7.2 Water Resources

7.2.1 Overview

This section discusses water resources in the vicinity of Yuba County Water Agency's (YCWA or Licensee) Yuba River Development Project (Project).[1] This section is divided into nine major subsections, including this overview (Section 7.2.1).

Section 7.2.2 provides drainage area information for the Yuba River Sub-basins and at major Project facilities. Section 7.2.3 provides information such as length and gradient of steam reaches potentially affected by the Project. Section 7.2.4 provides morphometric information regarding Project reservoirs.

Section 7.2.5 discusses hydrology in the Project Vicinity. For the purpose of this Preliminary Information Package, Licensee's hydrologic period of record extends from Water Year (WY) 1970 through WY 2008. This period includes both the driest and wettest periods for the basin. Also, for the purpose of this Preliminary Information Package "regulated" hydrology is used to refer to hydrologic conditions with both Project and non-Project facilities in the watershed, whereas "unimpaired" hydrology refers to flows that would have occurred in the basin during the period of record if no facilities, Project and non-Project, were present in the basin. For the most part, regulated hydrology includes measured flows in the streams and from Project facilities, and reservoir elevations, and is reported by the United States Department of Interior (USDOI) United States Geological Survey (USGS) in annual reports. Unimpaired hydrology was synthesized by Licensee and is discussed in Appendix F. Appendix F provides all regulated and unimpaired hydrology (mean daily values) as well as Licensee's methods used to estimate the unimpaired flow Appendix F also includes flow exceedance charts for all gage locations discussed in this section.

Sections 7.2.6 and 7.2.7 describe the existing instream flow uses and applicable water quality standards, respectively, that are potentially affected by the Project. Section 7.2.8 describes existing and proposed water rights potentially affected by the Project.

Section 7.2.9 describes existing, relevant, and reasonably available water quality information: in areas upstream of the Project (*i.e.,* on the Middle Yuba River upstream of Our House Diversion Dam, on Oregon Creek upstream of Log Cabin Diversion Dam, and on the North Yuba River upstream of New Bullards Bar Reservoir); within the Project Area;[2] and downstream of the

Project (*i.e.,* on the Yuba River downstream of the United States Army Corps of Engineers' (USACE) Daguerre Point Dam).

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[1] For the purpose of the Relicensing, the Project Vicinity is defined as the area surrounding the Project on the order of a United States Geological Survey (USGS) 1:24,000 topographic quadrangle.

[2] For the purposes of this document, the Project Area is defined as the area within the Federal Energy Regulatory Commission (FERC) Project Boundary and the land immediately surrounding the FERC Project Boundary (*i.e.,* within about 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure.

7.2.2 Drainage Areas of Yuba River Sub-basins

Section 3.1.1 describes in detail the seven major drainages in the Yuba River basin, and includes a map (Figure 3.2-1) showing each sub-basin. The total drainage area of each sub-basin, including the portion of the drainage area upstream and downstream of the Project, is provided in Table 7.2.2-1.

Table 7.2.2-1. Drainage areas of Yuba River Sub-basins.

Sub-Basin	Most Upstream Project Facility or Feature	Drainage Area			
		Upstream of Project Facilities	Downstream of Project Facilities		Total
		sq mi	sq mi	% of Total	sq mi
North Yuba River	New Bullards Bar Reservoir Normal Maximum Water Surface Elevation	419.6	71.1	14	490.7
Middle Yuba River	Our House Diversion Dam1	144.5	30.4	17%	174.9
Oregon Creek2	Log Cabin Diversion Dam1	29.1	6.1	17	35.2
South Yuba River	None	351.6	0	0%	351.6
Deer Creek	None	89.4	0	0%	89.4
Dry Creek	None	108.0	0	0%	108
Yuba River3, 4	New Colgate Powerhouse	14.6	80.1	85%	94.7
Total	-----	1156.8	187.7	14%	1,344.5

1 Since the impoundments formed by Our House and Log Cabin diversion dams are so minor, the drainage area is given at the dam rather than at the normal maximum water surface elevation formed by the dam.

2 Oregon Creek, on which the Project's Log Cabin Diversion Dam is located, is a tributary to the Middle Yuba River. For the purpose of the above table, Oregon Creek is considered a separate sub-basin, and its drainage area is not included in the Middle Yuba River drainage area.

3 While New Colgate Powerhouse is the most upstream Project facility on the Yuba River, the Yuba River originates at the confluence of the North and Middle Yuba rivers. Project facilities on the North and Middle Yuba rivers result in the entire drainage area of the Yuba River being affected by the Project.

4 Ninty-nine percent of the drainage area in the Yuba River is located upstream of the USACE's Daguerre Point Dam, and the remaining 1 percent downstream of the dam..

7.2.3 Stream Reaches Affected by the Project

Section 3.2 describes in detail the eight stream reaches directly, indirectly and cumulatively affected by the Project. A summary of each reach is provided in Table 7.2.3-1.

Table 7.2.3-1. Steam Reaches affected by the Project.[3]

Sub-Basin	Reach Name	Upstream Terminus	Downstream Terminus	Length (mi)	Gradient (%)
North Yuba River	New Bullards Bar Dam Reach	Base of New Bullards Bar Dam (RM 2.3, Elev 1,320 ft)	North Yuba River Confluence with Middle Yuba River (RM 0.0, Elev 1,124 ft)	2.3 mi	2.2
Oregon Creek, a Tributary to the Middle Yuba River	Log Cabin Diversion Dam Reach	Base of Log Cabin Diversion Dam (RM 4.1, Elev 1,965 ft)	Oregon Creek Confluence with Middle Yuba River (RM 0.0, Elev 1,442 ft)	4.1	2.5

[3] Stream reaches impounded by Project and non-Project dams are not included in this table. See Section 3.2.2.

Table 7.2.3-1. (continued)

Sub-Basin	Reach Name	Upstream Terminus	Downstream Terminus	Length (mi)	Gradient (%)
Middle Yuba River	Our House Diversion Dam Reach	Base of Our House Diversion Dam (RM 12.0, Elev 1,970 ft)	Middle Yuba River Confluence with Oregon Creek (RM 4.5, Elev 1,442 ft)	7.5	1.4
	Oregon Creek Reach	Middle Yuba River Confluence with Oregon Creek (RM 4.5, Elev 1,442 ft)	Middle Yuba River Confluence with North Yuba River (RM 0.0, Elev 1,124 ft)	4.5	1.3
Yuba River	Middle/North Yuba River Reach	Confluence of North and Middle Yuba Rivers (RM 39.7, Elev 1,124 ft)	New Colgate Powerhouse (RM 33.9, Elev 543 ft)	5.8	1.9
	New Colgate Powerhouse Reach	New Colgate Powerhouse (RM 33.9, Elev 543 ft)	USACE's Englebright Reservoir Normal Maximum Water Surface Elevation (RM 32.2)	1.7	0.1
	Narrows 2 Powerhouse Reach	Narrows 2 Powerhouse (RM 24.0, Elev 307 ft)	USACE's Daguerre Point Dam Normal Maximum Water Surface Elevation (RM 11.5)	12.5	0.3
	USACE's Daguerre Point Dam Reach	USACE's Daguerre Point Dam (RM 11.4)	Yuba River Confluence with the Feather River (RM 0.0, Elev 48 ft)	11.4	0.1

Elevation datum: NAVD 88

7.2.4 Morphometric Data for Existing Project Reservoirs

Table 7.2.4-1 summarizes relevant data related to New Bullards Bar Reservoir, the Project's only storage reservoir, including water surface elevation, gross storage, usable storage, surface area, volume, estimated maximum depths, and shoreline length.

Table 7.2.4-1. Morphometric information regarding Project reservoirs.

Project Reservoir	Upstream Drainage Area	Usable Storage Capacity	Normal Max. Water Surface Elev.	Surface Area	Shoreline Length	Maximum Length	Estimated Max. Depth
	(sq mi)	(ac-ft)	(ft)	(ac)	(mi)	(mi)	(ft)
New Bullards Bar Reservoir	488.6	966,103	1,956	4,790	71.9	8.5	645

The average hydraulic retention time of usable storage within New Bullards Bar Reservoir is approximately 6 months, based on a long-term average of storage and flow through the reservoir.

Figure 7.2.4-1 shows the storage-area-elevation curves for New Bullards Bar Reservoir from the 1972 USACE's New Bullards Bar Reservoir Regulation for Flood Control Manual.

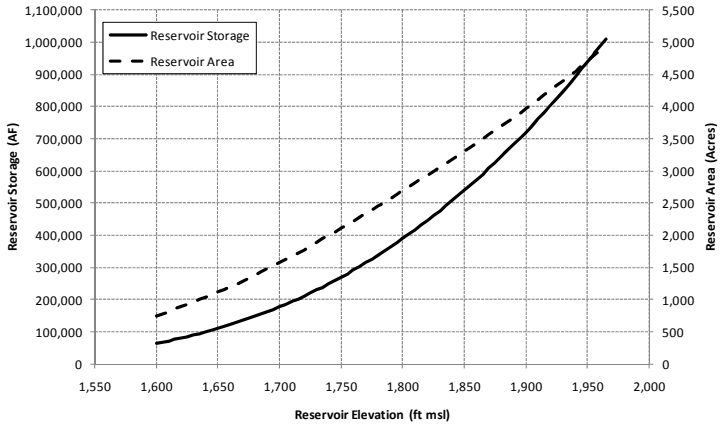

Figure 7.2.4-1. New Bullards Bar Reservoir storage-area-elevation curves.

7.2.5 Streamflow, Gage Data, and Flow Statistics

7.2.5.1 Streamflow and Other Gages in the Project Vicinity

Flow and reservoir elevation/storage data for the Project Vicinity comes from various USGS and Licensee-maintained gages within the Yuba River Basin. Table 7.2.5-1 identifies the main gages, some of which provide flow data, and others provide data on reservoir levels.

Table 7.2.5-1. Streamflow gages and Project tunnel, powerhouse, and reservoir gages.

USGS Gage Number	Name	Elevation (ft)	Drainage (sq. mi.)	Period of Record	
				Start	End
STREAMFLOW GAGES					
11408850	Middle Yuba River Near Camptonville	NA	136	8/1/1967	9/30/1989
11408880[1]	Middle Yuba River Below Our House Diversion Dam, Near Camptonville	1,957.51	145	10/1/1968	Present
11409300	Oregon Creek At Camptonville	2,230	23	10/1/1967	9/30/2000
11409400[1]	Oregon Creek below Log Cabin Diversion Dam, Near Camptonville	1,912.73	29.1	9/1 1968	Present
11413000	North Yuba River below Goodyears Bar	2,453	250	10/1/1930	Present
11413300	Slate Creek Below Diversion Dam, Near Strawberry Valley	3,570	49.4	10/1/1960	Present
11413520[1]	North Yuba River Below New Bullards Bar Dam, Near North San Juan	1,350	490	8/13/1966	9/30/2004
11417500	South Yuba River At Jones Bar, Near Grass Valley	1,060	308	10/1/1940	Present
11418000[1]	Yuba River Below USACE's Englebright Dam, Near Smartville	278.68	1,108	10/1/1941	Present
11418500	Deer Creek Near Smartville	630	84.6	10/1/1935	Present
11421000[1]	Yuba River Near Marysville	-2.95	1,339	10/1/1943	Present
11420700	Dry Creek near Browns Valley	NA	87	8/1/1964	10/03/1980
TUNNEL FLOW GAGES					
11408870	Lohman Ridge Diversion Tunnel At Intake, Near Camptonville	2,014.77	NA	10/1/1988	Present
11409350	Camptonville Diversion Tunnel At Intake, Near Camptonville	1,952.00	NA	10/1/1988	Present
POWERHOUSE FLOW GAGES					
11417980	Narrows Powerhouse No. 2 Below USACE's Englebright Dam	NA	NA	10/1/1970	9/30/2006
11413510	New Colgate Powerplant Near French Corral	NA	NA	10/1/1966	Present
11413517[1]	North Yuba River Low Flow Release Below New Bullards Bar Dam	NA	NA	10/1/2003	Present

Table 7.2.5-1. (continued)

USGS Gage Number	Name	Elevation (ft)	Drainage (sq. mi.)	Period of Record	
				Start	End
RESERVOIR STORAGE GAGES					
11413515	New Bullards Bar Reservoir Near North San Juan	1,965	489	1/1/1969	Present

Key: USGS = United States Geologic Society
ft = feet above mean sea level
Sq.mi = Square Mile
NA = Not Available

Notes: Elevation per NGVD 1929
Elevation and Drainage per USGS Records
[1]These five gages are used by Licensee to document compliance with the minimum flow requirements in the existing FERC license.

Figure 7.2.5-1 provides a schematic view of Project facilities and gages in the Project Vicinity.

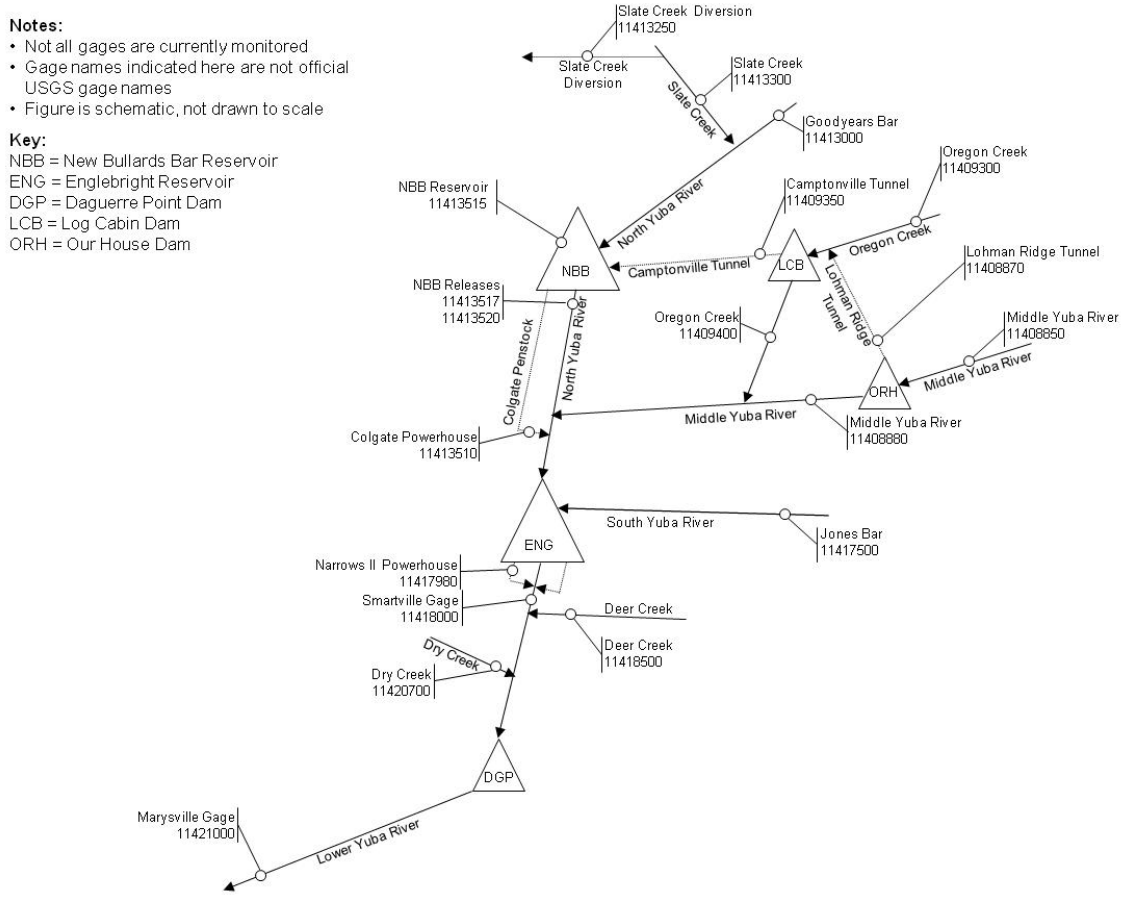

Figure 7.2.5-1. Schematic of the lower Yuba River and Project Vicinity, including USGS Gage ID numbers.

7.2.5.2 Regulated Hydrology Data for Project Facilities and Potentially Affected Sections of the Yuba River and Tributaries

This section summarizes hydrology data available for sections of the Yuba River and its tributaries that provide inflow to the Project area, the area immediately downstream of Project facilities, powerhouses, and other points of interest, (*e.g.,* USGS gage locations). Data are generally presented by sub-basin as outlined in Section 7.2.2, and in an upstream-to-downstream order. Licensee's synthesized unimpaired flow data for these points of interest are included with the complete hydrology data for both regulated and unimpaired flows in Appendix F.

Flow data shown in this section include average monthly gage flows, historical mean daily streamflows per year, and flow exceedance curves by tributary or facility within the Project Vicinity. Most of the figures are based on an analysis of regulated USGS gage flow data for the Period of Record (*i.e.,* WY 1970 through 2008). There are some exceptions due to new or discontinued gages, in which case the data were either synthesized based on a combination of data from several gages or a limited data set was used for analysis. Average monthly streamflows are shown as bar charts with end-point bars to represent minimum and maximum monthly flow values. Regulated mean daily flow figures help characterize daily trends and flow variability throughout the year. The flow exceedance curves represent the percentage of time a specified flow is equaled or exceeded throughout the period of record. See Appendix F for more detailed flow exceedance curves by month. The combination of the three figures for each tributary or facility provides a general description of gaged flow behaviors of these features within the Project Area.[4]

Historic Overview

Construction and operation of the Project have altered the flow regime of the lower Yuba River below the USACE's Englebright Dam and flow regimes in the reaches below New Bullards Bar Dam, Log Cabin Diversion Dam and Our House Diversion Dam. Little streamflow information is available for pre-Project time periods for the reaches directly below the three Project dams, but two gaging stations located on the lower Yuba River have been operated since well before the Project was constructed and therefore provide data to compare lower Yuba River hydrology for the pre-Project time period with the hydrology with the Project hydrology. From 1903 through 1943, USGS Gage 11419000 measured flows on the Yuba River near Smartville, just below Deer Creek. Since 1943, both the Smartville Gage, USGS Gage Number 11418000, located at river mile 23 and the Marysville Gage, USGS Gage Number 11421000, at river mile 5.6, have been operated.

Pre-Project hydrology can be compared with Project hydrology on a long term basis by comparing the exceedance probabilities of mean daily flows for various time periods. Three periods of interest are used for the comparison. The period of 1903 to 1941 is used for pre-project-condition hydrology at the Smartville Gage. This period was before the construction of the USACE's Englebright Dam. The period of 1944 to 1969 is used for pre-project-condition

[4] For the purposes of this document, the Project Area is defined as the area within the FERC Project Boundary and the land immediately surrounding the FERC Project Boundary (*i.e.,* within approximately 0.25 mile of the FERC Project Boundary) and includes Project-affected reaches between facilities and downstream to the next major water controlling feature or structure, USACE's Daguerre Point Dam.

flows with USACE's Englebright Dam and Pacific Gas and Electric Company (PG&E's) Narrows I powerhouse in place, and the period of 1969 to 2008 is used for the Project-period of record flows.

Time Period Setting

During the pre-Project time period of 1903 to 1941, no Project facilities were in place, the USACE's Englebright Dam was not in place, although it was under construction for the last few years of this period, and development of the upper Yuba River watershed was taking place. Most of the dams and diversions that were used primarily for gold mining were already in place during this period, but they were being re-build, replaced or removed. Debris dams were also in place, being re-built or being added at several locations throughout the middle to lower elevations of the watershed. During the 1903 to 1941 time period, three notable dams were constructed. The original Bullards Bar Dam (several brush, timber and rock structures were constructed at Bullards Bar in the mid to late 1800s), a 175-foot-high dam creating 31,500 acre-ft of storage capacity, was constructed in the early 1920s at a location 2 miles upstream of the location of New Bullards Bar Dam, and included the operation of the original Colgate Powerhouse, owned and licensed by PG&E. USACE's Englebright Dam was constructed by the California Debris Commission, a unit of the USACE, in the late 1930s and early 1940s and is now owned by the USACE. Lastly, USACE's Daguerre Point Dam was constructed in 1906 by the California Debris Commission and has been rebuilt several times in the same general vicinity since then.

For the lower Yuba River, the pre-Project time period of 1944 to 1969 is characterized by the construction and operation of USACE's Englebright Dam and the Narrows 1 Powerhouse. The Narrows 1 Powerhouse has a maximum rated release capacity of 740 cubic feet per second (cfs). USACE's Englebright Dam has an uncontrolled spillway crest, and inflows to USACE's Englebright Reservoir at rates greater than the Narrows 1 Powerhouse release capacity that lasted for any significant duration resulted in uncontrolled spilling at the dam. Upper Yuba River watershed development on the Middle and South Yuba rivers was mostly in place during this time period with the major South Yuba River dam, Spaulding Dam, having been constructed in 1913.

The Project time period of 1970 to 2008 includes the operation of New Bullards Bar Dam and the New Colgate and Narrows 2 powerhouses. During this time period, there were a range of operational procedures and constraints on the project affecting downstream hydrology. These procedures and constraints are discussed in detail in section 6.0. During the Project time period, three sets of instream flow requirements governed Project operations and resulted in varied hydrologies. Also during the Project time period, the use of Yuba River water, primarily diverted at USACE's Daguerre Point Dam, increased with the expansion of the irrigation system.

Comparison of Hydrologies

Figures 7.2.5-2 and 7.2.5-3 below show exceedance probabilities of mean daily flow in January for the two gaged locations, Marysville and Smartville, respectively. The Marysville gage figures include two time periods for comparison, the pre-Project time period of 1944 through 1969, and the Project time period of 1970 through 2008. The Smartville gage figures include three time periods for comparison, the pre-Project and Pre-Englebright Dam time period of 1904

through 1941, the pre-Project time period of 1944 through 1969, and the Project time period of 1970 through 2008. Exceedance probability figures show the percentage of occurrences, in this case the percentage of days that a flow occurred at or above a specific level. For example, in the figure for the Marysville gage mean daily flow exceedance for the month of January, the flows were at or above 2,000 cfs 40 percent of days for the pre-Project time period and 50 percent of days for the Project time period. Several of the exceedance charts are shown in the following pages. The full set of exceedance charts is in Appendix F – Hydrology CD.

The charts for both Marysville and Smartville show little difference in flow exceedance percentages for the months of January. The Yuba River runoff volume is substantially greater than the storage of Project facilities storage or USACE's Englebright Reservoir. Even though New Bullards Bar Reservoir is typically filling during these months, if the previous year was dry and storage was low, the effect of filling may not significantly affect the frequency and volume of flow in the lower Yuba River on a long term basis.

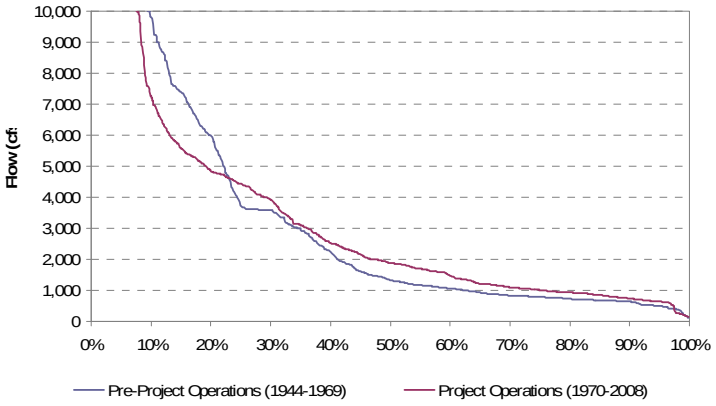

Figure 7.2.5-2. Flow exceedance of historical mean daily streamflow at Marysville Gage for January.

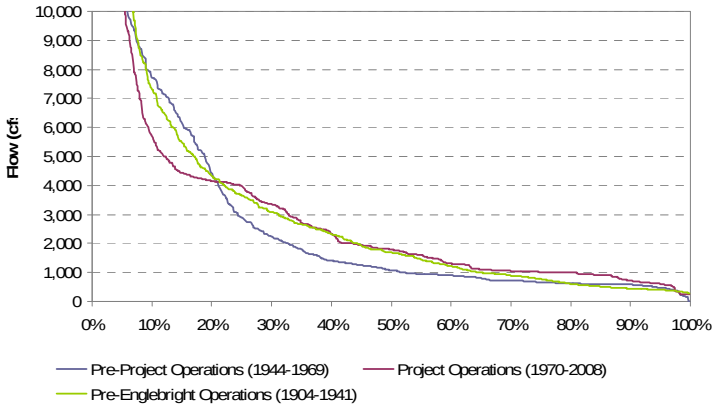

Figure 7.2.5-3. Flow exceedance of historical mean daily streamflow at Smartville Gage for January.

As examples of flow conditions during the snow-melt period, figures 7.2.5-4 and 7.2.5-5 show the exceedance probabilities of mean daily flows for Marysville and Smartville gage for the month of April, respectively. These figures show that, the Project period flows in April are consistently lower than flows during either the Pre-Englebright period or the Pre-Project period.

The lower flows of the Project period are due to New Bullards Bar Reservoir capturing much of the snowmelt runoff. Figures showing exceedance probability of mean daily flows for the months of March and May also show this trend, although with reduced differences in mean daily flow exceedances.

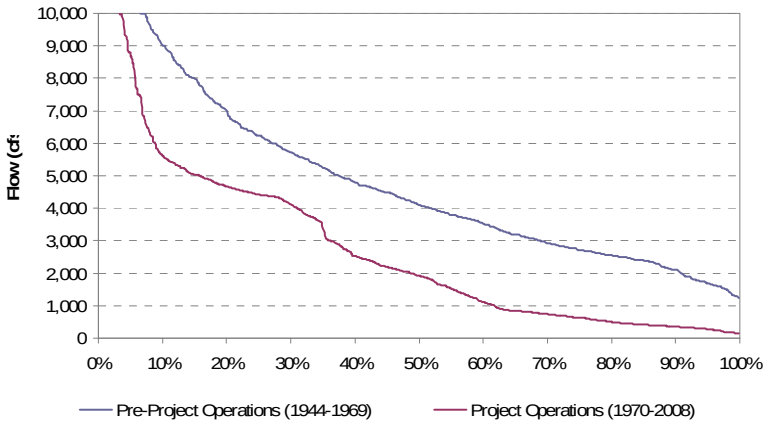

Figure 7.2.5-4. Flow exceedance of historical mean daily streamflow at Marysville Gage for April.

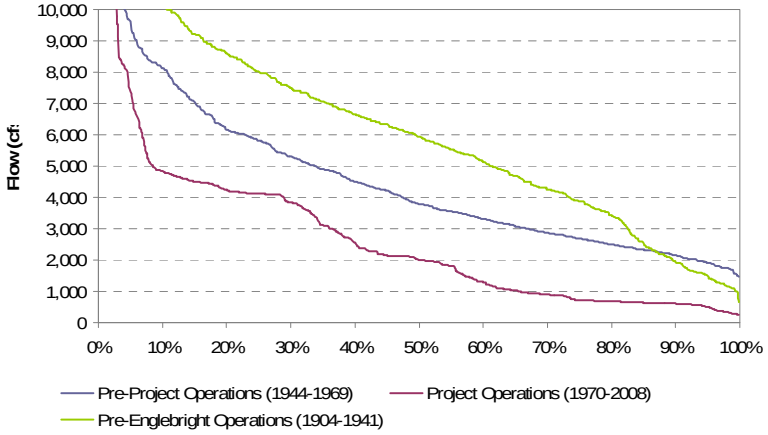

Figure 7.2.5-5. Flow exceedance of historical mean daily streamflow at Smartville Gage for April

Differences in mean daily flow exceedances are not solely related to Project operations; some of the differences in mean daily flow exceedances for March through May between the Project and Pre-Project periods are due to hydrologic differences for the two periods. The Project time period had substantially more years with unimpaired flow less than 50 percent of the long-term average unimpaired flow than the Pre-Project period. Unimpaired flow in the driest third of years averaged 400,000 acre feet (ac-ft) less for the Project period than in the pre-Project period.

Comparisons of the pre-Project and Project flows for the months of July through November show substantially higher flows during the Project time period as compared to the Pre-Englebright and Pre-Project periods at both locations for all five months. Figure 7.2.5-6 show exceedance probabilities for the Marysville and Smartville gages for the month of October. The

Marysville gage figure indicates 90 percent of the mean daily flow for the Project period is at least 400 cfs while the flow for the same month during the Pre-Project period is only 44 cfs. Figure 7.2.5-7 shows mean daily flows at the Smartville gage are at least 600 cfs for 90 percent of days during the Project period, while flows in both the Pre-Project and Pre-Englebright periods exceed 195 cfs 90 percent of days. Other months of the July to November period have even greater differences between the Project and Pre-Project flow exceedance probabilities (see Appendix F).

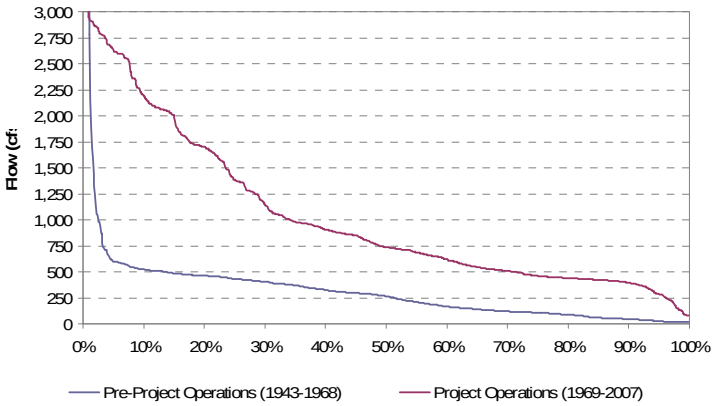

Figure 7.2.5-6. Flow exceedance of historical mean daily streamflow at Marysville Gage for October.

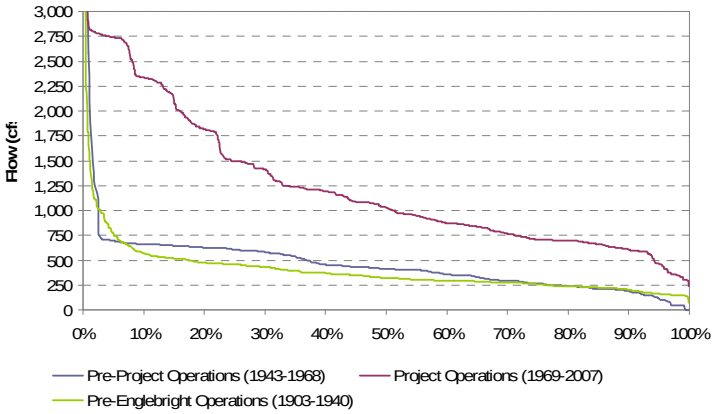

Figure 7.2.5-7. Flow exceedance of historical mean daily streamflow at Smartville Gage for October.

While the exceedance probability figures provide a good reference for recurrence of flow, they do not provide any context to flow variability and how these flows occur. The mean daily pre-Project flows are characterized by low (as low as 20 cfs) flows at Marysville for July through November in many years irrespective of hydrology, and similarly low fall flows at Smartville with highly varied flows from day to day. For example, Figure 7.2.5-8 is a chart of mean daily flow for the months of July through November of 1951. As releases from the Narrows 1 Powerhouse, mean daily flows at Smartville for the Pre-Project period varied from 700 cfs to 150 cfs with a mid-week power generation peaking schedule for most of this period. Mean daily flows in September and parts of October averaged around 700 cfs on weekdays and dropped to about 150 cfs on weekends. Figure 7.2.5-9 shows mean daily flows for the years 1959 through 1961. For this pre-Project time period, flows at Marysville ranged from 15 cfs to 50 cfs for most

of the summer, increased in the early fall for about a week or two to 150 cfs or more and then dropped back to around 50 cfs for October and into November. For the Yuba Accord, summer flows are required to be above 400 cfs at Marysville gage for 95 percent of all years and would be above 350 cfs for the remaining percentage of years, except years classified as Conference Years, which is the one percent chance driest year.

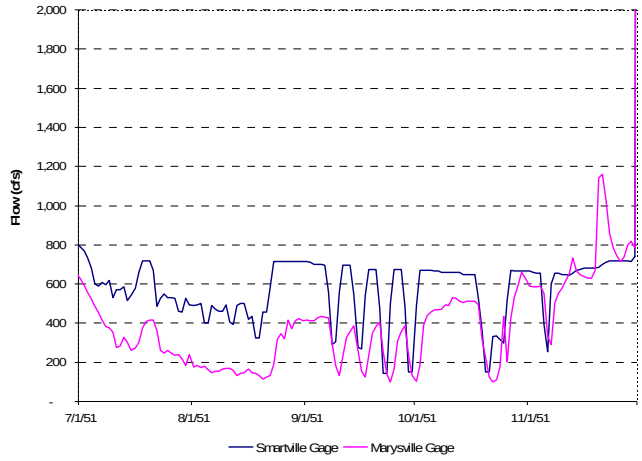

Figure 7.2.5-8. Mean Daily streamflow on the lower Yuba River for July through November of 1951.

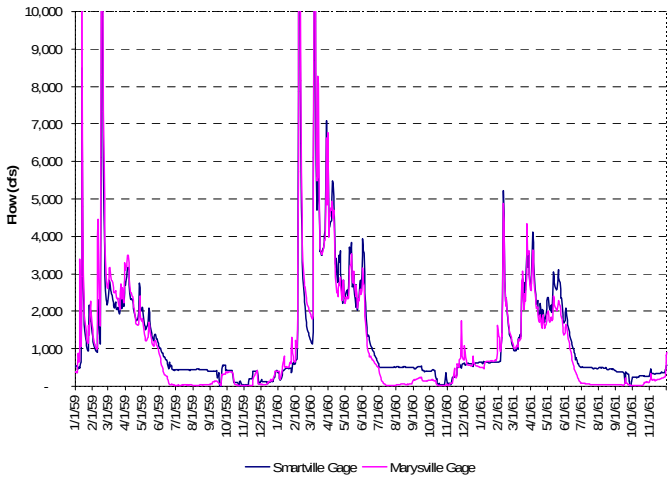

Figure 7.2.5-9. Mean Daily streamflow on the lower Yuba River for 1959 through 1961.

Project Conditions

North Yuba River. The three primary tributaries of the North Yuba River are Canyon Creek, Slate Creek, and Deadwood Creek. There are no major impairments on the mainstem of the North Yuba River upstream of New Bullards Bar that significantly affect the flow of the river. On its tributaries, however, there are two regulations of note: one is the Deadwood Creek Plant, which is a small hydropower plant on Deadwood Creek; the other is the Slate Creek Diversion Dam on Slate Creek, operated by South Feather Water and Power Agency (SFWPA), which diverts water into the Feather River basin.

North Yuba River Upstream of New Bullards Bar Reservoir

The hydrology of the North Yuba River is predominantly snowmelt driven, with rain and snowmelt peak flows occurring from March through May. The record of daily data from the primary gage in the watershed upstream of the Project, North Yuba River below Goodyears Bar (USGS 11413000), has a period of record from October 1930 through the present. The Goodyears Bar Gage is located at an elevation of approximately 2,453 feet, and includes a watershed area of approximately 250 square miles. Figure 7.2.5-10 shows average monthly streamflow for the North Yuba River at Goodyears Bar. During most months, the maximum monthly flows are significantly higher than the monthly average, representing significant precipitation events, or outliers. The maximum average monthly streamflow of 4,526 cubic feet per second (cfs) and daily maximum streamflow of 29,600 cfs were recorded during the height of an extreme flood in January 1997.

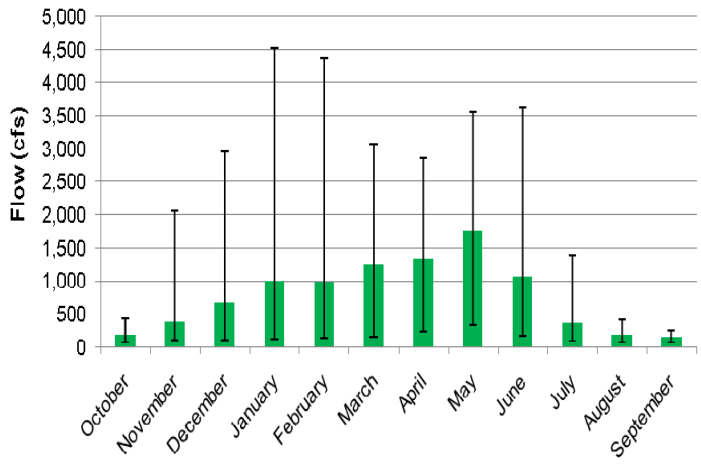

Figure 7.2.5-10. Average monthly streamflow for the North Yuba River below Goodyears Bar Gage (USGS 11413000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the North Yuba River are shown in Figure 7.2.5-11.

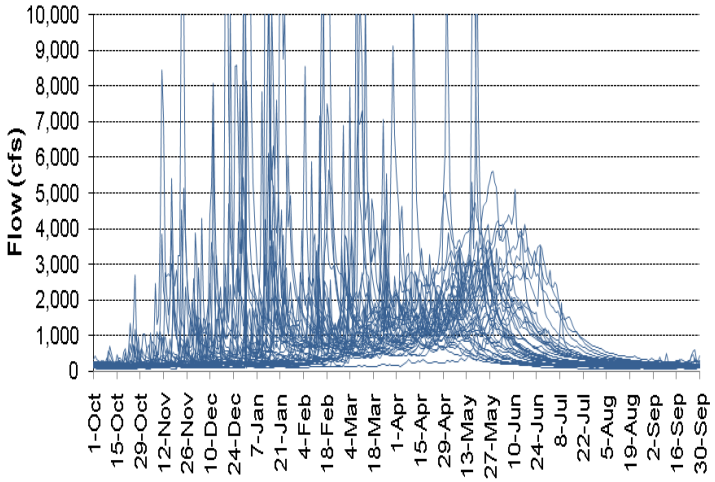

Figure 7.2.5-11. Historical mean daily streamflow each year for the North Yuba River below Goodyears Bar Gage (USGS Gage 11413000) from WY 1970 through WY 2008.

A flow exceedance curve of historical mean daily average flow on the North Yuba River at Goodyears Bar Gage is shown in Figure 7.2.5-12. Only 10 percent of daily average flows during the period of record exceed 2,000 cfs. Fifty percent of daily average flows exceed 360 cfs, and 90 percent of daily average flows exceed 140 cfs.

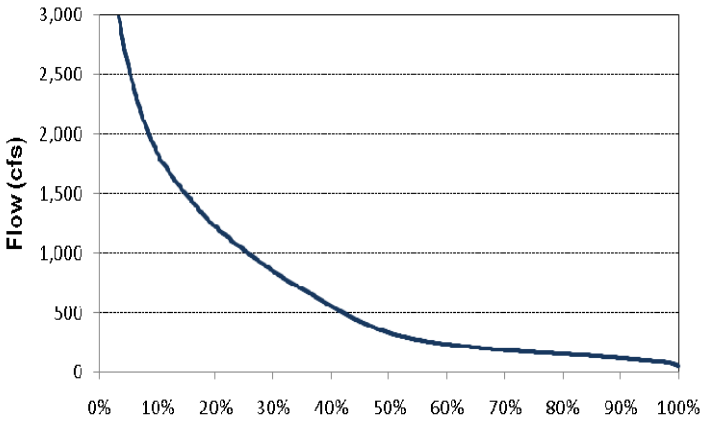

Figure 7.2.5-12. Flow exceedance of historical mean daily streamflow for the North Yuba River below Goodyears Bar Gage (USGS Gage 11413000) from WY 1970 through WY 2008.

Slate Creek, Tributary to North Yuba River Upstream of New Bullards Bar Reservoir

Slate Creek is one of the larger tributaries to the North Yuba River upstream of New Bullards Bar Reservoir. It originates near the town of La Porte in the northern portion of the Yuba River watershed and joins the North Yuba River approximately 0.5 mile upstream of the upper reaches of New Bullards Bar Reservoir at an elevation of approximately 1,980 feet. The Slate Creek watershed is approximately 61 square miles.

SFWPA diverts water from Slate Creek into the Feather River basin near Strawberry Valley via the Slate Creek Tunnel at approximately 3,500 feet, nearly 9 miles above Slate Creek's confluence with the North Yuba River. For a discussion of these diversions, refer to Section 7.2.8.1. Approximately 49 square miles of the Slate Creek watershed is upstream of the Slate Creek Diversion Dam; the other 12 square miles of the watershed is below the diversion dam. The average gradient of Slate Creek below the Slate Creek Diversion Dam is 3.3 percent.

Slate Creek inflows to the North Yuba River have been continuously gaged below the Slate Creek Tunnel by USGS Gage 11413300 since October 1960. Figure 7.2.5-13 shows average monthly streamflow for Slate Creek below the Slate Creek Diversion Dam. The maximum daily average streamflow of approximately 12,200 cfs was recorded during the height of the extreme flood in January 1997.

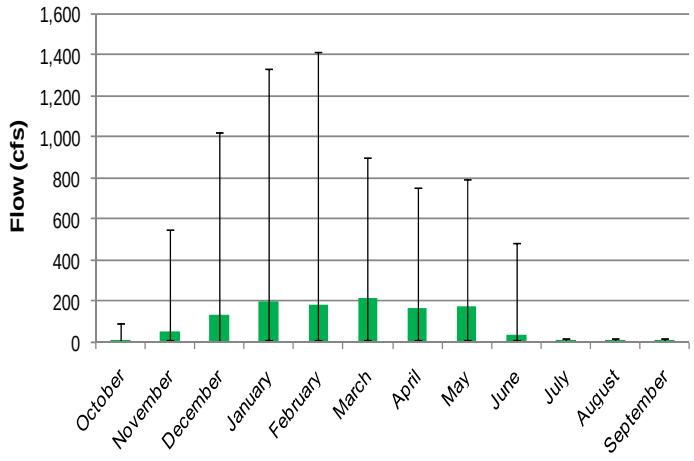

Figure 7.2.5-13. Average monthly streamflow for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in Slate Creek below the Slate Creek Diversion Dam are shown in Figure 7.2.5-14.

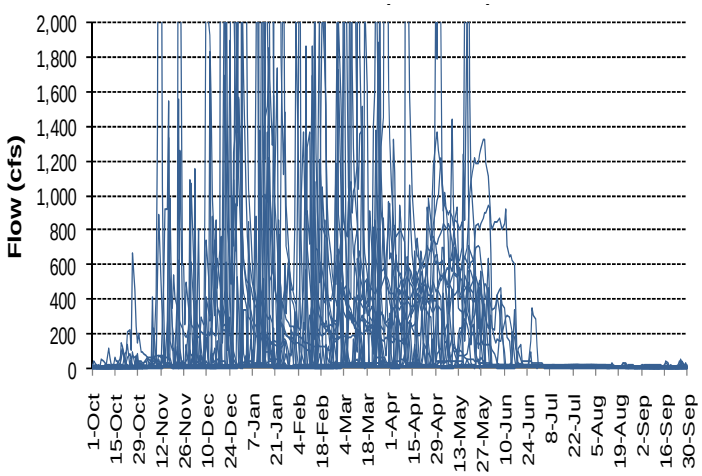

Figure 7.2.5-14. Historical mean daily streamflow each year for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

A flow exceedance curve for Slate Creek below SFWPA's Slate Creek Diversion Dam is shown in Figure 7.2.5-15. Only 10 percent of mean daily flows during the period of record exceed 300 cfs. Fifty percent of mean daily flows exceed 13 cfs, and 90 percent of mean daily flows exceed 2 cfs.

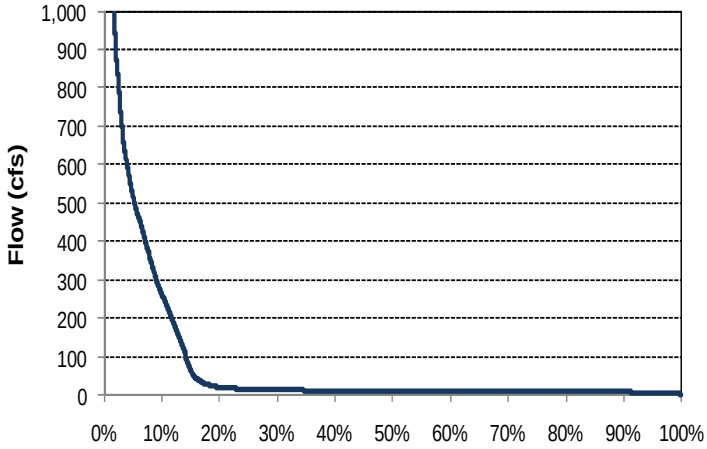

Figure 7.2.5-15. Flow exceedance of historical mean daily streamflow for Slate Creek below SFWPA's Slate Creek Diversion Dam (USGS Gage 11413300) from WY 1970 through WY 2008.

New Bullards Bar Reservoir

New Bullards Bar Reservoir has an estimated useable storage capacity of 966,103 ac-ft at gross pool, and has been measured daily at USGS Gage 11413515 from October 1969 to the present. Figure 7.2.5-16 shows average monthly storage for the New Bullards Bar Reservoir. The maximum average monthly storage volume of approximately 960,000 ac-ft was recorded in June of 1996.

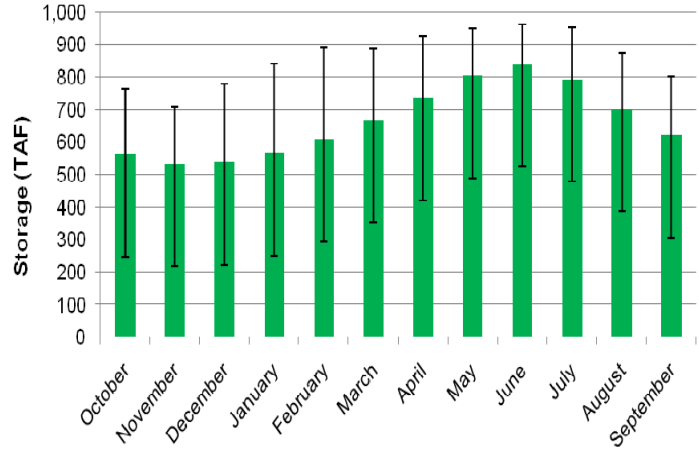

Figure 7.2.5-16. Average monthly storage for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008.

Historical daily storage for the reservoir is shown per year in Figure 7.2.5-17. The reservoir storage is typically at its highest in May and June, and at its lowest in December and January. The lowest storage since the reservoir first filled, 178,230 ac-ft occurred on December 29, 1981. The lowest maximum daily storage for the May and June time period, 289,454 ac-ft, occurred on May 2, 1977.

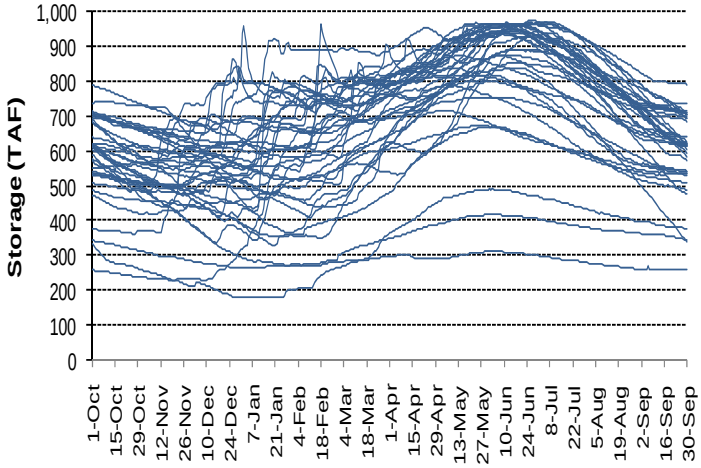

Figure 7.2.5-17. Historical daily storage each year for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008. WY 1977 represents the lowest peak storage during the period of record.

A storage exceedance curve for daily New Bullards Bar Reservoir storage is shown in Figure 7.2.5-18. Daily storage exceeds 895,000 ac-ft 10 percent of the time during the period of record. Daily storage exceeds 675,000 ac-ft 50 percent of the time, and exceeds 415,000 ac-ft 90 percent of the time.

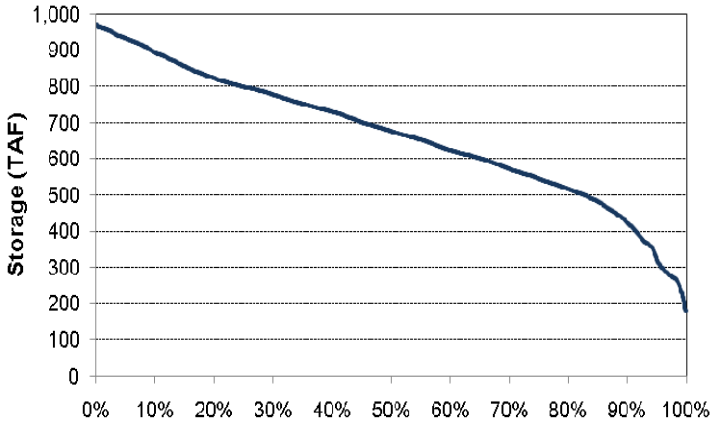

Figure 7.2.5-18. Storage exceedance of historical daily storage for New Bullards Bar Reservoir (USGS Gage 11413515) from WY 1970 through WY 2008.

New Colgate Power Tunnel and Powerhouse - Diversion from North Yuba River to Yuba River

The New Colgate Powerhouse Power Tunnel and Penstock, with a capacity of 3,500 cfs, conveys water from New Bullards Bar Reservoir on the North Yuba River to the New Colgate Powerhouse on the Yuba River. The power tunnel and penstock include 5.2 miles of tunnel and 2,809 feet of a 14.5 feet-diameter steel pipe. The New Colgate Powerhouse is an above-ground, steel-reinforced concrete powerhouse that houses two Voith Siemens Pelton-type turbines with a

combined capacity of 340 megawatts (MW) under a design head of 1,306 feet and a maximum release rate of 3,430 cfs.

Flows in the power tunnel are measured by USGS Gage 11413510 at the New Colgate Powerhouse. This gage has measured flows since the New Colgate Powerhouse became active in 1969. Figure 7.2.5-19 shows the monthly average New Colgate Powerhouse Tunnel flow; the maximum monthly average flow at full release capacity has occurred several times, always during very wet periods when the powerhouse was run at full capacity for the entire month. While the reported flows have exceeded 3,500 cfs on occasion, this is likely due to gage error.

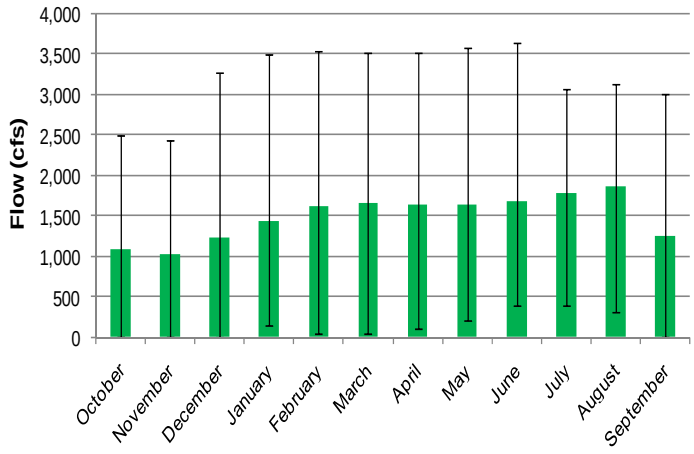

Figure 7.2.5-19. Historical monthly average flow through the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

Figure 7.2.3-20 shows the historical mean daily flow through the New Colgate Powerhouse Tunnel. Since the New Colgate Powerhouse Tunnel nearly always has access to water due to the large amount of storage in New Bullards Bar Reservoir, releases do not generally follow a typical hydrological pattern of high releases during the winter and low releases in the summer and fall.

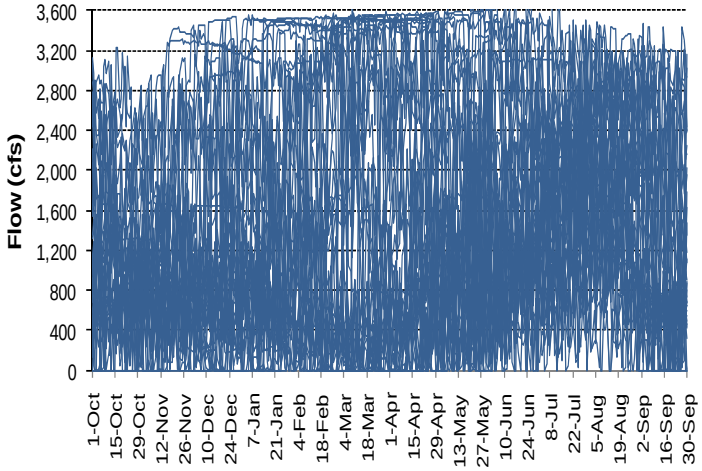

Figure 7.2.5-20. Historical mean daily flow each year for the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

The exceedance chart in Figure 7.2.5-21 shows the range and relative recurrence of mean daily flows throughout the period of record. This figure indicates the mean daily flows exceeded 3,200 cfs approximately 10 percent of the time, 1,200 cfs 50 percent of the time, and 200 cfs 90 percent of the time.

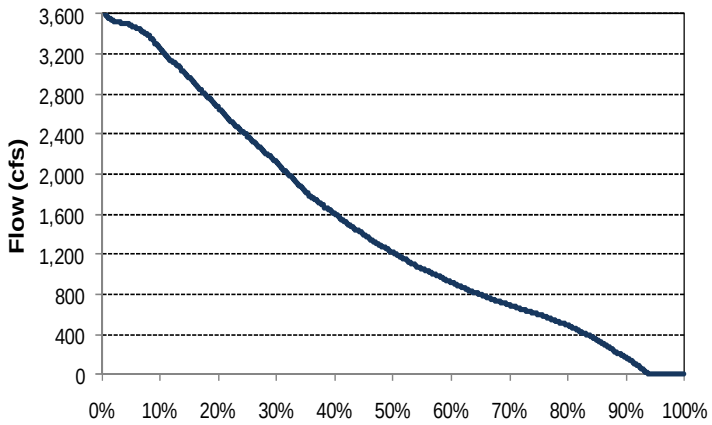

Figure 7.2.5-21. Flow exceedances of historical mean daily flows in the New Colgate Powerhouse Tunnel (USGS Gage 11413510) from WY 1970 through WY 2008.

North Yuba River Downstream of New Bullards Bar Dam

In the 2-mile-long reach of the North Yuba River below New Bullards Bar Dam, flow can come from one of three sources, releases from the New Bullards Bar Minimum Flow Powerhouse, releases from the New Bullards Bar Hollow Jet Valve, or spills from New Bullards Bar Dam spillway. The New Bullards Bar Minimum Flow Powerhouse constantly releases at about 6 cfs to meet the required 5 cfs minimum flow below New Bullards Bar Dam. The Hollow Jet Valve is used infrequently, generally when outages preclude releases to the New Colgate Powerhouse. Spills, while relatively infrequent, are a notable contributor to flows in the North Yuba River below New Bullards Bar Dam when they occur. Data for historical mean daily flows below New Bullards Bar Dam are from historical Licensee records and USGS gages 11413517 and 11413520, and are provided as Figures 7.2.5-22 through 7.2.5-24. While these figures do not show any flows in July, August, or September, North Yuba River flows below New Bullards Bar Dam have historically been maintained at or above the minimum required flow throughout the period of record. The scale of the figures obscures the low flows generally occurring in those months.

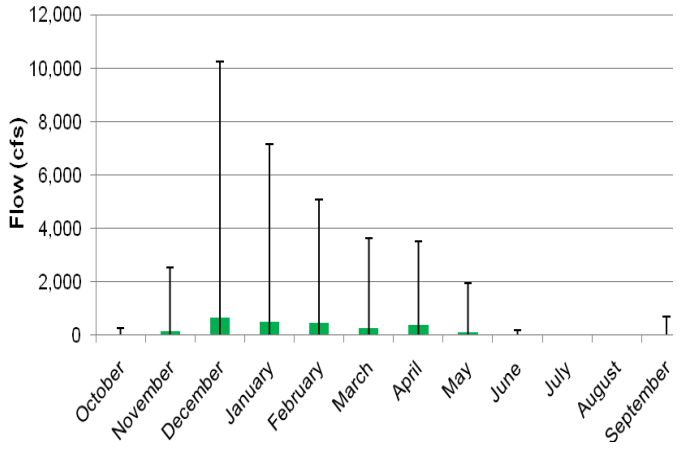

Figure 7.2.5-22. Historical monthly average spills from New Bullards Bar Reservoir from WY 1970 through WY 2008.

Spills from New Bullards Bar Dam typically occur between December and May, with some rare spills in June. Historically, the largest spills have occurred in late-December through mid-February, with the greatest mean daily spill of 53,633 cfs occurring on January 2, 1997.

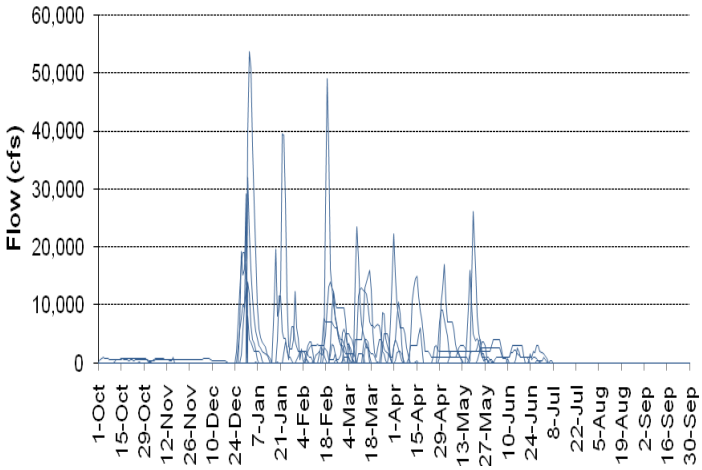

Figure 7.2.5-23. Historical mean daily average spills from New Bullards Bar Reservoir from WY 1970 through WY 2008.

As shown in Figure 7.2.5-24, New Bullards Bar Dam spills have occurred on approximately 5 percent of days within the period of record. Spills of over 10,000 cfs have occurred on approximately 1 percent of days within the record.

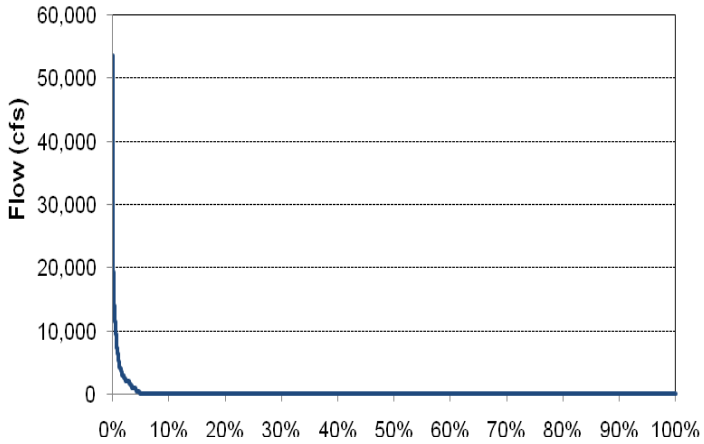

Figure 7.2.5-24. Flow exceedance of historical mean daily New Bullards Bar Dam spills from WY 1970 through WY 2008.

Middle Yuba River. The Middle Yuba River Sub-basin covers approximately 210 square miles. This amount includes the area of the Oregon Creek watershed, which is discussed separately below. River flows vary greatly throughout the year due to the narrow, steep canyons along the banks of the river. Flows in the Middle Yuba River primarily originate from snow runoff and rainwater gathered at Jackson Meadows Reservoir in Sierra County. Other inflows to the Project-affected basin are provided by two tributaries: Oregon Creek and Grizzly Creek.

Middle Yuba River Upstream of Our House Diversion Dam

Nevada Irrigation District (NID) affects flow upstream of Our House Diversion Dam by storing water in Jackson Meadows Reservoir and diverting water to the South Yuba River at the Milton Diversion Dam. For a discussion of these storages and diversions, refer to Section 7.2.8.1.

Inflow to Our House Diversion Dam from the Middle Yuba River is computed as inflow to Our House Diversion Dam, and is determined from three gages. Prior to 1989, USGS Gage 11408850 recorded Middle Yuba River flows near Camptonville. Since 1989, Middle Yuba River inflows to the Our House Diversion Dam are determined by adding the flow below Our House Diversion Dam, as measured at USGS Gage number 11408880 and flows in the Lohman Ridge Diversion Tunnel, as measured at USGS Gage 11408870. Figure 7.2.5-25 shows average monthly streamflow for Middle Yuba River based on the synthesized flows described above. The maximum monthly average streamflow, approximately 3,000 cfs, and maximum daily average stream flow of approximately 21,000 cfs, were recorded during the height of the extreme flood in January 1997.

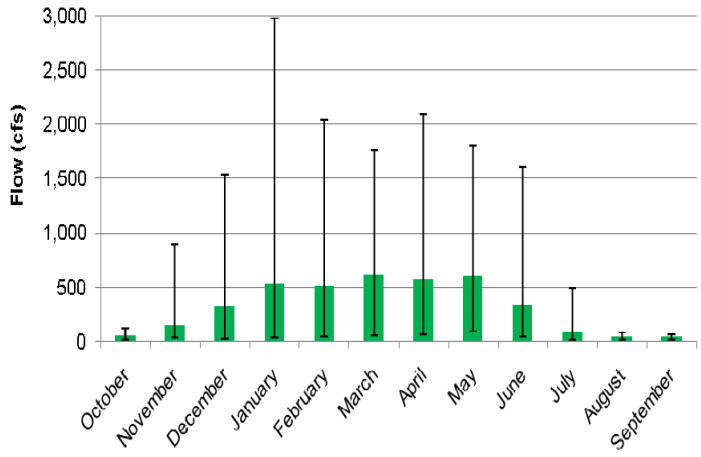

Figure 7.2.5-25. Average monthly Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Middle Yuba River are shown in Figure 7.2.5-26.

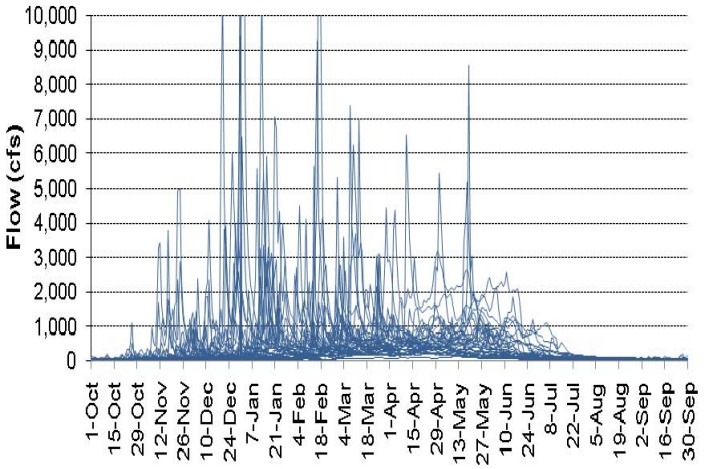

Figure 7.2.5-26. Historical mean daily Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

A flow exceedance curve for mean daily flows on the Middle Yuba River into Our House Diversion Dam is shown in Figure 7.2.5-27. Only 10 percent of mean daily flows during the period of record exceed 800 cfs. Fifty percent of mean daily flows exceed 115 cfs and 90 percent of mean daily flows exceed 30 cfs. These results indicate that the Middle Yuba River has generally lower flows than the North Yuba River.

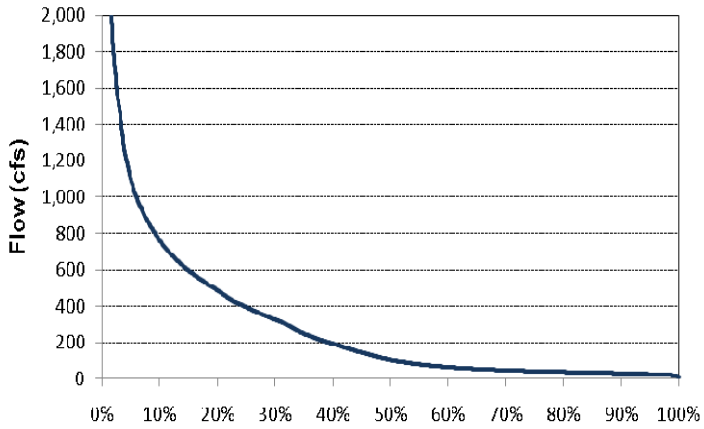

Figure 7.2.5-27. Flow exceedance of historical mean daily Middle Yuba River inflow to Our House Diversion Dam from WY 1970 through WY 2008.

Our House Diversion Dam Impoundment

Our House Diversion Dam is a 130-ft radius double curvature concrete arch dam located on the Middle Yuba River 12 miles upstream of its confluence with the North Yuba River, and has a drainage area of 144.8 square miles. The dam is 70 feet high with a crest length of 368 feet, a crest elevation of 2,049 feet, and has a maximum spillway capacity of 60,000 cfs. While there is no storage behind Our House Dam, the dam creates a headwater for diversion to the Project's Lohman Ridge Tunnel and for releases to the Middle Yuba River.

Lohman Ridge Diversion Tunnel – Diversion from Middle Yuba River to Oregon Creek

The Lohman Ridge Diversion Tunnel diverts flow from the Middle Yuba River at the Our House Diversion Dam impoundment to Oregon Creek. The tunnel has been measured at USGS Gage 11408870 since October 1988. The Lohman Ridge Diversion Tunnel is 12.5 feet high by 12.5 feet wide and diverts a maximum flow of 860 cfs through its 19,410 feet (90% unlined and 10% lined) length to Oregon Creek, approximately 1,000 feet upstream of Log Cabin Diversion Dam. Figure 7.2.3-28 shows average monthly flow for Lohman Ridge Diversion Tunnel diversions. The maximum monthly average flow, approximately 700 cfs, was recorded in May of 1996, a wet year.

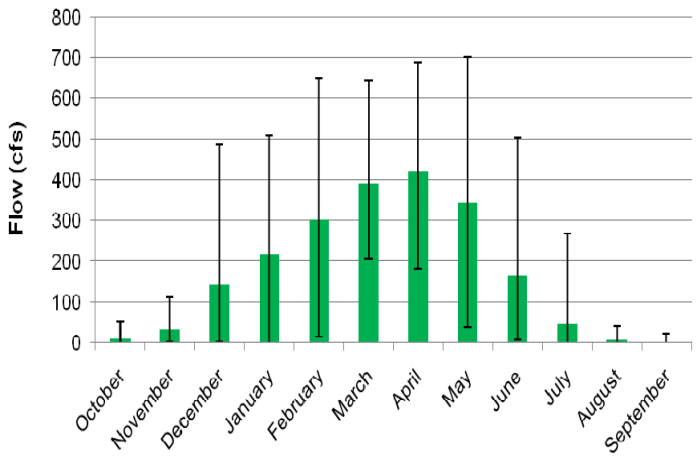

Figure 7.2.3-28. Average monthly flow for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Historical mean daily flows per year for the Lohman Ridge Diversion Tunnel are shown in Figure 7.2.5-29.

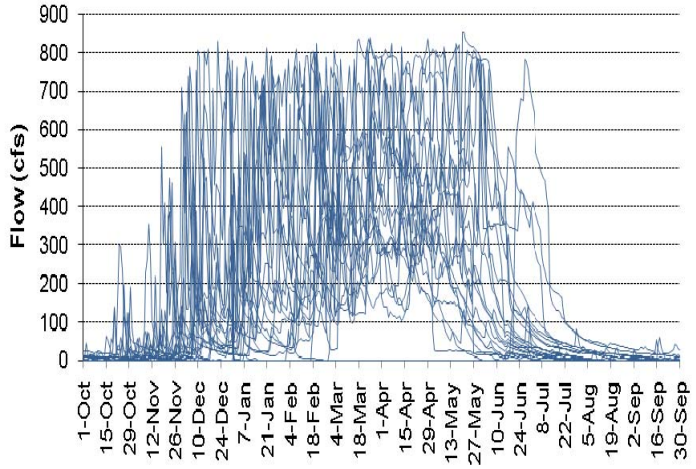

Figure 7.2.5-29. Historical mean daily flow each year for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

A flow exceedance curve for mean daily flows in the Lohman Ridge Diversion Tunnel is shown in Figure 7.2.5-30. Only 10 percent of mean daily flows during the period of record (WY 1989-2008) exceed 525 cfs. Fifty percent of mean daily flows exceed 52 cfs, mean daily flows exceed 0 cfs 90 percent of days.

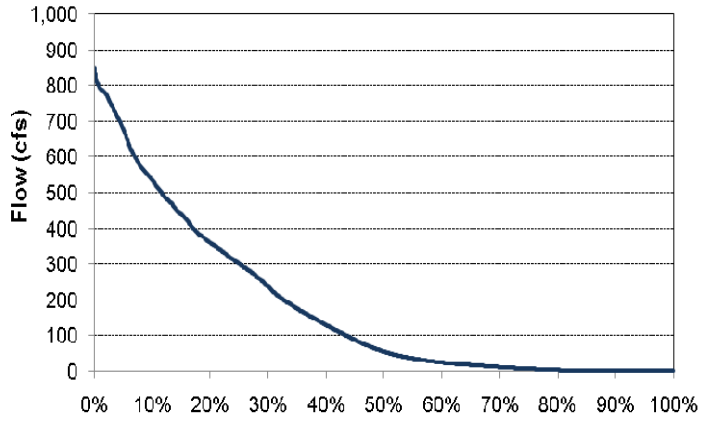

Figure 7.2.5-30. Flow exceedance of historical mean daily flow for the Lohman Ridge Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Middle Yuba River Downstream of Our House Diversion Dam

Our House Diversion Dam has two outlets: a 5-ft diameter steel pipe controlled by a slide gate on the upstream face of the dam diverts flows into the Lohman Ridge Diversion Tunnel, and a 24 inch pipe for releases to the Middle Yuba River. The outlet centerline of the 5-ft diameter steel pipe is at an elevation of 1,990 feet, and has a maximum capacity of 800 cfs. Flow to the 24 inch pipe is controlled by a hand-operated downstream gate valve, and has a maximum capacity of 60 cfs.

Flows on the Middle Yuba River below Our House Diversion Dam have been measured since 1970 by the USGS gage 11408880. Figure 7.2.5-31 shows average monthly flow in the Middle Yuba River below Our House Diversion Dam for water year 1970 through water year 2008. The maximum monthly average Middle Yuba River flow below Our House Dam of 2,973 cfs and the maximum mean daily flow of 21,000 cfs. Both were recorded during the height of the extreme flood in January 1997.

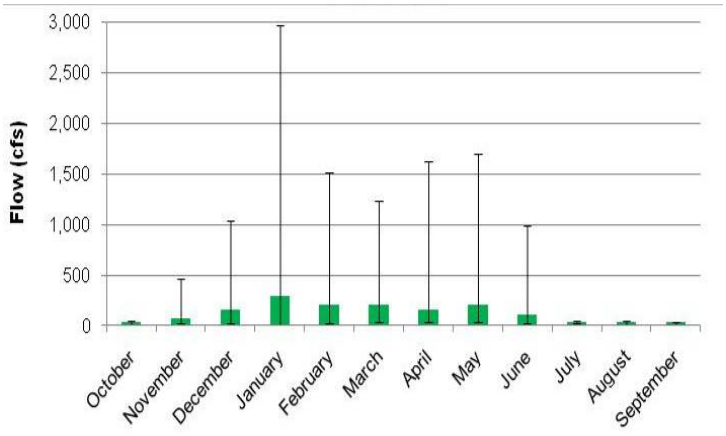

Figure 7.2.5-31. Average monthly Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

Historical mean daily flows in the Middle Yuba River below Our House Dam are shown in Figure 7.2.5-32.

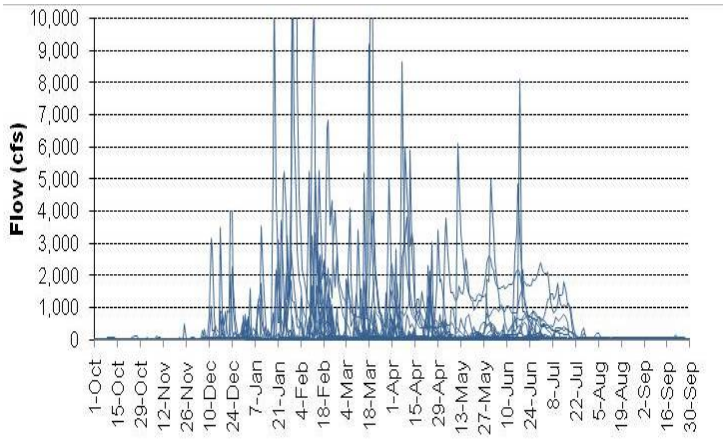

Figure 7.2.5-32. Historical Mean Daily Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

An exceedance curve of mean daily flows in the Middle Yuba River below Our House Dam is shown in Figure 7.2.5-33. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 102 cfs. Fifty percent of mean daily flows exceed 36 cfs, and mean daily flows exceed 27 cfs on 90 percent of days.

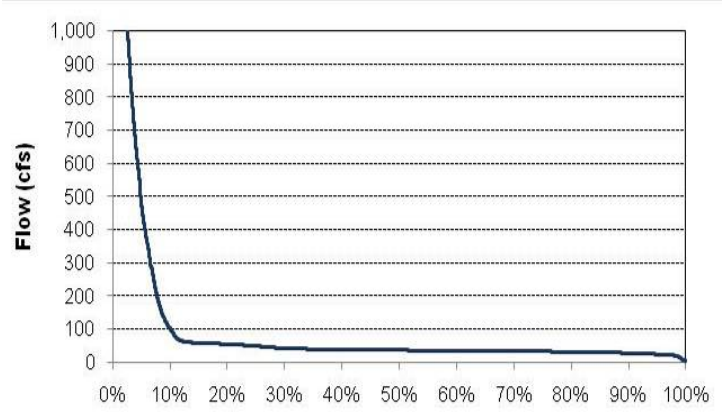

Figure 7.2.5-33. Flow exceedance of historical Mean daily Middle Yuba River flow below Our House Dam from WY 1970 through WY 2008.

Oregon Creek, Tributary to the Middle Yuba River, Upstream of the Project

Oregon Creek is entirely contained within the Middle Yuba River watershed, and originates near an elevation of approximately 4,455 feet. Oregon Creek flow above Log Cabin Diversion Dam is a combination of flow from the Lohman Ridge Diversion Tunnel, originating at Our House Diversion Dam on the Middle Yuba River, and Oregon Creek flows. Above the outfall of the Lohman Ridge Diversion Tunnel, Oregon Creek is free of impairments. Approximately 6 square miles of the 35 square mile Oregon Creek watershed lie below Log Cabin Diversion Dam.

Between October 1968 and September 2000, Oregon Creek flows to Log Cabin Diversion Dam were gaged by the USGS Gage 11409300 at Camptonville. Since then, inflows to Log Cabin Diversion Dam can be calculated by combining flows below Log Cabin Diversion Dam, as measured by USGS Gage 11409400, with flows in the Camptonville Diversion Tunnel, as measured by USGS Gage 11409350, and subtracting flows from the Lohman Ridge Diversion Tunnel, as measured at USGS Gage 11408870. Figure 7.2.5-34 shows average monthly streamflow for Oregon Creek based on a combination of historical and synthesized flows, as described above. The maximum monthly average streamflow, approximately 664 cfs, was recorded during the flood event in February of 1986, and the maximum daily average stream

flow of approximately 3,730 cfs, was recorded during the height of the extreme flood in January 1997.

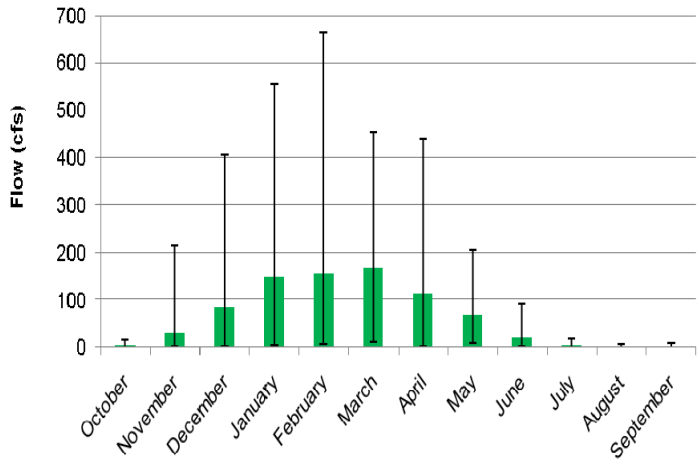

Figure 7.2.5-34. Average monthly Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

Historical mean daily streamflows per year in Oregon Creek are shown in Figure 7.2.5-35.

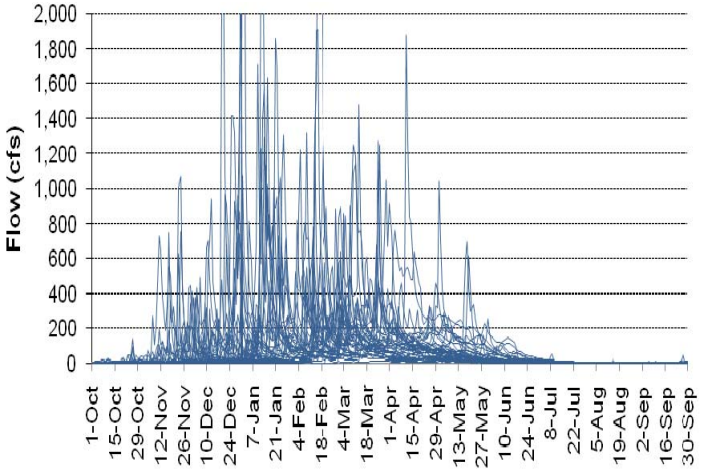

Figure 7.2.5-35 Historical mean daily Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows to Oregon Creek is shown in Figure 7.2.5-36. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 140 cfs. Fifty percent of mean daily flows exceed 15 cfs, and mean daily flows exceed 2 cfs on 90 percent of days.

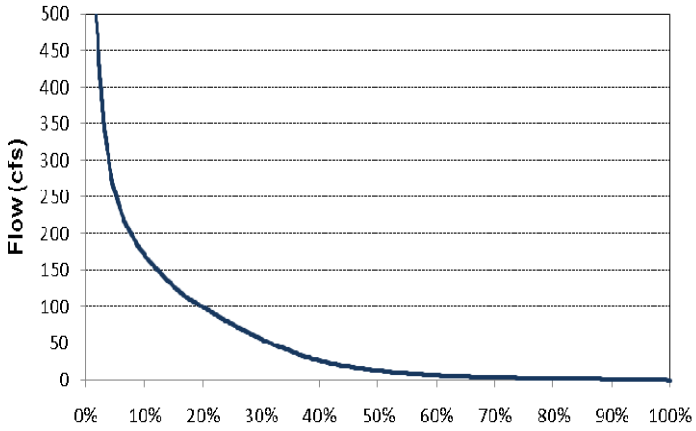

Figure 7.2.5-36. Flow exceedance of historical mean daily Oregon Creek flow above the Lohman Ridge Tunnel outfall from WY 1970 through WY 2008.

Log Cabin Diversion Dam Impoundment

The 55-ft high Log Cabin Diversion Dam diverts flows from Oregon Creek to New Bullards Bar Reservoir via the Camptonville Diversion Tunnel. Log Cabin Diversion Dam is approximately 4 miles upstream of Oregon Creek's confluence with the Middle Yuba River. Similar to Our House Diversion Dam, Log Cabin Dam does not have any storage; the dam creates a headwater for diversions into the Project's Camptonville Tunnel and for releases to the Oregon Creek.

Camptonville Diversion Tunnel – Diversions from Oregon Creek to North Yuba River

Flow to the Camptonville Diversion Tunnel is controlled by a slide gate just upstream of the dam. The outlet centerline is at an elevation of 1,938 feet and the pipe's maximum capacity is 1,100 cfs. Flow to the 18 inch diameter steel pipe is controlled by a hand-operated gate valve downstream. The pipe's maximum capacity is 13 cfs.

The Camptonville Diversion Tunnel is 6,107 feet long and has the capacity to convey 1,100 cfs to New Bullards Bar Reservoir on the North Yuba River. The first 4,275 feet of the conduit is an unlined horseshoe tunnel 14.5 feet wide by 14.5 feet high, and the remaining 1,832 feet of the tunnel is a lined horseshoe tunnel 11 feet 7 inches wide by 13 feet high.

The Camptonville Diversion Tunnel has the capacity to divert up to 1,100 cfs to New Bullards Bar Reservoir. The tunnel has been measured at USGS Gage 11408870 from October 1988 to the present. Figure 7.2.5-37 shows average monthly flow for Camptonville Diversion Tunnel diversions. The maximum average monthly flow, approximately 870 cfs, was recorded in April 1995, a wet year.

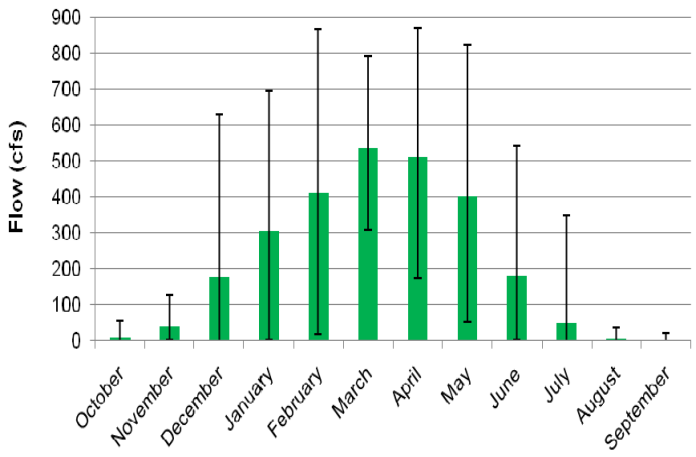

Figure 7.2.5-37. Average monthly streamflow in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Historical mean daily flows for the Camptonville Diversion Tunnel are shown in Figure 7.2.5-38.

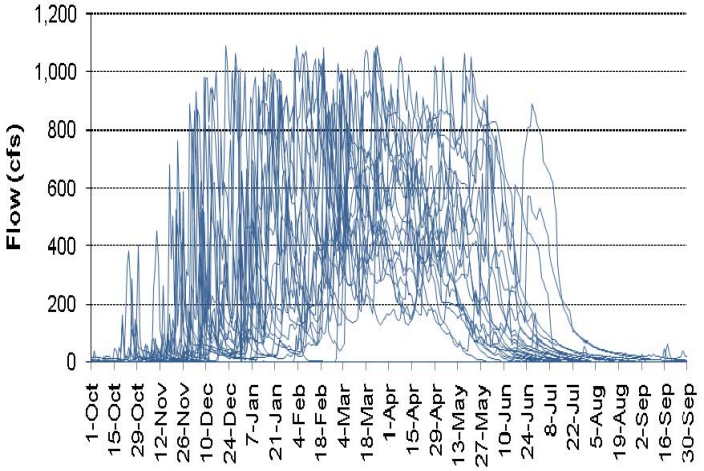

Figure 7.2.5-38. Historical mean daily streamflow each year in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

A flow exceedance curve for the Camptonville Diversion Tunnel is shown in Figure 7.2.5-39. Only 10 percent of man daily flows during the period of record exceed 670 cfs, indicating that the majority of flows are much lower. Fifty percent of mean daily flows exceed 63 cfs, and mean daily flows exceed 0 cfs 90 percent of days.

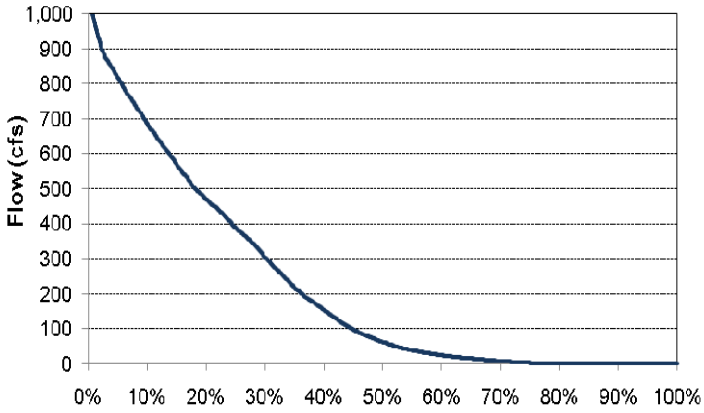

Figure 7.2.5-39. Flow exceedance of historical mean daily streamflow in the Camptonville Diversion Tunnel (USGS Gage 11408870) from WY 1989 through WY 2008.

Oregon Creek Downstream of Log Cabin Diversion Dam

Flows in Oregon Creek below Log Cabin Diversion Dam have been monitored since 1970 by the USGS gage 11409400. Figure 7.2.5-40 shows average monthly flow in Oregon Creek below Log Cabin Diversion Dam for water year 1970 through water year 2008. The maximum monthly average flow in Oregon Creek below Log Cabin Diversion Dam of 617 cfs, and the maximum mean daily flow of 5,340 cfs, were recorded in February and March 1986, respectively.

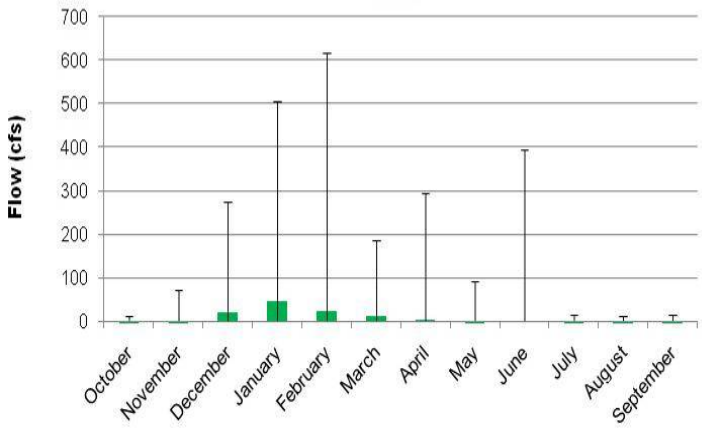

Figure 7.2.5-40. Average monthly Oregon Creek flow below Log Cabin Diversion Dam from WY 1970 through WY 2008.

Historical mean daily flows in Oregon Creek below the Log Cabin Diversion Dam are shown in Figure 7.2.5-41.

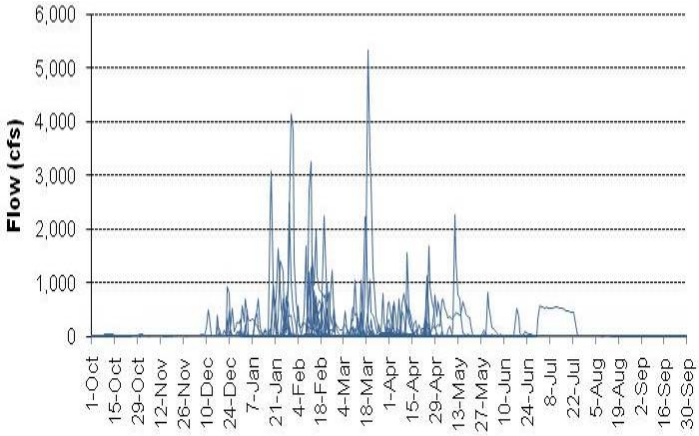

Figure 7.2.5-41. Historical Mean Daily Oregon Creek flow below Log Cabin Diversion Dam from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows in Oregon Creek below the Log Cabin Diversion Dam is shown in Figure 7.2.5-41. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 17 cfs. Fifty percent of mean daily flows exceed 10 cfs, and mean daily flows exceed 3 cfs on 90 percent of days.

South Yuba River. The headwaters of the South Yuba River begin at an elevation of 9,000 feet in Placer County near Castle Peak and Donner Summit. The South Yuba River watershed covers approximately 352 square miles. The South Yuba River joins the Yuba River at USACE's Englebright Reservoir at an elevation of approximately 525 feet, after flowing for 42 miles with an average gradient of 2 percent.

South Yuba River Upstream of the Project

The upper portion of the South Yuba River watershed (above 5,000 ft elevation) is primarily snowmelt-runoff driven, while the lower portion is rainfall-runoff-driven. Inflows to the basin are attributed to natural runoff in the basins.

NID's Yuba-River Hydroelectric Project and PG&E's Drum-Spaulding Project affect runoff into the Project by storing water in upstream reservoirs and diverting water to the Bear River at Spaulding Dam. For a discussion of these storages and diversions, refer to Section 7.2.8.1.

Flows on the lower South Yuba River have been continuously measured at the Jones Bar Gage (USGS 11417500), approximately 7 miles upstream of its confluence with the Yuba River, since April 1959. Figure 7.2.5-42 shows average monthly streamflow for the South Yuba River at the Jones Bar Gage. As with the North and Middle Yuba rivers, maximum monthly flows in the South Yuba River are significantly higher than monthly averages because they typically represent significant precipitation events, or outliers. The maximum monthly average streamflow, approximately 4,865 cfs, and the maximum daily average streamflow of approximately 30,300 cfs, were recorded during the height of the extreme flood in January 1997.

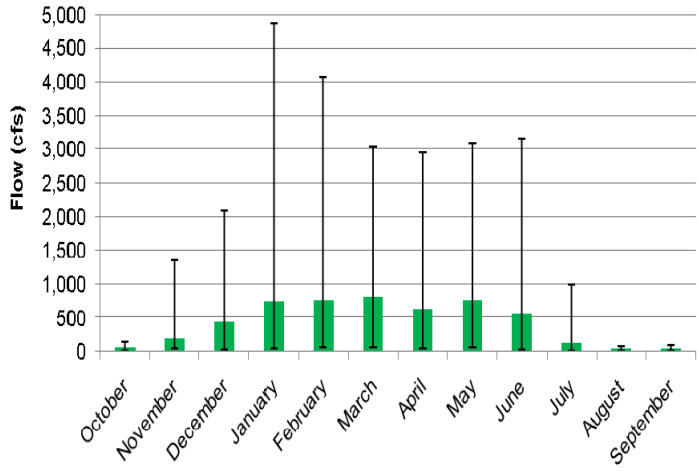

Figure 7.2.5-42. Average monthly streamflow for the South Yuba River near Jones Bar Gage (USGS Gage 11417500) from WY 1970 through WY 2008.

Figure 7.2.5-43 shows the historical mean daily streamflows on the South Yuba River near Jones Bar.

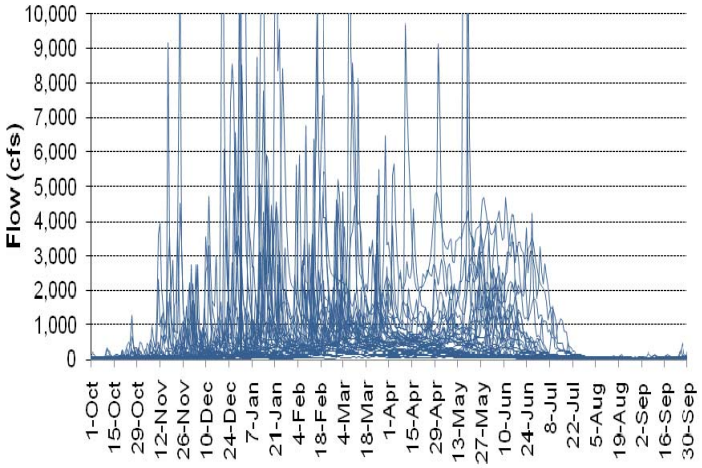

Figure 7.2.3-43. Historical mean daily streamflow each year for the South Yuba River near Jones Bar Gage from WY 1970 through WY 2008.

A flow exceedance curve for the South Yuba River is shown in Figure 7.2.5-44. Only 10 percent of mean daily flows during the period of record exceed 1,000 cfs, indicating that the majority of flows are much lower. Fifty percent of mean daily flows exceed 125 cfs, and 90 percent of mean daily flows exceed 40 cfs. Generally, these results indicate that the South Yuba River has mean daily flows similar to the mean flows in the Middle Yuba River.

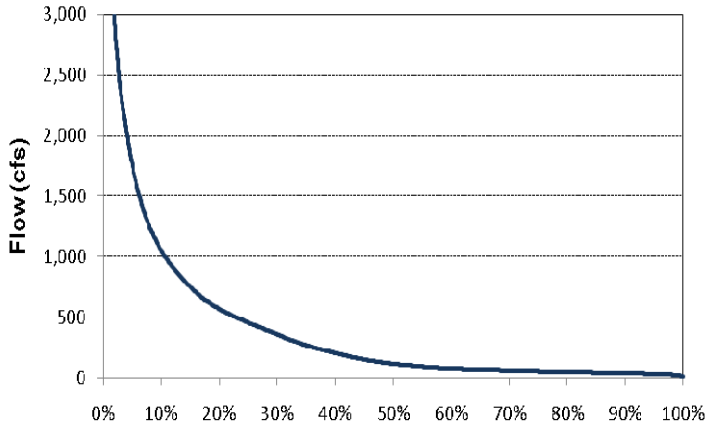

Figure 7.2.5-44. Flow exceedance of historical mean daily streamflow for the South Yuba River near Jones Bar Gage from WY 1970 through WY 2008.

Yuba River. The Yuba River begins at the confluence of the North and Middle Yuba rivers, approximately 16 miles upstream of USACE's Englebright Dam at an elevation of approximately 1,124 feet. The river then extends approximately 24 miles below USACE's Englebright Dam to the Feather River in Marysville after flowing for over 39 miles. The Yuba River sub-basin covers approximately 95 square miles.

The majority of the Yuba River sub-basin is rainwater-driven since it is located at relatively low elevations. In addition to the North and Middle Yuba rivers, inflows to the basin are attributed to the South Yuba River, Deer Creek, and Dry Creek. There are several impairments along the Yuba River between the confluence of the North and Middle Yuba rivers and its confluence with the Feather River. The two largest impairments are the USACE's Englebright and Daguerre Point dams as well as the Narrows 1 and 2 Powerhouses. There is also a pumpline diversion located approximately 1 mile upstream from the USACE's Daguerre Point Dam. The only Project facility along the lower Yuba River is the Narrows 2 Powerhouse.

Yuba River Upstream of New Colgate Powerhouse

Flow in the Yuba River at the confluence of the North and Middle Yuba rivers consists primarily of flows from the North Yuba River that are releases and spills from New Bullards Bar Dam plus accretion, releases and spills from Our House Dam on the Middle Yuba River plus accretion, and releases and spills from Log Cabin Dam on Oregon Creek plus accretions. No stream gage information is available for the upper reach of the Yuba River between the head of the Yuba River at the confluence of the North and Middle Yuba rivers and the New Colgate Powerhouse.

Yuba River Downstream of New Colgate Powerhouse to USACE's Englebright Reservoir

Flow through the New Colgate Powerhouse, including releases into the Yuba River, is described above.

USACE's Englebright Reservoir

USACE's Englebright Dam was constructed from 1938 to 1941 to capture sediment produced by upstream hydraulic mining activities. The reservoir is situated downstream of New Bullards Bar Dam at the confluence of the mainstem Yuba River and the South Yuba River. The average annual inflow to USACE's Englebright Reservoir, excluding releases from New Bullards Bar Reservoir, is approximately 400,000 ac-ft. USACE's Englebright Reservoir has a total storage capacity of approximately 70,000 ac-ft but provides only limited conservation storage PG&E holds an appropriative water right license for the storage of up to 45,000 ac-ft in USACE's Englebright Reservoir. The reservoir storage capacity is used primarily to attenuate power peaking releases from New Colgate Powerhouse and to capture storm runoff from the upstream watershed. USACE's Englebright Reservoir is used extensively for recreation.

USACE's Englebright Dam has no low-level outlet; water from the reservoir is released for power generation at the PG&E Narrows 1 Powerhouse and the Narrows 2 Powerhouse, or spills over the top of the dam during high flow conditions.

Yuba River Downstream of Narrows 2 Powerhouse

Controlled releases from USACE's Englebright Dam are made through the Narrows 1 and 2 powerhouses. The Narrows 1 Powerhouse, owned and operated by PG&E, has a 730 cfs capacity, and diverts water from USACE's Englebright Reservoir on its southern shore, near the dam. The Narrows 1 Powerhouse is located approximately a quarter mile below USACE's Englebright Dam. The Narrows 2 Powerhouse, owned and operated by Licensee, is a key component of the Project. The Narrows 2 Powerhouse diverts up to 3,400 cfs from USACE's Englebright Reservoir from its intake on the northern shore. The Narrows 2 Powerhouse is located on the northern bank of the Yuba River, about 600 feet below USACE's Englebright Dam. Data for historical Narrows 1 and 2 releases are from historical Licensee records. Figures 7.2.5-45 and 7.2.5-46 show the historical monthly average flows through each powerhouse.

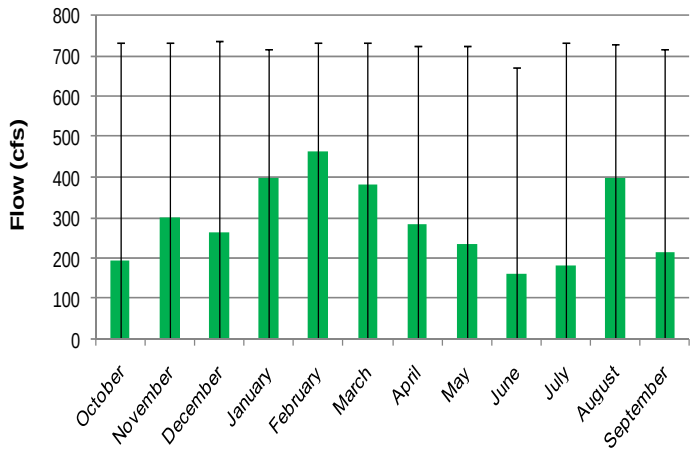

Figure 7.2.5-45. Average monthly flow for Narrows 1 Powerhouse releases from WY 1970 through WY 2008.

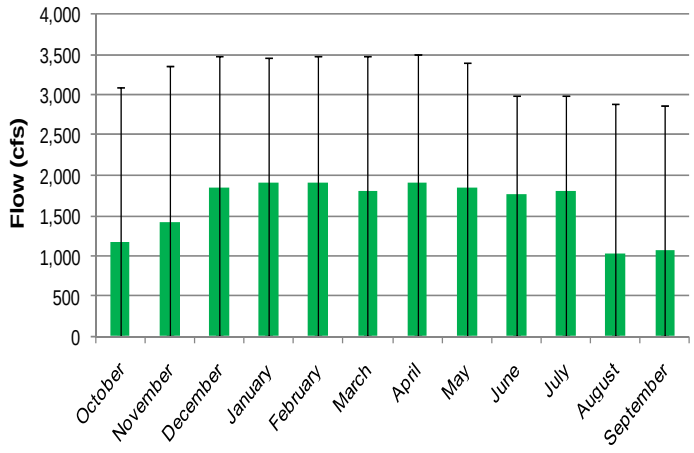

Figure 7.2.5-46. Average monthly flow for Narrows 2 Powerhouse releases from WY 1970 through WY 2008.

Figure 7.2.5-47 shows historical mean daily releases through the Narrows 1 Powerhouse. Occasional points exceeding 730 cfs are a reflection of a gaging error. Similarly, Figure 7.2.5-48 shows historical mean daily releases through the Narrows 2 Powerhouse. Releases range from 0 cfs to the maximum powerhouse capacity of 3,400 cfs.

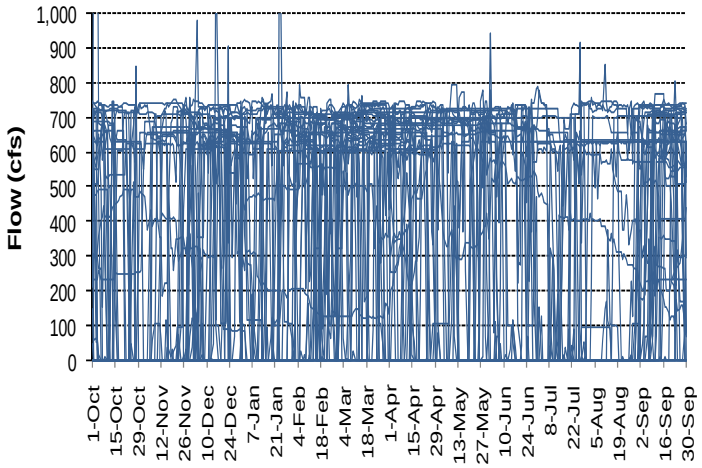

Figure 7.2.5-47. Historical mean daily releases each year for the Narrow I Powerhouse from WY 1970 through WY 2008.

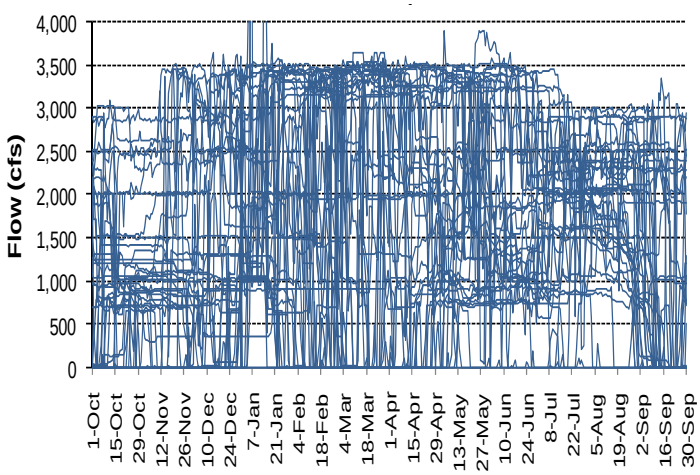

Figure 7.2.5-48. Historical mean daily Outflow each Year for the Narrows 2 Powerhouse from WY 1970 through WY 2008.

Figure 7.2.5-49 shows the exceedance probability of releases through the Narrows 1 and Narrows 2 powerhouses. Fifty percent of the time, there are no releases through the Narrows 1 Powerhouse, 10 percent of the time, releases through the Narrows 1 Powerhouse exceed 709 cfs. Narrows 2 Powerhouse releases exceed 0 cfs 90 percent of the time, exceed 1,514 cfs 50 percent of the time, and exceed 3,315 cfs 10 percent of the time.

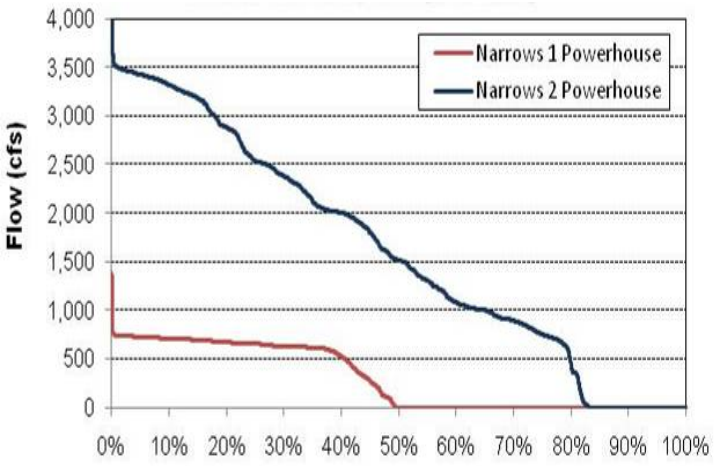

Figure 7.2.5-49. Flow Exceedance of Historical mean daily Releases Through the Narrows 1 Narrows 2 Powerhouses from WY 1970 through WY 2008.

Yuba River at Smartville Gage

Flows on the Yuba River below USACE's Englebright Dam are characterized by flows at two gaging stations. At the upper end of this reach, the Smartville Gage (USGS 11418000) is located just below USACE's Englebright Dam, and reflects releases from Engelbright Reservoir through the Narrows 1 and 2 powerhouses and spills over USACE's Englebright Dam. The Smartville Gage has been in active operation since October 1941. The Smartville gage is a compliance

measurement point for license-required minimum streamflows and water-right streamflow compliance, as well as for Yuba Accord required minimum streamflows.

Figure 7.2.5-50 shows average monthly streamflow for the Yuba River at Smartville. The maximum monthly average streamflow, approximately 22,000 cfs, and the maximum daily average streamflow of approximately 134,000, were recorded during the the height of the extreme flood in January 1997.

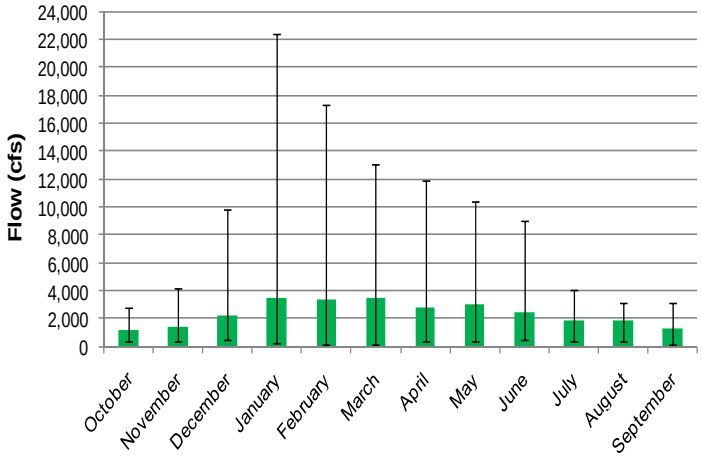

Figure 7.2.5-50. Average monthly Yuba River flow at the Smartville Gage (USGS 11418000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Yuba River at Smartville are shown in Figure 7.2.5-51.

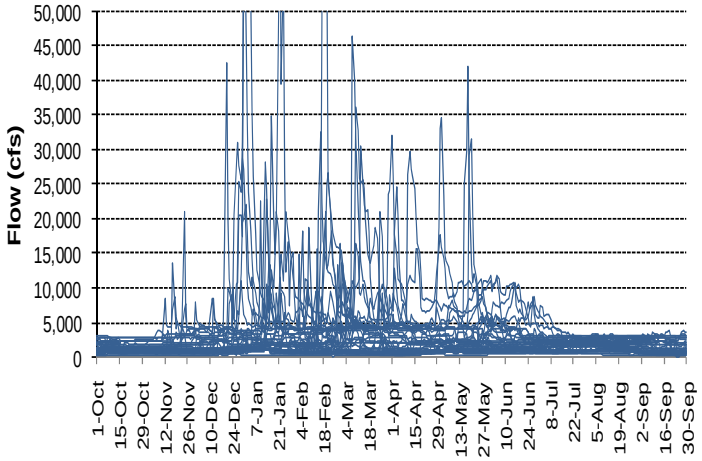

Figure 7.2.5-51. Historical mean daily streamflow each year for the Yuba River at Smartville (USGS 11418000) from WY 1970 through WY 2008.

A flow exceedance curve for the Yuba River at Smartville is shown in Figure 7.2.5-52. Only 10 percent of mean daily flows during the period of record (WY 1970-2008) exceed 4,400 cfs. Fifty percent of mean daily flows exceed 1,500 cfs, and 90 percent of mean daily flows exceed 600 cfs.

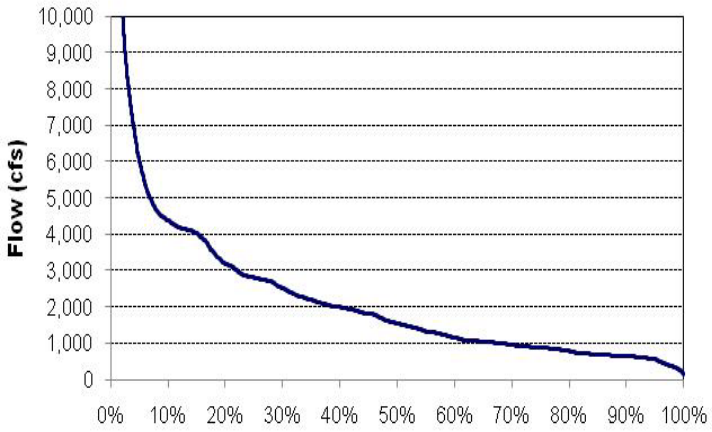

Figure 7.2.5-52. Flow exceedance of historical mean daily streamflow for the Yuba River at Smartville from WY 1970 through WY 2008.

Dry Creek, Tributary to Yuba River Downstream of the Project

Dry Creek, flowing near the western edge of Yuba County, has a watershed area of approximately 108 square miles, with its headwaters near the town of Challenge at an elevation of approximately 3,155 feet. Dry Creek flows generally southward and its flows are captured by Merle Collins Reservoir, a 57,000 ac-ft reservoir at an elevation of approximately 1,160 feet, owned and operated by Browns Valley Irrigation District (BVID). Flowing approximately 12 miles before meeting the Yuba River, Dry Creek releases from Merle Collins Reservoir are augmented by accretions from local runoff and agricultural return flows, reaching the Yuba River approximately 10 miles below USACE's Englebright Dam at an elevation of approximately 147 feet.

As shown in Table 7.2.2-1, Dry Creek is not affected by the Project because none of the facilities or diversion structures on Dry Creek are part of the Project.

Dry Creek flows near Browns Valley (below Merle Collins Reservoir) were measured by USGS Gage 11420700, approximately 5 miles upstream of Dry Creek's confluence with the Yuba River, from August 1964 through October 1980, but no records exist for flows after October 1980. Figure 7.2.5-53 shows average monthly streamflow for Dry Creek near Browns Valley. The maximum streamflow, approximately 760 cfs, was recorded in December of 1970, a wet year.

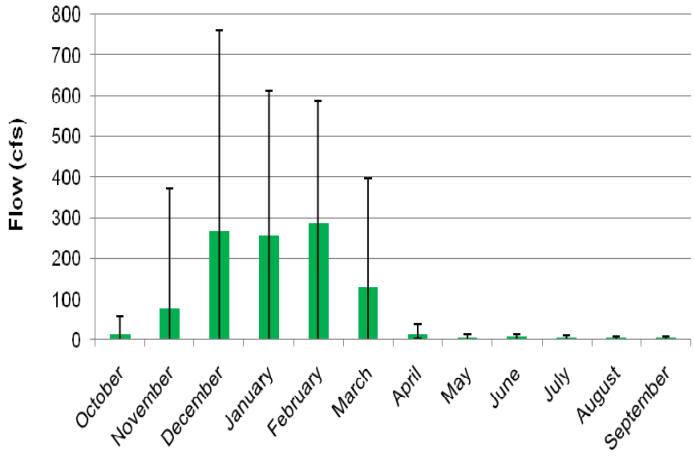

Figure 7.2.5-53. Average monthly streamflow for Dry Creek from CY 1969 through CY 1980.

Historical mean daily streamflows per year in Dry Creek are shown in Figure 7.2.3-54.

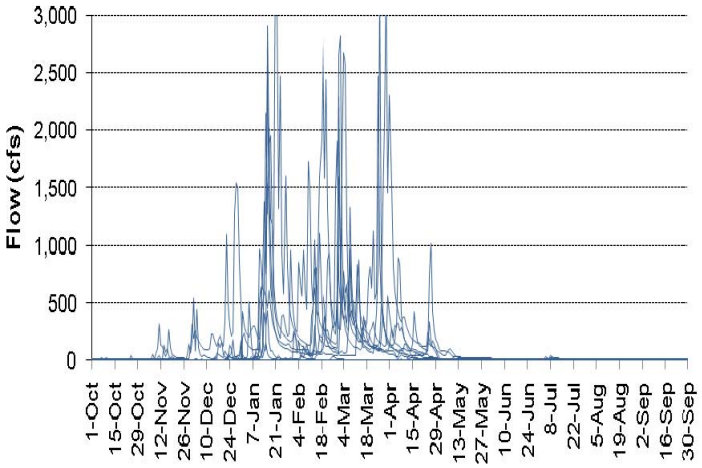

Figure 7.2.5-54. Historical mean daily streamflow each year for Dry Creek from CY 1969 through CY 1980.

A flow exceedance curve for Dry Creek near Browns Valley is shown in Figure 7.2.3-55. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 170 cfs fifty percent of mean daily flows exceed 8 cfs, and 90 percent of mean daily flows exceed 2 cfs.

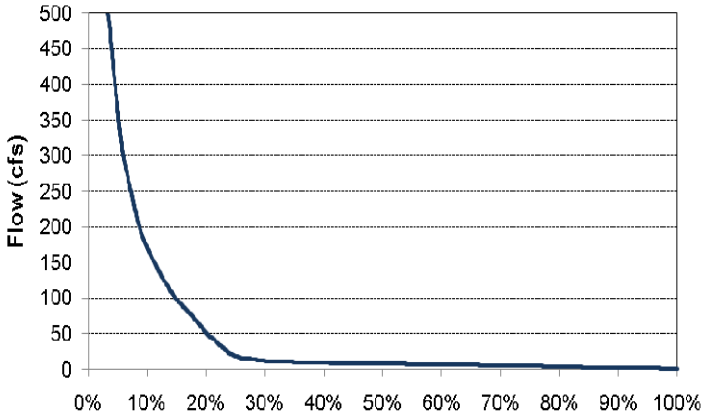

Figure 7.2.5-55. Flow exceedance of historical mean daily streamflow for Dry Creek from CY 1969 through CY 1980.

Deer Creek, Tributary to Yuba River Downstream of the Project

Deer Creek originates in Nevada County, and, in addition to its own natural runoff, receives water from the Middle and South Yuba River watersheds through PG&E's Drum-Spaulding Project (via the South Yuba Canal). The approximately 89 square mile Deer Creek watershed is primarily rainfall-runoff driven. Before it flows into the Yuba River near Smartville below USACE's Englebright Reservoir, Deer Creek is subject to impoundment at NID's Scotts Flat Reservoir and in Lake Wildwood. Several canals divert water from Deer Creek into the Bear River watershed. As indicated in Table 7.2.2-1, Deer Creek is not affected by the Project because none of the facilities or diversion structures are part of the Project.

Historical Deer Creek flows near Smartville have been measured at the USGS Gage 11418500, approximately 1 mile upstream of Deer Creek's confluence with the Yuba River, since October 1935. The watershed contributing to Deer Creek flow below the Deer Creek Gage is approximately 5 square miles. Figure 7.2.3-56 shows average monthly streamflow for Deer Creek near Smartville. The maximum streamflow, approximately 1,400 cfs, was recorded during the height of the extreme flood in January 1997.

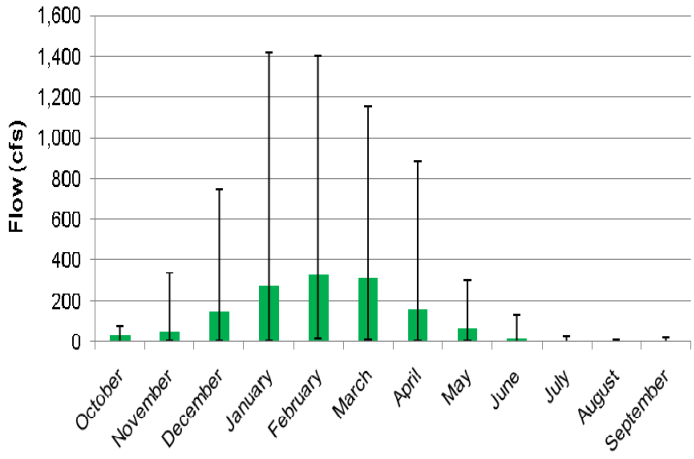

Figure 7.2.5-56. Average monthly streamflow for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in Deer Creek are shown in Figure 7.2.5-57.

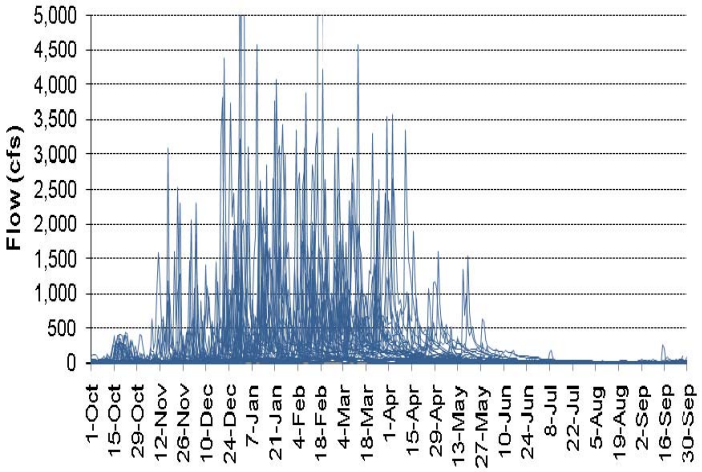

Figure 7.2.5-57. Historical mean daily streamflow each year for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

A flow exceedance curve of mean daily flows on Deer Creek at Smartville is shown in Figure 7.2.5-58. Only 10 percent of mean daily flows during the period of record (1969-2008) exceed 305 cfs. Fifty percent of mean daily flows exceed 12 cfs, and 90 percent of mean daily flows exceed 3 cfs. In general, these results indicate that flows at 50 percent exceedance and above, or low flow trends, in Dry Creek are similar to those of Deer Creek.

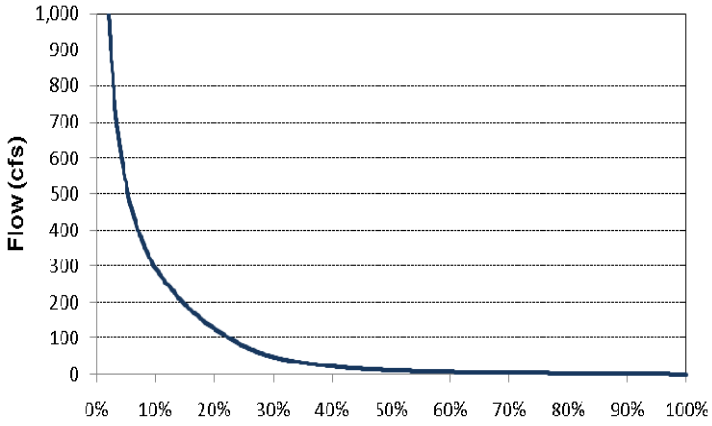

Figure 7.2.5-58. Flow exceedance of historical mean daily streamflow for Deer Creek at Smartville (USGS Gage 11418500) from WY 1970 through WY 2008.

USACE's Daguerre Point Dam

Similar to USACE's Englebright Dam, USACE's Daguerre Point Dam was constructed by the California Debris Commission to prevent hydraulic mining debris from the Yuba River watershed from flowing into the Feather and Sacramento rivers. The 30-foot high dam, which was constructed in 1906 and rebuilt in 1964 following damage from floods has no appreciable storage capacity. USACE's Daguerre Point Dam has two fish ladders, one on the north bank and one on the south bank of the river, and two diversions, one on the north bank and one on the south bank. These two diversions provide water to YCWA's Member Units for irrigation of farms within the Member Units. Some of the water diverted to the north is done under YCWA's water rights and some is diverted under Member Units' water rights. Water diverted to the south is all diverted under YCWA's water rights. Diversions and water deliveries from the lower Yuba River are discussed in more detail in section 7.2.8.3. USACE's Daguerre Point Dam also creates important groundwater recharge to the North and South Yuba Groundwater Basins.

Yuba River Downstream of USACE's Daguerre Point Dam to the Feather River

At the lower end of the Yuba River, the Marysville Gage (USGS 11421000) has measured Yuba River flows approximately 6 miles upstream of its confluence with the Feather River since October 1943. Flows at Marysville reflect upstream (Smartville) flows, agricultural diversions at USACE's Daguerre Point Dam, inflows at Deer and Dry creeks, and accretions or depletions that occur along the lower Yuba River.

Figure 7.2.5-59 shows average monthly streamflow for the Yuba River at Marysville. The maximum monthly average streamflow, approximately 26,000 cfs, and the maximum daily average streamflow of approximately 140,000 cfs, were recorded during the height of the extreme flood in January 1997.

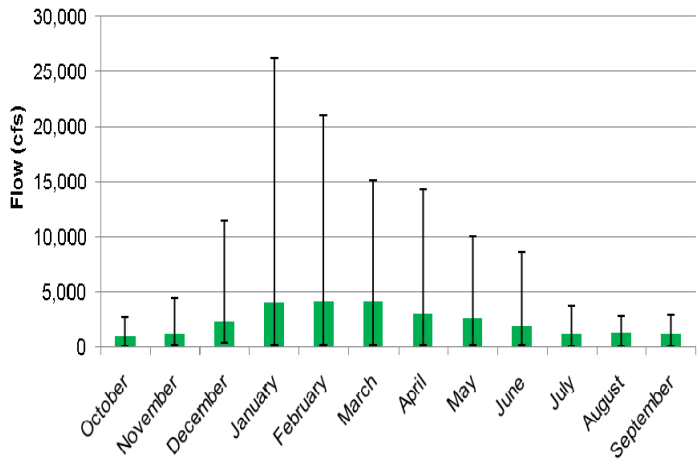

Figure 7.2.5-59. Average monthly streamflow for the Yuba River at Marysville (USGS Gage 11421000) from WY 1970 through WY 2008.

Historical mean daily streamflows per year in the Yuba River at Marysville are shown in Figure 7.2.5-60. The average daily flow variability between the minimum and maximum flows at the Marysville gage is 33,300 cfs, with the greatest monthly flow variability at both locations occurring in January and February.

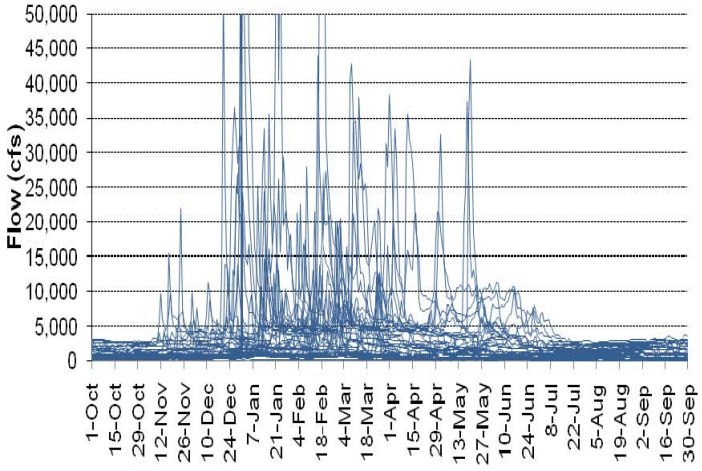

Figure 7.2.5-60. Historical mean daily streamflow each year for the Yuba River at Marysville (USGS Gage 11421000) from WY 1970 through WY 2008.

A flow exceedance curve for the Yuba River at Marysville is shown in Figure 7.2.5-61. Only 10 percent of mean daily flows during the period of record exceed 5,000. Fifty percent of mean daily flows exceed 1,300 cfs, and 90 percent of mean daily flows 400 cfs.

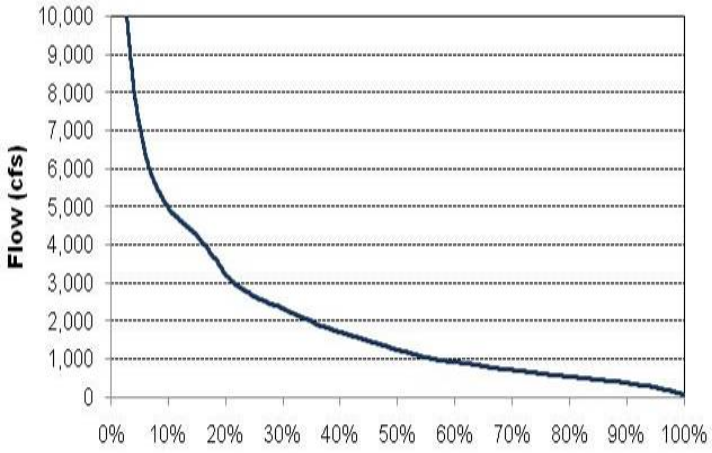

Figure 7.2.5-61. Flow exceedance of historical mean daily streamflow for the Yuba River at Marysville from WY 1970 through WY 2008.

7.2.6 Existing Instream Flow Uses

Section 4.1.9 describes the designated beneficial uses of water in the Project Vicinity, as specified in the SWRCB's Basin Plan. These beneficial uses include: 1) Municipal and Domestic Water Supply; 2) Agricultural Water Supply (irrigation); 3) Industrial Service Supply (power generation); 4) Water Contact Recreation; 5) Non-Water Contact Recreation; 6) Warm Freshwater Habitat; 7) Cold Freshwater Habitat; and 8) Wildlife Habitat. Refer to Table 4.1.10-1 for detailed description of the designated beneficial uses.

7.2.7 Applicable Water Quality Standards

As described in Section 4.1.9, water quality standards "*consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses*." [33 USC § 1313(C) (2) (A)]. Table 4.1.9-1 lists the SWRCB's designated beneficial uses in the Project Vicinity. Table 7.2.7-1, below, lists water quality objectives described in the Basin Plan related each of these uses. This list is not exhaustive and can be modified by the SWRCB to reflect site-specific information.

Table 7.2.7-1. Water quality objectives to support designated beneficial uses in the Project Vicinity.

Water Quality Objective	Description
Bacteria	In terms of fecal coliform. Less than a geometric average of 200/100 ml on five samples collected in any 30-day period and less than 400/100 ml on ten percent of all samples taken in a 30-day period.
Biostimulatory Substances	Water shall not contain biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical Constituents	Waters shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Specific trace element levels are given for certain surface waters, none of which include the waters in the vicinity of the Project. Electrical conductivity (at 77 ºF) shall not exceed 150 micromhos/cm (90 percentile) in well-mixed waters of the Feather River from the Fish Barrier Dam at Oroville to Sacramento River. Other limits for organic, inorganic and trace metals are provided for surface waters that are designated for domestic or municipal water supply. In addition, waters designated for municipal or domestic use must comply with portions of Title 22 of the California Code of Regulation. For protection of aquactic life, surface water in California must also comply with the California Toxics Rule (40 CFR Part 131).

Table 7.2.7-1. (continued)

Water Quality Objective	Description
Color	Water shall be free of discoloration that causes a nuisance or adversely affects beneficial uses.
Dissolved Oxygen	Monthly median of the average daily dissolved oxygen concentration shall not fall below 85 percent of saturation in the main water mass, and the 95 percent concentration shall not fall below 75 percent of saturation. Minimum level of 7 mg/l. Specific D.O. water quality objectives below Oroville dam are 8.0 mg/L from September 1 to May 31, for Feather River from Fish Barrier Dam at Oroville to Honcut Creek (surface water body #40). When natural conditions lower dissolved oxygen below this level, the concentrations shall be maintained at or above 95 percent of saturation.
Floating Material	Water shall not contain floating material in amounts that cause a nuisance or adversely affect beneficial uses.
Oil & Grease	Water shall not contain oils, greases, waxes or other material in concentrations that cause a nuisance, result in visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.
PH	The pH of surface waters will remain between 6.5 to 8.5, and cause changes of less than 0.5 in receiving water bodies.
Pesticides	Waters shall not contain pesticides or a combination of pesticides in concentrations that adversely affect beneficial uses. Other limits established as well.
Radioactivity	Radionuclides shall not be present in concentrations that are harmful to human, plant, animal or aquatic life nor that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal or aquatic life.
Sediment	The suspended sediment load and suspended-sediment discharge rate of surface waters shall not be altered in such a manner as to cause a nuisance or adversely affect beneficial uses.
Settable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes a nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause a nuisance or adversely affect beneficial uses.
Tastes and Odor	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes and odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses.
Temperature	The natural receiving water temperature of interstate waters shall not be altered unless it can be demonstrated to the satisfaction of the Regional Water Quality Control Board that such alteration in temperature does not adversely affect beneficial uses. Increases in water temperatures must be less than 5 ºF above natural receiving-water temperature.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. Compliance with this objective will be determined by analysis indicator organisms, species diversity, population density, growth anomalies, and biotoxicity tests as specified by the Regional Water Quality Control Board.
Turbidity	In terms of changes in turbidity (NTU) in the receiving water body: where natural turbidity is 0 to 5 NTUs, increases shall not exceed 1 NTU; where 5 to 50 NTUs, increases shall not exceed 20 percent; where 50 to 100 NTUs, increases shall not exceed 10 NTUs; and where natural turbidity is greater than 100 NTUs, increase shall not exceed 10 percent.

Source: CVRWQCB 1998.

Section 303(d) of the Clean Water Act (CWA) requires that every two years each State submit to the United States EPA a list of rivers, lakes and reservoirs in the State for which pollution control or requirements have failed to provide for water quality. The SWRCB and CVRWQCB work together to research and update the list for California. Based on a review of this list and its associated TMDL Priority Schedule, in the Project vicinity USACE's Englebright Reservoir has been identified by the SWRCB as CWA §303(d) State Impaired for mercury; Deer Creek, a tributary to the Yuba River, has been identified as impaired for pH; and Kanaka Creek, a tributary to the Middle Yuba River, has been identified as impaired for arsenic (SWRCB 2006).

There are currently no approved total maximum daily load (TMDL) plans for the Yuba River. However, additional surface waters of the Yuba River watershed are being considered for addition to the CWA §303(d) list. In 2009, the Central Valley Regional Water Quality Control

Board (CVRWQCB) recommended including New Bullards Bar Reservoir, the North Yuba River between New Bullards Bar and USACE's Englebright Reservoirs, the Middle Yuba River, the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir, and the Lower Yuba River from USACE's Englebright Reservoir to the Feather River in the list as impaired for mercury (CVRWQCB 2009). The CVRWQCB is also recommending that the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir be listed as impaired for temperature and the lower Yuba River as impaired for iron (CVRWQCB 2009).

7.2.8 Existing and Proposed Water Rights Potentially Affecting or Affected by the Project

Section 6.3.1.3 provides a list of water rights held by Licensee for power generation. Provided below is description of other existing or proposed water rights potentially affecting or affected by the Project.

7.2.8.1 Water Rights Upstream of the Project That Affect the Project

Numerous water rights holders divert and store waters upstream of the Project. The upstream projects with significant impacts on Project operations include SFWPA's South Fork Power Project, NID's Yuba-Bear Hydroelectric Project, and PG&E's Drum-Spaulding Project. Each of these project's effects are summarized here.

South Fork Power Project

SFWPA diverts water from Slate Creek, a tributary to the North Yuba River upstream of New Bullards Bar Reservoir at the Slate Creek Diversion Dam. This diversion diverts up to a maximum flow of 848 cfs of water out of Slate Creek to Sly Creek Reservoir on Lost Creek, a tributary to the South Fork Feather River. SFWPA's water rights limit Slate Creek diversions to 600 cfs and at times diversions are physically limited to 500 cfs due to high water elevations in Sly Creek Reservoir.

Table 7.2.8-1 shows the average diversions in cfs and total annual diversions in ac-ft at the Slate Creek Diversion Dam as measured at USGS Gage 11413250, for three water years representative of Dry, Normal, and Wet conditions.

Table 7.2.8-1. North Yuba River Sub-Basin Diversions by SFWPA South Fork Power Project - Slate Creek Diversions for Representative Water Year Types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	68	48,995
Normal	2003	141	102,108
Wet	1995	209	151,075

Source: USGS Gage 11413250, Slate C Tunnel Nr Strawberry Valley CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw

Yuba-Bear Hydroelectric Project

NID diverts and regulates flows in the Middle and South Yuba river watersheds. On the Middle Yuba River, NID's Jackson Meadows Reservoir (RM 45.6) and Milton Diversion Dam (RM

43.4) affect flows entering the Yuba River Development Project. Jackson Meadows Reservoir can store 69,205 ac-ft of water and the Milton Diversion Dam, which has no associated storage, can divert up to 450 cfs from the Middle Yuba River to Bowman Lake on Canyon Creek, a tributary to the South Yuba River. Table 7.2.8-2 shows the average diversions in cfs and total annual diversions in ac-ft at the Milton Diversion Dam for water years representative of Dry, Normal, and Wet conditions.

Table 7.2.8-2. Middle Yuba River Sub-basin diversions by NID's Yuba-Bear Hydroelectric Project – Milton Diversion Dam diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	40	28,682
Normal	2003	97	70,527
Wet	1995	87	62,991

Source: USGS Gage 11408000, Milton-Bowman Tunnel Outlet Nr Graniteville CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw .
Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

On the South Yuba River, NID's Canyon Creek reservoir system (including French, Faucherie, Sawmill, Jackson and Bowman, with a combined useable storage of roughly 90,000 ac-ft) affects South Yuba River flows. Bowman-Spaulding Diversion Dam can divert up to 300 cfs from Canyon Creek to PG&E's Lake Spaulding on the South Yuba River. Bowman-Spaulding Diversion Conduit also captures the majority of flows from several feeder streams, all tributary to the South Yuba River, between Bowman Reservoir and Lake Spaulding. These waters are then subsequently diverted out of South Yuba River basin into the Deer Creek and Bear River drainages by PG&E. Table 7.2.8-3 shows the average diversions in cfs and total annual diversions in ac-ft at NID diversion facilities tributary to the South Yuba River for water years representative of Dry, Normal, and Wet conditions.

Table 7.2.8-3. South Yuba River Sub-basin diversions by NID's Yuba-Bear Hydroelectric Project – Bowman-Spaulding Diversion Dam and Conduit diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	48	35,004
Normal	2003	102	73,934
Wet	1995	141	102,257

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

Drum-Spaulding Project

PG&E diverts and regulates flows in the South Yuba River watershed. Several upstream storage reservoirs, including Spaulding and Fordyce, with a combined useable storage of 125,000 ac-ft, affect South Yuba River flows. Water is diverted at Spaulding Dam, where the Spaulding Tunnel can divert up to 1,200 cfs to the South Yuba and Drum canals. These canals transfer diverted flows into the Deer Creek and Bear River drainages, respectively. Table 7.2.8-4 shows the average diversions in cfs and total annual diversions in ac-ft at PG&E diversion facilities tributary to the South Yuba River for water years representative of Dry, Normal, and Wet conditions.

Table 7.2.8-4. South Yuba River Sub-basin diversions by PG&E's Drum-Spaulding Project – Spaulding Dam diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	289	208,511
Normal	2003	525	378,140
Wet	1995	583	419,962

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

Table 7.2.8-5 shows the cumulative annual average diversions in cfs and ac-ft from the South Yuba River upstream of the Project due to NID and PG&E's combined operations.

Table 7.2.8-5. Cumulative South Yuba River Sub-basin diversions by PG&E's Drum-Spaulding Project and NID's Yuba-Bear Hydroelectric Project – diversions for representative water year types.

Year Type	Representative Water Year	Average Diversion (cfs)	Annual Diversion (ac-ft)
Dry	2001	337	243,514
Normal	2003	627	452,074
Wet	1995	724	522,219

Source: USGS Gage 11417500 – South Yuba River at Jones Bar CA. http://waterdata.usgs.gov/nwis/dv/?referred_module=sw. Note: These values should be considered estimates, as tunnel gage statistics do not take into account changes in upstream storage.

7.2.8.2 Water Rights Within the Project

YCWA pumps some water directly from New Bullards Bar Reservoir to supply water to the Cottage Creek Water Treatment Plant for domestic and recreation uses adjacent to the reservoir. The amount of this pumping averages approximately 6 ac-ft per year.

7.2.8.3 Water Rights Downstream of the Project Affected by the Project

Downstream of the Project, water is diverted under consumptive-use water-right permits to eight water users, which are collectively referred to as the YCWA Member Units. YCWA also makes surface water available to the City of Marysville for the City's diversion to and use at Lake Ellis. The YCWA Member Units and the City of Marysville and their delivery points are listed in Table 7.2.8-6. The YCWA Member Units service areas are shown in Figure 7.2.8-1.

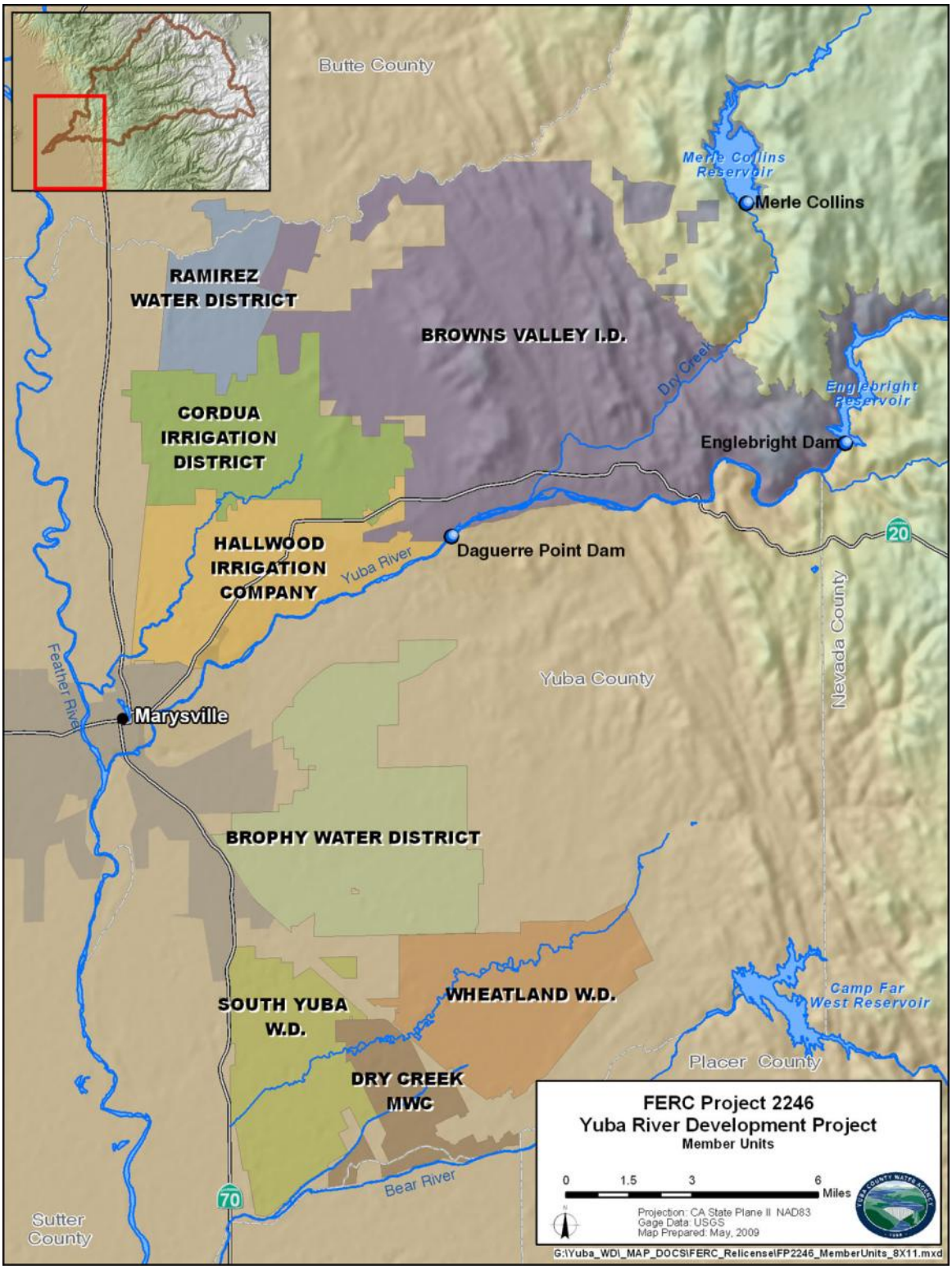

Figure 7.2.8-1. Yuba County Water Agency Member Units service areas.

Table 7.2.8-6. Yuba County Water Agency's annual contract amounts and place of delivery.

Water Diversion Point and Member Units	Base Contract (ac-ft)	Supplemental Contract (ac-ft)	Total Contract (ac-ft)	Member Unit Water Rights (ac-ft)	Total Contract and Water Rights (ac-ft)
BROWNS VALLEY IRRIGATION DISTRICT PUMPLINE DIVERSION FACILITY					
Browns Valley Irrigation District[2]	9,500	-	9,500	24,462[1]	33,962
SOUTH CANAL[4]					
Brophy Water District	43,470	32,177	75,647	-	75,647
South Yuba Water District	25,487	18,843	44,330	-	44,330
Dry Creek Mutual Water Company[4]	13,682	3,061	16,743	-	16,743
Wheatland Water District [1]	23,092	17,138	40,230	-	40,230
NORTH CANAL[3]					
Cordua Irrigation District[4]	12,000	-	12,000	60,000	72,000
Hallwood Irrigation Company	-	-		78,000	78,000
Ramirez Water District	14,790	10,311	25,101	-	25,101
MARYSVILLE[5]					
City of Marysville	-	2,500	2,500	-	2,500
Total	**142,021**	**84,030**	**226,051**	**162,462**	**388,513**

[1] Includes both Phase 1 and Phase 2 of the Wheatland Project.
[2] BVID receives water at the Pumpline Diversion Facility, located 1 mile upstream from USACE's Daguerre Point Dam.
[3] CID, HIC, and RWD receive water through the Hallwood-Cordua Canal (North Canal), located on the north abutment of USACE's Daguerre Point Dam.
[4] BWD, SYWD, DCMWC and WWD receive water from the South Yuba Canal (South Canal), which begins on the south side of the Yuba River slightly upstream of the south abutment of USACE's Daguerre Point Dam.
[5] The City of Marysville diverts water from the Yuba River near Marysville.

BVID, CID, and HIC have their own water rights on the lower Yuba River. Under settlement contracts with YCWA, CID and HIC receive surface water supplies as part of Project operations to supply their own water rights listed in Table 7.2.8-6. Dry year deficiency criteria in these contracts are different from the deficiency criteria in YCWA's contracts with other member units. Provisions in YCWA's water right settlement contracts preclude deficiencies in water right settlement deliveries unless the California Department of Water Resources (DWR) April forecast of unimpaired runoff as measured at the Smartville Gage is less than 40 percent of average. No deficiencies in such deliveries may be imposed on BVID. Contract shortage provisions are presented in Table 7.2.8-7.

Table 7.2.8-7. Yuba County Water Agency water supply contract deficiency provisions.

Category	Unimpaired Runoff Forecast (f) [a]	Percentage of Settlement/ Contract Allocation Available
PRE-1914 RIGHTS SETTLEMENTS		
Cordua Irrigation District, Hallwood Irrigation Company	$f \geq 40\%$	100%
	$f < 40\%$	80%
Browns Valley Irrigation District	All	100%
YCWA SUPPLY CONTRACTS		
Base Project Water	$f > 85\%$	100%
	$50\% < f \leq 85\%$	85%
	$40\% \leq f \leq 50\%$	70%
	$f < 40\%$	50%
Supplemental Water	All forecasts	Determined annually by Licensee in its reasonable discretion considering forecasted runoff and operational conditions.

[a] April 1 DWR forecast of unimpaired Yuba River runoff near Smartville, in percentage of 50-year average.

YCWA's contract allocations are based on the gross acreage served by each member unit. The maximum "Base Project Water" allocation is computed by multiplying 90 percent of the gross acreage by 2.87 ac-ft per acre. The maximum "Supplemental Water Supply" is computed by multiplying 90 percent of the gross acreage by 2.13 ac-ft per acre. For member units that have water rights senior to YCWA's, their contract allocations are based on their water right amounts.

In 2009, YCWA started providing water to the Wheatland Water District (WWD) under a water service contract. Until then, water users within WWD relied on solely groundwater for irrigation. The Wheatland Project now conveys water, diverted by YCWA at USACE's Daguerre Point Dam, to WWD through the South Canal system. The Wheatland Project is being constructed in two phases. Phase 1, which was completed in 2009, provides for delivery of surface water to WWD and the immediate irrigation of approximately 7,750 acres of the approximately 9,200 acres that will be served upon the completion of both phases. Under Phase 1, WWD's contract with YCWA provides for a total allocation (base and supplemental) of 23,092 ac-ft per year. When Phase 2 is completed, this contract will for a total allocation (base and supplemental) of 40,230 ac-ft per year.

7.2.9 Existing Water Quality Information

7.2.9.1 Existing Water Quality Data

As part of its acquisition of existing, relevant, and reasonably available data for inclusion in this document, Licensee found a considerable amount of water quality information, the most relevant of which was collected from the 1950s to the present. Licensee consulted with and reviewed the following sources of information to prepare the description of water quality in this section:

- Licensee's own data
- California's Office of Environmental Health Hazard Assessment (OEHHA) fish ingestion advisories
- DWR
- NID's Yuba-Bear Hydroelectric Project Relicensing ongoing water quality and water temperature studies
- PG&E's Drum-Spaulding Project Relicensing ongoing water quality and water temperature studies
- Sacramento River Watershed Program (SRWP) regional monitoring data
- USGS' California Water Science Center Investigations
- USGS' National Water Information System (NWIS) Reports
- US Environmental Protection Agency's (EPA) Storage and Retrieval (STORET) Reports
- Yuba River Temperature Monitoring Project performed by the United States Fish and Wildlife Service (USFWS)
- Upper Yuba River Studies Program's (UYRSP) technical reports
- Water quality data from the South Yuba River Citizens League (SYRCL)
- Water quality data from the Friends of Deer Creek (FODC)

Quantitative information from the above source documents is summarized below. Raw data and selected references are provided in Attachment 7.2A.

7.2.9.2 Licensee's Water Temperature Data Collection Network

Licensee is actively collecting stream water temperature data upstream, within and downstream of the Project, and is also collecting reservoir water temperature data in New Bullards Bar Reservoir and in USACE's Englebright Reservoir. Table 7.2.9-1 lists Licensee's stream temperature data collection network. Data have been collected at several locations in the Yuba River below USACE's Englebright Dam since 2003; at other locations, data collection began in summer 2008. Reservoir temperature data have been recorded twice per month by Licensee since 1990 at a single point near the upstream face of New Bullards Bar Dam and at USACE's Englebright Dam. Normally, reservoir data have been collected at 10-foot intervals, along with *in situ* air temperature.

Table 7.2.9-1. Key of Licensee's Active Stream Temperature Data Collection Locations.

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Availability	Streamflow Gage, if Co-Located[3]
MIDDLE YUBA RIVER							
-----	Upstream of Our House Diversion Dam Impoundment	T10a T10b	MYR 12.2	39.413015	-120.994590	3/28/09-6/9/09	-----
Our House Diversion Dam Reach	At Intake to Lohman Ridge Diversion Tunnel	T20	MYR 12.0	39.411910	-120.997427	7/3/08-7/25/08, 10/1/08-10/15/08, 11/1/08-5/5/09	USGS 11408870 (PG&E NY17)
	Downstream of Our House Diversion Dam	T30	MYR 11.9	39.410661	-120.998604	10/24/08-5/5/09	USGS 11408880 (PG&E NY18)
Oregon Creek Reach	Upstream of North Yuba River	T90a T90b	MYR 0.0	39.368639	-121.135658	8/19/08-12/18/08, 3/28/09-6/9/09	-----
OREGON CREEK							
-----	Upstream of Log Cabin Diversion Dam Impoundment	T40	OC 4.3	39.440146	-121.056149	7/8/08-4/5/09	USGS 11409300 (PG&E NY19)
Log Cabin Diversion Dam Reach	At Intake to Camptonville Diversion Tunnel	T50	OC 4.2	39.440491	-121.058746	7/8/08-7/13/08, 10/1/08-10/12/08, 11/1/08-12/4/08, 12/14/08-5/5/09	USGS 11409350 (PG&E NY30)
	Downstream of Log Cabin Diversion Dam	T60	OC 4.0	39.439455	-121.059264	8/30/08-5/5/09	USGS 11409400 (PG&E NY20)
NORTH YUBA RIVER							
-----	Upstream of New Bullards Bar Reservoir	T65a T65b	NYR 16.0			12/12/08-3/23/09	-----
New Bullards Bar Dam Reach	At Low Flow Releases from New Bullards Bar Dam	T70a T70b	NYR 2.4	39.392348	-121.141584	7/18/08-5/5/09	USGS 11413517 (PG&E NY23)
	Upstream of Middle Yuba River	T80a T80b	NYR 0.0	39.368694	-121.136793	8/19/08-12/18/08, 3/28/09-6/9/09	-----
SOUTH YUBA RIVER							
-----	At Jones Bar	Jones Bar a Jones Bar b Jones Bar c	SYR 7.1	39.292222	-121.103610	NO DATA	USGS 11417500 (PG&E NY29)
DOBBINS CREEK							
-----	At Lake Francis Outlet[2]	T140a T140b	DC 2.4	39.359171	-121.205168	4/2/09-6/9/09	-----
-----	Upstream of Yuba River	T145a T145b	DC 0.1	39.329735	-121.197641	4/2/09-6/9/09	-----
DRY CREEK							
-----	Upstream of Yuba River	T185a T185b	DryC 0.7	39.228930	-121.402270	4/1/09-4/20/09	-----
DEER CREEK							
-----	Upstream of Yuba River	T175a T175b	DeerC 0.9	39.224091	-121.269866	2/4/09-5/27/09 (12/23-2/4 recorder out of water)	-----
YUBA RIVER							
Middle/ North Yuba River Reach	Downstream of Confluence of North Yuba River and Middle Yuba River	T100a T100b	YR 39.5	39.367839	-121.136655	8/19/08-12/18/08, 3/28/09-6/9/09	-----
	Upstream of New Colgate Powerhouse	T110a T110b	YR 34.1	39.330602	-121.187675	8/19/08-12/18/08, 3/28/09-6/9/09	-----

Table 7.2.9-1. (continued).

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Availability	Streamflow Gage, if Co-Located[3]
YUBA RIVER (continued)							
New Colgate Powerhouse Reach	In Colgate Powerhouse Penstock	T120	YR 34.0	39.330824	-121.191565	7/1/08-7/1/09	-----
	Downstream of New Colgate Powerhouse	T130a T130b	YR 33.9	39.330260	-121.193169	8/19/08-12/18/08	-----
	Downstream of Dobbins Creek	T150a T150b	YR 33.6	39.328398	-121.196162	3/28/09-6/9/09	-----
	In Narrows #2 Powerhouse Penstock	T160a T160b	YR 23.9	39.238911	-121.270034	5/5/09-7/1/09	(PG&E NY24)
	Downstream of Narrows #2 Powerhouse at Smartville	T170	YR 23.6	39.235799	-121.272688	4/15/09-6/4/09	USGS 11419000 (PG&E NY28)
	Downstream of Narrows #2 Powerhouse at Smartville (data collected on 1-hr interval, rather than every 15 min)	Smartville a Smartville b Smartville c	YR 23.6	39.235799	-121.272688	WY2003 - 2007	USGS 11419000 (PG&E NY28)
	Downstream of Deer Creek	T180a T180b	YR 22.7	39.230047	-121.285165	11/8/08-5/27/09	-----
	At Parks Bar (data collected on 1-hr interval, rather than every 15 min)	Parks Bar a Parks Bar b Parks Bar c	YR 17.4	39.219612	-121.346980	NO DATA	-----
	At Long Bar (data collected on 1-hr interval, rather than every 15 min)	Longs Bar a Longs Bar b Longs Bar c	YR 16.0	39.218503	-121.369961	NO DATA	-----
	Downstream of Dry Creek	T190a T190b	YR 13.3	39.219611	-121.415128	11/8/08-3/9/09	-----
	Upstream of USACE's Daguerre Point Dam	T200a Y200b	YR 13.2	39.208009	-121.443116	11/8/08-3/10/09, 4/14/09-5/14/09	-----
USACE's Daguerre Point Dam Reach	At USACE's Daguerre Point Dam Fish Ladder	T210a T210b	YR 11.4	39.207853	-121.443529	11/18/08-1/11/09, 4/2/09-6/7/09	-----
	At USACE's Daguerre Point Dam Fish Ladder (data collected on 1-hr interval, rather than every 15 min)	Daguerre a Daguerre b Daguerre c	YR 11.4	39.208009	-121.443116	WY2003 – 2007	-----
	At Walnut Avenue (Near Western Extent of Yuba Goldfields)	T220a T220b	YR 8.1	39.188220	-121.495307	8/28/08-6/8/09	-----
	At Marysville Gage	T225	YR 6.0	39.176164	-121.524386	NO DATA	USGS 11421000
	At Marysville Gage (data collected on 1-hr interval, rather than every 15 min)	Marysville a Marysville b Marysville c	YR 6.0	39.176164	-121.524386	WY2003 - 2007	USGS 11421000
	Upstream of Simpson Lane (Between Yuba Goldfields and Marysville)	T230a T230b	YR 4.8	39.165328	-121.541350	8/28/08-6/8/09	-----
	At Marysville (Downstream of Highway 70 Bridge	T240a T240b	YR 0.7	39.134510	-121.590720	8/21/08-3/17/09, 5/28/09-6/23/09	-----

Table 7.2.9-1. (continued).

Project Reach	Location	Designation for Recorders[1]	River Mile	Latitude	Longitude	Data Included in PIP	Streamflow Gage, if Co-Located[3]
FEATHER RIVER							
-----	Upstream of Yuba River	T250a T250b	-----	39.139425	-121.607282	8/15/08-6/23/09	-----
-----	Downstream of Yuba River on Right Bank	T260a T260b	-----	39.108603	-121.603149	8/15/08-6/23/09	-----
-----	Downstream of Yuba River on Left Bank	T270a T270b	-----	39.108594	-121.604663	8/08 – 3/09	-----

[1] Licensee has installed redundant water temperature recorders at all locations except locations that are co-located with secure USGS stream flow gages or secure penstock sites.
[2] Water temperature data collected only when Lake Francis is releases water.
[3] Co-located means that a flow gage may be in the vicinity of the water temperature recorder but possible not at the exact location.

7.2.9.3 Water Quality Upstream of the Project

Surface water flows into Project facilities from several sources: the North Yuba River; Oregon Creek at the Log Cabin Diversion Dam impoundment; the Middle Yuba River at Our House Diversion Dam impoundment; the South Yuba River at USACE's Englebright Reservoir. Existing, relevant, and reasonably available water quality information from source documents for stream reaches upstream of the Project is summarized in Table 7.2.9-2 and described below. Figures 7.2.9-1 through 7.2.9-4 provide a summary of recent surface water temperature data collected upstream of the Project. Summary results for water quality data are presented in Table 7.2.9-2.

Source Information

Licensee found four source documents[5] of relevant information regarding existing water quality in the Yuba River watershed upstream of the Project. The contents of these source documents, as well as anecdotal information, are described here.

Licensee's Water Temperature Data. Licensee began collecting continuous water temperature data upstream of the Project in 2005 and has installed continuous water temperature data in the following locations as of August 2009:

- North Yuba River above New Bullards Bar Reservoir (NYR 10.7)
- Oregon Creek above Log Cabin Diversion Impoundment (OC 4.3)
- Middle Yuba River above Our House Diversion Impoundment (MYR 12.2)
- South Yuba River at Jones Bar above USACE's Englebright Reservoir (SYR 7.1)

See Table 7.2.9-1 for additional information on these temperature monitoring locations. Figures 7.2.9-1 to 7.2.9-4 below provide mean daily temperature measurements for several of the locations listed above, based on data availability. Daily average water temperatures have been found to exceed 20°C in all major reaches upstream of the Project with the exception of the North Yuba River.

Attachment 7.2A includes all data collected to date, in Microsoft Excel and PFD formats. Data collection is continuing through 2009.

NID's Yuba-Bear and PG&E's Drum-Spaulding Hydroelectric Project Relicensing Studies. Water quality and water temperature monitoring studies are on-going in the Middle and South Yuba rivers upstream of the Project as part of the FERC relicensing of NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project. The closest upstream sample locations to the Project were the Middle Yuba River below Jackson Meadows Dam and the South Yuba River below the Canyon Creek confluence. Date were collected at these locations during the spring and summer of 2008 (NID 2009; PG&E 2009). Samples were analyzed for general chemistry, inorganic ions, metals including methylmercury and mercury, and nutrients.

[5] A "source document" contains original data collected by the author's and associated conclusions, interpretations and other information developed *de novo* by the authors.

Analyte concentrations were below aquatic toxicity benchmarks set forth by the EPA, the CVRWQCB, and others in both seasons.

SFWPA's South Feather Power Project Relicensing Studies. Water temperature monitoring studies were conducted in 2004 and 2005 as part of South Feather Water and Power Agency's (SFWPA) South Feather Power Project relicensing (FERC No. 2088). Stream temperature monitoring results on Slate Creek below SFWPA's Slate Creek Diversion Dam, a tributary to the North Yuba River, are included in this section.

South Yuba River Citizens League (2000-2007). SYRCL collected samples from the North Yuba River just upstream of New Bullards Bar Reservoir during an 8 to 12 month period in 2001 (SYRCL 2006). Seven samples were collected for six general water quality parameters: pH (7-8.1 su), turbidity (0-45 NTU), dissolved oxygen (8.3-12.3 mg/L), TOC (0.59-2.6 mg/L), nitrate-nitrite (0.025-0.05 mg/L), and electrical conductivity (20-30 µS/cm).

SYRCL collected *E. coli* samples at various locations in the South Yuba and Middle Yuba rivers. In the upper reaches of these river systems, including the Jackson Meadows Dam Reach, *E. coli* concentrations were extremely low (0 MPN/100ml to 1 MPN/100ml). In the lower reaches of the South Yuba River, *E. coli* were more abundant, but still relatively low (0 MPN/100ml to 40 MPN/100ml).

In the Middle Yuba River, all of the average levels of bacteria and metals data collected by SYRCL, except for arsenic, are within EPA's drinking water standards (SYRCL 2006). The EPA standard for arsenic is 10 ppb, while the average measured arsenic level in the Middle Yuba River is 15.84 ppb. Kanaka Creek, which feeds into the Middle Yuba River 4 miles upstream of Our House Diversion Dam is listed under Section 303(d) of the Clean Water Act (CWA) as "impaired" due to arsenic levels and contributes to the measured high levels of arsenic (SYRCL 2007). This site accounted for the highest measured level of arsenic (47.2 ppb in August 2002).

SYRCL provided water quality data collected between 2001 and 2007 from five sites along the Middle Yuba River upstream of the Project: Site 7 (Below Jackson Meadows Reservoir); Site 8 (Plumbago Crossing above Kanaka Creek); Site 27 (Kanaka Creek); Site 37 (Milton Reservoir); Middle Fork downstream of Jackson Meadows; and Site 46 (Our House Dam Pike). The overall minimum and maximum conductivity values were 10 µS/cm and 430 µS/cm, respectively. The average conductivity was 102.9 µS/cm. The overall minimum and maximum DO values were 2.2 mg/L and 14.5 mg/L, respectively. The average DO value was 9.9 mg/L. The overall minimum and maximum water temperature values were 1.8°C and 22.7°C, respectively. The overall average water temperature value was 10.7°C. The overall minimum and maximum turbidity values were 0 NTU and 6.89 NTU, respectively. The average turbidity value was 0.29 NTU. The overall minimum and maximum pH values were 5.6 and 8.5, respectively. The average pH value was 7.2.

SYRCL monitored total suspended solids (TSS), and bacterial levels at the five sites (#7, 8, 27, 37 and 46) as well. For these years, TSS averaged 2.36 mg/L with a high of 9.4 mg/L. The levels of *E. coli* averaged 9.74 MPN/100mL with a high of 101.7 MPN/100ml.
SYRCL provided temperature data to the CVRWQCB for the South Yuba River between Lake

Spaulding and USACE's Englebright Reservoir for the years 2001 to 2006 (CVRWQCB 2009). In 2009, the CVRWQCB recommended that the South Yuba River be identified as impaired for temperature.

USFWS (1999). USFWS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to "*formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions*." Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at the Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir.

Anecdotal Information

Licensee found three sources of anecdotal information that may be relevant to water quality upstream of the Project. The contents of these anecdotal sources are described here.

EPA's STORET Database (2009). Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009. Results of the STORET query yielded six observations above the Project on the North Yuba River, six observations above the Project on the Middle Yuba River, and 10 observations above the Project on the South Yuba River (EPA 2009). Summarized in Table 7.2.9-2, all data reflect surface water quality between 1952 and 1968.

Sierra Foothill Research and Extension Center (2008). Bordering USACE's Englebright Reservoir, the Sierra Foothill Research and Extension Center (REC) is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in Oak Woodland habitats, particularly range management.

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and e. coli, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was informative. SYRCL is concerned with bacteria levels in Yuba surface water yet no data besides the SYRCL data were found. Chu *et al.*(2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

USGS National Water Information System (2009). Surface water quality data were retrieved for the Project Area from the USGS NWIS database management system on May 7, 2009. Results of the NWIS query yielded one observation above the Project on the North Yuba River, two observations above the Project on the Middle Yuba River below of the confluence with Oregon Creek, and no observations above the Project on the South Yuba River (USGS 2009). Summarized in Table 7.2.9-2, all data reflect surface water quality between 1960 and 2004.

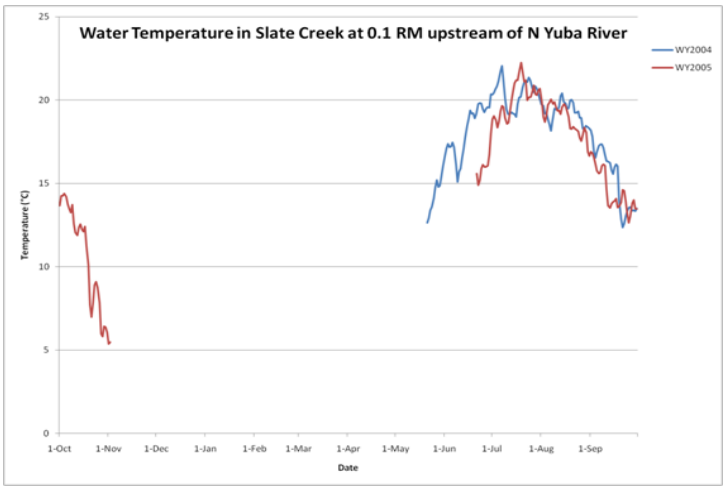

Figure 7.2.9-1. Mean daily water temperature collected in Slate Creek 0.1 mile upstream of the North Yuba River in 2004-2005.
Source: South Feather Water and Power Agency
Other Slate Creek thermograph locations at RM 0.2, 6.4, 8.9, 9.1 and 9.7.

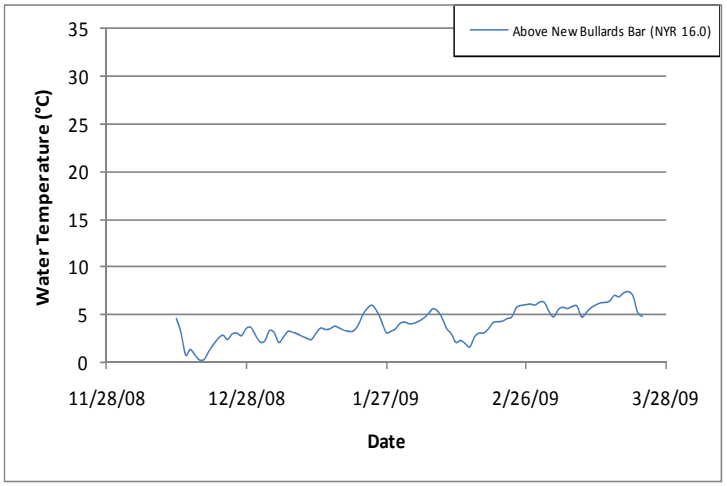

Figure 7.2.9-2. Mean daily water temperature collected in the North Yuba River upstream of New Bullards Bar (NYR 16.0) in 2008-2009.
Source: YCWA.

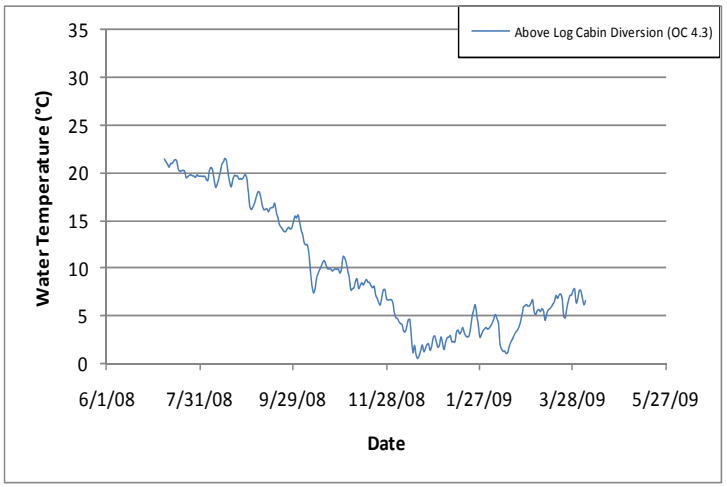

Figure 7.2.9-3. Mean daily water temperature in Oregon Creek upstream of Log Cabin Diversion Dam impoundment (OC 4.3) in 2008-2009.
Source: YCWA.

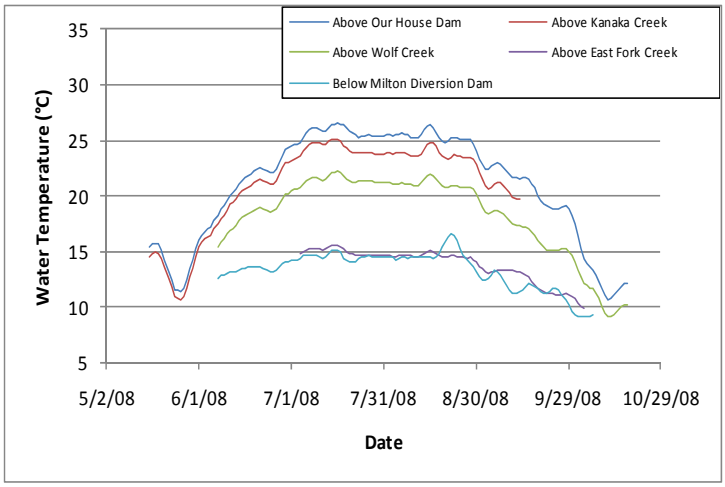

Figure 7.2.9-4. Mean daily water temperature in the Middle Yuba River upstream of Our House Diversion Dam (five monitoring locations) in 2008.
Source: Nevada Irrigation District.

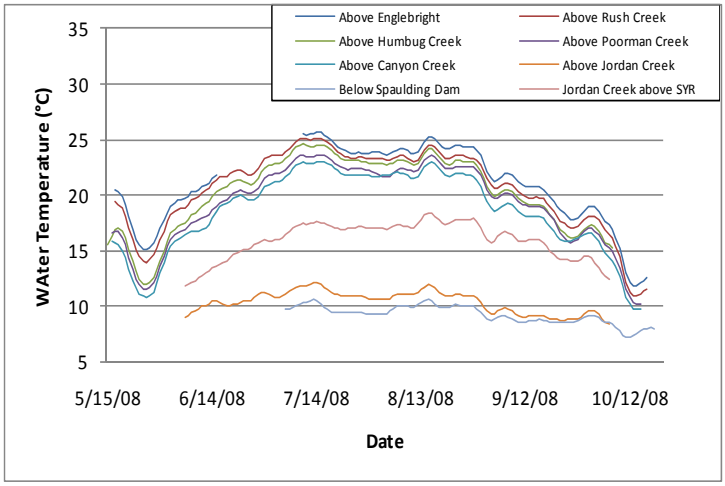

Figure 7.2.9-5. Mean daily water temperature in the South Yuba River upstream of USACE's Englebright Reservoir (eight monitoring locations) in 2008.
Source: Pacific Gas and Electric Company.

Table 7.2.9-2. Existing and relevant water quality data upstream of the Project.

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (ug/L)	Metals (ug/L)	Pesticides (ug/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
NORTH YUBA RIVER											
North Yuba River below Slate Creek	NYR 18	7/58 – 4/68	8.89 - 11.11	7.1 - 7.8	10.6- 10.8				27 - 61	Nitrate dissolved 0.2 - 0.5	STORET 2009
		10/71 – 6/72		1.0 - 11.0		**20-30**	**Mercury filtered 0.4 - 0.6 Mercury unfiltered 0.2**	**Assorted pesticides— Not Detected**	18-39	**Nitrate + nitrite 0 - 0.04 Orthophosphate dissolved 0 - 0.06**	USGS 2009
North Yuba River Upstream of New Bullards Bar Reservoir	NYR 17	2001		7-8.1	8.3-12.3					**Nitrate + nitrite 0.025 - 0.05**	SYRCL 2005 *In* YCWA 2007
OREGON CREEK											
Oregon Creek at Log Cabin Diversion		*After a review of the data resources listed above, the Licensee is unaware of existing water quality data for this area. Water temperature data are presented separately.*									
MIDDLE YUBA RIVER											
Middle Yuba River Upstream of Our House Dam[1]	MYR 12.1	5/08–10/08	8.4 – 24.4								NID 2009
	MYR 12.1 and upstream	2001-2007	1.8-22.7	5.6-8.5	2.2-14.5		Arsenic 15.8 (avg)				SYRCL 2007
	MYR 12.1 and upstream	7/98 – 9/98	7.3 – 25.3								USFWS 1999
Middle Yuba River Below Oregon Creek	MYR 4.3	10/52-10/67	9.4-17	6.4-7.9	8.5-11		Arsenic 0.20		23-72	0	STORET 2009
	MYR 4.3	7/98 – 9/98	17.3 – 25.5								USFWS 1999
Middle Yuba River at Freemans Crossing	MYR 4	5/65-10/67	10.8								STORET 2009

Table 7.2.9-2. (continued)

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (ug/L)	Metals (ug/L)	Pesticides (ug/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
SOUTH YUBA RIVER											
South Yuba River below Lake Spaulding											
South Yuba River Below Canyon Creek	SYR 32.5	6/08-8/08	15.5-18.8	7.3-7.8	7.3-7.3	<10	Methyl-mercury, dissolved <0.050 ug/L Lead <0.04		26	**Nitrate + nitrite <0.1-0.15**	NID 2008
South Yuba River at Jones Bar	SYR 6.2	4/58 – 4/68	11.94 - 12.78	6.4 - 7.3	10.2 - 11.8				18.9 - 27		STORET 2009
South Yuba River at Bridgeport	SYR 0.1	10/57 – 4/68	12.78 - 22.22	7.2 - 8.0	7.7 - 11.5				23 - 56		STORET 2009

[1] Includes SYRCL sampling sites 7, 8, 27, 37, and 46.
MYR Middle Yuba River
NYR North Yuba River
SYR South Yuba River

7.2.9.4 Water Quality Within the Project

Existing, relevant, and reasonably available water quality information from source documents is summarized in Table 7.2.9-3 and described below.

Source Information

Licensee found three source documents with relevant information regarding existing water quality in the Project Area. The contents of these source documents, as well as anecdotal information, are described here.

Licensee's Water Temperature Data. Licensee began collecting continuous water temperature data within the Project in 1995 and has installed continuous water temperature data recorders at 17 locations within the Project Area (Table 7.2.9-1). Figures 7.2.9-6 to 7.2.9-15 below provide mean daily temperature measurements for several of the locations based on data availability. Licensee has collected reservoir temperature profiles on a generally bi-weekly basis in New Bullards Bar Reservoir and USACE's Englebright Reservoir since 1990. See Figures 7.2.9-8 and 7.2.9-11 for a set of monthly profiles taken in 2008. Data collection is continuing through 2009.

Lake Wildwood Wastewater Treatment Plant Improvement Project. Phase IIA Baseline Yuba River Technical Studies (2003-2005). The Lake Wildwood community conducted several studies to explore changing its wastewater discharge location from Deer Creek to the Yuba River below USACE's Englebright Reservoir (Jones & Stokes 2005). Water quality samples collected from the Yuba River below USACE's Englebright Reservoir from 2003 to 2005 were analyzed for pesticides, selected metals, nutrients, and water treatment by-products. All pesticides were not-detected. Of the metals analyzed, aluminum ranged between 18.8 and 125 ug/L, copper ranged between 0.3 and 0.8 ug/L, mercury ranged between 0.00047 and 0.00371 ug/L, and zinc ranged from 1 to 10.8 ug/L. Silver and lead were not detected. Other constituents measured included: pH (7.24-7.48 su), specific conductance (74-79 µmhos/cm), TOC (<0.6-2.1 mg/L), nitrate + nitrite (<0.03 - <0.06 mg/L), and electrical conductivity (20-30 µS/cm).

USFWS (1999). USFS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to "*formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions*." Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir. Summary results are presented in Table 7.2.9-2.

Anecdotal Information

Licensee found five sources of anecdotal information that may be relevant to water quality in the Project Area. The contents of these anecdotal sources are described here.

EPA's STORET Database (2009). Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009. Results of the STORET query yielded four observations within New Bullards Bar Reservoir (EPA 2009). All data reflect surface water quality between 1952 and 1967. Data were also found from four locations between New Bullards Bar Reservoir and USACE's Daguerre Point Dam. Of the four locations, the water quality below USACE's Englebright Reservoir has been sampled the most; STORET contains over 300 sample results of samples collected between 1960 and 1971.

Sierra Foothill Research and Extension Center (2008). Bordering USACE's Englebright Reservoir, the Sierra Foothill REC is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in Oak Woodland habitats, particularly range management.

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and *E. coli*, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was informative. SYRCL is concerned with bacteria levels in Yuba surface water, yet no data besides the SYRCL data were found. Chu *et al.*(2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

pH. Upon review of the data resources listed above, Licensee found that Deer Creek, a tributary creek in the Project vicinity but not a Project-affected reach, has been identified as impaired for pH (SWRCB 2006).

South Yuba River Citizens League (2000-2003). Since 2000, as weather and access have allowed, SYRCL has been sampling up to 33 sites in the Yuba River watershed for dissolved oxygen, pH, conductivity, temperature, turbidity, total suspended solids, and some metals (arsenic, mercury). Based on these data, SYRCL has identified arsenic, bacteria, and mercury as constituents of concern in the watershed (SYRCL 2006).

USGS National Water Information System (2009). Surface water quality data were retrieved for the Project Area from the USGS NWIS database management system on May 7, 2009. Results of the NWIS query yielded one observation above the Project on the North Yuba River; two observations above the Project on the Middle Yuba River below of the confluence with Oregon Creek, and no observations above the Project on the South Yuba River (USGS 2009). Summarized in Table 7.2.9-3, all data reflect surface water quality between 1960 and 2004.

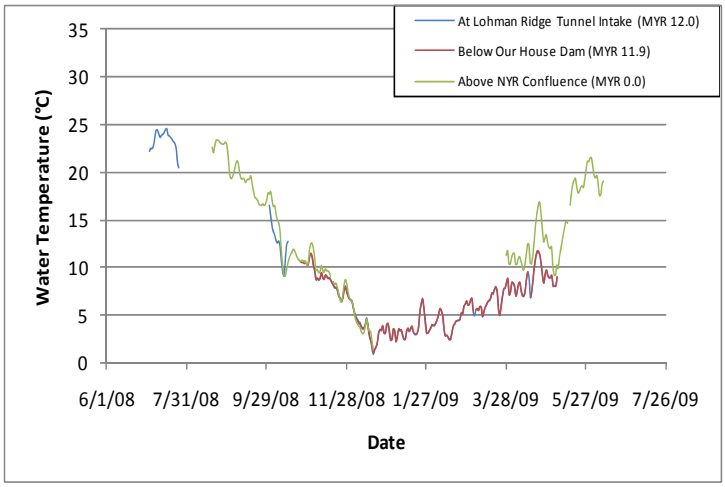

Figure 7.2.9-6. Mean daily water temperatures in the Middle Yuba River in 2008 and 2009.
Source YCWA

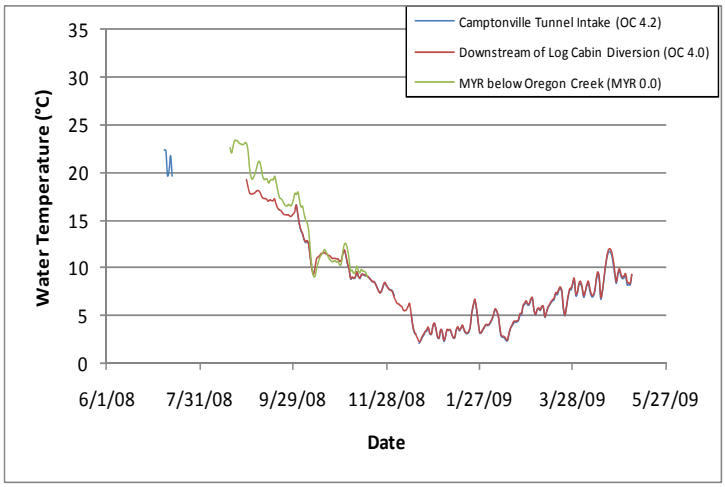

Figure 7.2.9-7. Mean daily water temperatures in Oregon Creek and Middle Yuba River in 2008 and 2009.
Source YCWA

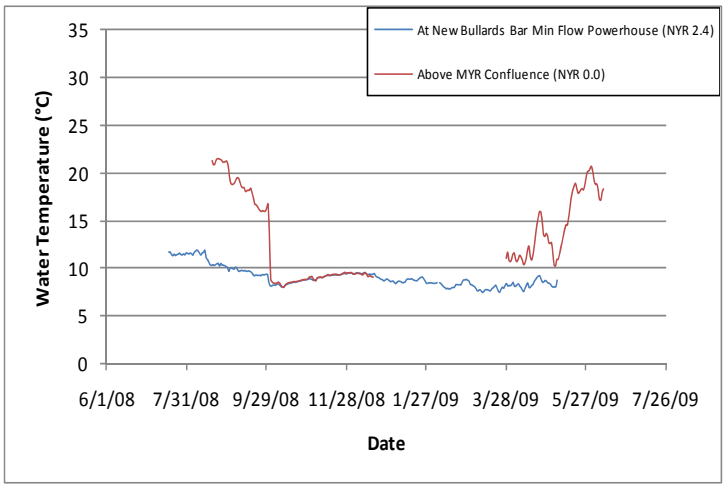

Figure 7.2.9-8. Mean daily water temperatures in North Yuba River in 2008 and 2009.
Source YCWA

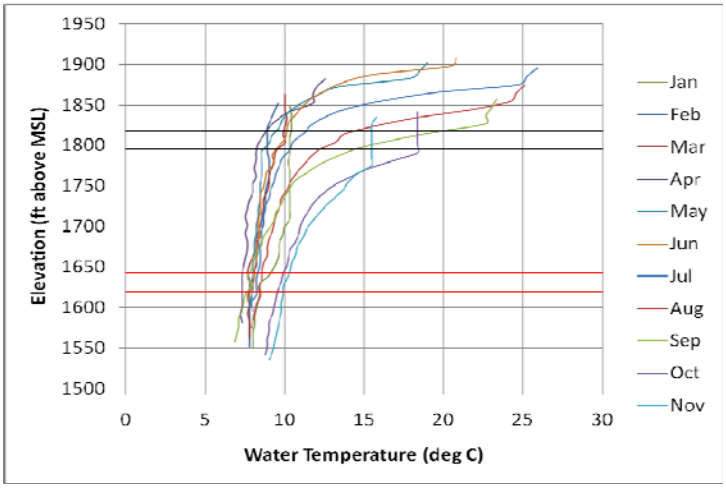

Figure 7.2.9-9. Monthly temperature profiles of New Bullards Bar Reservoir in 2008. Upper power intake, which is not used. elevation range is shown as horizontal black lines, and lower power intake, elevation range is shown as horizontal red lines.
Source: YCWA

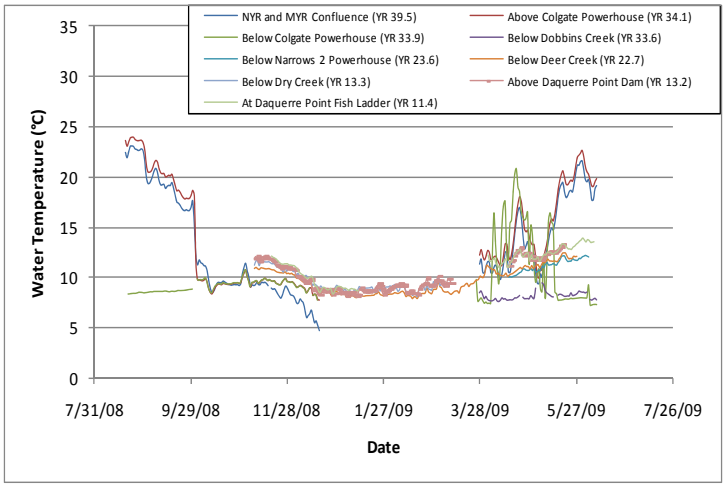

Figure 7.2.9-10. Mean daily water temperatures at nine locations in the Yuba River in 2008 and 2009.
Source YCWA

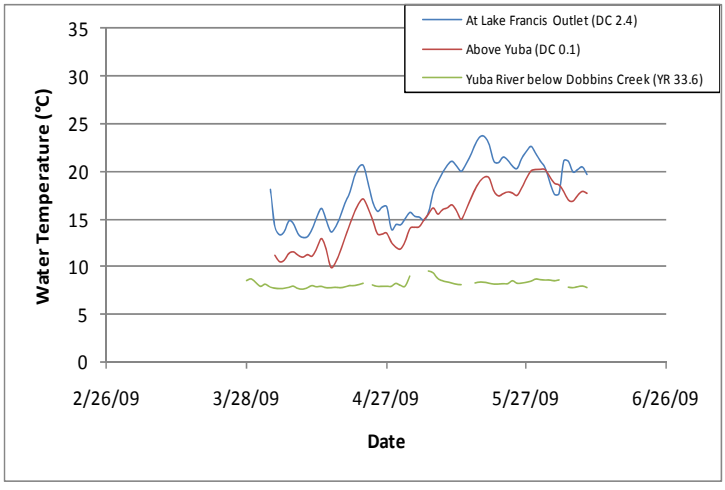

Figure 7.2.9-11. Mean daily water temperatures in Dobbins Creek and Yuba River in 2009.
Source YCWA

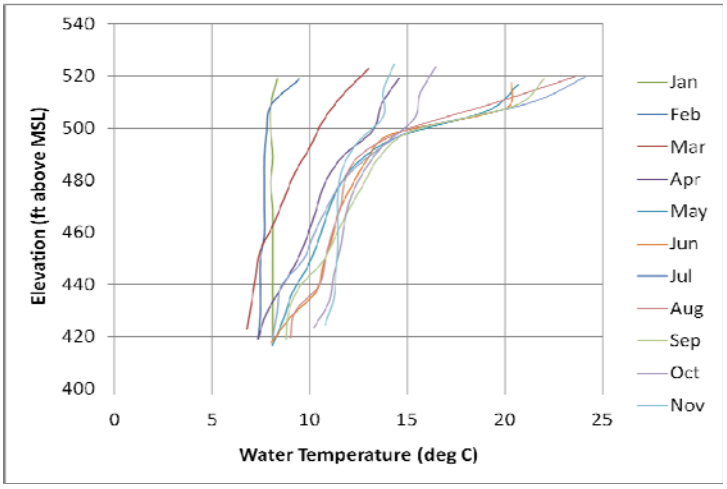

Figure 7.2.9-12. Monthly temperature profiles of USACE's Englebright Reservoir in 2008. Note that data were unavailable for December.
Source: YCWA

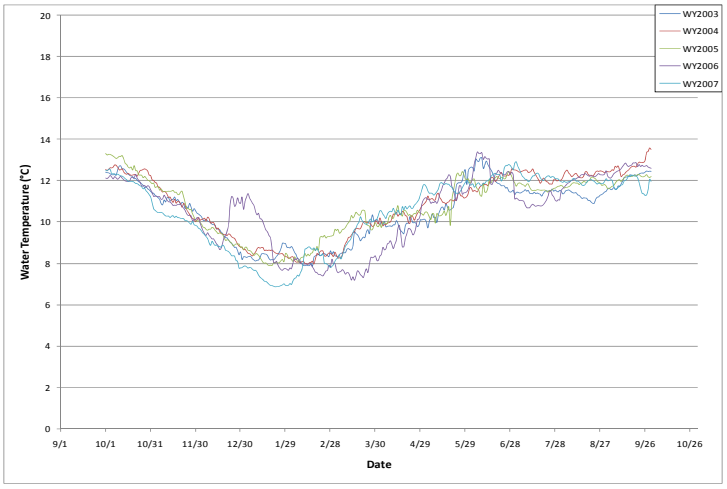

Figure 7.2.9-13. Mean daily water temperatures in the Yuba River at Smartville (YR 23.6) in 2003-2007.
Source YCWA.

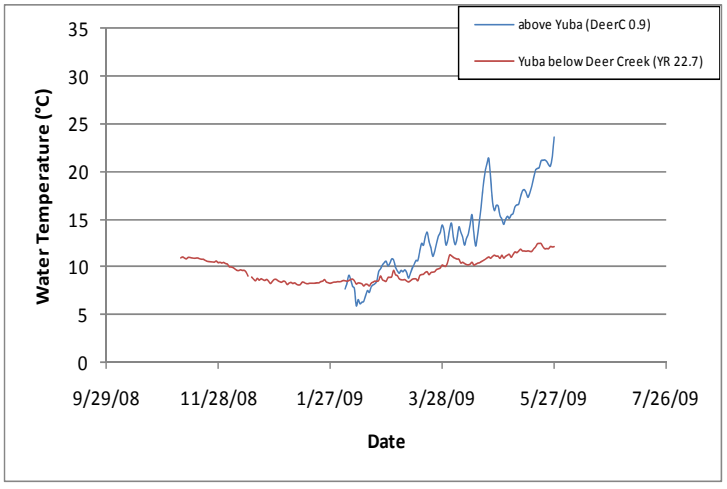

Figure 7.2.9-14. Mean daily water temperatures in Deer Creek and the Yuba River in 2008 and 2009.
Source YCWA

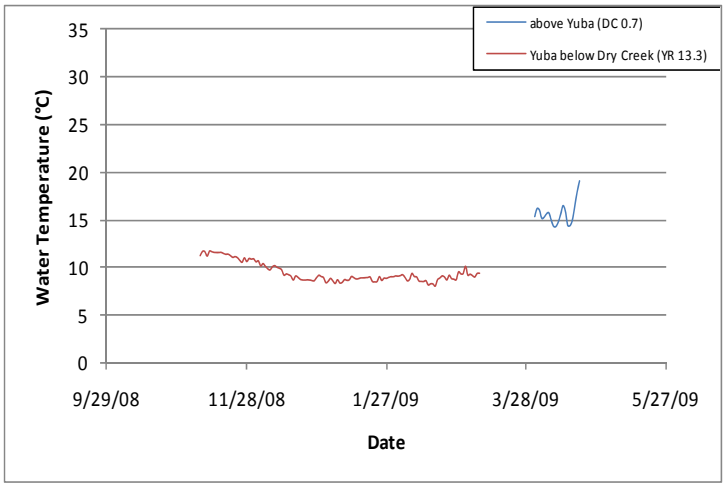

Figure 7.2.9-15. Mean daily water temperatures in Dry Creek and the Yuba River in 2008 and 2009.
Source YCWA

Table 7.2.9-3. Existing and relevant water quality data within the Project Area.

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (ug/L)	Metals (ug/L)	Pesticides	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
NEW BULLARDS BAR RESERVOIR											
Bullards Bar Reservoir Near Little Oregon Creek	NYR 4.4	5/65	15	7.5					30		STORET 2009
Bullards Bar Reservoir Near North San Juan	NYR 3.8	10/67	8.33-25.00	6.8 - 7.8	1.8 - 8						STORET 2009
NEW BULLARDS BAR DAM REACH											
North Yuba River at Bullards Bar Powerhouse	NYR 3	10/52 – 5/65	11.11 - 22	7.5 - 7.8	8.0						STORET 2009
MIDDLE/NORTH YUBA RIVER REACH											
Yuba River Above New Colgate Powerhouse	YR 34.2	4/58-4/68	6.7-27	6.7-9.3	6.7-12.7	dissolved 20	Arsenic dissolved 10		19-76	**Nitrate/Nitrite 0.2-1.0**	STORET 2009
		10/02	12.0	7.9	5.9						USGS 2009
NEW COLGATE POWERHOUSE REACH											
Below New Colgate Powerhouse	YR 33.7	1/01 – 6/02	5.0 - 14.0	6.4 - 7.9	8.3 - 13.2					**Trace amounts of nitrate, nitrite, ammonia & phosphates.**	USGS 2009
USACE'S ENGLEBRIGHT RESERVOIR											
USACE's Englebright Reservoir	YR 24 – YR 32.2	*After a review of the data resources listed above, the Licensee is unaware of existing water quality data for this area. Bi-weekly water temperature profiles have been collected from 1990-present.*									

Table 7.2.9-3. (continued)

Location	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (ug/L)	Metals (ug/L)	Pesticides	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
NARROWS 2 POWERHOUSE REACH											
Yuba River below USACE's Englebright Dam	YR 23.6	5/71	18.89	7.2	9.8		Mercury, total non-detect				STORET 2009
		10/60 - 3/66	N/A	7.1 - 8.2		dissolved 0 - 10			18 - 86	Nitrate dissolved, filtered 0 - 5.6	STORET 2009
		12/66-11/99	7.0 - 21.5	7.1 - 8.6	6.4 - 15.9	dissolved <10 – 86	Trace amounts of mercury			Nitrate dissolved, filtered 0 – 0.7	USGS 2009
		2/01 - 5/04	8.0 - 16.0	6. 3 -8.3	7 - 15.4			Trace amounts of pesticides		**Trace amounts of nitrate, nitrite, ammonia & phosphates.**	USGS 2009
		10/03-4/05		7.25-7.48			Copper 0.3-0.8 Mercury 0.00047-00371 Zinc 1-10.8			**Nitrate + Nitrite Non-Detect Orthophosphate (filtered) 0.02-0.02**	Jones & Stokes 2005
Parks Bar Bridge (Hwy 49)	YR 18	4/51-9/69	3.89-25.56	6.7- 8.4	7.5-14				17- 66		STORET 2009
Yuba River at Smartville	YR	3/60-3/66		7.3-8.1					21-62		USGS 2009
DEER CREEK (*tributary creek in the Project vicinity but not a Project-affected reach)*											
Deer Creek	Confluence @ YR 23	10/57-9/69	8.3-25	7.3-8.2	8.5-12.7				29-73	Nitrite, dissolved 0.1-1.3	STORET 2009
USACE'S DAGUERRE POINT DAM IMPOUNDMENT											
USACE's Daguerre Point Dam Impoundment	YR 11.4 to 11.5	*After a review of the data resources listed above, the Licensee is unaware of existing water quality data for this area.*									

NYR North Yuba River
SYR South Yuba River
YR Yuba River

7.2.9.5 Water Quality Downstream of the Project

As described in Section 6.0, there is one reach between USACE's Daguerre Point Dam and the confluence of the Yuba and Feather rivers: the USACE's Daguerre Point Dam Reach. Existing, relevant, and reasonably available water quality information from source documents are summarized in Table 7.2.9-4 and described here.

Source Information

Licensee found four source documents with relevant information regarding existing water quality downstream of the Project Area. The contents of these source documents, as well as anecdotal information, are described here.

Licensee's Existing Water Temperature Data. Licensee began collecting continuous water temperature data downstream of the Project in 2008 and has installed continuous water temperature data at five locations (Table 7.2.9-1). Figures 7.2.9-16 to 7.2.9-17 provide mean daily temperature measurements for Water Year 2003 through Water Year 2007 between USACE's Daguerre Point Dam and the Yuba River at Marysville. Figures 7.2.9-18 and 7.2.9-19 provides an overlay comparison of Licensee data collection that began in summer 2008 for locations downstream of USACE's Daguerre Point Dam. Data collection is continuing through 2009.

Sacramento River Watershed Program (1996-1998). The Sacramento River Watershed Program (SRWP) collected 27 samples over a 3-year period between 1996 and 1998 from a site near Marysville directly upstream of the Yuba River's confluence with the Feather River (LWA 2001). Samples were analyzed for pH (7-7.8 su), turbidity (1-153 mg/L), dissolved oxygen (8-12 mg/L), TOC (0.7-2.4 mg/L), nitrate-nitrite (0.05-0.14 mg/L), electrical conductivity (EC; 44-105 µS/cm), and mercury (total; 1.19-46.7 ng/L). Samples collected in the earliest rounds were also analyzed for seven trace metals which were taken off the analyte list in 1999, after these metals were found only in concentrations consistently below drinking water criteria (LWA 2001).

Oroville Relicensing Water Quality Study 2002-2004. In support of the Oroville Dam's relicensing effort, the CDWR collected 30 samples from a site near Marysville, directly upstream of the Yuba River's confluence with the Feather River. DWR analyzed each sample for more than 50 analytes, including total and dissolved metals. General chemistry results were pH (7.1-7.4 su), turbidity (0.5-17.2 mg/L), dissolved oxygen (8.4-14.2 mg/L), TOC (0.8-3.6 mg/L), nitrate-nitrite (<0.01-0.08 mg/L), and electrical conductivity (76-28 µS/cm).

USFWS (1999). USFWS performed a stream and reservoir water temperature study of the Yuba River and its upstream tributaries in 1998-1999, in order to "formulate and implement a water temperature monitoring program that was sufficiently comprehensive to provide an initial basin-wide estimate of thermal diversity in the Yuba River watershed under current conditions." Field data collection was performed in summer 1998, and the data collection network extends to reaches upstream of, within, and downstream of the Project. Bi-weekly water temperature profiles were taken at the Licensee's New Bullards Bar Reservoir and USACE's Englebright Reservoir. Summary results are presented in Table 7.2.9-2.

Anecdotal Information

Licensee found four sources of anecdotal information that may be relevant to water quality downstream of the Project Area. The contents of these anecdotal sources are described here.

EPA's STORET Database (2009). Surface water quality data were retrieved for the Project Area from the STORET database management system on May 7, 2009. As shown in Table 7.2.9-4, results of the STORET query yielded observations from two locations below USACE's Daguerre Point Dam (EPA 2009). More than 500 records are available from the site above the confluence with the Feather River. All data reflect surface water quality between 1967 and 1982.

Sierra Foothill Research and Extension Center (2008). Bordering USACE's Englebright Reservoir, the Sierra Foothill Research and Extension Center (REC) is one of nine agricultural research and extension centers in California administered by the University of California, Division of Agriculture & Natural Resources. It provides land, labor, facilities and management for agricultural research in Oak Woodland habitats, particularly range management .

One area of research for the Sierra Foothill REC is studying how water flowing through foothill woodlands is affected by such land management activities, such as oak tree removal and livestock grazing. This includes studies of how dissolved organic carbon and bacteria, such as total coliform and *E. coli*, are transported to streams located on the property used for grazing. Although no chemical data from Project waters were found from this source, scoping research performed by one researcher was found to be informative. SYRCL is concerned with bacteria levels in Yuba surface water, yet no data besides the SYRCL data were found. Chu *et al.*(2008) confirms that Yuba County agencies have not conducted any bacterial monitoring of freshwater recreational areas.

South Yuba River Citizens League (2000-2003). Since 2000, as weather and access have allowed, SYRCL has been sampling up to 33 sites in the Yuba River watershed for dissolved oxygen, pH, conductivity, temperature, turbidity, total suspended solids, and some metals (arsenic, mercury). Based on these data, SYRCL has identified arsenic, bacteria, and mercury as constituents of concern in the watershed (SYRCL 2006).

USGS National Water Information System (2009). Surface water quality data were retrieved for the Project Area from the NWIS database management system on May 7, 2009. Results of the NWIS query yielded observations made from 1976 to 1995 on the Yuba River above Marysville (USGS 2009).

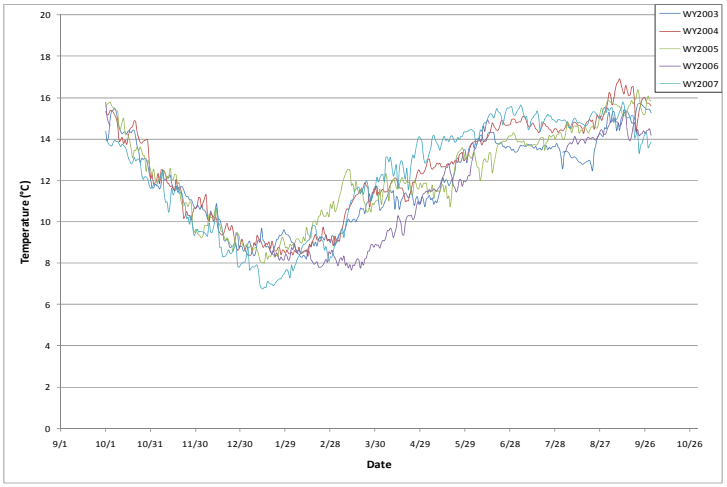

Figure 7.2.9-16. Mean daily water temperatures in the Yuba River at USACE's Daguerre Point Dam Fish Ladder from 2003 through 2007.
Source YCWA.

Figure 7.2.9-17. Mean daily water temperatures in the Yuba River at USGS' Marysville Gage from 2003 through 2007.
Source YCWA.

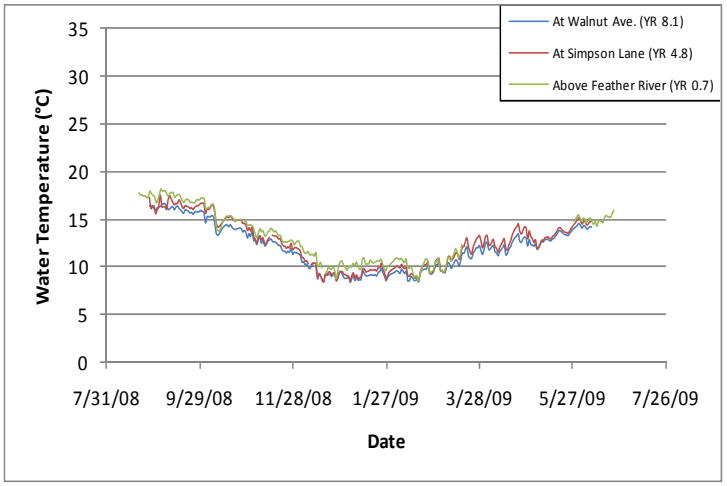

Figure 7.2.9-18. Mean daily water temperatures in the Yuba River downstream of USACE's Daguerre Point Dam in 2008 and 2009.
Source YCWA.

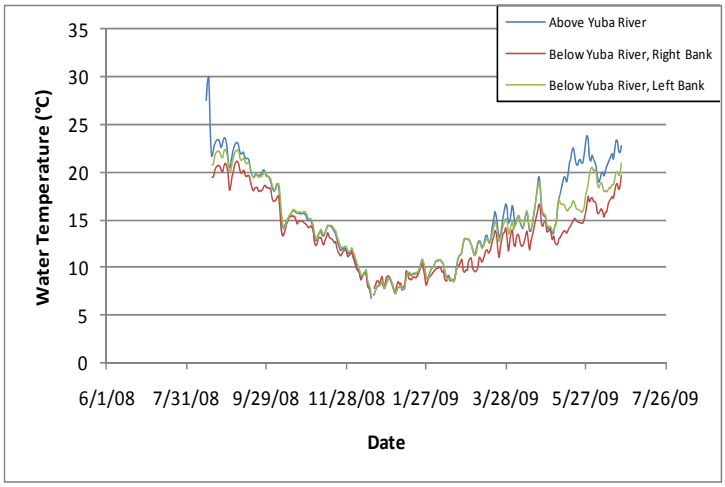

Figure 7.2.9-19. Mean daily water temperatures in the Feather River near the Yuba River confluence in 2008 and 2009.
Source YCWA.

Table 7.2.9-4. Existing and relevant water quality data downstream of the Project.

River Reach	River Mile	Date(s)	Temperature (°C)	pH (su)	Dissolved Oxygen (mg/L)	Iron (ug/L)	Metals (ug/L)	Pesticides (ug/L)	Hardness (mg/L as $CaCO_3$)	Nutrients (mg/L)	Source
USACE'S DAGUERRE POINT DAM REACH											
Below USACE's Daguerre Point Dam	YR 11.3	10/67-4/68	13.6-18.3	7.7-8.1	9.9-11.5				32-52		STORET 2009
Yuba River at Marysville	YR 0.7	10/67-6/82	3.33-27.22	6.6-8.1	8.0-16.2				20-90		STORET 2009
		12/76-11/95	7 – 21.5	7.1-8.6	7.3-12.5	<10-30	Not-detected		23-56	Trace nutrients	USGS 2009
		1996-98		7-7.8	8.-12		Mercury, total 1.19-46.7 ng/L			Nitrate-Nitrite 0.05-0.14	LWA 2001
		2002-04		7.1-7.4	8.4-14.2					Nitrate-Nitrite <0.01-0.08	DWR 2006

su standard units
YR Yuba River

7.2.9.6 Mercury in the Yuba Watershed

Mercury contamination in sport fish is found to be widespread in water bodies throughout northern California due to both: 1) historical mercury mining in the Coast Ranges; and 2) the use of the mercury in the gold extraction processes of the Sierra-Nevada gold mines (DWR 2007; Davis *et al.* 2002). In the Sierra-Nevada, a large fraction of the mercury used in hydraulic mining of placer ores in the late 1800's was lost during processing and now persists in the environment. Mercury associated with gold mining has been measured in the sediment, water, and biota from the Sierra Nevada's gold mining regions, the Central Valley, the Sacramento-San Joaquin Delta and San Francisco Bay (DWR 2007; Davis. *et al.* 2002). Mercury is of concern because it is a potent neurotoxin that bioaccumulates in muscle tissue.

Since the early 1990's, the upper Yuba River watershed has been studied by UC Davis and USGS (Alpers *et al.* 2005; Hunderlach *et al.* 1999; May *et al.* 2000; and Slotton *et al.* 1995 IN May *et al.* 2000). Findings from these studies indicate that significant amounts of Gold Rush era mercury still exists in sediments in the upper Yuba watershed. These sediments are being transported downstream into reservoirs on the Yuba River, where they are largely trapped (Hunderlach 1999; Alpers 2005).

As shown in Table 7.2.9-5, mercury in its bioavailable form, and attributable to historic gold mining, has been found in fish tissue at concentrations above reference concentrations[6] and California's OEHHA 1999 guideline of 0.30 ppm wet-weight in the North Fork Yuba, the Middle Fork Yuba, the South Fork Yuba River, and the lower Yuba River (May *et al.*, 2000; OEHHA 2003; CVRWQCB 2009). Consequently, in the Project Area and its immediate vicinity, New Bullards Bar Reservoir, USACE's Englebright Reservoir, the reaches between New Bullards Bar Reservoir, the Middle Yuba River, the South Yuba River downstream of Lake Spaulding to USACE's Englebright Reservoir, and the Yuba River downstream of USACE's Englebright Reservoir to the Feather River, are all listed or proposed for listing for mercury impairment (Medium TMDL Priority)[7]. Further, human-health based fish consumption advisories are also in place for USACE's Englebright Reservoir (OHHEA 2009).[8]

Table 7.2.9-5. Mercury in fish tissue in the Project Vicinity at concentrations above OEHHA's guidance value.

Reservoir/River Reach	Data Source	Species Sampled	Fish Tissue Concentrations > 0.3 ppm?[a]	SWRCB 303(d) List as Impaired Waterbody for Toxicity	OEHHA fish ingestion advisory
UPSTREAM OF THE PROJECT					
North Yuba River	Slotton *et al.* (1997)	Aquatic invertebrates, Rainbow trout	No	--	--

[6] Fish tissue, water, and sediment samples taken from the reference locations selected for these studies were non-zero but below regulatory benchmarks, as ambient sources of mercury also exist (May *et al*. 2000; Alpers *et al*. 2005). Ambient sources include aerial deposition from industrial sources and forest fires that release mercury sequestered biomass.

[7] Based on a review of the 2006 California 303(d) List and Total Maximum Daily Loads (TMDL) Priority Schedule and its 2009 proposed updates, as shown on the SWRCB's website: http://www.swrcb.ca.gov.

[8] OEHHA previously provided consumption advisories for the South Yuba River from Lake Spaulding to USACE's Englebright Reservoir and for Deer Creek (a tributary creek), but determined in 2009 that their sample size was inadequate to make this determination and retracted the advisory (OEHHA 2009).

Table 7.2.9-5. (continued)

Reservoir/River Reach	Data Source	Species Sampled	Fish Tissue Concentrations > 0.3 ppm?[a]	SWRCB 303(d) List as Impaired Waterbody for Toxicity	OEHHA fish ingestion advisory
Oregon Creek	Slotton *et al.* (1997)	Aquatic invertebrates, Rainbow trout	No	--	--
Middle Yuba River	SWRCB (2002) and LWA (2007) *IN* CVRWQCB (2009)	Sacramento Pikeminnow and Rainbow Trout	Yes	Proposed IN CVRWCB (2009)	--
South Yuba River (Lake Spaulding to USACE's Englebright Reservoir	Slotton *et al.* (1997)	Aquatic invertebrates, Brown Trout Rainbow Trout	Yes	Proposed IN CVRWCB (2009)	OEHHA (2003); RETRACTED—OEHHA (2009)
IN THE PROJECT AREA					
New Bullards Bar Reservoir	SWRCB (2002) and Melwani *et al.* (2007) IN CVRWQCB (2009)	Carp Smallmouth Bass Bluegill Largemouth Bass	Yes	Proposed IN CVRWCB (2009)	--
New Colgate Powerhouse Reach	SWRCB (2002) IN CVRWQCB (2009)	Smallmouth Bass	Yes	Proposed IN CVRWCB (2009)	--
Middle/North Yuba River Reach					
New Colgate Powerhouse Reach					
USACE's Englebright Reservoir	May *et al.* (2000) and Slotton *et al.* (1996) IN CVRWQCB (2001)	largemouth bass, smallmouth bass, spotted bass, carp, green sunfish, hardhead, and Sacramento sucker	Yes	SWRCB 2006	OEHHA (2003); UPDATED and CONFIRMED—OEHHA (2009)
Deer Creek (Tributary Creek)[b]	May *et al.* (2000); Slotton *et al.* (1997)	Brown trout, Rainbow Trout	Yes	--	OEHHA (2003); RETRACTED—OEHHA (2009)
Narrows 2 Powerhouse Reach	SWRCB (2002) In CVRWQCB (2009)	Rainbow Trout, Sacramento pikeminnow, Sacramento sucker, and Smallmouth Bass	Yes	Proposed IN CVRWCB (2009)	--
USACE's Daguerre Point Dam Impoundment					
DOWNSTREAM OF THE PROJECT					
USACE's Daguerre Point Dam Reach	SWRCB (2002) In CVRWQCB (2009)	Rainbow Trout, Sacramento pikeminnow, Sacramento sucker, and Smallmouth Bass	Yes	Proposed IN CVRWCB (2009)	--

a California's OEHHA 1999 guideline of 0.30 ppm wet-weight in fish tissue.

b Deer Creek (tributary creek in the Project vicinity but not a Project-affected reach). Fish tissue samples collected upstream of Project Area, nearer to Scotts Flat Reservoir and Nevada City than the Yuba River.

7.2.10 List of Attachments

This section includes one attachment:

- Attachment 7.2A – Water Quality and Water Temperature Data

Due to the file size of the Water Quality and Water Temperature data it is not posted on the website, but a CD of the files can be obtained by contacting Jim Lynch at HDR|DTA (Telephone 916-564-4214 or E-Mail james.lynch@hdrinc.com).

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