	9	September-87	21	1	20	0
1	10	October-87	7	4	1	2
1	11	November-87	12	7	1	4
1	12	December-87	25	20	1	5
1	1	January-88	51	45	1	6
1	2	February-88	39	31	1	7
1	3	March-88	53	35	1	17
1	4	April-88	87	32	1	54
1	5	May-88	157	27	19	111
1	6	June-88	78	11	20	47
1	7	July-88	32	9	19	5

1	8	August-88	24	2	19	3
1	9	September-88	22	1	19	1
1	10	October-88	2	1	1	0
1	11	November-88	13	11	1	2
1	12	December-88	17	12	1	5
1	1	January-89	19	14	1	5
1	2	February-89	31	23	1	7
1	3	March-89	193	114	24	55
1	4	April-89	255	72	63	120
1	5	May-89	301	28	86	187
1	6	June-89	187	14	50	123
1	7	July-89	20	-4	19	6
1	8	August-89	19	-3	19	4
1	9	September-89	25	2	19	4
1	10	October-89	17	11	1	5
1	11	November-89	8	3	1	4
1	12	December-89	9	4	1	5
1	1	January-90	18	12	1	5
1	2	February-90	36	28	1	7
1	3	March-90	97	50	27	20
1	4	April-90	168	47	43	79
1	5	May-90	162	23	53	86
1	6	June-90	80	12	23	46
1	7	July-90	23	0	19	5
1	8	August-90	19	-3	19	3
1	9	September-90	18	-2	20	1
1	10	October-90	0	-2	1	0
1	11	November-90	9	7	1	2
1	12	December-90	5	3	1	1
1	1	January-91	4	3	1	0
1	2	February-91	6	3	1	2
1	3	March-91	108	83	1	24
1	4	April-91	99	64	1	33
1	5	May-91	272	81	56	135
1	6	June-91	278	41	73	164
1	7	July-91	53	22	16	15
1	8	August-91	36	14	19	4
1	9	September-91	26	5	19	1
1	10	October-91	14	10	1	3
1	11	November-91	9	4	1	4
1	12	December-91	11	6	1	5
1	1	January-92	16	10	1	5
1	2	February-92	73	53	1	19
1	3	March-92	71	51	1	19
1	4	April-92	170	55	34	81

1	5	May-92	170	26	43	101
1	6	June-92	36	9	16	10
1	7	July-92	29	6	19	5
1	8	August-92	27	4	18	5
1	9	September-92	23	2	19	2
5	10	October-92	8	3	1	4
5	11	November-92	10	5	1	4
5	12	December-92	29	23	1	5
5	1	January-93	203	170	1	32
5	2	February-93	123	105	8	9
5	3	March-93	288	183	63	42
5	4	April-93	280	137	61	82
5	5	May-93	557	147	124	287
5	6	June-93	494	75	131	288
5	7	July-93	202	36	50	116
5	8	August-93	38	15	18	5
5	9	September-93	32	9	19	5
1	10	October-93	12	6	1	5
1	11	November-93	5	3	1	2
1	12	December-93	14	9	1	4
1	1	January-94	18	13	1	4
1	2	February-94	43	35	1	7
1	3	March-94	70	62	1	7
1	4	April-94	117	80	1	36
1	5	May-94	205	64	32	109
1	6	June-94	92	17	29	47
1	7	July-94	29	5	19	5
1	8	August-94	30	7	18	5
1	9	September-94	27	4	19	5

/ith Cherry Intertie

Diversion to San Francisco			
Total Diverion to SF Bay Area	River flow for CU	River flow for local storage	Storage release from Cherry
246	132	17	98
298	206	22	166
172	55	6	2
243	160	14	69
252	146	17	88
267	134	17	116
274	126	18	129
212	86	19	106
240	125	15	100
241	140	18	82
246	70	20	156
282	169	18	95
271	109	17	145
250	156	17	77
259	133	15	110
223	95	19	109
182	84	16	82
197	67	20	109
265	140	19	106
294	114	19	162
234	100	18	116
272	168	16	89
260	130	17	112
261	117	13	131
227	153	12	62
269	139	18	112

Data for existing system scenario

Don Pedro			
Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
1520	622	428	471
4416	1959	969	1488
240	62	108	70
2586	1128	641	817
1818	756	490	572
1227	457	383	387
863	308	286	269
600	211	237	152
2203	975	554	674
1535	655	443	437
356	118	150	87
1523	589	481	454
875	295	291	289
1744	668	493	583
1284	535	367	382
705	234	264	208
857	295	310	252
382	122	178	82
1740	752	497	491
812	286	277	250
579	218	225	136
1753	713	516	524
1892	776	501	615
1732	751	444	537
3149	1429	714	1005
800	299	241	260

250	134	13	103
217	131	8	77
226	147	15	65
247	160	18	69
259	133	17	109
268	165	17	86
251	171	19	61
288	156	17	114
295	147	18	130
276	95	15	166
272	136	18	118
243	146	17	81
237	155	13	68
240	133	17	90
270	113	16	141
281	128	17	135
245	152	19	75
264	138	18	109
243	149	6	88
256	122	18	116
244	97	19	128
199	80	20	99
271	124	17	130
240	117	14	109
267	138	19	110
248	171	16	61
259	133	19	108
239	170	13	56
257	116	17	124
253	179	17	56
243	146	18	80
255	154	18	83
291	135	19	137
248	143	15	90
229	146	14	69
237	120	12	105
231	108	19	103
201	55	22	124
245	186	15	44
250	129	17	104
252	165	16	71
252	95	16	141
240	206	12	22
207	197	8	2
240	165	18	57

1891	842	520	529
2244	930	550	764
2122	765	565	792
2118	899	529	690
1041	375	331	335
1794	688	510	597
1626	595	469	563
831	272	278	281
1081	366	367	348
969	350	325	294
1250	421	411	417
2222	907	569	745
2706	1192	656	859
1302	448	396	458
1169	457	377	334
830	307	298	226
2862	1199	691	972
1175	387	379	409
2352	1044	597	711
809	269	282	258
750	293	275	182
470	155	197	118
1419	537	442	441
1775	759	439	577
917	319	321	278
2403	1046	630	727
1096	460	309	327
2790	1272	682	836
837	289	256	291
3505	1704	774	1027
1744	791	449	504
1414	559	416	439
941	373	305	263
1740	783	441	516
1998	766	551	681
1785	784	461	540
486	180	193	112
240	62	108	70
2350	1076	660	614
1715	739	442	534
2740	1131	748	861
864	315	275	274
3453	1633	828	993
4416	1959	969	1488
2277	911	575	791

284	139	19	126
262	175	15	72
229	78	20	131
199	107	20	72
200	96	21	83
199	99	20	80
189	71	17	101
172	69	17	86
298	196	22	80
250	106	21	123

975	368	322	285
2669	1092	712	865
462	150	184	127
545	222	202	121
954	282	391	282
635	184	271	180
801	325	304	172
703	234	325	145
2117	908	500	709
672	304	214	154

Diversion to San Francisco			
Total Diverion to SF Bay Area	River flow for CU	River flow for local storage	Storage release from Cherry
23	2	0	20
16	5	0	10
14	6	0	8
12	6	0	5
9	6	0	3
17	11	5	1
25	17	8	0
23	22	2	0
27	26	1	0
26	21	0	6
27	8	0	19
27	2	0	25

Don Pedro			
Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
21	6	9	6
38	18	12	7
110	44	37	28
131	67	33	31
173	92	36	44
202	104	45	53
205	110	55	39
232	102	73	57
258	49	69	139
99	18	28	53
26	7	12	7
28	4	18	5

/ith Cherry Intertie

Data for existing system scenario

Diversion to San Francisco

Don Pedro

Total Diverion to SF Bay Area	River flow for CU	River flow for local storage	Storage release from Cherry
28	0	0	28
15	0	0	15
9	0	0	9
9	8	0	1
4	3	0	0
15	10	5	0
22	14	8	0
24	23	1	0
29	28	1	0
28	28	1	0
28	11	0	17
29	0	0	29
23	0	0	23
14	0	0	13
7	7	0	0
7	7	0	0
7	7	0	0
16	9	6	0
28	19	9	0
25	24	1	0
29	28	1	0
28	28	1	0
28	9	0	20
29	3	0	26
20	11	0	10
15	0	0	15
16	0	0	16
13	1	0	12
15	3	0	12
15	6	0	9
29	16	12	0
28	20	8	0
24	8	0	16
24	5	0	19
23	0	0	23
24	0	0	24
25	0	0	25

Total Inflow	Don Pedro Local Inflow	Inflow From Cherry & Eleanor	Don Pedro Inflow from Hetch Hetchy
14	5	4	5
10	5	1	4
81	45	3	34
119	43	30	45
289	162	53	74
199	132	59	7
210	144	58	7
399	235	107	56
660	157	153	349
169	33	54	82
25	8	13	5
29	6	19	5
18	7	5	5
28	19	5	4
139	81	31	27
184	80	59	45
135	50	32	54
135	56	9	70
199	134	58	7
275	132	87	56
225	56	81	88
132	21	41	70
27	11	12	5
37	8	24	5
22	4	13	5
13	6	2	4
22	6	10	5
19	12	2	5
34	15	11	7
49	13	29	7
91	35	32	25
54	28	19	7
9	0	3	6
18	7	6	5
11	-4	10	5
16	-3	14	5
20	3	13	5

19	12	0	8
19	12	0	7
20	9	0	11
7	7	0	0
25	17	7	0
27	19	8	0
25	24	1	0
29	28	1	0
28	28	1	0
28	14	0	15
29	0	0	29
25	3	0	22
19	3	0	16
19	8	0	11
20	1	0	19
6	6	0	0
17	9	8	0
26	18	7	0
25	24	1	0
29	28	1	0
28	8	0	20
28	0	0	28
29	0	0	29
25	0	0	25
16	13	0	3
14	13	1	0
10	10	0	0
6	6	0	0
15	8	7	0
25	18	7	0
25	24	1	0
29	28	1	0
28	28	1	0
28	9	0	19
29	0	0	29
25	0	0	25
18	17	1	0
11	8	0	3
14	10	0	4
14	8	0	6
13	8	5	0
25	18	7	0
25	24	1	0
29	28	1	0
28	12	0	15

29	12	12	4
80	16	59	5
80	19	56	5
184	144	27	13
195	78	59	58
227	160	60	7
276	110	77	90
297	35	60	202
93	14	24	55
17	-2	14	5
25	0	20	5
15	-1	11	5
11	2	4	4
22	7	10	5
29	7	17	5
112	68	10	33
155	42	40	73
237	105	74	58
189	50	74	65
55	14	15	26
16	4	7	5
13	-2	10	5
21	-1	17	5
12	3	4	5
53	32	17	4
61	23	31	8
89	34	2	53
266	145	53	67
209	83	59	67
255	190	58	7
235	100	76	59
388	26	127	235
120	18	35	67
24	7	12	5
32	7	19	5
19	1	13	5
54	23	27	4
61	22	9	30
63	23	14	26
112	52	16	44
350	185	88	77
242	125	58	60
215	72	81	61
111	25	27	59
19	6	8	5

28	0	0	28
29	0	0	29
20	0	0	20
11	0	0	11
8	0	0	8
10	0	0	10
13	0	0	13
19	12	8	0
25	16	8	0
21	20	1	0
25	24	1	0
23	22	0	0
23	1	0	22
24	0	0	24
16	0	0	16
11	0	0	11
13	1	0	12
12	5	0	7
9	9	0	0
8	3	5	0
21	13	8	0
17	16	1	0
20	19	1	0
18	18	1	0
18	1	0	17
18	0	0	18
16	0	0	16
11	1	0	10
13	0	0	13
12	1	0	10
12	3	0	9
15	12	3	0
24	13	11	0
20	16	5	0
20	19	1	0
18	3	0	15
18	0	0	18
18	0	0	18
25	0	0	25
19	0	0	19
16	3	0	13
8	8	0	0
6	6	0	0
23	16	7	0
28	20	8	0

17	2	10	5
21	0	16	5
6	-4	5	5
8	2	2	4
18	8	5	5
17	9	3	5
39	24	7	7
130	36	34	59
165	56	58	51
144	75	62	7
134	35	50	49
22	7	10	5
13	-2	10	5
10	-12	17	5
7	-2	4	5
5	0	1	4
68	4	59	5
55	18	32	5
68	30	30	7
160	73	14	73
169	74	46	49
161	58	46	57
100	31	37	31
28	11	12	5
18	3	11	5
19	-5	19	5
13	2	6	5
16	8	4	4
68	4	59	5
48	12	31	5
42	21	13	7
34	19	7	7
56	25	11	20
51	26	17	7
11	4	1	6
8	1	2	5
13	-2	10	5
22	1	16	5
9	0	4	5
8	2	1	4
126	76	45	5
113	49	59	5
261	175	53	33
202	84	59	58
164	99	58	7

25	24	1	0
29	28	1	0
28	28	1	0
28	8	0	20
29	0	0	29
25	0	0	25
19	0	0	19
19	0	0	19
20	0	0	20
18	0	0	18
18	13	0	4
30	20	10	0
31	24	7	0
29	28	1	0
28	28	1	0
28	1	0	27
29	0	0	29
20	0	0	20
15	0	0	15
16	2	0	14
11	9	0	3
9	9	0	0
21	14	7	0
25	16	8	0
21	20	1	0
25	24	1	0
23	6	0	17
23	1	0	23
24	0	0	24
25	0	0	25
19	13	0	6
19	12	0	7
9	9	0	0
17	17	0	0
20	14	7	0
24	17	6	0
24	24	0	0
29	28	1	0
28	28	1	0
28	7	0	21
29	0	0	29
25	0	0	25
19	1	0	19
18	0	0	18
13	12	0	1

288	148	83	56
355	64	62	230
150	32	40	78
32	16	12	5
31	7	19	5
12	2	4	5
5	0	1	4
12	6	1	5
25	18	3	5
63	19	34	11
139	41	35	64
156	49	58	49
116	62	46	7
184	58	52	74
51	22	14	15
24	8	10	5
25	1	19	5
6	-5	5	5
9	3	1	4
74	18	51	5
50	36	9	5
65	51	7	7
114	48	46	20
131	37	34	60
46	19	19	8
36	11	19	6
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85	25	33	27
23	11	7	5
25	11	9	5
25	7	13	5
15	4	6	5
27	18	5	4
99	35	59	5
191	93	59	39
275	147	53	74
255	127	59	68
174	109	58	7
314	143	86	85
304	68	26	211
34	18	9	7

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22	0	0	22
12	11	1	0
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10	10	0	0
14	9	5	0
20	14	6	0
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29	28	1	0
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28	11	0	17
29	0	0	29
22	0	0	22
14	0	0	14
14	4	0	10
14	8	0	6
5	5	0	0
12	10	3	0
19	12	7	0
23	23	0	0
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28	3	0	25
29	0	0	29
18	17	1	0
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12	1	0	12
15	3	0	12
15	14	0	0
27	16	10	0
28	20	8	0
24	19	0	5
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23	1	0	22
24	0	0	24
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13	0	0	13
13	0	0	13
12	0	0	12
12	1	0	11
26	13	13	0

26	12	9	5
26	9	12	5
24	12	7	5
112	42	65	4
217	73	59	84
238	98	59	80
140	37	31	72
233	135	30	68
206	141	58	7
270	121	88	60
397	58	100	239
103	24	30	50
27	12	11	5
31	12	13	5
23	16	2	5
16	11	1	4
44	18	5	21
75	28	9	37
200	106	31	63
285	157	59	69
173	108	58	7
270	171	92	7
506	117	135	254
127	25	40	61
33	17	12	5
34	10	19	5
55	18	32	5
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37	15	17	5
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28	16	5	7
62	27	28	7
110	28	32	50
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32	6	20	5
16	3	7	5
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14	6	1	7
21	9	5	7

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14	0	0	14
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11	0	6	5
17	2	10	5
20	1	14	5
10	2	3	5
11	4	3	4
72	35	32	5
185	121	59	5
196	135	53	7
268	202	59	7
270	205	58	7
349	188	100	60
591	115	167	310
284	30	68	186
41	15	16	10
74	25	42	7
18	5	4	9
26	19	3	4
95	14	6	75
152	92	30	30
237	110	53	74
283	153	59	71
219	112	58	49
309	151	104	54
275	49	77	149
43	19	15	9
25	8	12	5
32	6	21	5
29	8	16	5
26	10	11	4
107	16	19	71
490	283	139	68
419	280	61	78
278	144	59	75
231	114	62	54
307	140	105	62
453	76	146	231
321	30	89	202
39	16	18	5
41	14	22	5
17	11	1	5
9	3	1	4
22	14	3	5
55	36	5	15

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25	24	1	0
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25	3	0	22
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27	19	8	0
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29	28	1	0
28	28	1	0
28	8	0	20
29	0	0	29
25	3	0	23

82	22	32	28
182	71	34	76
179	60	63	56
187	54	69	64
51	19	25	6
22	8	9	5
30	12	13	5
31	5	21	5
30	10	14	5
123	53	65	4
236	100	65	72
308	166	59	83
372	234	67	70
373	245	59	69
484	391	85	7
539	216	156	166
537	103	129	306
297	68	67	162
65	20	16	29
89	26	45	18
166	39	62	65
156	90	29	38
301	160	59	82
342	199	59	84
390	259	53	78
585	444	59	82
335	214	58	64
356	254	93	9
948	193	244	511
604	77	171	356
184	16	53	115
50	15	29	6
58	16	13	29
292	143	91	59
421	256	81	84
250	111	59	80
227	101	53	72
234	102	59	73
168	58	58	53
237	65	69	103
269	41	45	183
74	10	18	45
22	7	11	5
24	1	18	5
27	9	13	5

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19	8	0	11
17	8	0	9
15	8	0	7
21	14	7	0
28	20	8	0
25	24	1	0
29	28	1	0
28	8	0	20
28	0	0	28
29	1	0	29
25	9	0	16
19	8	0	11
21	19	2	0
20	20	1	0
3	3	0	0
13	10	3	0
22	15	7	0
24	23	1	0
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28	13	0	15
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18	2	0	15
10	0	0	10
11	0	0	11
12	0	0	12
14	2	0	12
14	12	0	2
28	16	11	0
27	20	7	0
25	24	1	0
23	1	0	22
23	0	0	23
24	0	0	24
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11	8	0	4
13	9	0	4
15	13	2	0
12	11	0	1
20	12	8	0
21	13	8	0
17	16	1	0
20	19	1	0
18	7	0	11

58	32	21	4
59	20	34	5
59	16	31	12
80	39	8	34
174	72	34	69
205	87	64	54
171	50	57	64
60	15	23	23
22	9	8	5
27	11	11	5
33	10	19	5
26	6	15	5
36	22	9	4
148	33	59	56
142	51	33	58
606	427	107	71
460	284	105	71
233	104	67	62
363	86	131	147
471	37	119	315
121	23	31	66
26	9	12	5
38	10	22	5
20	7	8	5
9	3	1	4
12	5	2	5
6	-1	3	5
37	19	11	7
83	45	25	12
150	31	60	60
63	22	33	7
26	11	9	6
15	4	6	5
20	4	11	5
22	1	16	5
17	4	8	5
16	7	5	4
70	20	45	5
108	45	59	5
66	31	28	7
48	35	6	7
102	32	12	58
51	27	17	7
19	11	1	6
16	9	2	5

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18	0	0	18
16	0	0	16
11	0	0	11
13	0	0	12
13	7	0	6
12	11	0	1
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21	13	8	0
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18	0	0	18
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13	6	0	7
12	6	0	6
21	12	9	0
21	13	8	0
17	16	1	0
20	19	1	0
18	11	0	7
18	0	0	18
18	0	0	18
16	0	0	16
11	0	0	11
13	0	0	13
13	0	0	13
12	0	0	12
12	6	6	0
21	13	8	0
17	16	1	0
20	19	1	0
18	18	0	0
18	0	0	18
18	0	0	18
16	0	0	16
11	6	0	5
13	2	0	11
12	3	0	9
0	0	0	0
9	2	7	0
20	12	8	0

11	2	3	5
21	1	15	5
10	1	5	5
21	11	6	4
49	12	32	5
50	14	32	5
63	23	32	7
219	114	49	56
192	72	69	51
165	28	70	67
130	14	50	66
11	-4	10	5
13	-3	11	5
32	2	25	5
48	11	32	5
15	3	8	4
41	4	32	5
49	12	32	5
67	28	31	7
115	50	16	48
136	47	28	62
76	23	32	22
53	12	35	6
12	0	7	5
4	-3	2	5
20	-2	17	5
9	-2	6	5
12	7	1	4
40	3	32	5
27	3	19	5
11	3	1	7
110	83	17	10
175	64	58	53
147	81	59	7
171	41	70	60
50	22	23	5
22	14	3	5
28	5	17	5
22	10	6	5
15	4	7	4
42	6	32	5
47	10	32	5
92	53	32	7
129	51	52	26
171	55	52	63

17	16	1	0
20	19	1	0
18	6	0	11
18	3	0	15
18	0	0	18
25	0	0	25
19	0	0	19
19	6	0	13
22	20	2	0
18	18	0	0
26	18	8	0
28	20	8	0
25	24	1	0
29	28	1	0
28	28	1	0
28	28	0	0
29	7	0	22
20	2	0	19
15	0	0	15
16	0	0	16
16	0	0	16
15	2	0	13
16	15	0	0
28	16	12	0
27	20	7	0
25	24	1	0
23	16	0	7
23	10	0	13
24	0	0	24

98	26	65	7
51	9	36	6
15	6	5	5
13	4	4	5
8	2	2	5
11	3	3	5
13	5	3	4
62	23	34	5
280	170	67	43
184	105	17	62
296	183	61	52
193	137	49	7
328	147	65	117
478	75	114	289
210	36	60	115
26	15	6	5
35	9	21	5
19	6	7	5
12	3	5	4
27	9	13	5
33	13	15	5
63	35	21	7
126	62	29	35
175	80	36	60
107	64	31	12
37	17	13	6
22	5	12	5
25	7	13	5
27	4	19	5

Diversion to San Francisco		
Total Diverion to SF Bay Area	Hetch Hetchy release for CU	Hetch Hetchy release local storage
259	242	17
297	276	23
206	198	7
242	228	14
251	234	17
267	249	18
274	255	19
273	253	21
238	224	15
241	222	19
295	273	21
283	264	19
270	251	19
251	234	17
259	244	15
271	252	20
281	263	17
271	248	23
262	244	18
294	274	19
283	264	19
273	256	17
260	242	18
261	247	14
227	214	12
269	251	19

250	235	15
217	208	9
226	211	15
247	230	17
259	241	18
267	249	18
253	235	18
288	270	19
293	274	18
277	261	16
273	253	19
242	225	17
236	222	14
240	222	17
271	253	18
281	262	18
244	226	17
264	246	18
243	236	7
257	238	19
292	272	20
271	248	22
270	253	17
241	226	15
267	248	19
247	231	17
260	241	19
238	225	13
257	239	18
251	234	16
243	226	17
255	237	18
291	271	20
247	231	16
229	216	14
237	224	13
279	259	20
272	249	23
245	231	13
249	231	18
250	233	17
252	235	18
239	229	10
206	198	8
240	222	18

284	265	19
260	246	14
278	258	20
271	248	23
270	249	21
255	234	21
262	244	18
227	207	20
295	276	19
297	276	21

Diversion to San Francisco		
Total Diverion to SF Bay Area	Hetch Hetchy release for CU	Hetch Hetchy release local storage
26	24	2
17	17	0
15	15	0
12	12	0
10	10	0
19	12	6
25	18	7
24	23	1
28	27	0
28	28	0
28	28	0
27	27	0

Diversion to San Francisco

Total Diverion to SF Bay Area	Hetch Hetchy release for CU	Hetch Hetchy release local storage
29	28	0
16	15	0
9	9	0
9	9	0
4	3	0
15	10	5
22	14	8
24	23	1
28	28	0
29	29	0
29	28	0
28	28	0
26	24	2
14	14	0
6	6	0
7	7	0
7	7	0
17	9	8
27	19	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
17	17	0
18	18	0
26	19	8
28	20	8
26	24	2
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2

19	19	0
20	19	1
19	19	0
7	7	0
25	18	7
27	19	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
20	19	0
4	4	0
17	9	8
26	18	7
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
18	18	0
13	13	0
10	10	0
6	6	0
15	8	7
25	18	7
25	24	1
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29	28	0
28	28	0
27	25	2
19	18	0
11	11	0
13	13	0
14	14	0
13	8	5
25	18	7
25	24	1
28	28	0
29	29	0

29	28	0
28	28	0
27	25	2
17	17	0
11	11	0
13	13	0
15	15	0
22	15	7
28	20	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
18	18	0
17	17	0
14	9	5
28	20	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
24	22	2
17	17	0
18	17	1
17	17	0
16	16	0
24	17	8
26	18	9
23	22	1
27	26	1
25	25	1
26	25	1
26	26	0
26	25	0
19	19	0
15	15	0
8	8	0
6	6	0
23	16	7
28	20	8

25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
19	19	0
18	18	0
26	18	7
28	20	8
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29	28	0
28	28	0
27	25	2
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20	14	7
24	17	6
24	24	0
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
12	12	0

2	2	0
16	9	7
27	19	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
17	17	0
3	3	0
14	10	4
25	18	7
24	23	1
28	28	0
29	29	0
29	28	0
28	28	0
26	24	2
14	14	0
8	8	0
8	8	0
4	4	0
12	10	3
19	12	7
23	23	0
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13	12	0
14	14	0
15	15	0
23	16	7
28	20	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
27	25	2

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20	19	1
9	9	0
6	5	0
14	10	4
19	12	7
24	23	1
28	28	0
29	29	0
29	28	0
28	28	0
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7	7	0
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18	11	6
20	20	0
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25	24	2
13	13	0
14	13	0
7	7	0
9	9	0
16	10	6
27	19	8
24	24	1
28	28	0
29	29	0

29	28	0
28	28	0
26	24	2
14	14	0
15	14	1
15	15	0
8	8	0
18	11	6
27	19	8
25	24	1
28	28	0
29	29	0
29	28	0
28	28	0
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19	19	0
20	19	1
19	19	0
3	3	0
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27	19	8
24	24	1
28	28	0
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28	28	0
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27	19	8
25	24	1
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27	25	2
19	19	0
20	19	0
19	19	0
16	16	0
22	15	7
27	19	8

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29	28	0
28	28	0
27	25	2
19	19	0
20	19	1
20	20	0
18	18	0
25	18	7
27	19	8
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25	24	1
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29	29	0
29	28	0
28	28	0
27	25	2
17	17	0
2	2	0
7	7	0

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27	19	8
24	24	1
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29	28	0
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27	25	2
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28	28	0
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