UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

APR 18 2014

Mr. Ron Milligan
Operations Manager, Central Valley Project
U.S. Bureau of Reclamation
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

Dear Mr. Milligan:

Thank you for the opportunity to review the U.S. Bureau of Reclamation's (Reclamation) Central Valley Project (CVP) supplemental information in support of your pending announcement of improved hydrologic conditions and increased supplies available to Water Rights Settlement Contractors in the Sacramento Valley and wildlife refuges north of the Delta. This information serves as updated information that is consistent with Reasonable and Prudent Alternative (RPA) Action I.2.3.C, your earlier February forecasts, which we responded to on February 20, 2014, and implementation of the Drought Operations Plan (DOP) for the remainder of Water Year 2014, which we concurred with on April 8, 2014.

We understand that the most recent April runoff projections at the 90% exceedance level, demonstrate improved conditions such that the full critical year 75% contract supply is now available. This availability is contingent on close coordination of Keswick Reservoir releases and planned diversions by the major Water Rights Settlement Contractors. Given these conditions, NMFS agrees that there will be significant potential gains to Reclamation's ability to manage the limited cold water pool by shifting the April and May diversion patterns of the Sacramento River Settlement Contractors into late May and June, as feasible, which would result in minimizing effects of deliveries on cold-water management on the Sacramento River and end-of-September storage at Lake Shasta. This shift in diversion timing will allow more water to remain in storage at Shasta Lake until late May and June, when higher releases are necessary to sustain temperature compliance downstream during the hotter months of June through September. Cool temperatures are needed in these months to protect Winter-run Chinook egg incubation. As previously agreed to in the DOP, we also expect significant gains in Shasta storage through limiting fall withdrawal for rice decomposition.

NMFS wishes to thank Reclamation and the Sacramento River Settlement Contractors for their proactive approach of significantly and quickly changing diversion patterns in March and April from what was originally projected in the March forecast. We understand that following the announcement of 75% allocation, these contractors will work quickly to develop detailed

schedules within their districts to gradually ramp up their diversions, consistent with the overall goal to conserve Shasta storage for temperature management (Enclosure 1). During April and May, water volume differences if the revised releases are implemented are estimated to be 130-150 thousand acre-feet (TAF) in Shasta storage.

Reclamation has run a comparative evaluation of Sacramento River temperature projections assuming both a 40 percent water SRS supply and a 75% SRS supply with a voluntary shift in diversion pattern, both using the April 90 percent exceedance hydrology projections and estimates to diversion patterns (Enclosure 2). The results show similar outcomes for Keswick releases, Shasta Lake storages, and Sacramento River temperatures. For Sacramento River temperatures, both assumptions project a 56°F temperature target location above Clear Creek is possible through late September. Shasta Dam release temperature is expected to exceed 56°F by the end of September, nearing 58°F by mid-October. This is a significant improvement over our February results, where for the 90% exceedance, the analysis suggested that a temperature target location at Clear Creek was only possible through July, and that the Shasta Dam release temperature would be expected to exceed 56° F by mid-August, nearing 62° F by mid-September. While these results are encouraging, the Winter-run Chinook Contingency plan attached to the Drought Operations Plan remains in effect. NMFS will work with DFW and Reclamation to closely monitor conditions in the upper Sacramento river throughout the season, and take actions as necessary to conserve this species.

In summary, NMFS has reviewed Reclamation's supplemental information, including new temperature projections associated with shifted diversions and improved hydrology. We find that these proposed operations are consistent with the DOP, and our earlier correspondence on the February forecasts. We agree with your analysis that increasing to 75% allocations to Sacramento River Settlement Contractors and north of Delta refuges is consistent with the operational plan to target Keswick releases within the range specified in the DOP and with the goal of temperature compliance at Clear Creek. This analysis, and therefore agreement, is contingent on implementation of the shifted diversion patterns, as planned, by the Sacramento River Settlement Contractors.

NMFS will continue to review management of cold water releases throughout water year 2014 with the Sacramento River Temperature Task Group. Additional monitoring and temperature modeling will be necessary to wisely use the cold water resources available. NMFS will re-assess any changes in operations based on receipt of your full monthly set of forecasts and temperature model runs later this month.

Thank you for the recent discussions with your staff in meeting forecast requirements in the CVP/SWP Opinion. I look forward to further communication between our agencies to fully meet the requirements provided in RPA Action I.2.3.C of the CVP/SWP Opinion. If you have

any questions regarding this letter, please feel free to contact me, or have your staff contact Mr. Garwin Yip at (916) 930-3611, or via email at garwin.yip@noaa.gov.

Sincerely,

Maria C. Rea
Assistant Regional Administrator
West Coast Region

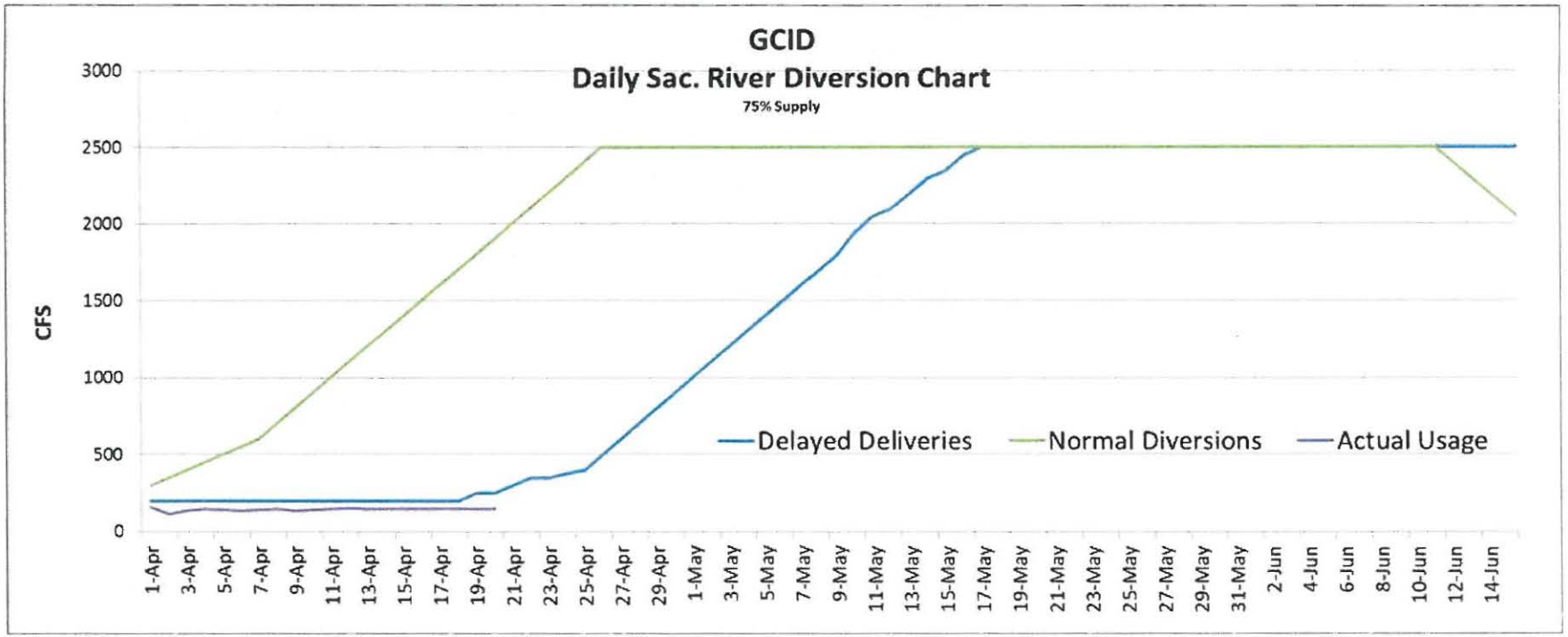
Enclosures:

1. GCID Daily Sacramento River Diversion Chart
2. Evaluation of Storage and Water Temperatures Sacramento River Settlement Contractors Supplies

cc: Copy to file 151422SWR2006SA00268
Sue Fry, Reclamation, Bay-Delta Office, 801 I St., Suite 140, Sacramento, California 95814

Enclosure 1

Comparison of Glenn Colusa Irrigation District's (GCID) diversions with demand shift, normal diversions, and actual usage. Delayed deliveries decrease GCID's supply usage of 65,000-85,000 acre-feet during the April and May period. This difference is indicative of other Settlement Contractors in the Sacramento Valley in terms of shifting and serves as a surrogate. Together Sacramento River Settlement Contractor's delayed deliveries result in a 130,000 - 150,000 acre-feet gain in Shasta Storage.



Enclosure 2

Evaluation of Storage and Water Temperatures
Sacramento River Settlement Contractors Supplies
April 16, 2014

Introduction

Reclamation continues to evaluate the water available to supply the Sacramento River Settlement (SRS) Contractors this critically dry year. The full natural inflow into Lake Shasta for the current water year is still projected to be well below 3.2 million acre-feet. Consistent with the SRS contracts, the limited natural inflow triggers a critical year water supply reduction, and the water supply under contract with Reclamation will be reduced by 25%.

In February of this year, Reclamation was concerned that the ongoing drought and unusually dry conditions in the Sacramento Valley would further limit available supplies to the SRS Contractors, and the SRS Contractors were notified that supplies could be as little as only 40% of their contact quantities.

Based the most recent April runoff projections at the 90% exceedance level, it appears conditions have improved such that the full 75% contract supply is now possible assuming close coordination of Keswick releases and planned diversions by the major SRS Contractor Districts. A primary area of attention has been the April and May period to assess the possible effects to cold-water management on the Sacramento River and end-of-September storage at Lake Shasta from operations associated with a 40% SRS supply vs. a 75% SRS supply with a voluntary shift in diversion pattern. The voluntary shift of diversion would serve to reduce April and May diversions allowing more water to remain in storage at Shasta Lake until higher releases are necessary to sustain temperature compliance downstream during the hotter months of June through September.

For our current analysis, Reclamation has run a comparative evaluation of Sacramento River temperature projections assuming both a 40% SRS supply and a 75% STRS supply with a voluntary shift in diversion pattern, both using the April 90% exceedance hydrology projections and estimates to diversion patterns. The results of this comparative analysis are presented below, and these results show similar outcomes for Keswick releases, Shasta Lake storages, and Sacramento River temperatures. For Sacramento River temperatures, both assumptions project a 56° F at the "@ Clear Creek gage" into September.

The estimated Keswick releases, Shasta storages, and Sacramento River temperature projections are all consistent with the recent Drought Operations Plan (DOP). Although the overall CVP Operational Forecast is not complete yet using the April runoff projections, we can confirm that Sacramento River at Wilkin Slough was targeted at 4,000 cfs in April and May prior to temperature operations, and that Delta outflow was adequate to meet the objectives consistent with the DOP.

Upper Sacramento River – April 2014 Preliminary Temperature Analysis

Summary of Temperature Target Results by Month for both a 40% Supply and 75% Supply (shifted pattern)

Initial Target Location	JUN	JUL	AUG	SEP	OCT
90%-Exceedance Outlook (Figure 1)					
Sac. R. above Clear Creek (CCR)	CCR	CCR	CCR	CCR~56° F to 57° F	CCR~58° F

Temperature Model Inputs, Assumptions, Limitations and Uncertainty:

1. Operation is based on the April 2014 Operation Outlooks (monthly flows, reservoir release, and end-of-month reservoir storage) for the 90% and 50% exceedances.
2. The profiles used for Shasta, Trinity and Whiskeytown were taken on April 9, March 18, and April 9, respectively.
3. Guidance on forecasted flows from the creeks (e.g., Cow, Cottonwood, Battle, etc.) between Keswick Dam and Bend Bridge is not available beyond 5 days. Model input side flows (Cottonwood Cr & Bend Bridge local flow w/o Cottonwood Cr) were selected from the historical record, and are consistent with the forecast exceedance frequency. During spring, the relatively warm creek flows can be a significant percentage of the flows at Bend Bridge.
4. Although mean daily flows and releases are temperature model inputs, they are based on the mean monthly values from the operation outlooks. Mean daily flow patterns are user defined.
5. Cottonwood Creek flows, Keswick to Bend Bridge local flows, and diversions are mean daily synthesized flows based on the available historical record for a 1922-2002 study period.
6. Meteorological inputs were derived from a database of 86 years of meteorological data (1920-2005). The meteorological inputs in the model represent "Average" meteorological conditions.
7. Meteorology, as well as flow volume and pattern, significantly influences reservoir inflow temperatures and downstream tributary temperatures; and consequently, the development of the cold-water pool during winter and early spring.

Temperature Analysis Results:

Note that for all exceedances, Lake Shasta storage is too low to utilize the upper gates of the TCD. This TCD limitation, along with the relatively small cold-water pool volume, significantly impacts temperature management.

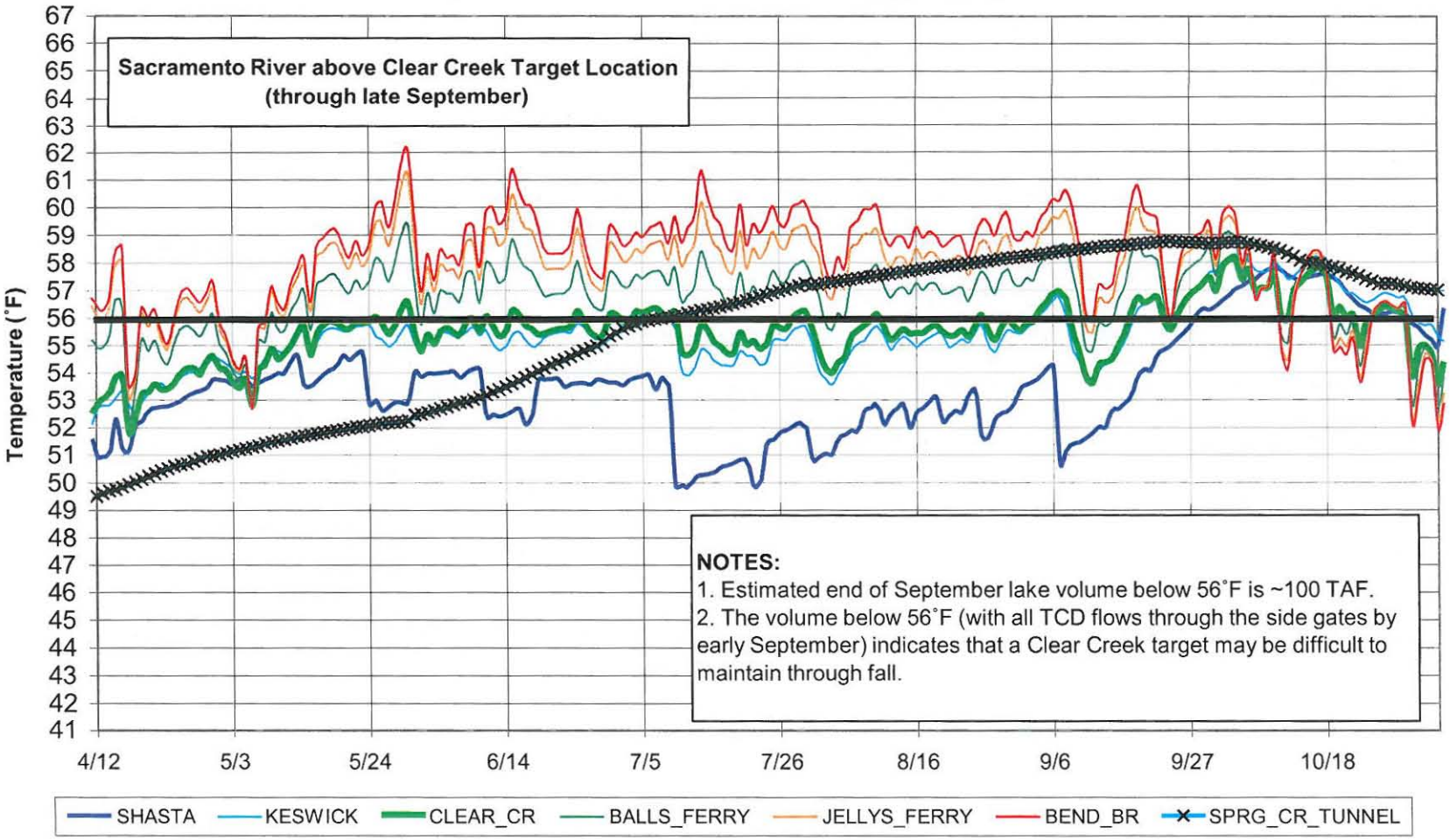
90%-Exceedance for both supply scenarios:

A temperature target location above Clear Creek is possible through about late September (Figure 1). By early September, the TCD intake level will be through the side gates. Shasta Dam release temperature is expected to exceed 56° F by the end of September, nearing 58° F by mid-October.

This analysis also shows a continued improvement in Sacramento River temperature model results with the 90% exceedance hydrology. This is a significant improvement over our February results, where for the 90% exceedance, our analysis suggested that a temperature target location at Clear Creek was only possible through July, and that the Shasta Dam release temperature would be expected to exceed 56° F by mid-August, nearing 62° F by mid-September.

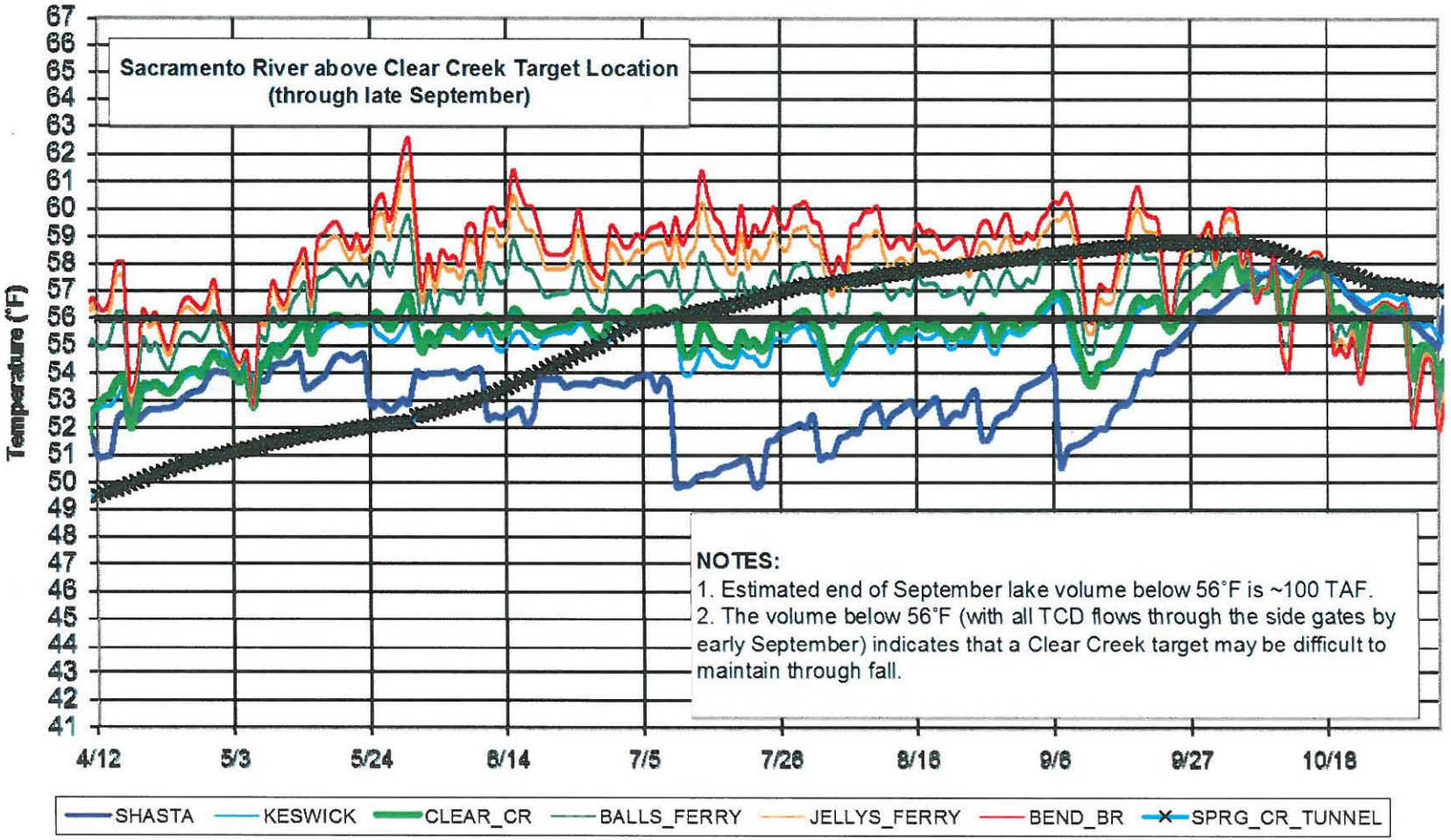
Sacramento River Modeled Temperature
2014 April 90%-Exceedance Outlook

75% SRS Supply with shifted diversions



Sacramento River Modeled Temperature
2014 April 90%-Exceedance Outlook

40% SRS Supply



Shasta Reservoir Storage and Keswick Release
90% Exceedance Forecast
75% SRS Supply with Shifted Diversion

	Apr	May	Jun	Jul	Aug	Sep	Oct
Shasta Storage, TAF	2,250	2,010	1,690	1,370	1,050	890*	870
Keswick Release, cfs	4,000	7,500	9,100	9,600	8,200	5,200	4,100

Shasta Reservoir Storage and Keswick Release
90% Exceedance Forecast
40% SRS Supply

	Apr	May	Jun	Jul	Aug	Sep	Oct
Shasta Storage, TAF	2,220	2,010	1,690	1,370	1,050	890*	870
Keswick Release, cfs	4,500	7,000	9,100	9,600	8,200	5,200	4,100

* For comparison purposes, the end-of-September storage using the March 90% exceedance forecast (DOP, no salinity barriers) was 656 taf.