

San Francisco Public Utilities Commission Hydrological Conditions Report For September 2016

J. Chester, C. Graham, A. Mazurkiewicz, & M. Tsang, October 5, 2016



Past and current Upcountry Powerhouses: Kirkwood (left), Holm (upper center), old and new Moccasin (right) and Early Intake (lower center). Early Intake PH was commissioned May 6, 1918, and decommissioned August 25 1960. The original Moccasin PH was commissioned August 14 1925, and decommissioned February 7 1969. Holm PH was commissioned August 1 1960, and remains in operation, with a capacity of 160 MW. Kirkwood PH commissioned March 1 1967, and remains in operation, with a capacity of 101 MW. The new Moccasin PH was commissioned January 27, 1969 and remains in operation today, with a capacity of 110 MW.

Current Tuolumne System and Local Bay Area storage conditions are summarized in Table 1.

Table 1 Current Storage As of October 1, 2016							
Reservoir	Current Storage		Maximum Storage		Available Capacity		Percentage of Maximum Storage
	Acre-Feet	Millions of Gallons	Acre-Feet	Millions of Gallons	Acre-Feet	Millions of Gallons	
Tuolumne System							
Hetch Hetchy ¹	285,076		360,360		75,284		79.1%
Cherry ²	210,861		273,340		62,479		77.1%
Lake Eleanor ³	19,871		27,100		7,229		73.3%
Water Bank	474,395		570,000		95,605		83.2%
Tuolumne Storage	990,203		1,230,800		240,597		80.5%
Local Bay Area Storage							
Calaveras ⁴	34,488	11,238	96,824	31,550	62,336	20,312	35.6%
San Antonio	45,544	14,841	50,496	16,454	4,952	1,614	90.2%
Crystal Springs	54,254	17,679	58,377	19,022	4,122	1,343	92.9%
San Andreas	17,865	5,821	18,996	6,190	1,131	369	94.0%
Pilarcitos	2,419	788	2,995	976	575	187	80.8%
Total Local Storage	154,571	50,367	227,688	74,192	73,117	23,825	67.9%
Total System	1,144,774		1,458,488		313,714		78.5%

¹ Maximum Hetch Hetchy Reservoir storage with drum gates activated.

² Maximum Cherry Reservoir storage with flash-boards installed.

³ Maximum Lake Eleanor storage with flash-boards installed.

⁴ Available capacity does not take into account current DSOD storage restrictions.

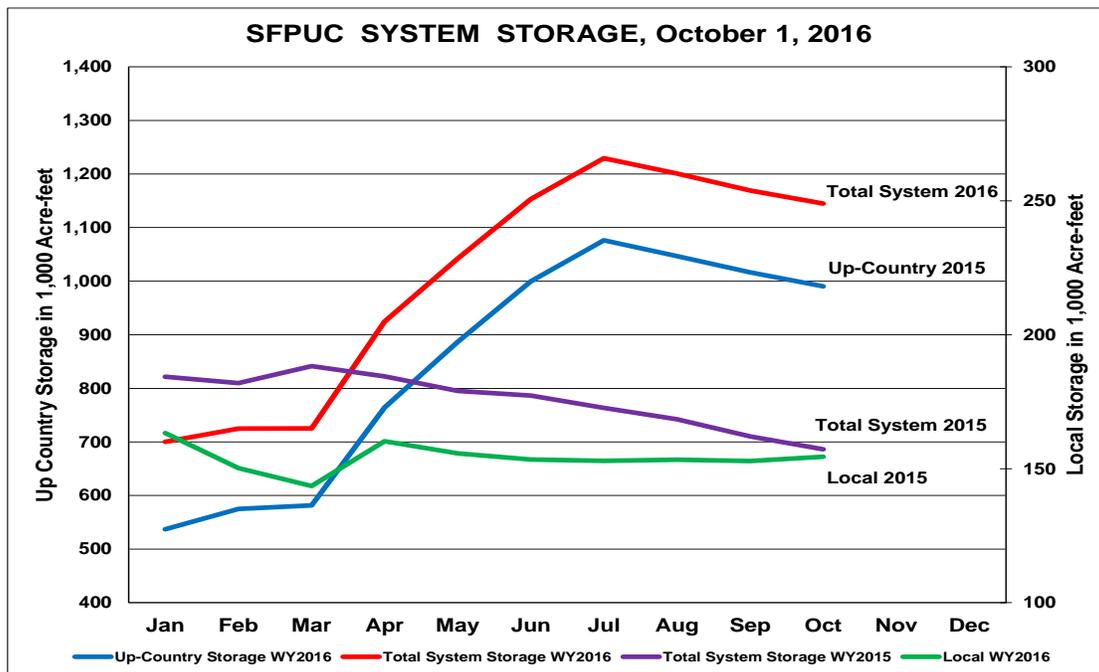


Figure 1: Monthly system storage for 2016

Hetch Hetchy System Precipitation Index ^{5/}

Current Month: The September six-station precipitation index was 0.05 inch, or 6.0% of the average index for the month.

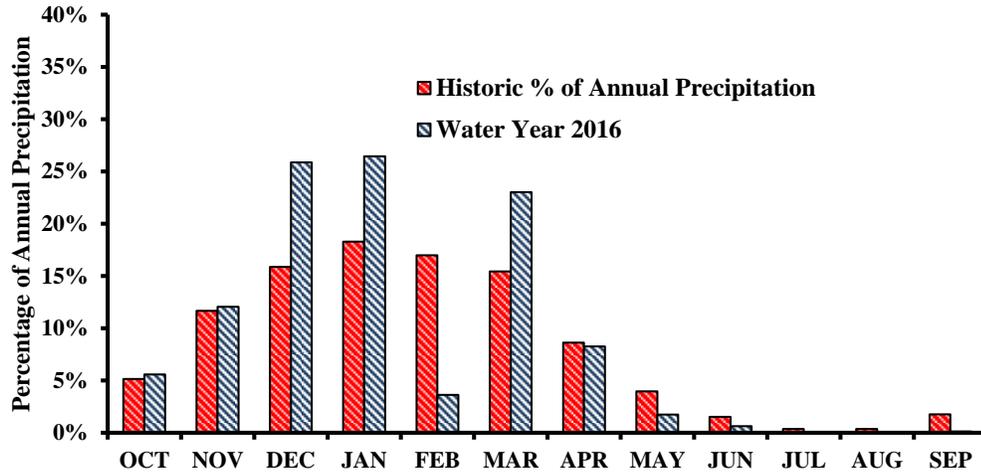


Figure 2: Monthly distribution of the Hetch Hetchy Six-station precipitation index as percent of the annual average precipitation.

Cumulative Precipitation to Date: The accumulated six-station precipitation index for water year 2016 is 38.03 inches, which is 106.9% of the average annual water year total, or 107.3% of average annual to date. Hetch Hetchy received 0.05 inch precipitation September, a total of 37.98 inches for water year 2016. The cumulative Hetch Hetchy precipitation is shown in Figure 3 in red.

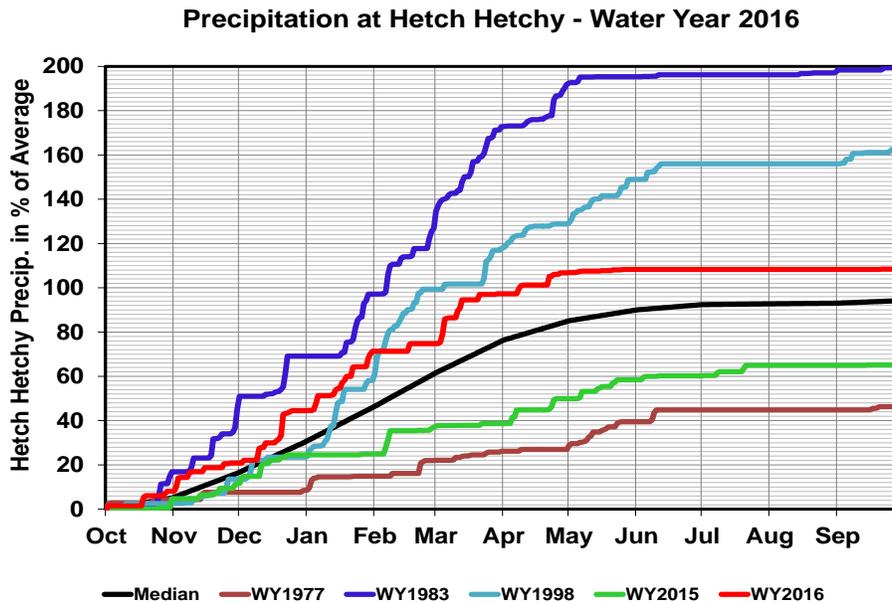


Figure 3: Water year 2016 cumulative precipitation measured at Hetch Hetchy Reservoir through September 30th, 2016. Precipitation at the Hetch Hetchy gauge for wet, dry, median, and WY 2015 are included for comparison purposes.

^{5/}The precipitation index is computed using six Sierra precipitation stations and is an indicator of the wetness of the basin for the water year to date. The index is computed as the average of the six stations and is expressed in inches and in percent.

Tuolumne Basin Unimpaired Inflow

Unimpaired inflow to SFPUC reservoirs and the Tuolumne River at La Grange as of September 30th is summarized below in Table 2.

	September 2016				October 1, 2015 through September 30, 2016			
	Observed Flow	Median ⁶	Average ⁶	Percent of Average	Observed Flow	Median ⁶	Average ⁶	Percent of Average
Inflow to Hetch Hetchy Reservoir	1,801	3,112	4,881	36.9%	784,889	703,453	737,009	106.4%
Inflow to Cherry Reservoir and Lake Eleanor	0	911	1,853	0%	435,227	444,452	450,818	96.2%
Tuolumne River at La Grange	6,192	7,012	11,078	55.9%	1,821,429	1,676,737	1,814,249	100.4%
Water Available to the City	0	0	883	0%	651,330	580,260	765,325	85.1%

⁶Hydrologic Record: 1919 – 2015

Hetch Hetchy System Operations

Draft and releases from Hetch Hetchy Reservoir during the month of September totaled 31,456 acre-feet to meet SJPL deliveries, instream release requirements, and reservoir management goals.

The instream release schedule at Hetch Hetchy Reservoir for the month of September was year type A (normal to wet conditions). This year type is based upon accumulated runoff from October 1st, 2015 through July 31st, 2016. The instream release requirement from Hetch Hetchy Reservoir was 100 cfs through September 14 and reduced to 80 cfs for the rest of the month. The cumulative inflow through September, 2016 at Hetch Hetchy Reservoir meets the criteria to maintain a water year type A. The Hetch Hetchy instream release requirement is 60 cfs for October.

19,202 acre-feet of draft was made from Cherry Reservoir during the month of September to meet instream release requirements and to meet reservoir management goals. No water was transferred via pumping from Lake Eleanor to Cherry Reservoir in September. The required minimum instream release from Cherry Reservoir was 15 cfs in September. Instream release requirements from Lake Eleanor were 20 cfs through September 15 and reduced to 10 cfs for the rest of the month. In the month of October, 5 cfs is required below Cherry Reservoir and 10 cfs is required below Lake Eleanor.

Regional System Treatment Plant Production

The Harry Tracy Water Treatment Plant average production rate for September was 34 MGD. The Sunol Valley Water Treatment Plant was in standby for the month and production rate was less than 1 MGD.

Local System Water Delivery

The average September delivery rate was 213 MGD which is a 3% decrease below the August delivery rate of 221 MGD.

Local Precipitation

Dry conditions prevailed during the month. The September rainfall summary is presented in Table 3.

Reservoir	Month Total (inches)	Percentage of Average for the Month	Water Year to Date ⁷ (inches)	Percentage of Average for the Year-to-Date ⁷
Pilarcitos	0.00	0 %	40.70	103 %
Lower Crystal Springs	0.00	0 %	27.50	102 %
Calaveras	0.00	0 %	22.78	104 %

⁷ WY 2016: Oct. 2015 through Sep. 2016.

Snowmelt and Water Supply

Inflows to the Tuolumne Basin reservoirs continued to be low throughout September. Our first precipitation measured at Hetch Hetchy was seen on September 22, after 100 days of no rain. The small amount measured on 9/22 (0.05 inches) was not enough to impact flows, and baseflow recession continued. While recreational releases ceased on Labor Day, releases from Hetch Hetchy, Cherry and Eleanor Reservoirs to meet instream flow requirements continued to exceed the inflow to the reservoirs resulting in continued contributions to Water Bank.

Going into Water Year 2017, upcountry storage is close to median conditions over the past 20 years. Hetchy storage is the median value over this period, Cherry is 92% of median, and Eleanor is 102% of median. Water Bank has still not recovered from the past 4 years of drought, and is currently 84% of the median when compared to the past 20 years. The plot below shows the impact of the drought on upcountry water supply, as well as the small impact the drought had on Hetchy storage. With the Water First policy, and the operational flexibility allowed by the Water Bank, Hetchy storage at the end of the water year is more dependent on SJPL deliveries than inflows.

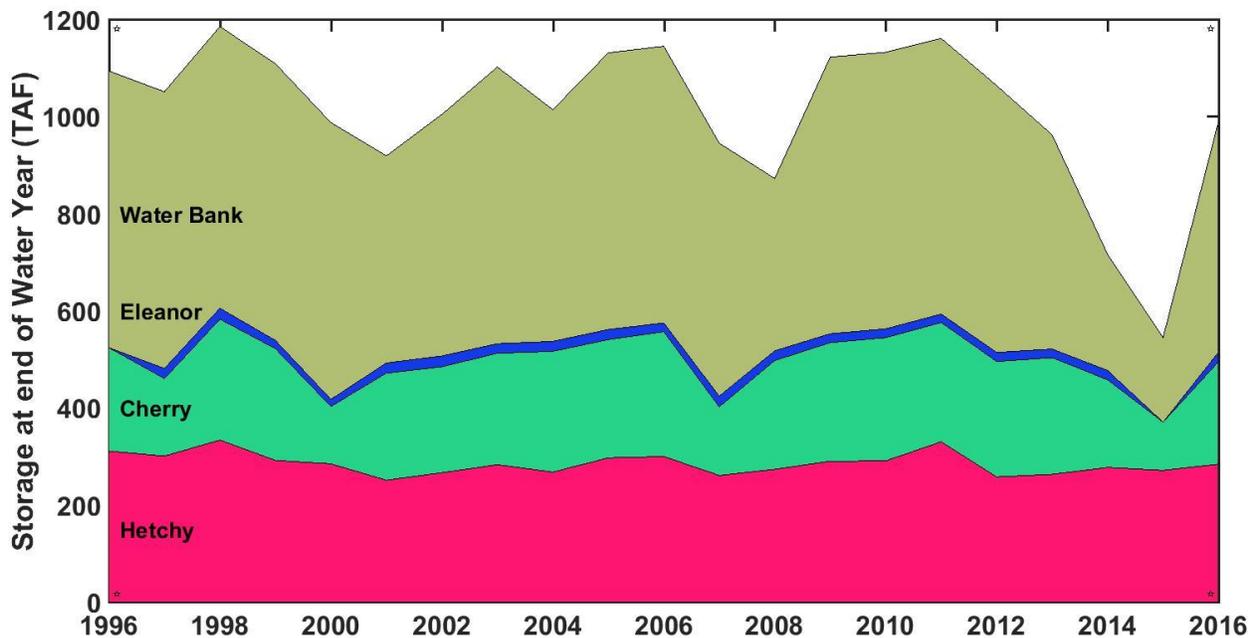


Figure 4: End of Water Year total upcountry storage from 1996 to present. Note impact of 2012-2015 drought on system storage (especially Water Bank), and relative consistent Hetchy storage through wet years and dry.

Unimpaired Flow at La Grange & Water Available to the City

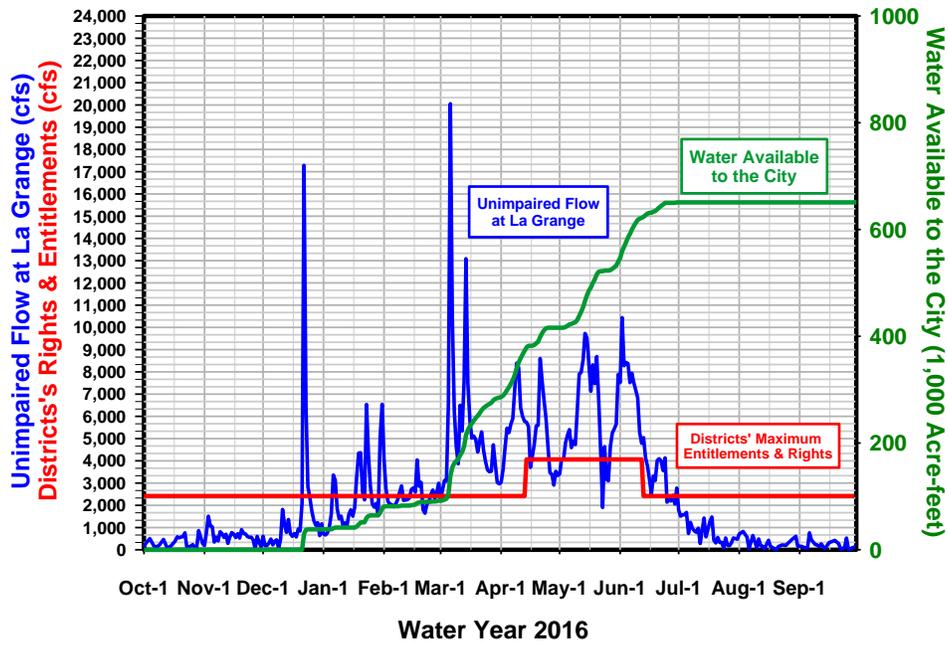


Figure 5: Calculated unimpaired flow at La Grange and the allocation of flows between the Districts and the City. 651,330 acre-feet of water has become available to the City during water year 2016.

cc	HHWP Records	Graham, Chris	Mazurkiewicz, Adam	Ritchie, Steve
	Briggs, David	Hale, Barbara	Meier, Steve	Sheehan, Charles
	Carlin, Michael	Hannaford, Margaret	Moses, Matt	Sandkulla, Nicole
	Chester, John	Hörger, Brent	Patterson, Mike	Tsang, Michael
	DeGraca, Andrew	Kelly, Harlan	Perl, Charles	Williams, Mike
	Dhakal, Amod	Kehoe, Paula	Pluche, Rebecca	
	Dufour, Alexis	Lehr, Dan	Nelson, Chris	
	Gambon, Paul	Levin, Ellen	Ramirez, Tim	