O. Hydrologic Modeling – Additional Supporting Information

APPENDIX O

Hydrologic Modeling –
Additional Supporting Information

APPENDIX O1

Memorandum

Subject: **Updated HH/LSM Assumptions and Results – Proposed WSIP**
From: **Daniel B. Steiner**
Date: **March 20, 2008**

1. Introduction

This memorandum summarizes assumptions for, and discusses the interpretation of, the Hetch Hetchy/Local Simulation Model (HH/LSM) results for the simulation of the Water System Improvement Program (WSIP or the proposed program). Table 1-1 and Table 1-2 summarize the program/setting characteristics and modeling assumptions, and the performance and hydrologic results, respectively, for the WSIP as they compare to the modeled existing setting (2005, with Calaveras Reservoir constrained by the California Division of Safety of Dams [DSOD] restrictions).

The hydrology under the proposed program is primarily discussed in terms of a comparison to the baseline condition presented in the Draft Program Environmental Impact Report, i.e., the simulated current (2005) operation of the San Francisco Public Utilities Commission (SFPUC) regional water system, assuming that the operation of Calaveras and Crystal Springs Reservoirs is constrained by DSOD restrictions. Primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and additional parameters that assist in identifying the causes of hydrologic changes are also described as needed.

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT
System Wide Parameters			
Customer Purchase Request (Demand Level)[6]	MGD	265	300
Demand Level Supplied from Other Sources[7]			
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290
Average Annual Deliveries and Supplies[9]			
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297
Features and Facilities[10]			
Regional Reclaimed Water/Conservation/Groundwater - SF			●
Regional Reclaimed Water/Conservation/Groundwater - Other			
Calaveras Reservoir - 12.4 BG (Constrained)		●	
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●
Calaveras Reseroivr Release for Fish			●
Calaveras Reservoir Release for Fish & Flow Recapture			●
Alameda Creek Diversion Dam Bypass Flow & Recapture			
Pilarcitos Reservoir Pump for Creek Summer Release			
Crystal Springs Reservoir - 18.52 BG (Constrained)		●	
Crystal Springs Reservoir - 20.28 BG (Restricted)			
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●
Sunol Valley Water Treatment Plant Expansion			●
Sunol Valley Water Treatment Plant Feed from SJPL			●
Harry Tracy Water Treatment Plant Expansion			●
Bay Division Pipeline Increased Conveyance			●
San Joaquin Pipeline Increased Conveyance			●
Desalination Project			
Westside Groundwater Project			●
Tuolumne River Transfer			**29,350 (From Storage)**
Water Supply Reliability[11]			
Action	Level	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW
Rationing (Level 1)	2	10	10
Rationing (Level 2)	3	20	20
Rationing (Level 3)	4	25	25
	Years	Action Level	Action Level
	1921		
	1924	2	1
	1925		1
	1926		1
	1929		1
	1930		1
	1931	3	2
	1932		
	1933		
	1934	2	1
	1935		
	1939		
	1944		
	1946		
	1947		
	1948		1
	1949		
	1950		1
	1953		
	1954		
	1955		1
	1957		
	1959		
	1960	2	1
	1961	3	2
	1962		
	1964		1
	1966		
	1968		
	1971		
	1972		1
	1976	2	1
	1977	3	2
	1979		
	1981		
	1984		
	1985		1
	1987	2	1
	1988	3	2
	1989	3	2
	1990	3	3
	1991	3	2
	1992	3	3
	1994	2	1
	DD1993	4	3
	DD1994	4	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%
	Historical	Incidental 20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
System Wide Parameters			
Incremental Supply - Average[13]			
System Customer Purchase Request Level	MGD	265	300
Demand Level Supplied from Other Sources	MGD	0	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290
System Deliveries	MGD	258	287
Regional Desalination	MGD	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245
Inferred Local Watershed Production	MGD	37	41
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*221*	24
Incremental Design Drought Supply[14]			
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7
Restoration of Crystal Springs Capacity		0	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6
Regional Desalination (26 mgd)	MGD	0	0
Sum of Incremental Supplies	MGD	0	48
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267
Design Drought Delivery Calculator[15]		2	3
	MGD		
Average Annual Delivery During	Year 1	265	290
Average Annual Delivery During	Year 2	239	290
Average Annual Delivery During	Year 3	212	261
Average Annual Delivery During	Year 4	212	261
Average Annual Delivery During	Year 5	212	232
Average Annual Delivery During	Year 6	212	261
Average Annual Delivery During	Year 7	212	232
Average Annual Delivery During	Year 8	199	232
Average Annual Delivery During	Last 6 Mo	99	116
	DD Ave	219	256
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256
Local System Operational Parmeters			
Crystal Springs Reservoir Operation			
Storage - Minimum/Maximum	BG	5.4 - 18.52	5.4 - 22.15
	TAF	16.6 - 56.8	16.6 - 68.0
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG
Calaveras Reservoir Operation			
Storage - Minimum/Maximum	BG	8.4 - 12.4	8.4 - 31.5
	TAF	25.7 - 38.0	25.7 - 96.8
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300
San Andreas Reservoir Operation			
Storage - Minimum/Maximum	BG	3.0 - 6.2	3.0 - 6.2
	TAF	9.2 - 19.0	9.2 - 19.0
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)
San Antonio Reservoir Operation			
Storage - Minimum/Maximum	BG	1.0 - 16.5	1.0 - 16.5
	TAF	3.1 - 50.5	3.1 - 50.5
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)
Pilarcitos Reservoir Operation			
Storage - Minimum/Maximum	BG	0.66 - 0.97	0.66 - 0.97
	TAF	2.0 - 3.0	2.0 - 3.0
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)
Water Treatment Plants			
Sunol Valley Water Treatment Plant Maximum	MGD	120	160
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture
Sunol Valley Water Treatment Plant Minimum	MGD	20	20
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL
Harry Tracy Water Treatment Plant Maximum	MGD	120	140
Harry Tracy Water Treatment Plant Minimum	MGD	20	20
Conveyance			
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Tuolumne River System Operational Parameters			
Hetch Hetchy Reservoir Operation			
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer
1987 Stipulation Minimum Release Flows		Yes	Yes
1987 Stipulation Supplemental Release Flows		No	No
Cherry Reservoir Operation			
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer
Eleanor Reservoir Operation			
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor
New Don Pedro Water Bank Account			
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep
Conveyance			
San Joaquin Pipelines Maximum	MGD	290	313
San Joaquin Pipelines Minimum	MGD	70	70
San Joaquin Pipelines Flow Rate Changes		11 Stepwise	17 Stepwise
		Surrogate minimum changes by allowing only 7 changes in a year	Allow up to 7 changes in a year (surrogate)
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)
			Note: Cyclic 5-year maintenance, maximum 271 MGD available all other months exc and 135.5 MGD available
TID/MID Operational Parameters			
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR
Tuolumne River La Grange Flow Releases			
Don Pedro, 1996 FERC		X	X
VAMP - considered but not modeled[18]		X	X

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Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Design Drought Production & Disposition[19]			
San Joaquin Pipeline Diversion	MGD	208.7	235.0
Bay-Area Deliveries	MGD	218.3	248.9
Added Groveland & Coastside Delivery	MGD	2.6	3.6
Local Reservoir Evaporation	MGD	10.7	12.5
Inflow from ACDD	MGD	1.3	1.6
Flow Recapture	MGD	0	5.3
Local Reservoir Stream Release	MGD	0.6	5.4
Desalination	MGD	0	0
Westside Basin	MGD	0	5.6
District Transfer to NDP Water Bank	MGD	0	24.7
Local Storage - Begin	MG	53,854	77,310
Local Storage - End	MG	18,403	18,495
Study Average Production & Disposition (1921-02)[20]			
Tuolumne River System			
Reservoirs			
Hetch Hetchy			
Inflow	AF	749,605	749,605
River	AF	275,255	267,021
Stream Minimum Release	AF	65,728	65,593
Tunnel	AF	470,709	478,932
Evaporation	AF	3,893	3,869
Reservoir	AF	281,938	275,235
Cherry			
Inflow	AF	279,293	279,293
Eleanor Gravity	AF	289	289
Eleanor Pump	AF	118,251	118,274
River	AF	41,636	41,439
Stream Minimum Release	AF		
Tunnel	AF	352,692	352,915
Evaporation	AF	3,505	3,501
Reservoir	AF	239,971	239,309
Eleanor			
Inflow	AF	169,617	169,617
Eleanor Gravity	AF	289	289
Eleanor Pump	AF	118,251	118,274
River	AF	49,171	49,148
Stream Minimum Release	AF		
Evaporation	AF	1,906	1,906
Reservoir	AF	22,191	22,191
Don Pedro Reservoir			
Inflow	AF	1,587,517	1,560,828
MID Diversion	AF	302,054	302,055
TID Diversion	AF	573,164	573,168
LaGrange Total Stream	AF	668,876	644,009
LaGrange Minimum Stream Release	AF	221,477	221,477
Total Evaporation	AF	43,493	42,604
Reservoir	AF	1,472,337	1,434,872
Water Bank Account			
Balance	AF	514,299	516,733
Transfer	AF	0	29,350
San Joaquin Pipelines			
Volume (AF)	AF	247,763	274,450
Volume (MG)	MG	80,734	89,429
Rate (MGD)	MGD	221	245
Max Rate (MGD)	MGD	290	313
Min Rate (MGD)	MGD	70	0
East Bay System			
Reservoirs			
Calaveras			
Inflow	MG	12,368	12,368
From ACDD	MG	1,316	1,730
Stream	MG	3,660	4,167
Stream Flow Recapture	MG	0	1,538
To SVWTP	MG	9,013	8,244
To San Antonio	MG	0	0
Evaporation	MG	1,023	1,704
Resevoir	MG	10,969	28,170
San Antonio			
Inflow	MG	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734
Stream	MG	991	613
To SVWTP	MG	1,693	2,628
Evaporation	MG	1,012	973
Resevoir	MG	15,323	14,490
Alameda Creek Diversion Dam			
Inflow	MG	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730
Spill	MG	2,881	2,467
Alameda Creek Confluence			
Accretion	MG	625	625
From ACDD	MG	2,881	2,467
From Calaveras Dam	MG	3,660	4,167
At Confluence	MG	7,167	7,259
Treatment Plants			
SVWTP Total	MG	13,662	15,738
From Calaveras	MG	9,013	8,244
From San Antonio	MG	1,693	2,628
From SJPL	MG	2,956	3,329
From Recapture	MG	0	1,538
SVWTP Total MGD	MGD	37	43
SVWTP Max MGD	MGD	120	158
SVWTP Min MGD	MGD	20	20

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Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP
Peninsula System			
Reservoirs			
Crystal Springs			
Inflow	MG	3,722	3,722
From San Andreas	MG	0	0
From Pilarcitos and SJPL	MG	8,045	7,643
Stream	MG	773	325
Pump to San Andreas	MG	9,438	9,005
Pump to Coastside	MG	247	591
Evaporation	MG	1,323	1,490
Reservoir	MG	16,360	18,621
San Andreas			
Inflow	MG	1,428	1,428
From other Streams	MG	9,954	9,590
Stream	MG	0	0
To HTWTP	MG	10,851	10,487
Evaporation	MG	530	531
Reservoir	MG	5,892	5,882
Pilarcitos			
Inflow		1,297	1,297
To San Andreas	MG	516	584
For Stone Diversion	MG	262	280
Stream other than Diversion	MG	417	332
Evaporation	MG	103	102
Reservoir	MG	776	767
Stone Dam			
Accretion blw Pilarcitos	MG	167	211
Pilarcitos non-diversion Release	MG	417	332
Pilarcitos Release for Diversions	MG	584	543
Diversion to Coastside	MG	167	211
Diversion to Crystal Springs	MG	142	180
Spill past Stone	MG	860	695
Treatment Plants			
HTWTP Total	MG	10,851	10,487
HTWTP Total MGD	MGD	30	29
HTWTP Max MGD	MGD	149	106
HTWTP Min MGD	MGD	20	20
Other Facilites			
Westside Basin Net	MG	0	11
Desalination Input	MG	0	0
Additional Information			
Total Local Reservoir Stream Release	MG	5,842	5,437
Total Local Reservoir Stream Evaporation	MG	3,991	4,800
Deliveries			
In-City	MG	29,589	26,686
South Bay	MG	43,106	52,906
Crystal Springs	MG	15,120	16,931
San Andreas	MG	5,400	6,604
Coastside	MG	675	1,082
Groveland	MG	365	365
Total Deliveries	MG	94,255	104,574
Total Deliveries	MGD	258	287
Storage			
Total Local Storage Begin	MG	49,849	71,363
Total Local Storage End	MG	43,129	65,197
Residual Difference during 82-year Simulation	MGD	0.22	0.21
Westside Storage Begin	MG	0	23,474
Westside Storage End	MG	0	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03

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Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of Notice of Preparation publication in September 2006. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. N/A

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030).

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River, and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when a variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the Design Drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies, and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of systemwide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies, and does not include supplies from regional water conservation, recycled water, or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change MID/TID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the MID/TID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during simulated historical period.

2. Proposed WSIP

The SFPUC proposes to adopt and implement the WSIP to increase the reliability of the regional water system. The WSIP is a program to implement the service goals and system performance objectives established by the SFPUC for the regional water system in the areas of water quality, seismic reliability, delivery reliability, and water supply through the year 2030.

The WSIP level of service objectives for water supply are to: (1) fully meet customer purchase requests in nondrought years through planning year 2030, estimated at 300 million gallons per day (mgd) average annual delivery; and (2) provide drought-year delivery with a maximum systemwide delivery reduction (rationing) of 20 percent in any one year of a drought. These objectives correspond to a required system firm yield of 256 mgd in 2030. System firm yield is defined as the average annual water delivery that can be sustained throughout an extended drought. The current firm yield of the system is 219 mgd under the current restricted operating conditions that limit storage levels in Calaveras and Crystal Springs Reservoirs.

During nondrought years, the SFPUC would serve the increased 35 mgd in purchase requests through a combination of conservation, water recycling, groundwater supply programs, increased diversions from the Tuolumne River, and greater utilization of Bay Area watershed supplies associated with the restoration of operational storage capacity (primarily in Calaveras Reservoir). The SFPUC would implement conservation, water recycling, and groundwater supply programs in the SFPUC retail service area to achieve the equivalent of 10 mgd of supply per year, in all years. These programs would be in addition to demand management and conservation measures already accounted for in the 2030 purchase requests for the retail service area.

In most years, the SFPUC could serve the projected 2030 water purchases of 300 mgd with its existing sources of water supply; however, these sources alone have not allowed for full water deliveries during past droughts, and they would be insufficient during future droughts as purchase requests increase. The SFPUC proposes to serve this 2030 need for increased system firm yield (i.e., water supply during a drought scenario) with a combination of conservation, water recycling, and groundwater programs in the SFPUC retail service area; water transfers (29,350 acre-feet per year) from the Turlock Irrigation District (TID) and Modesto Irrigation District (MID); a groundwater conjunctive-use program, incorporating the Westside Basin Groundwater Program; and restoration of reservoir operating capacity at Crystal Springs and Calaveras Reservoirs. Systemwide rationing is limited to no more than 20 percent in any year, with a firm yield of 256 mgd throughout an extended drought.

2.1 Water Deliveries and Drought Response Actions

With a current systemwide purchase request of approximately 265 mgd, the regional water system cannot provide full deliveries during all anticipated drought sequences. Drought response actions (delivery shortages) are necessary at the onset of a drought to provide a viable, albeit reduced, supply throughout the duration of a drought. Because the regional water system has limited current resources, rationing of the SFPUC supply by more than 20 percent may be required during an extended drought. With the proposed program, the purchase requests would increase from 265 mgd to 300 mgd, with 10 mgd of these requests satisfied by conservation, recycling, and groundwater programs in the city of San Francisco. In the future, the system would experience a net demand of 290 mgd. The additional net demand and increase in the water supply reliability of the regional water system would be served by the water supply programs described above. Table 1-1 compares the drought response actions for the proposed program and base (Calaveras constrained) settings. Figure 2.1-1 illustrates the drought response actions for the simulated 82-year historical period (1921-2002).

In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In the WSIP setting, the action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. The water transfer from MID/TID is also occurring during these periods. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers.

Figure 2.1-1

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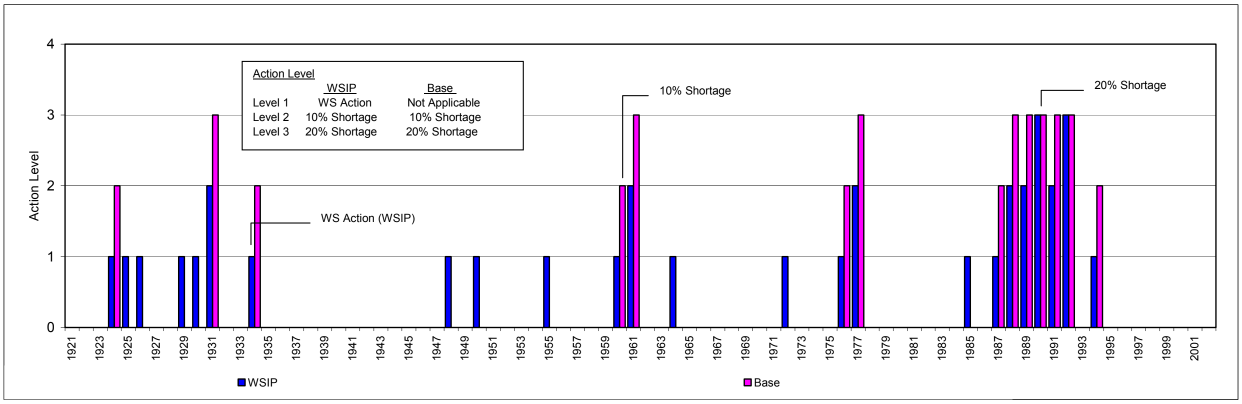
Drought Response Actions – WSIP and Base



In modeling parlance, there is no level 1 action in the base setting. Without supplemental resources, the existing system only has the delivery shortage measure available to cope with drought. This shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the WSIP and the base settings for these action levels. As evidenced in Figure 2.1-1, rationing would be required more frequently and with greater severity (level 2 and level 3 actions) in the base setting.

Figure 2.1-1 illustrates that, when compared to the base setting, the WSIP setting triggers the supplemental resource (Westside Basin Groundwater Program) at an early indication of drought, and during periods when in the base setting there were no supplemental resources available to the system. The utilization of the supplemental resource during these times results in the elimination or reduction, or at least a non-increase in the severity, of delivery shortage.

Although not illustrated in Figure 2.1-1, Table 1-1 shows the delivery shortages anticipated during the entire SFPUC design drought. Shortages during the design drought with the WSIP are maintained within the objective to limit the severity of shortage to no more than 20 percent. With the existing system (Calaveras and Crystal Springs Reservoirs constrained), the 20-percent-limitation (cap) objective cannot be achieved during the last 18 months of the design drought, and a 25-percent shortage is applied. The system's yield in the base setting is 219 mgd.

The difference in water deliveries between the proposed program and the base settings is shown chronologically for the 82-year simulation in Table 2.1-1. The differences all indicate an increase in deliveries due to an increase in the level of purchase requests, and an increase in the reliability of delivery. The annual (fiscal-year-based) increase of approximately 9.1 million gallons represents the basic increase in delivery associated with an increase in purchase requests from 265 mgd to 290 mgd. The years that show other levels of additional deliveries illustrate the increase in purchase requests and represent years when shortages are reduced in the WSIP setting compared to the base setting.

2.2 Diversions from Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin is the flow through the San Joaquin Pipeline (SJPL). Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. Regardless of an increase in purchase requests, the availability of increased conveyance capacity would increase diversions during the summer to retain storage in the Bay Area reservoirs, typically exercising the SJPL at its maximum capacity. The increase in purchase requests would require the utilization of the maximum capacity for a longer period into the fall. Generally, fewer diversions would occur during the late fall and early winter because of the lesser drawdown of the Bay Area reservoirs (requiring less replenishment), and because systematic maintenance within Hetch Hetchy facilities (lessening available conveyance capacity) would impair diversions in the WSIP setting. The increase in diversions during the winter and spring would

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Table 2.1-1

Difference in Total System-wide Delivery (MG)

WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1922	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1923	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1924	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1925	1,627	1,198	894	695	869	1,278	1,584	1,935	1,008	1,145	1,095	940	14,269	17,607
1926	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,125	9,125
1927	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1928	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1929	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1930	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,125	9,125
1931	810	611	461	374	437	609	727	907	1,008	2,009	1,947	1,710	11,610	9,125
1932	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	1,145	1,095	940	15,370	17,856
1933	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1934	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1935	1,627	1,198	894	695	869	1,278	1,584	1,935	1,008	1,145	1,095	940	14,268	17,607
1936	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1937	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1938	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1939	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1940	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1941	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1942	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1943	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1944	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1945	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1946	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1947	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1948	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1949	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1950	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1951	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1952	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1953	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1954	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1955	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1956	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1957	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1958	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1959	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1960	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1961	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1962	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	1,145	1,095	940	15,370	17,856
1963	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1964	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1965	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1966	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1967	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1968	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1969	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1970	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1971	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1972	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1973	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1974	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1975	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1976	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1977	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1978	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	-263	1,145	1,095	940	13,260	15,746
1979	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1980	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1981	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1982	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1983	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1984	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1985	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1986	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,125
1987	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1988	1,627	1,198	894	695	869	1,278	1,584	1,935	2,150	2,009	1,947	1,710	17,896	18,749
1989	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	2,009	1,947	1,710	17,856	17,856
1990	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	885	845	733	14,654	17,856
1991	646	509	403	337	381	503	586	709	775	2,009	1,947	1,710	10,513	7,311
1992	1,547	1,259	1,075	947	1,006	1,309	1,479	1,721	1,847	885	845	733	14,654	17,856
1993	646	509	403	337	381	503	586	709	-1,335	1,145	1,095	940	5,917	5,201
1994	810	611	461	374	437	609	727	907	1,008	2,347	2,262	1,909	12,462	9,124
1995	1,627	1,198	894	695	869	1,278	727	907	1,008	1,145	1,095	940	12,383	15,721
1996	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1997	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1998	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
1999	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2000	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2001	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
2002	810	611	461	374	437	609	727	907	1,008	1,145	1,095	940	9,124	9,124
Avg (21-02)	920	699	536	439	509	707	831	1,024	1,054	1,290	1,237	1,062	10,307	10,307

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Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	0	-921	0	0	0	12,368	2,118	2,189	2,118	2,189	2,189	2,118	24,368	27,130
1922	952	1,841	-1,902	952	0	0	7,365	5,043	4,880	2,189	2,189	2,118	25,627	25,627
1923	0	-2,762	0	0	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	25,476	25,476
1924	-951	0	1,902	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	17,864	17,864
1925	2,189	-19,334	-19,979	5,803	17,272	11,512	2,118	2,189	2,118	2,189	2,189	2,118	10,384	10,384
1926	5,043	5,616	-7,088	5,803	9,452	15,317	4,880	2,189	2,118	2,189	2,189	2,118	49,826	49,826
1927	1,903	-921	0	4,757	0	6,659	2,762	2,189	2,118	2,189	2,189	2,118	25,963	25,963
1928	2,949	0	-2,331	3,805	4,297	5,708	4,603	2,189	2,118	2,189	2,189	2,118	29,834	29,834
1929	4,756	1,841	1,902	1,902	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	30,843	30,843
1930	2,189	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	2,118	2,650	2,650
1931	2,189	5,616	-7,088	5,803	5,242	5,803	2,118	2,189	2,118	2,189	2,189	6,721	35,089	30,486
1932	8,562	2,762	5,708	5,708	0	15,412	4,880	6,945	6,721	2,189	2,189	2,118	63,194	67,797
1933	-951	0	-7,088	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	25,171	25,171
1934	2,189	5,616	5,803	6,659	6,015	5,803	2,118	2,189	2,118	2,189	2,189	2,118	45,006	45,006
1935	5,043	-19,334	-19,979	19,122	17,272	10,560	9,483	7,897	7,642	2,189	2,189	2,118	44,202	44,202
1936	2,189	4,603	-7,088	7,611	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	35,553	35,553
1937	3,806	1,841	1,902	3,805	0	951	6,445	5,043	4,880	2,189	2,189	2,118	35,169	35,169
1938	1,903	0	0	5,708	0	0	5,524	5,043	4,880	2,189	2,189	2,118	29,554	29,554
1939	-1,902	-921	-2,855	2,854	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,478	18,478
1940	2,189	-19,334	-19,979	15,317	7,734	13,319	8,286	5,043	4,880	2,189	2,189	2,118	23,951	23,951
1941	-1,902	-921	0	0	0	0	0	952	921	2,189	2,189	2,118	5,546	5,546
1942	2,379	0	-1,142	0	0	2,663	5,524	2,854	2,762	2,189	2,189	2,118	21,536	21,536
1943	1,903	-921	-7,088	0	0	3,805	6,721	2,189	2,118	2,189	2,189	2,118	15,223	15,223
1944	1,902	-921	0	1,902	7,046	15,317	2,118	2,189	2,118	2,189	2,189	2,118	38,167	38,167
1945	-475	-19,334	-19,979	5,803	13,749	15,317	2,118	2,189	2,118	2,189	2,189	2,118	8,002	8,002
1946	5,043	1,841	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	30,365	30,365
1947	952	1,841	0	-952	3,437	10,560	2,118	2,189	2,118	2,189	2,189	2,118	28,759	28,759
1948	2,189	5,616	-7,088	4,756	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	26,775	26,775
1949	2,189	5,616	2,854	-952	-859	1,902	2,118	2,189	2,118	2,189	2,189	2,118	23,671	23,671
1950	3,805	-19,334	-19,979	16,459	16,413	5,803	2,118	2,189	2,118	2,189	2,189	2,118	16,088	16,088
1951	2,189	7,365	0	0	0	8,562	2,118	2,189	2,118	2,189	2,189	2,118	31,037	31,037
1952	2,949	0	1,712	0	0	0	9,206	2,189	2,118	2,189	2,189	2,118	24,670	24,670
1953	1,902	-921	0	0	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	29,219	29,219
1954	-1,807	0	0	2,854	5,328	10,560	2,118	2,189	2,118	2,189	2,189	2,118	29,856	29,856
1955	-951	-19,334	-15,222	16,459	14,866	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,542	14,542
1956	2,189	5,616	0	0	0	2,663	2,118	2,189	2,118	2,189	2,189	2,118	23,389	23,389
1957	2,949	0	1,902	3,805	7,046	10,560	2,118	2,189	2,118	2,189	2,189	2,118	39,183	39,183
1958	952	2,762	-7,088	9,514	0	0	0	1,047	1,013	2,189	2,189	2,118	14,696	14,696
1959	0	0	0	2,854	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	31,092	31,092
1960	2,189	-19,334	-19,979	5,803	10,398	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-2,199	-2,199
1961	2,189	5,616	-7,088	5,803	9,538	5,803	2,118	2,189	2,118	2,189	5,043	9,483	45,001	34,782
1962	9,799	10,219	4,757	3,805	3,437	18,075	7,642	7,897	7,642	2,189	2,189	2,118	79,769	89,988
1963	2,949	1,841	-7,088	0	0	7,610	5,524	1,902	1,841	2,189	2,189	2,118	21,075	21,075
1964	2,189	0	0	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	35,399	35,399
1965	2,189	-19,334	-14,270	5,708	5,156	11,512	12,889	952	921	2,189	2,189	2,118	12,219	12,219
1966	2,949	-2,762	-1,379	9,704	8,765	5,803	2,118	2,189	2,118	2,189	2,189	2,118	36,001	36,001
1967	2,189	5,616	-2,855	0	0	0	6,445	0	0	2,189	2,189	2,118	17,891	17,891
1968	2,189	0	-7,088	8,562	7,734	5,803	2,118	2,189	2,118	2,189	2,189	2,118	30,121	30,121
1969	2,189	4,603	-952	0	0	951	7,642	2,189	2,118	2,189	2,189	2,118	25,236	25,236
1970	0	-19,334	-19,979	12,367	11,171	19,122	2,118	2,189	2,118	2,189	2,189	2,118	16,268	16,268
1971	2,379	-921	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	24,939	24,939
1972	2,189	5,616	0	-952	3,437	5,803	2,118	2,189	2,118	2,189	2,189	2,118	29,014	29,014
1973	2,189	5,616	-7,088	0	0	0	6,721	2,189	2,118	2,189	2,189	2,118	18,241	18,241
1974	1,902	0	0	0	0	10,464	4,603	5,043	4,880	2,189	2,189	2,118	33,388	33,388
1975	-1,902	-19,334	-19,979	11,512	5,156	3,805	8,286	5,043	4,880	2,189	2,189	2,118	3,963	3,963
1976	-1,902	-921	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	8,813	8,813
1977	5,043	5,616	4,756	0	0	5,803	2,118	2,189	2,118	-4,756	-1,902	7,365	28,350	34,139
1978	7,611	-921	-2,854	5,708	5,156	10,464	12,152	5,803	5,616	2,189	2,189	2,118	55,231	49,442
1979	-2,854	0	1,902	2,854	0	11,416	2,118	2,189	2,118	2,189	2,189	2,118	26,239	26,239
1980	5,043	-19,334	-15,222	13,319	0	7,610	4,880	2,189	2,118	2,189	2,189	2,118	7,099	7,099
1981	1,902	0	-7,088	7,610	6,874	11,512	2,118	2,189	2,118	2,189	2,189	2,118	33,731	33,731
1982	2,189	-921	0	0	0	0	0	1,902	1,841	2,189	2,189	2,118	11,507	11,507
1983	1,047	-2,762	951	0	0	0	4,787	4,757	4,603	2,189	2,189	2,118	19,879	19,879
1984	952	-4,603	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,073	15,073
1985	2,189	-19,334	-19,979	10,560	9,538	5,803	2,118	2,189	2,118	2,189	2,189	2,118	1,698	1,698
1986	2,189	5,616	-7,088	5,803	3,437	7,610	7,365	5,043	4,880	2,189	2,189	2,118	41,351	41,351
1987	0	0	1,902	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,815	18,815
1988	5,043	5,616	-7,088	10,465	7,734	5,803	2,118	2,189	2,118	2,189	2,189	9,483	47,859	40,494
1989	4,756	1,841	4,757	2,854	2,578	5,803	2,118	5,043	4,880	5,043	3,806	7,365	50,844	48,491
1990	6,659	-19,334	-15,222	10,560	9,538	5,803	2,118	2,189	2,118	5,043	4,756	6,444	20,672	20,643
1991	3,805	-921	-2,331	0	0	10,465	4,880	2,854	2,762	2,189	3,805	1,841	29,349	37,757
1992	0	4,603	3,805	952	2,406	18,075	6,721	6,945	6,721	1,047	-1,902	1,841	51,214	58,063
1993	1,902	-921	-1,379	0	0	0	4,603	2,854	2,762	2,189	2,189	2,118	16,317	10,807
1994	-2,854	0	0	-952	10,312	5,803	2,118	2,189	2,118	2,189	2,189	2,118	25,230	25,230
1995	5,043	-19,334	-19,979	7,610	6,874	0	9,206	1,903	1,842	2,189	2,189	2,118	-339	-339
1996	1,902	0	-2,331	0	0	0	4,880	5,043	4,880	2,189	2,189	2,118	20,870	20,870
1997	1,903	0	0	0	0	10,465	2,118	2,189	2,118	2,189	2,189	2,118	25,289	25,289
1998	2,189	2,762	-7,088	0	0	951	11,048	3,901	3,775	2,189	2,189	4,880	26,796	24,034
1999	1,902	-921	0	6,659	0	8,562	9,206	2,189	2,118	2,189	2,189	2,118	36,211	38,973
2000	1,902	-19,334	-19,979	15,317	7,734	16,173	2,118	2,189	2,118	2,189	2,189	2,118	14,734	14,734
2001	3,806	2,762	-7,088	7,611	8,593	15,317	2,118	2,189	2,118	2,189	2,189	2,118	43,922	43,922
2002	952	0	-1,902	6,659	6,015	10,560	2,118	2,189	2,118	2,189	2,189	2,118	35,205	35,205
Avg (21-02)	2,106	-2,522	-4,852	4,307	3,833	7,532	3,864	2,797	2,706	2,160	2,195	2,561	26,687	26,720

result from the need to replenish Bay Area reservoir storage after the maintenance period, serve increased purchase requests, and top off Bay Area reservoir storage prior to summer. The difference in SJPL diversions between the WSIP setting and the base setting is illustrated in Figure 2.2-1. The difference in average monthly diversions through the SJPL is shown by year type for the 82-year simulation period.

Table 2.2-2 illustrates the average monthly diversions through the SJPL, by year type, for the 82-year simulation period for the proposed program and the base settings. The table illustrates a trend of diverting less water from the Tuolumne River Basin in wetter years (as Bay Area reservoir watersheds provide more supply during those years) than in drier years.

Figure 2.2-1
SJPL Diversions – WSIP and Base-Calaveras Constrained

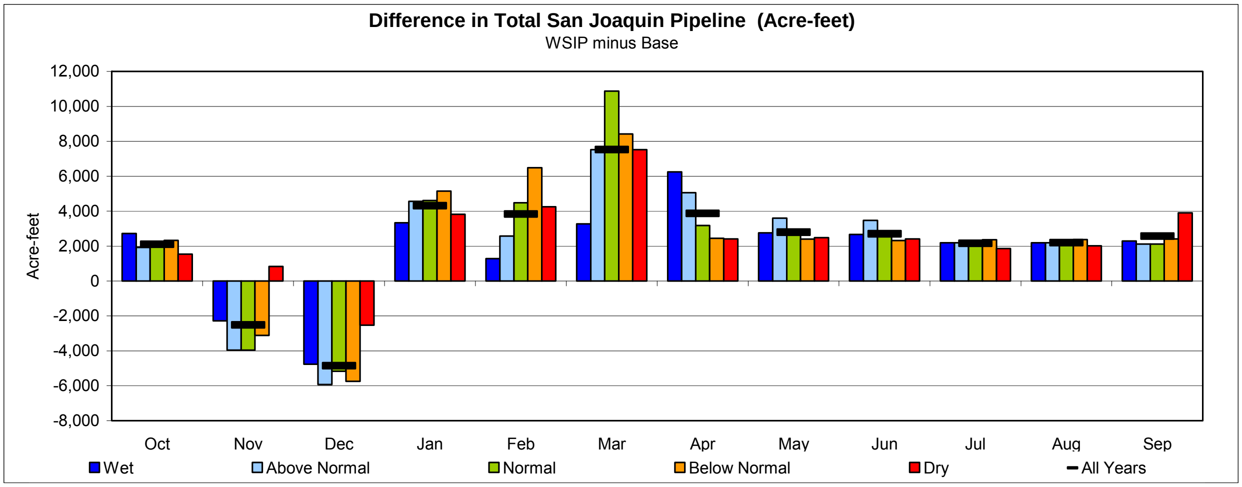

Table 2.2-2

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	WSIP Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Base Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	WSIP minus Base Aug	Sep	WY Total	FY Total
Wet	2,730	-2,285	-4,757	3,336	1,289	3,264	6,249	2,759	2,670	2,189	2,189	2,291	21,924	21,045
Above Normal	1,920	-3,954	-5,932	4,555	2,583	7,521	5,058	3,593	3,477	2,189	2,189	2,118	25,318	25,752
Normal	2,016	-3,959	-5,167	4,608	4,479	10,875	3,177	2,724	2,636	2,189	2,189	2,118	27,885	28,696
Below Normal	2,328	-3,120	-5,748	5,143	6,480	8,422	2,443	2,396	2,318	2,357	2,379	2,410	27,810	28,166
Dry	1,534	834	-2,533	3,823	4,248	7,521	2,406	2,486	2,406	1,862	2,016	3,907	30,511	29,913
All Years	2,106	-2,522	-4,852	4,307	3,833	7,532	3,864	2,797	2,706	2,160	2,195	2,561	26,687	26,720

2.3 Hetch Hetchy Reservoir and Releases

The additional draw of water for the additional deliveries occurring under the WSIP would generally result in an increase in draw from Hetch Hetchy Reservoir. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (Base); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (WSIP minus Base).

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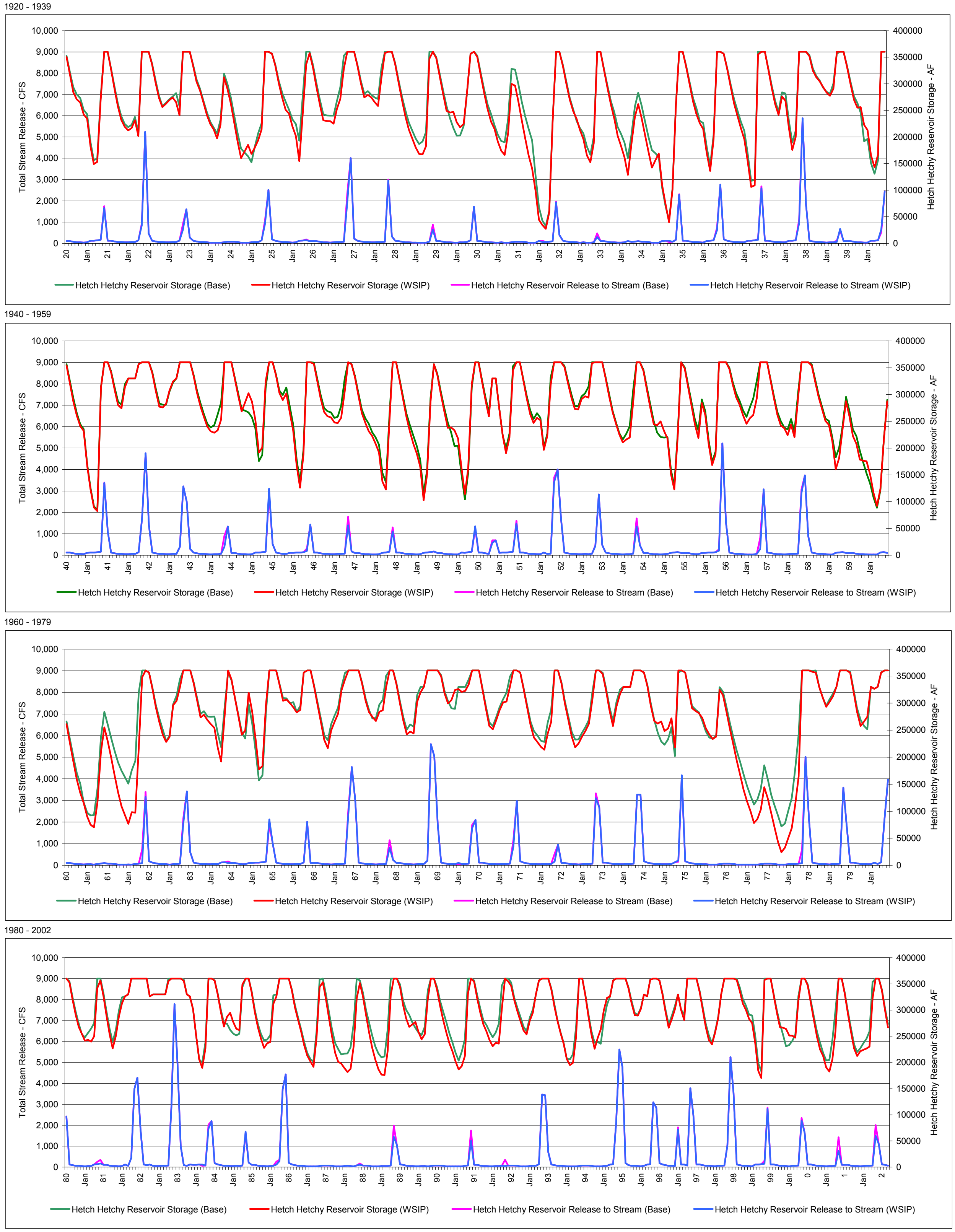
Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release



APPENDIX O1

Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

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Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	280,411	273,133	250,957	243,012	190,418	156,484	159,470	275,503	360,400	360,400	328,999	296,132
1922	263,554	239,474	224,744	218,657	223,120	237,696	208,009	360,400	360,400	360,400	338,270	307,157
1923	278,219	258,004	264,081	270,793	275,934	282,536	257,891	360,400	360,400	360,400	335,374	308,545
1924	290,590	267,956	246,473	228,542	217,437	206,672	232,567	319,193	299,564	273,802	240,713	206,954
1925	178,108	170,809	163,868	152,585	181,467	206,969	225,842	360,400	360,400	356,465	336,398	305,731
1926	283,429	266,388	251,261	233,101	224,226	193,028	276,699	360,400	360,400	335,420	302,178	270,343
1927	242,836	240,506	240,191	240,158	267,736	293,484	352,928	360,400	360,400	360,400	335,906	305,535
1928	281,739	286,393	279,420	274,249	271,550	329,719	360,400	360,400	360,400	339,284	307,062	275,931
1929	249,997	227,192	212,086	197,122	186,905	191,676	209,350	360,400	360,400	350,290	318,800	287,725
1930	258,166	235,262	216,614	202,893	202,985	220,974	284,455	356,465	360,400	352,956	321,099	289,912
1931	261,671	242,966	222,186	204,418	192,376	190,297	233,699	328,151	326,987	299,243	266,140	238,628
1932	215,243	193,719	128,322	67,999	42,831	32,420	61,085	231,720	360,400	360,400	335,277	304,222
1933	273,508	252,000	230,146	217,141	206,853	182,105	166,743	200,181	360,400	360,400	328,781	297,686
1934	267,451	246,451	218,992	205,761	189,607	160,228	202,741	257,431	283,334	259,261	229,404	200,246
1935	175,286	169,675	162,484	104,010	69,201	43,091	102,489	260,984	360,400	360,400	333,976	303,626
1936	273,576	253,792	230,244	226,479	181,301	145,902	204,009	360,400	360,400	356,465	330,041	298,414
1937	270,601	249,107	228,767	211,579	167,908	117,966	118,707	360,400	360,400	360,400	329,400	296,775
1938	268,124	247,723	284,031	281,929	231,023	189,521	212,145	360,400	360,400	360,400	354,217	329,018
1939	314,865	306,147	292,907	285,114	281,559	300,846	356,592	360,400	360,400	334,345	303,865	276,815
1940	263,881	245,583	192,045	196,568	151,034	130,959	155,867	360,400	360,400	356,639	324,687	292,798
1941	265,260	244,779	235,495	169,687	125,534	91,292	84,162	313,335	360,400	360,400	343,479	313,352
1942	286,926	281,147	319,229	330,000	330,000	330,000	356,592	360,400	360,400	360,400	341,717	311,266
1943	283,369	281,064	280,888	305,315	322,404	330,000	360,400	360,400	360,400	360,400	337,008	307,394
1944	283,446	263,729	245,490	238,577	242,844	262,836	285,029	360,400	360,400	360,400	331,478	301,749
1945	272,276	269,834	266,760	257,391	236,587	175,803	186,832	312,263	360,400	360,400	337,116	307,472
1946	298,923	313,194	277,762	243,830	179,367	135,427	196,880	360,400	360,400	359,455	329,955	299,722
1947	275,020	268,766	266,516	256,291	258,478	278,846	329,910	360,400	356,592	335,035	302,365	271,816
1948	255,930	245,807	229,831	220,170	206,440	153,592	136,183	258,923	360,400	360,400	327,962	295,366
1949	263,928	242,431	222,739	203,721	178,274	113,920	159,848	293,245	356,592	338,228	305,702	274,661
1950	248,017	229,653	203,967	204,416	151,359	104,230	154,484	312,900	360,400	360,400	326,837	295,032
1951	266,327	330,000	330,000	273,739	223,537	199,065	226,940	352,902	360,400	360,400	328,968	297,507
1952	270,971	254,282	265,208	256,577	201,139	226,846	331,859	360,400	360,400	360,400	353,839	326,515
1953	300,631	278,509	277,588	296,644	302,108	314,750	360,400	360,400	360,400	360,400	332,324	301,476
1954	269,513	247,582	227,840	215,998	226,805	241,051	308,969	360,400	360,400	346,144	313,200	281,430
1955	250,117	228,834	220,830	219,437	220,572	159,061	129,641	227,821	360,400	350,686	318,112	285,351
1956	253,489	233,090	290,850	268,782	213,957	174,362	193,602	360,400	360,400	360,400	349,979	323,594
1957	302,332	288,502	270,158	258,319	275,642	292,503	325,882	360,400	360,400	360,400	329,011	297,001
1958	267,551	250,230	238,122	234,786	254,300	230,793	302,596	360,400	360,400	360,400	356,088	328,214
1959	299,729	277,321	254,820	250,756	220,030	182,778	200,788	240,985	295,567	269,299	234,888	222,167
1960	195,138	173,648	152,513	133,893	107,807	88,465	121,115	216,331	290,212	266,155	233,132	201,024
1961	170,373	151,178	116,885	97,300	92,106	92,793	141,951	236,348	284,141	260,208	235,221	211,711
1962	190,469	175,055	162,758	151,091	175,846	193,205	319,373	360,400	360,400	356,465	328,567	296,435
1963	272,296	250,374	230,167	239,516	298,144	313,908	344,728	360,400	360,400	360,400	338,584	309,330
1964	280,158	284,985	275,345	274,808	275,278	243,860	218,576	293,373	356,592	342,134	309,983	278,588
1965	246,691	234,664	297,938	262,593	211,621	157,081	166,277	281,195	360,400	360,400	360,400	335,306
1966	309,419	309,020	299,715	301,871	283,891	294,508	356,592	360,400	360,400	333,638	302,345	271,809
1967	240,578	231,046	260,686	276,916	291,853	330,000	355,978	360,400	360,400	360,400	360,400	337,886
1968	308,358	287,801	271,744	272,635	297,331	306,191	350,516	360,400	360,400	336,513	304,211	273,939
1969	250,819	260,520	256,387	314,777	330,000	330,000	360,400	360,400	360,400	360,400	351,614	322,081
1970	303,598	290,627	289,425	330,000	330,000	330,000	343,990	360,400	360,400	360,400	328,204	295,064
1971	264,645	257,322	273,546	292,421	307,143	319,256	348,766	360,400	360,400	356,465	327,952	296,750
1972	265,329	248,476	240,268	230,515	228,425	264,440	288,021	360,400	360,400	338,614	303,374	274,452
1973	246,861	232,496	232,826	245,678	256,360	269,008	321,179	360,400	360,400	356,178	327,202	292,614
1974	266,182	301,887	324,891	330,000	330,000	330,000	360,400	360,400	360,400	356,465	333,738	299,491
1975	269,312	245,191	229,214	223,020	232,950	255,478	201,886	356,465	360,400	356,465	326,350	294,783
1976	287,784	282,995	266,869	247,602	236,438	233,942	240,409	329,430	320,991	293,102	263,576	235,784
1977	211,881	191,000	168,216	146,157	128,335	112,542	121,920	141,809	184,960	160,051	130,121	110,883
1978	92,092	72,046	77,314	101,462	124,716	178,418	242,510	360,400	360,400	360,400	360,057	360,400
1979	330,000	310,323	295,083	306,838	317,722	330,000	360,400	360,400	360,400	358,285	325,107	290,802
1980	269,252	258,070	251,507	330,000	326,446	330,000	356,592	360,400	360,400	360,400	354,917	324,717
1981	297,001	273,946	253,982	248,138	256,698	264,712	275,335	360,400	360,400	332,373	297,002	264,239
1982	239,211	262,326	299,280	324,411	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	358,088
1984	330,000	326,192	301,515	251,330	205,725	199,414	238,663	360,400	360,400	356,465	331,150	300,761
1985	274,862	274,060	262,155	255,078	251,721	254,736	343,995	360,400	360,400	335,723	301,239	273,210
1986	254,074	241,940	243,674	252,349	328,243	330,000	360,400	360,400	360,400	360,400	339,678	308,901
1987	285,496	263,052	238,915	218,205	206,195	201,690	259,958	358,308	360,400	330,951	296,621	263,532
1988	236,781	225,459	215,116	216,862	217,237	229,133	274,112	360,400	356,592	332,923	300,330	276,174
1989	251,922	230,428	217,332	209,757	211,390	263,214	360,400	360,400	360,400	349,016	318,183	300,442
1990	290,787	276,174	265,731	256,913	252,466	268,079	337,897	360,400	360,400	344,204	316,923	296,870
1991	277,475	255,860	237,549	218,406	203,404	220,219	244,459	360,400	360,400	356,617	327,706	302,708
1992	280,460	271,581	258,644	248,110	257,159	273,680	346,925	360,400	360,400	352,662	323,955	304,049
1993	286,996	268,486	259,605	285,541	300,859	330,000	356,592	360,400	360,400	360,400	341,872	310,298
1994	280,162	257,147	237,028	207,354	205,802	215,899	266,874	360,400	360,400	330,294	292,878	259,786
1995	237,634	238,887	235,508	279,395	309,999	326,065	356,592	360,400	360,400	360,400	360,400	343,353
1996	317,122	294,200	291,087	304,073	330,000	326,065	357,776	360,400	360,400	356,465	331,457	300,112
1997	272,590	289,404	307,981	330,000	300,695	291,579	360,400	360,400	360,400	360,400	336,697	305,853
1998	274,237	252,363	236,673	258,866	286,106	330,000	360,400	360,400	360,400	360,400	359,763	343,429
1999	321,345	308,591	291,234	289,606	251,804	198,620	183,193	360,400	360,400	360,400	330,711	299,709
2000	273,719	253,298	230,795	233,390	241,001	253,471	326,894	360,400	360,400	349,445	318,802	286,920
2001	258,656	237,867	218,236	204,074	204,728	243,680	299,768	360,400	360,400	333,230	298,285	265,969
2002	234,555	219,980	226,900	236,337	245,064	259,327	353,663	360,400	360,400	339,724	304,940	273,272
Avg (21-02)	265,578	253,671	245,075	240,657	234,512	232,346	267,303	337,298	352,928	344,130	318,964	290,795

APPENDIX O1

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-9,246	-8,325	-8,325	-8,329	-8,334	-7,301	-6,165	-5,156	0	0	-2,188	-4,304
1922	-5,253	-7,095	-5,192	-6,146	-6,150	-6,150	-6,150	0	0	0	-2,188	-4,304
1923	-4,303	-1,540	-1,540	-1,541	-1,542	-16,859	-16,859	0	0	0	-2,188	-4,304
1924	-3,351	-3,351	-5,254	-4,305	-3,448	-9,252	-9,667	-7,016	-9,128	-11,305	-13,472	-15,575
1925	-17,755	1,579	21,558	15,769	-1,490	-13,001	-11,427	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-13,185	-22,448	-38,341	-32,994	-24,304	-2,846	-5,031	-7,213	-9,325
1927	-11,222	-10,302	-10,301	-15,064	-15,073	-21,733	-24,494	0	0	0	-2,188	-4,304
1928	-7,251	-7,252	-4,920	-8,728	-13,030	-18,738	-2,582	0	0	-2,188	-4,373	-6,487
1929	-11,241	-13,083	-14,985	-16,896	-18,625	-24,428	-26,545	-13,060	0	-2,188	-4,374	-6,488
1930	-8,673	10,661	30,639	24,854	15,330	3,819	1,701	0	0	-2,188	-4,373	-6,488
1931	-8,673	-14,289	-7,202	-13,009	-18,258	-24,061	-26,178	-28,351	-30,446	-32,597	-34,738	-41,418
1932	-49,957	-52,719	-29,168	-23,642	-8,354	-5,115	-2,831	-2,047	0	0	-2,188	-4,304
1933	-3,351	-3,351	3,737	-3,872	-10,749	-16,552	-14,214	-11,906	0	0	-2,188	-4,304
1934	-6,490	-12,107	-16,394	-22,866	-28,003	-31,226	-17,285	-19,463	-21,558	-23,711	-25,858	-27,946
1935	-32,972	-13,638	6,341	4,926	3,888	-3,341	-2,155	-1,638	0	0	-2,188	-4,304
1936	-6,490	-11,093	-3,899	-11,595	-11,272	-9,690	-8,173	0	0	0	-2,188	-4,304
1937	-8,108	-9,949	-11,842	-15,654	-13,885	-11,642	-9,574	-5,254	0	0	-2,188	-4,304
1938	-6,205	-6,205	-7,916	-13,628	-13,635	-13,597	-11,979	0	0	0	-2,188	-4,304
1939	-2,399	-1,479	1,375	-1,478	-4,057	-9,861	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	30,715	16,444	14,582	12,241	10,336	0	0	-2,188	-4,374	-6,488
1941	-4,582	-3,661	-3,051	-3,053	-2,610	-2,189	-1,670	-1,249	0	0	-2,188	-4,304
1942	-6,681	-6,681	-5,539	0	0	0	0	0	0	0	-2,188	-4,304
1943	-6,205	-5,284	1,803	1,804	1,805	0	0	0	0	0	-2,188	-4,304
1944	-6,205	-5,284	-5,284	-7,190	-14,240	-29,557	-31,675	0	0	0	-2,188	-4,304
1945	-3,826	15,508	35,486	29,700	15,967	15,967	14,052	12,289	0	0	-2,188	-4,304
1946	-9,344	-11,185	-11,186	-11,192	-11,199	-9,551	-8,057	0	0	-2,188	-4,374	-6,487
1947	-7,436	-9,278	-9,278	-8,332	-11,774	-22,334	-24,451	0	0	-2,188	-4,374	-6,487
1948	-8,672	-14,288	-7,201	-11,961	-14,546	-16,022	-13,526	-11,326	0	0	-2,188	-4,304
1949	-6,491	-12,106	-14,960	-14,023	-13,172	-11,152	-8,918	-7,464	0	-2,188	-4,374	-6,488
1950	-10,289	9,044	29,153	13,472	11,935	10,014	8,067	6,759	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	-8,563	-7,527	-7,523	0	0	-2,188	-4,304
1952	-7,252	-7,251	-8,964	-4,487	-4,490	-4,490	-13,696	0	0	0	-2,188	-4,304
1953	-6,205	-5,284	-5,284	-5,287	-5,289	-20,606	-1,931	0	0	0	-2,188	-4,304
1954	-2,495	-2,494	-2,494	-5,350	-10,681	-21,241	-23,359	0	0	-2,188	-4,373	-6,487
1955	-5,533	13,801	29,022	12,581	-2,278	-8,081	-6,815	-5,700	0	-2,188	-4,374	-6,488
1956	-8,673	-14,289	-6,886	-6,890	-6,894	-6,002	-5,052	0	0	0	-2,188	-4,304
1957	-7,252	-7,251	-9,154	-12,965	-20,019	-30,579	-32,696	0	0	0	-2,188	-4,304
1958	-5,253	-8,016	-928	-10,442	-10,448	-10,448	-10,448	0	0	0	-2,188	-4,304
1959	-4,302	-4,302	-4,302	-7,159	-7,163	-22,479	-19,260	-5,774	-7,885	-10,062	-12,233	-14,336
1960	-16,515	2,818	22,797	17,012	8,159	3,649	2,785	-800	-2,916	-5,100	-7,279	-9,389
1961	-11,572	-17,188	-1,506	-7,311	-16,858	-22,661	-24,778	-26,934	-29,021	-31,161	-36,149	-45,591
1962	-55,363	-65,583	-70,339	-74,228	-77,753	-95,828	-103,470	-12,616	0	0	-2,188	-4,304
1963	-7,252	-9,093	-2,005	-2,006	-2,007	-9,618	-15,142	0	0	0	-2,188	-4,304
1964	-6,490	-6,490	-6,490	-14,105	-20,987	-26,791	-26,713	-16,485	3,808	1,616	-574	-2,692
1965	-4,878	14,456	21,323	21,332	21,343	20,542	17,422	14,913	0	0	0	-2,118
1966	-5,066	-2,304	227	-9,476	-1,077	-6,880	0	0	0	-2,188	-4,373	-6,488
1967	-8,672	-14,288	-11,434	-11,441	-11,447	-5,986	-12,432	0	0	0	0	-2,118
1968	-4,305	-4,305	2,783	-5,778	-13,514	-19,318	-21,436	0	0	-2,188	-4,374	-6,488
1969	-8,672	-13,275	-12,324	-12,331	-9,886	0	0	0	0	0	-2,188	-4,304
1970	-4,302	15,032	35,010	-3,935	-9,154	-7,203	-9,320	0	0	0	-2,188	-4,304
1971	-6,681	-5,759	-5,760	-5,763	-5,765	-16,326	-18,444	0	0	0	-2,188	-4,304
1972	-6,490	-12,106	-12,106	-11,162	-14,606	-20,409	-22,526	0	0	-2,188	-4,373	-6,487
1973	-8,671	-14,288	-7,200	-7,205	-7,209	-7,209	-13,930	0	0	-2,188	-4,374	-6,487
1974	-8,388	-8,387	-8,388	0	0	0	0	0	0	0	-2,188	-4,304
1975	-2,400	16,935	36,914	25,423	20,283	16,477	16,477	3,935	0	0	-2,188	-4,304
1976	-2,399	-1,478	5,609	5,613	5,616	-188	-2,305	-4,492	-6,606	-8,786	-10,962	-13,067
1977	-18,102	-23,718	-28,474	-28,500	-28,536	-34,340	-36,458	-38,599	-40,614	-35,764	-33,741	-41,015
1978	-48,585	-47,664	-44,811	-50,547	-55,741	-66,206	-78,358	0	0	0	-2,188	-3,994
1979	-43	-43	-1,946	-4,800	-4,803	0	0	0	0	-2,188	-4,373	-6,488
1980	-11,527	7,807	23,029	0	0	0	0	0	0	0	-2,188	-4,304
1981	-6,205	-6,205	883	-6,728	-13,606	-25,118	-25,117	-18,500	-3,808	-5,992	-8,173	-10,284
1982	-12,465	-11,545	-11,545	-11,550	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-4,787	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-6,490	12,844	32,822	22,279	12,753	6,951	4,833	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	-7,200	-13,008	-16,452	-3,935	0	0	0	0	-2,188	-4,304
1987	-4,302	-4,303	-6,205	-5,257	-4,401	-10,204	-12,321	-14,502	-7,152	-9,332	-11,509	-13,616
1988	-18,651	-24,266	-17,179	-27,654	-35,402	-41,206	-43,324	-38,112	-4,861	-7,043	-9,223	-18,698
1989	-23,444	-25,286	-30,042	-32,914	-35,510	-41,313	-31,976	0	0	-5,042	-8,842	-16,200
1990	-22,852	-3,518	11,704	1,150	-8,387	-14,191	-16,309	0	0	-5,042	-9,793	-16,230
1991	-20,028	-19,108	-16,776	-16,786	-16,796	-27,261	-32,140	-28,652	0	-2,188	-5,991	-7,828
1992	-7,824	-12,427	-16,233	-17,194	-19,610	-37,685	-44,406	0	-5,378	-6,418	-4,508	-6,346
1993	-8,246	-7,325	-5,945	-5,949	-5,952	0	0	0	0	0	-2,188	-4,304
1994	-1,448	-1,448	-1,448	-498	-10,809	-16,612	-18,731	0	0	-2,188	-4,374	-6,487
1995	-11,526	7,809	27,787	20,193	13,327	0	0	0	0	0	0	-2,118
1996	-4,020	-4,020	-1,688	-1,690	0	0	0	0	0	0	-2,188	-4,304
1997	-6,205	-6,204	-6,205	0	0	-10,465	0	0	0	0	-2,188	-4,304
1998	-6,490	-9,252	-2,165	-2,166	-2,167	0	0	0	0	0	-2,188	-7,066
1999	-8,966	-8,045	-8,045	-14,708	-14,715	-14,716	-12,940	-2,785	0	0	-2,188	-4,304
2000	-6,205	13,129	33,108	17,810	10,087	-6,087	-8,204	0	0	-2,188	-4,373	-6,488
2001	-10,290	-13,052	-5,964	-13,579	-22,179	-37,496	-39,613	0	-214	-2,402	-4,587	-6,701
2002	-7,648	-7,648	-5,746	-12,408	-18,430	-28,990	-31,109	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-9,674	-7,064	-1,709	-5,714	-8,315	-13,152	-13,132	-3,925	-2,056	-3,021	-5,076	-7,602

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Table 2.3-3 illustrates the difference in Hetch Hetchy Reservoir storage between the WSIP and base settings. Immediately after Hetch Hetchy Reservoir is filled (May or June, and then continuing through July), occasional differences in storage would occur, typically during a multi-year drought sequence or during an occasional single year when the reservoir does not fill. No reduction in yearly storage during that period would indicate that the same amount of water is being passed through the reservoir, regardless of the size of the conveyance capacity of the SJPL or the purchase requests. Water not diverted to the SJPL would return to the Tuolumne River at Kirkwood Powerhouse or Moccasin Reservoir and flow to Don Pedro Reservoir. In the late summer and early fall, storage levels would consistently be slightly different (lower) between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. The additional storage depletion would be somewhat ameliorated later in the fall and into winter as SJPL diversions are reduced because of lower Bay Area reservoir replenishment needs and conveyance system maintenance. The storage difference would become almost neutral in December with the WSIP setting because of the additional conveyance maintenance that would occur under the WSIP (which does not occur in the base setting). The maintenance impairs diversions to the SJPL. After December, storage in the reservoir associated with the WSIP setting again would be affected as replenishment of Bay Area reservoir storage resumes following the maintenance period and because of increased purchase requests. During drier years, there is a difference in storage between the WSIP and base settings; the WSIP setting results in a lower amount of storage in the reservoir by the end of April. Figure 2.3-2 illustrates the reservoir storage, averaged by year type, for the WSIP setting. Figure 2.3-3 illustrates the average difference in storage, averaged by year type, for the two settings. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.3-2

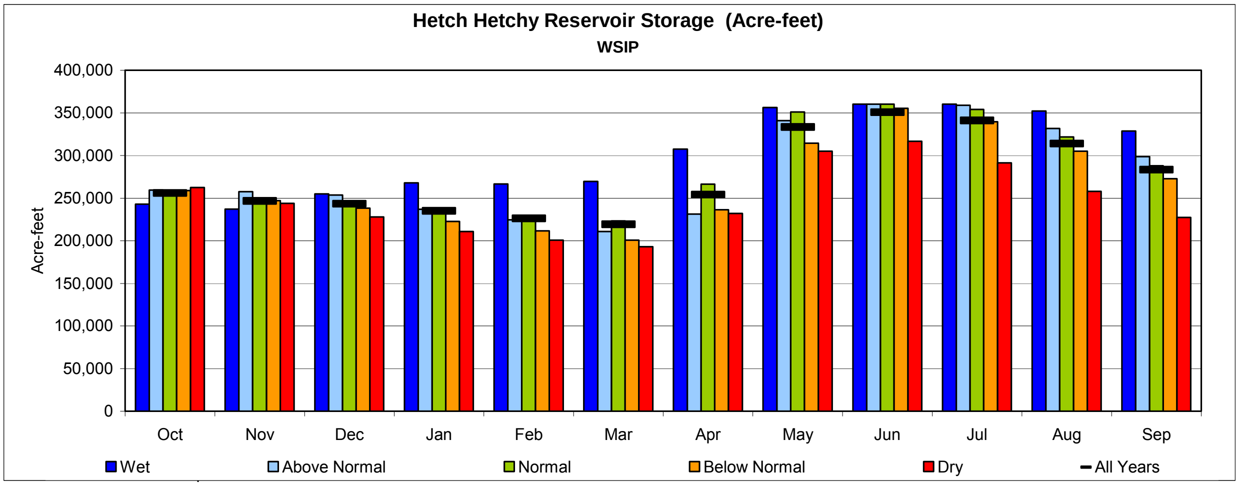


Figure 2.3-3

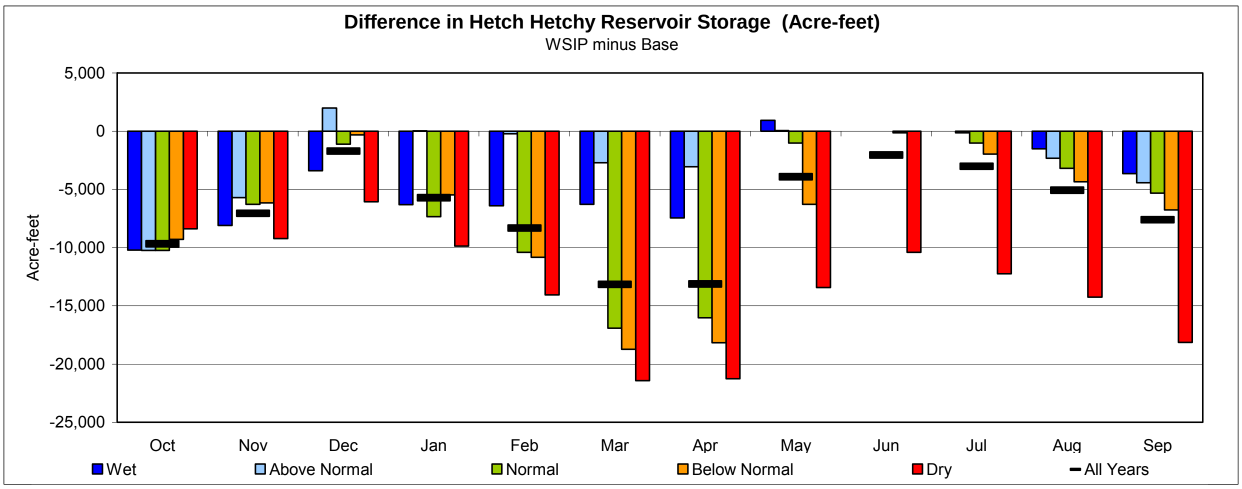
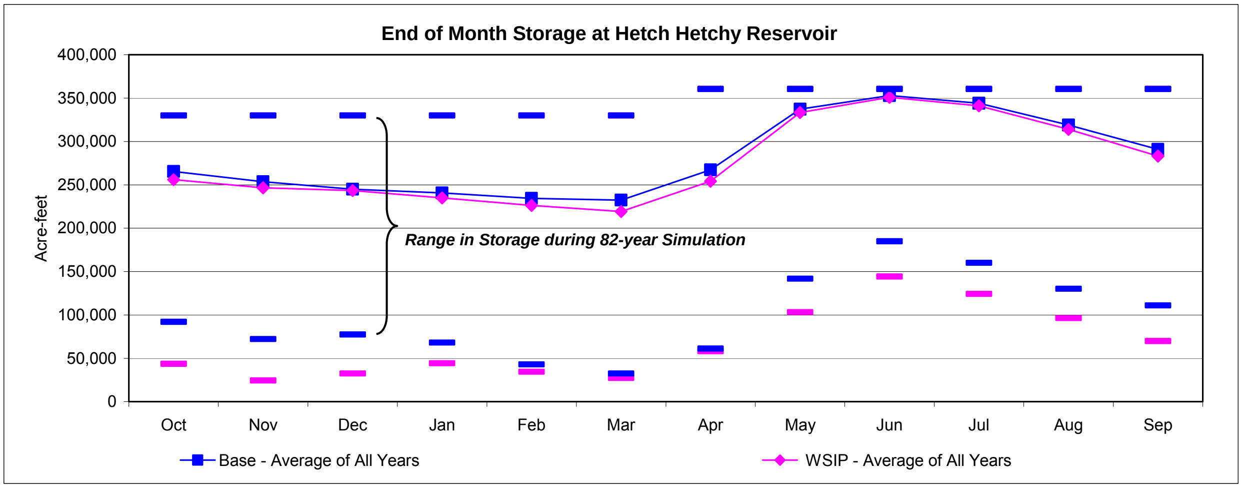


Figure 2.3-4



The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the WSIP would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the WSIP would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream (the amount which is above minimum release requirements). Figure 2.3-1 illustrates the stream releases from O'Shaughnessy Dam for the WSIP and base settings. Supplementing Figure 2.3-1 are Table 2.3-4 and Table 2.3-5, which show the stream releases from O'Shaughnessy Dam for the WSIP and base settings. Table 2.3-6 illustrates the difference in stream releases between the WSIP and base settings. Compared to the base setting, the WSIP setting typically results in a lesser stream release, predominantly during May or June, which reflects the months when releases to the stream above minimum release requirements are made in anticipation of the reservoir being filled. In a few exceptions to this circumstance, an increase in releases to the stream occurs. Several of these exceptions are considered anomalous within modeling, the result of only shifting releases from one month to another. The other exceptions occur due to the balancing of reservoir storage among the Hetch Hetchy system and the Bay Area reservoirs. The decrease in releases is the result of a more depleted reservoir, which is the result of greater demands between the settings.

Table 2.3-6 illustrates the difference in stream releases between the WSIP and base settings, expressed in terms of a monthly volume (acre-feet) of flow. The difference in monthly flow below O'Shaughnessy Dam indicates a potential change in releases between the WSIP and base settings, ranging from a decrease of approximately 40,000 acre-feet to an increase of approximately 14,900 acre-feet. Considering the manner in which releases are determined and made to the stream, quantifying the effect of these changes in terms of average monthly flow (in cubic feet per second [cfs]) is not always meaningful.[1] Assuming that a change in release volume equates to a delay or earlier initiation of releasing 6,000 acre-feet per day, the difference in stream releases from O'Shaughnessy Dam between the WSIP and base settings would range from delayed releases of up to 7 days to an addition of up to 2 days of release. Normally, the effect of a delay in release would not affect the year's peak stream release rate during a year.

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1 See "Estimated Effect of WSIP on Daily Releases below Hetch Hetchy Reservoir," Memorandum by Daniel B. Steiner, December 31, 2006.

APPENDIX O1

Table 2.3-4

Hetch Hetchy Reservoir Release to Stream (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	98,913	7,686	7,686	5,316	164,079
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	52,095	312,197	28,813	7,686	5,316	434,836
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	39,054	95,231	16,928	7,686	5,316	192,349
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	56,758	149,864	11,621	7,686	5,316	256,028
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	8,854	6,545	6,764	6,764	4,284	64,106
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	118,928	238,640	13,543	7,686	5,316	407,210
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	181,693	19,601	7,686	6,764	4,284	244,949
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	38,258	6,764	6,764	4,284	78,154
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	3,362	3,689	4,463	6,149	114,929	24,366	7,686	5,316	183,356
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	17,729	6,764	6,764	4,284	58,137
1934	3,074	2,975	2,460	2,460	2,802	7,009	3,868	4,919	6,545	4,612	4,612	3,669	49,005
1935	2,152	2,083	2,152	7,009	6,916	7,624	4,463	10,084	136,065	7,686	7,686	5,316	199,236
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	38,045	164,181	11,621	7,686	5,316	261,893
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	10,084	154,062	7,686	7,686	5,316	221,052
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	58,406	350,036	112,643	7,686	5,316	570,305
1939	3,689	3,570	3,074	2,460	2,802	3,074	3,868	41,832	6,545	6,764	6,764	4,284	88,726
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	40,199	145,292	7,686	7,686	5,316	239,959
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	200,571	67,763	7,686	5,316	331,573
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	24,276	79,627	6,764	6,764	4,284	144,252
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	184,630	31,926	7,686	5,316	274,036
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	12,189	85,083	7,686	7,686	5,316	162,048
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	86,043	10,353	6,764	6,764	4,284	139,129
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	65,929	7,686	7,686	5,316	125,157
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	80,211	7,686	7,686	5,316	144,148
1951	3,689	34,010	42,960	7,009	6,916	7,624	8,271	10,084	87,710	7,686	7,686	5,316	228,961
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	209,387	238,065	106,256	7,686	5,316	595,185
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	26,262	168,768	29,365	7,686	5,316	261,108
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	82,272	27,809	6,764	6,764	4,284	151,025
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	12,723	310,301	94,682	7,686	5,316	472,972
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	17,650	183,319	7,686	6,764	4,284	240,169
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	178,371	221,860	55,443	7,686	5,316	491,773
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	6,149	188,681	11,621	7,686	5,316	238,413
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	118,067	203,340	36,602	7,686	5,316	394,450
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	6,545	6,764	6,764	4,284	60,730
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	126,387	61,519	7,686	5,316	253,256
1966	3,689	3,570	3,074	3,074	3,362	3,689	7,676	123,555	6,545	6,764	6,764	4,284	176,046
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	146,692	270,669	185,208	7,686	5,316	638,668
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	49,547	14,833	6,764	6,764	4,284	104,729
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	7,009	3,362	3,689	4,463	105,428	124,926	7,686	7,686	5,316	279,898
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	52,458	177,149	11,621	7,686	5,316	279,151
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	10,254	57,109	6,764	6,764	4,284	108,886
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	190,830	159,403	7,686	7,686	5,316	394,018
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	14,107	247,984	11,621	7,686	5,316	314,883
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	6,149	298,570	132,949	7,686	5,316	471,645
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	8,854	10,353	6,764	6,764	4,284	63,056
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	175,217	463,488	302,677	61,509	5,316	1,037,063
1984	3,689	7,378	7,009	7,009	6,916	7,624	4,463	113,013	130,916	11,621	7,686	5,316	312,640
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	104,203	12,733	6,764	6,764	4,284	159,054
1986	3,074	2,975	2,460	3,074	3,362	7,624	17,050	228,842	263,786	12,678	7,686	5,316	557,927
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	6,545	4,612	4,612	3,669	42,337
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	89,012	62,889	7,686	6,764	4,284	190,435
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	74,555	6,764	6,764	4,284	113,806
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	3,074	4,463	4,612	4,612	3,669	41,143
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	110,603	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	539,165
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	10,084	166,036	7,686	7,686	5,316	232,412
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	136,496	97,677	7,686	7,686	5,316	278,860
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	48,240	6,545	6,764	6,764	4,284	95,134
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	91,804	64,932	7,686	6,764	4,284	198,567
Avg (21-02)	3,351	3,614	3,449	4,514	3,861	4,506	6,199	68,039	123,274	33,709	7,711	4,793	267,021

APPENDIX O1

Table 2.3-5

Hetch Hetchy Reservoir Release to Stream (Acre-feet)

Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	104,064	7,686	7,686	5,316	169,230
1922	3,689	3,570	3,074	3,074	3,362	3,689	8,271	57,465	312,197	28,813	7,686	5,316	440,206
1923	3,689	3,570	3,074	3,074	3,362	3,689	7,676	55,903	95,231	16,928	7,686	5,316	209,198
1924	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1925	2,152	2,083	2,152	3,074	3,362	3,689	8,271	67,753	149,864	11,621	7,686	5,316	267,023
1926	3,689	3,570	3,074	2,460	2,802	7,624	7,676	11,767	6,545	6,764	6,764	4,284	67,019
1927	3,074	2,975	2,460	3,074	3,362	3,689	4,463	144,018	238,640	13,543	7,686	5,316	432,300
1928	3,689	3,570	3,074	3,074	3,362	3,689	4,463	184,434	19,601	7,686	6,764	4,284	247,690
1929	3,074	2,975	2,460	2,460	1,961	2,152	2,083	4,919	52,130	6,764	6,764	4,284	92,026
1930	3,074	2,975	2,460	2,152	2,802	3,074	3,868	8,854	102,907	6,764	6,764	4,284	149,978
1931	3,074	2,975	2,460	2,152	2,802	2,152	2,083	3,074	4,463	4,612	4,612	3,669	38,128
1932	2,152	2,083	2,152	7,009	6,916	3,689	4,463	6,149	116,974	24,366	7,686	5,316	188,955
1933	3,689	3,570	3,074	2,152	2,802	2,152	2,083	3,074	28,182	6,764	6,764	4,284	68,590
1934	3,074	2,975	2,460	2,460	2,802	7,009	3,868	4,919	6,545	4,612	4,612	3,669	49,005
1935	2,152	2,083	2,152	7,009	6,916	3,689	4,463	10,084	137,701	7,686	7,686	5,316	196,937
1936	3,689	3,570	3,074	2,460	6,356	7,624	8,271	45,190	164,181	11,621	7,686	5,316	269,038
1937	3,689	3,570	3,074	3,074	6,916	7,624	8,271	12,743	159,632	7,686	7,686	5,316	229,281
1938	3,689	3,570	3,074	3,074	6,916	7,624	8,271	68,866	350,036	112,643	7,686	5,316	580,765
1939	3,689	3,570	3,074	2,460	2,802	3,074	7,676	37,787	6,545	6,764	6,764	4,284	88,489
1940	3,074	2,975	2,460	2,460	6,916	7,624	8,271	31,527	145,292	7,686	7,686	5,316	231,287
1941	3,689	3,570	3,074	7,009	6,916	7,624	8,271	10,084	201,819	67,763	7,686	5,316	332,821
1942	3,689	3,570	3,074	3,074	3,362	3,689	8,271	105,473	283,373	86,094	7,686	5,316	516,671
1943	3,689	3,570	3,074	3,074	3,362	3,689	23,247	197,709	148,920	18,174	7,686	5,316	421,510
1944	3,689	3,570	3,074	2,460	2,802	3,074	3,868	55,934	79,627	6,764	6,764	4,284	175,910
1945	3,074	2,975	2,460	3,074	6,916	7,624	8,271	10,084	172,351	31,926	7,686	5,316	261,757
1946	3,689	3,570	7,009	7,009	6,916	7,624	8,271	19,234	85,083	7,686	7,686	5,316	169,093
1947	3,689	3,570	3,074	3,074	3,362	3,689	4,463	110,484	10,353	6,764	6,764	4,284	163,570
1948	3,074	2,975	2,460	2,460	2,802	7,009	7,676	10,084	77,241	7,686	7,686	5,316	136,469
1949	3,689	3,570	3,074	2,460	2,802	7,009	7,676	8,854	10,353	6,764	6,764	4,284	67,299
1950	3,074	2,975	2,460	2,460	6,916	7,009	8,271	10,084	73,459	7,686	7,686	5,316	137,396
1951	3,689	41,299	42,960	7,009	6,916	7,624	8,271	10,084	95,720	7,686	7,686	5,316	244,260
1952	3,689	3,570	3,074	3,074	6,916	3,689	4,463	223,078	238,065	106,256	7,686	5,316	608,876
1953	3,689	3,570	3,074	3,074	3,362	3,074	3,868	28,311	168,768	29,365	7,686	5,316	263,157
1954	3,689	3,570	3,074	2,460	2,802	3,074	4,463	105,620	27,809	6,764	6,764	4,284	174,373
1955	3,074	2,975	2,460	3,074	3,362	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,841
1956	3,074	2,975	6,395	7,009	6,916	7,624	8,271	17,135	310,301	94,682	7,686	5,316	477,384
1957	3,689	3,570	3,074	2,152	1,961	2,152	3,868	50,333	183,319	7,686	6,764	4,284	272,852
1958	3,074	2,975	2,460	3,074	3,362	3,689	4,463	188,814	221,860	55,443	7,686	5,316	502,216
1959	3,689	3,570	3,074	2,152	1,961	7,009	7,676	8,854	6,545	6,764	6,764	4,284	62,342
1960	3,074	2,975	2,460	2,152	1,961	2,152	7,676	8,854	6,545	6,764	6,764	4,284	55,661
1961	3,074	2,975	2,460	3,074	2,802	2,152	3,868	4,919	6,545	4,612	4,612	3,669	44,762
1962	2,152	2,083	2,152	2,460	1,961	3,689	4,463	45,687	202,079	11,621	7,686	5,316	291,349
1963	3,689	3,570	3,074	2,152	2,802	3,689	4,463	133,252	203,340	36,602	7,686	5,316	409,635
1964	3,689	3,570	3,074	3,074	3,362	3,074	7,676	8,854	10,353	6,764	6,764	4,284	64,538
1965	3,074	2,975	6,395	7,009	6,916	7,624	8,271	10,084	111,487	61,519	7,686	5,316	238,356
1966	3,689	3,570	3,074	3,074	3,362	3,689	7,676	123,555	6,545	6,764	6,764	4,284	176,046
1967	3,074	2,975	2,460	3,074	3,362	3,689	4,463	159,921	270,669	185,208	7,686	5,316	651,897
1968	3,689	3,570	3,074	2,460	2,802	3,074	3,868	71,420	14,833	6,764	6,764	4,284	126,602
1969	3,074	2,975	2,460	3,074	3,362	3,689	12,681	344,502	300,076	115,876	7,686	5,316	804,771
1970	3,689	3,570	3,074	3,074	3,362	3,689	4,463	114,745	124,926	7,686	7,686	5,316	285,280
1971	3,689	3,570	3,074	3,074	3,362	3,689	4,463	71,223	177,149	11,621	7,686	5,316	297,916
1972	3,689	3,570	3,074	3,074	3,362	3,074	3,868	32,769	57,109	6,764	6,764	4,284	131,401
1973	3,074	2,975	2,460	3,074	3,362	3,689	4,463	204,754	159,403	7,686	7,686	5,316	407,942
1974	3,689	3,570	3,074	3,074	3,362	3,689	4,463	201,034	194,704	11,621	7,686	5,316	445,282
1975	3,689	3,570	3,074	3,074	2,802	3,689	8,271	10,084	243,813	11,621	7,686	5,316	306,689
1976	3,689	3,570	3,074	3,074	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	40,033
1977	2,152	2,083	2,152	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	35,165
1978	2,152	2,083	2,152	3,074	3,362	3,689	4,463	45,254	298,570	132,949	7,686	5,626	511,060
1979	3,689	3,570	3,074	2,460	3,362	3,689	4,463	220,976	107,368	7,686	7,686	5,316	373,339
1980	3,689	3,570	3,074	3,074	6,916	3,689	8,271	133,323	235,879	148,920	7,686	5,316	563,407
1981	3,689	3,570	3,074	2,152	2,802	3,074	7,676	15,457	20,663	6,764	6,764	4,284	79,969
1982	3,074	2,975	2,460	3,074	6,916	3,689	26,103	228,913	254,131	108,434	7,686	5,316	652,771
1983	7,624	3,570	3,074	3,074	3,362	3,689	4,463	180,307	463,488	302,677	61,509	5,316	1,042,153
1984	3,689	7,378	7,009	7,009	6,916	3,689	4,463	124,666	130,916	11,621	7,686	5,316	320,358
1985	3,689	3,570	3,074	3,074	3,362	3,074	4,463	99,040	12,733	6,764	6,764	4,284	153,891
1986	3,074	2,975	2,460	3,074	3,362	16,102	20,985	228,842	263,786	12,678	7,686	5,316	570,340
1987	3,689	3,570	3,074	2,152	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,111
1988	2,152	2,083	2,152	3,074	3,362	3,074	2,083	4,919	10,353	4,612	4,612	3,669	46,145
1989	2,152	2,083	2,152	3,074	2,802	3,074	4,463	122,056	62,889	7,686	6,764	4,284	223,479
1990	3,074	2,975	2,460	2,460	2,802	3,074	2,083	3,074	4,463	4,612	4,612	3,669	39,358
1991	2,152	2,083	2,152	2,152	1,961	2,152	3,868	4,919	104,230	6,764	6,764	4,284	143,481
1992	3,074	2,975	2,460	2,460	2,802	3,074	3,868	21,507	4,463	4,612	4,612	3,669	59,576
1993	2,152	2,083	2,152	3,074	3,362	3,689	8,271	213,205	204,082	44,068	7,686	5,316	499,140
1994	3,689	3,570	3,074	2,460	1,961	2,152	2,083	3,074	4,463	4,612	4,612	3,669	39,419
1995	2,152	2,083	2,152	3,074	3,362	7,624	8,271	131,296	334,396	294,086	11,843	5,316	805,655
1996	3,689	3,570	3,074	2,460	3,362	7,624	8,271	190,622	169,121	11,621	7,686	5,316	416,416
1997	3,689	3,570	3,074	116,811	6,916	7,624	4,463	231,648	146,890	7,686	7,686	5,316	545,373
1998	3,689	3,570	3,074	2,460	3,362	3,689	4,463	64,194	312,909	217,820	7,686	5,316	632,232
1999	3,689	3,570	3,074	2,460	6,916	7,624	8,271	18,453	168,986	7,686	7,686	5,316	243,731
2000	3,689	3,570	3,074	2,152	3,362	3,689	4,463	144,697	97,677	7,686	7,686	5,316	287,061
2001	3,689	3,570	3,074	2,460	2,802	3,074	3,868	87,834	6,545	6,764	6,764	4,284	134,728
2002	3,074	2,975	2,460	3,074	3,362	3,689	4,463	123,552	64,932	7,686	6,764	4,284	230,315
Avg (21-02)	3,351	3,703	3,449	4,542	3,904	4,514	6,294	74,969	124,312	33,709	7,711	4,797	275,255

APPENDIX O1

Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-5,151	0	0	0	-5,151
1922	0	0	0	0	0	0	0	-5,370	0	0	0	0	-5,370
1923	0	0	0	0	0	0	0	-16,849	0	0	0	0	-16,849
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-10,995	0	0	0	0	-10,995
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-25,090	0	0	0	0	-25,090
1928	0	0	0	0	0	0	0	-2,741	0	0	0	0	-2,741
1929	0	0	0	0	0	0	0	0	-13,872	0	0	0	-13,872
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	-2,045	0	0	0	-5,599
1933	0	0	0	0	0	0	0	0	-10,453	0	0	0	-10,453
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	-1,636	0	0	0	2,299
1936	0	0	0	0	0	0	0	-7,145	0	0	0	0	-7,145
1937	0	0	0	0	0	0	0	-2,659	-5,570	0	0	0	-8,229
1938	0	0	0	0	0	0	0	-10,460	0	0	0	0	-10,460
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	8,672	0	0	0	0	8,672
1941	0	0	0	0	0	0	0	0	-1,248	0	0	0	-1,248
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-31,658	0	0	0	0	-31,658
1945	0	0	0	0	0	0	0	0	12,279	0	0	0	12,279
1946	0	0	0	0	0	0	0	-7,045	0	0	0	0	-7,045
1947	0	0	0	0	0	0	0	-24,441	0	0	0	0	-24,441
1948	0	0	0	0	0	0	0	0	-11,312	0	0	0	-11,312
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	6,752	0	0	0	6,752
1951	0	-7,289	0	0	0	0	0	0	-8,010	0	0	0	-15,299
1952	0	0	0	0	0	0	0	-13,691	0	0	0	0	-13,691
1953	0	0	0	0	0	0	0	-2,049	0	0	0	0	-2,049
1954	0	0	0	0	0	0	0	-23,348	0	0	0	0	-23,348
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-4,412	0	0	0	0	-4,412
1957	0	0	0	0	0	0	0	-32,683	0	0	0	0	-32,683
1958	0	0	0	0	0	0	0	-10,443	0	0	0	0	-10,443
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-39,538	-13,398	0	0	0	-52,936
1963	0	0	0	0	0	0	0	-15,185	0	0	0	0	-15,185
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	14,900	0	0	0	14,900
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-13,229	0	0	0	0	-13,229
1968	0	0	0	0	0	0	0	-21,873	0	0	0	0	-21,873
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-9,317	0	0	0	0	-5,382
1971	0	0	0	0	0	0	0	-18,765	0	0	0	0	-18,765
1972	0	0	0	0	0	0	0	-22,515	0	0	0	0	-22,515
1973	0	0	0	0	0	0	0	-13,924	0	0	0	0	-13,924
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	4,023	4,171	0	0	0	8,194
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-39,105	0	0	0	-310	-39,415
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-6,603	-10,310	0	0	0	-16,913
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-5,090	0	0	0	0	-5,090
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	5,163	0	0	0	0	5,163
1986	0	0	0	0	0	-8,478	-3,935	0	0	0	0	0	-12,413
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-33,044	0	0	0	0	-33,044
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-29,675	0	0	0	-29,675
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-6,208	0	0	0	0	0	0	0	0	-6,208
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,369	-2,950	0	0	0	-11,319
2000	0	0	0	0	0	0	0	-8,201	0	0	0	0	-8,201
2001	0	0	0	0	0	0	0	-39,594	0	0	0	0	-39,594
2002	0	0	0	0	0	0	0	-31,748	0	0	0	0	-31,748
Avg (21-02)	0	-89	0	-28	-43	-7	-94	-6,930	-1,038	0	0	-4	-8,234

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation in the base setting, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different in the WSIP setting. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Figure 2.4-1 shows the results for the WSIP and base settings. The operation resulting for the WSIP setting is essentially the same as for the base setting, except during the prolonged drought of 1987-1992. During this drought period, there is a greater draw from Hetch Hetchy Reservoir in the WSIP setting compared to the base setting. The additional draw of water reduces the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the WSIP setting, which, to satisfy MID/TID entitlements to inflow, is met with additional releases from Lake Lloyd.

Figure 2.4-2 illustrates an almost identical operation of Lake Eleanor between the WSIP and base settings. Any difference that occurs in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is associated more with modeling discretion than with any substantive likely difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates the differences in stream releases between the WSIP and base settings. The one notable difference in operation for the 82-year simulation occurs during the year following the rare 1987-1992 drought sequence, when the additional draw from Lake Lloyd storage described above would require replenishment. In this one occurrence, the releases to the stream above the minimum release requirement that would occur in the base setting would not occur in the WSIP setting. Table 2.4-2 illustrates average releases by year type for the WSIP and base settings, and shows almost no difference in releases between the two settings.

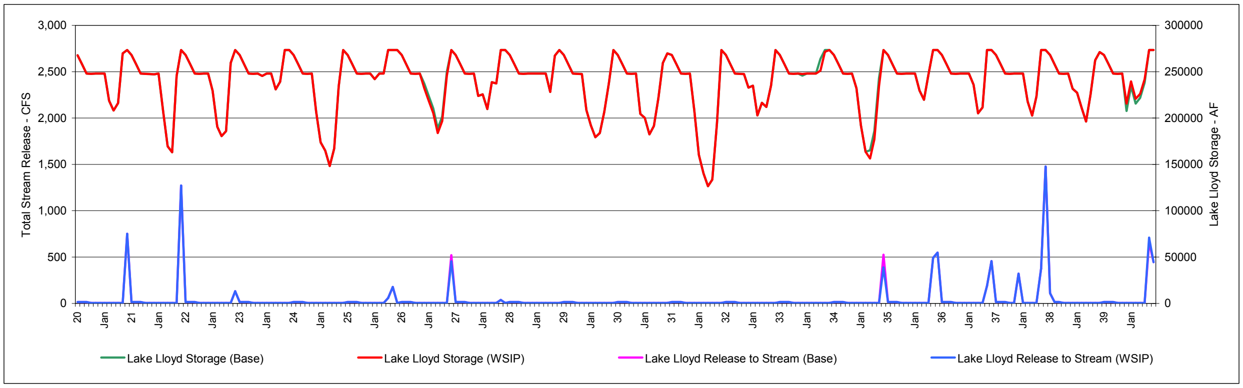
2.5 Flow below the Tuolumne River and Cherry River Confluence

The flow that occurs below the confluence of the Tuolumne River and Cherry River is considered important to recreational activity (whitewater rafting) during the May-through-September period. To estimate the effect of the WSIP on the occurrence of flow at this location, HH/LSM monthly volumetric flow results were post-processed to reflect the daily and hourly shaping potential currently exercised by Hetch Hetchy operators to satisfy water and power objectives while accommodating the desires of recreational interests. Figure 2.5-1 and Figure 2.5-2 illustrate the controlled flow below Hetch Hetchy facilities below the confluence of the Tuolumne and Cherry Rivers, averaged by year type, for the WSIP and base settings. Illustrated are the combined flow elements of: (1) stream releases from O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; (2) the return of Canyon Tunnel diversions through Kirkwood Powerhouse that exceed the Mountain Tunnel diversion; and (3) diversions through Holm Powerhouse. For this analysis, the monthly volumes of diversion through Holm Powerhouse have been shaped into a release of 4 hours per day for 6 days a week. The other flow elements represent the average daily flow rate associated with the monthly volume of flow. Figure 2.5-1 and Figure 2.5-2 illustrate that the HH/LSM operation protocols for reservoir operation incidentally result in approximately 1,000 cfs of flow below the confluence if Holm Powerhouse releases are shaped. This opportunity occurs in both the WSIP and base settings. The flow rates illustrated in this analysis do not reflect either the occasional shaping opportunities that occur with Kirkwood Powerhouse releases or the existence of unregulated flow that enters the streams below O'Shaughnessy Dam, Lake Lloyd, and Lake Eleanor; both of these factors would increase the illustrated flow rate. The difference in flow between the two settings that could occur during the concentrated period of flow is illustrated in Figure 2.5-3.

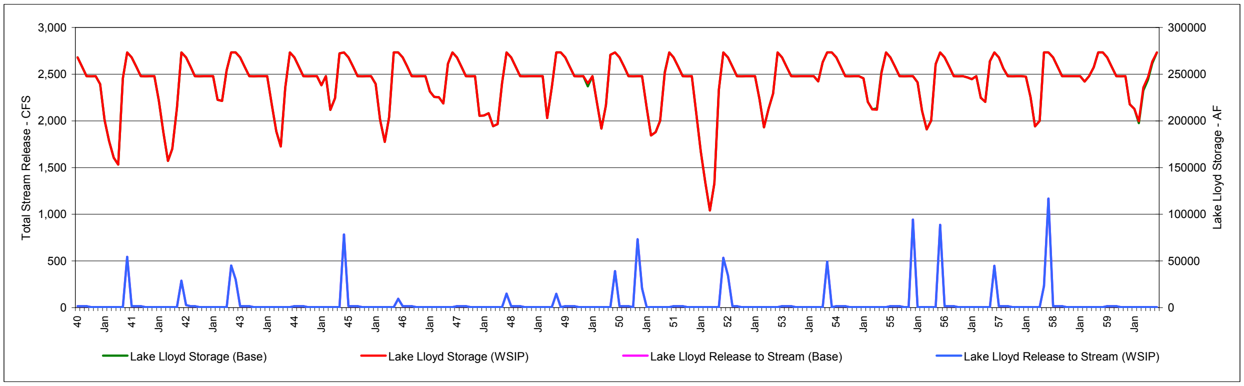
APPENDIX O1

Figure 2.4-1
Lake Lloyd Storage and Stream Release

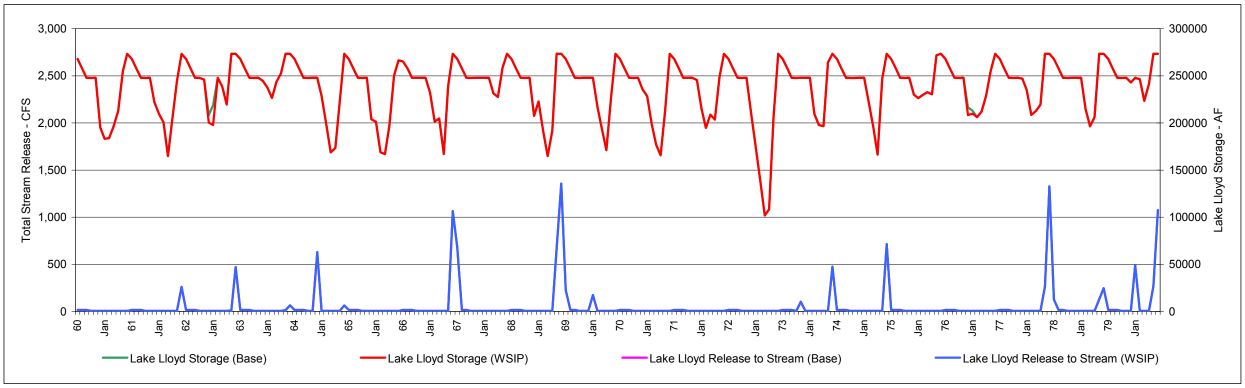
1920 - 1939



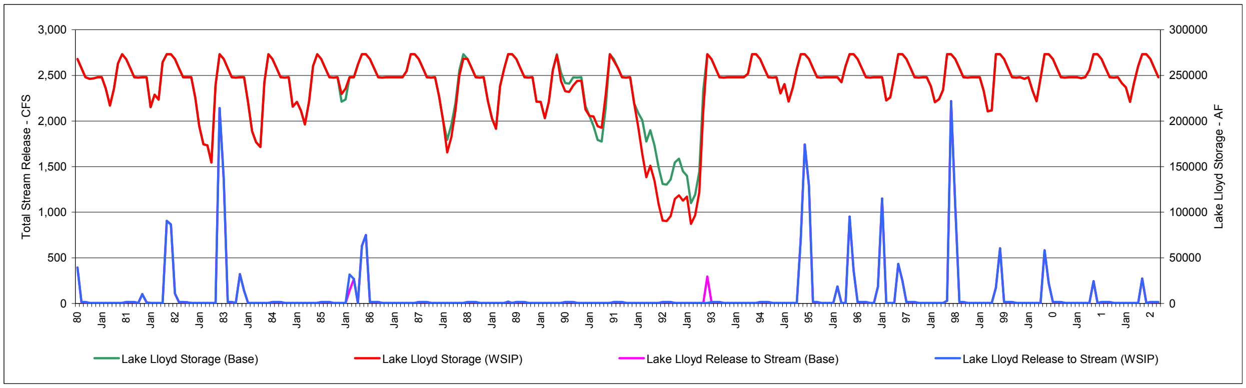
1940 - 1959



1960 - 1979



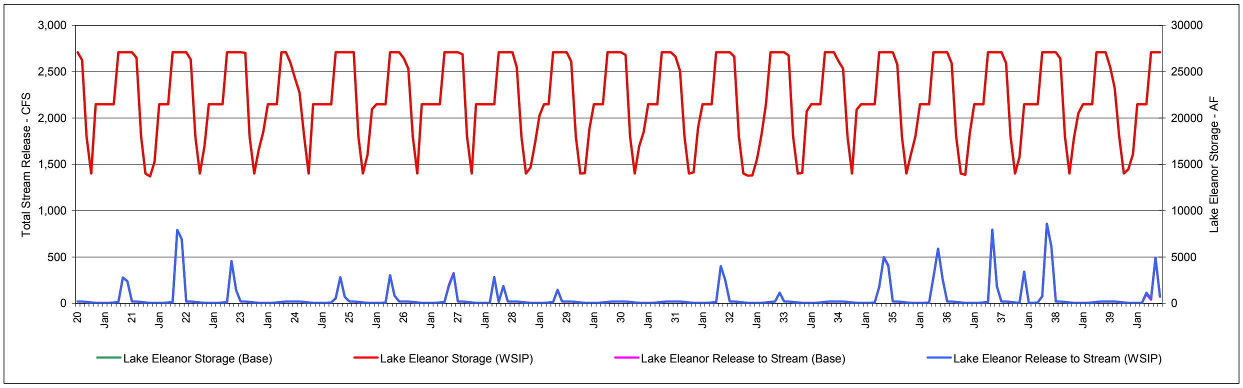
1980 - 2002



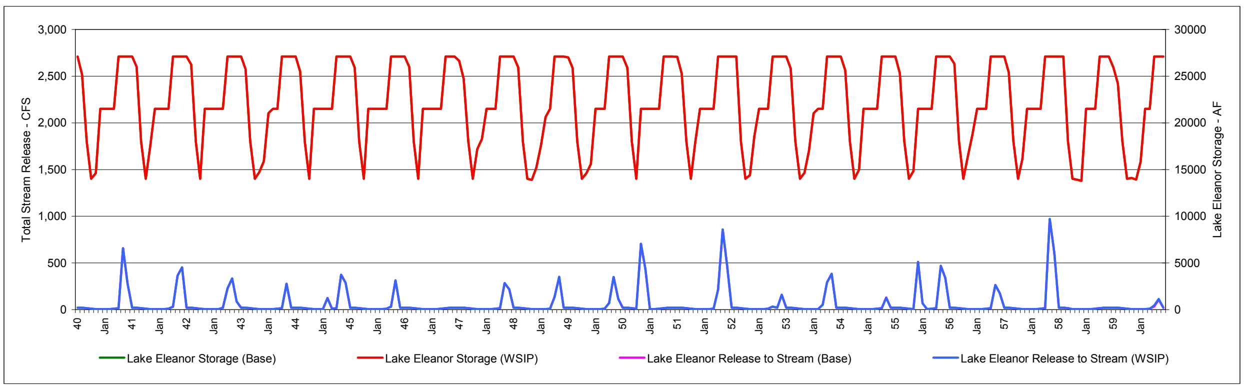
APPENDIX O1

Figure 2.4-2
Lake Eleanor Storage and Stream Release

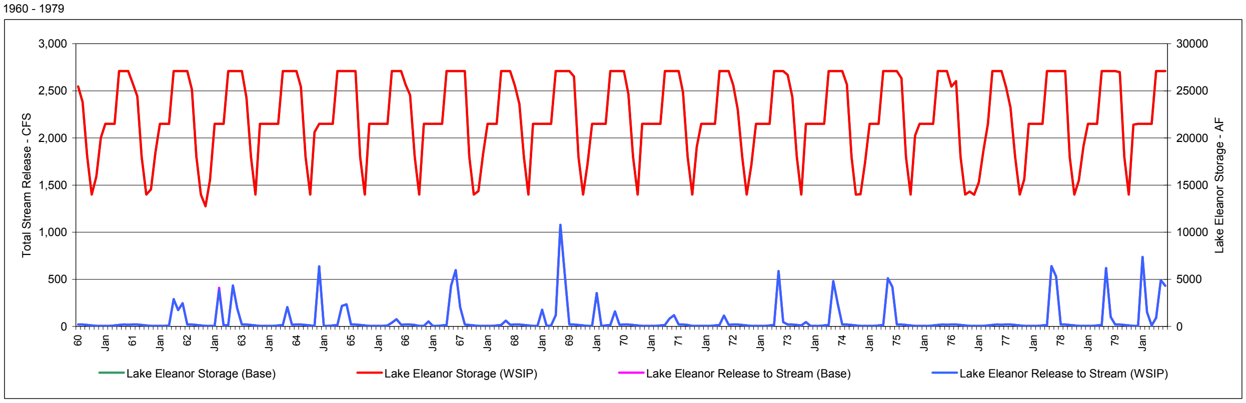
1920 - 1939



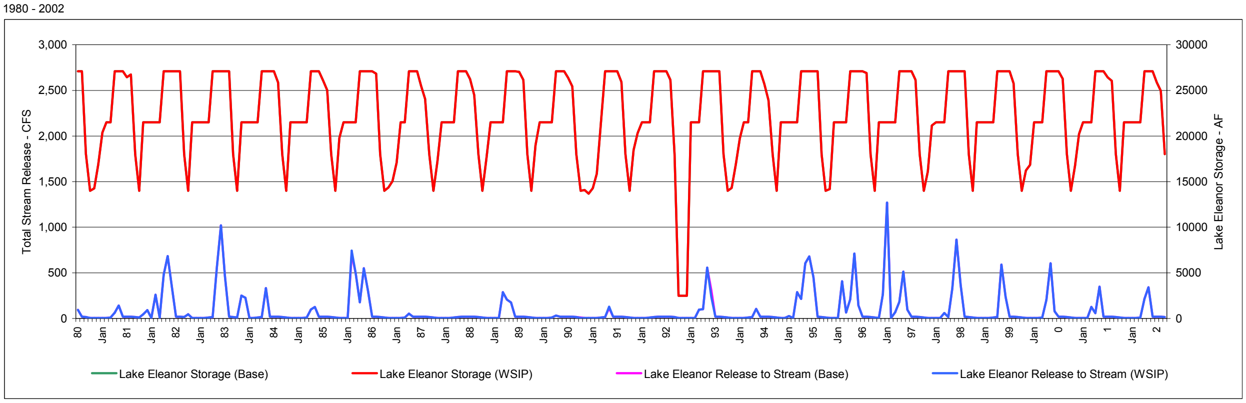
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.4-1

Difference in Lake Lloyd Release to Stream (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-3,924	0	0	0	-3,924
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	-8,042	0	0	0	-8,042
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	3,357	0	0	0	0	3,357
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	-50	0	0	0	0	0	0	0	0	0	-50
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	9,733	0	0	0	0	0	0	0	9,733
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	1	0	0	0	0	1
1991	0	0	0	0	0	0	0	0	0	1	0	0	1
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	1	0	0	0	0	0	-17,192	0	0	0	-17,191
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-1	0	119	0	0	41	-356	0	0	0	-197

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Table 2.4-2

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

												WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,224	6,566	1,362	1,319	298	17,483	62,931	22,325	953	922	123,370
Above Normal	307	4,282	1,525	307	870	307	298	10,285	26,807	993	953	922	47,857
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,104	1,654	612	505	337	7,412	20,303	5,131	953	922	41,439

Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	334	653	8,227	6,566	754	1,319	298	17,483	64,005	22,325	953	922	123,839
Above Normal	307	4,282	1,525	307	870	307	298	10,088	27,511	993	953	922	48,363
Normal	307	298	307	953	278	307	298	6,734	9,633	953	953	922	21,943
Below Normal	307	298	307	307	278	307	485	2,383	2,551	953	953	922	10,051
Dry	307	298	307	307	278	307	298	307	298	953	953	922	5,535
All Years	312	1,193	2,105	1,654	494	505	337	7,371	20,659	5,131	953	922	41,636

Difference in Lake Lloyd Release to Stream (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange)

											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-3	0	608	0	0	0	-1,075	0	0	0	-469
Above Normal	0	0	0	0	0	0	0	197	-704	0	0	0	-506
Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-1	0	119	0	0	41	-356	0	0	0	-197

Figure 2.5-1

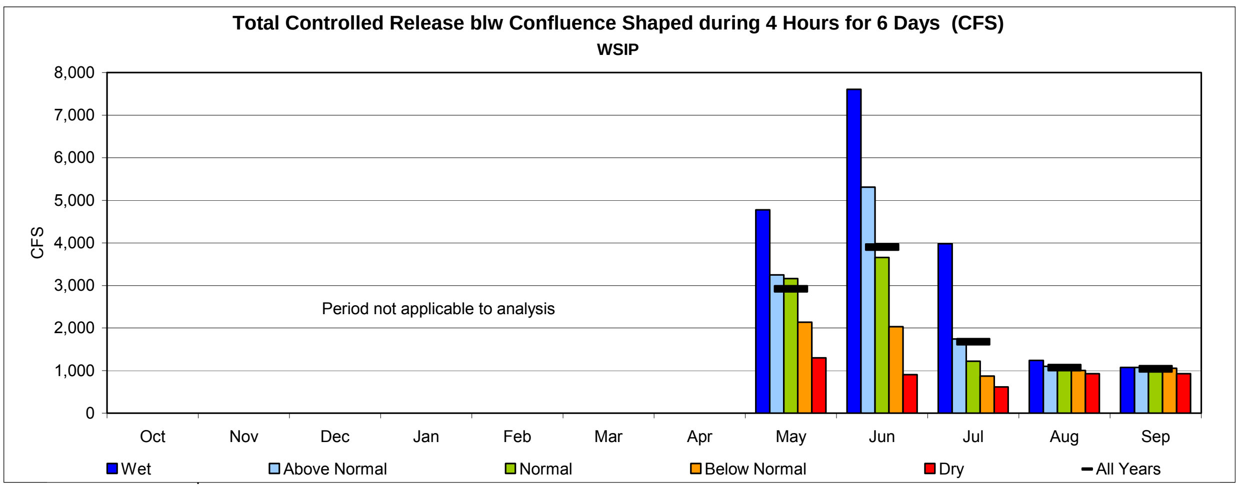


Figure 2.5-2

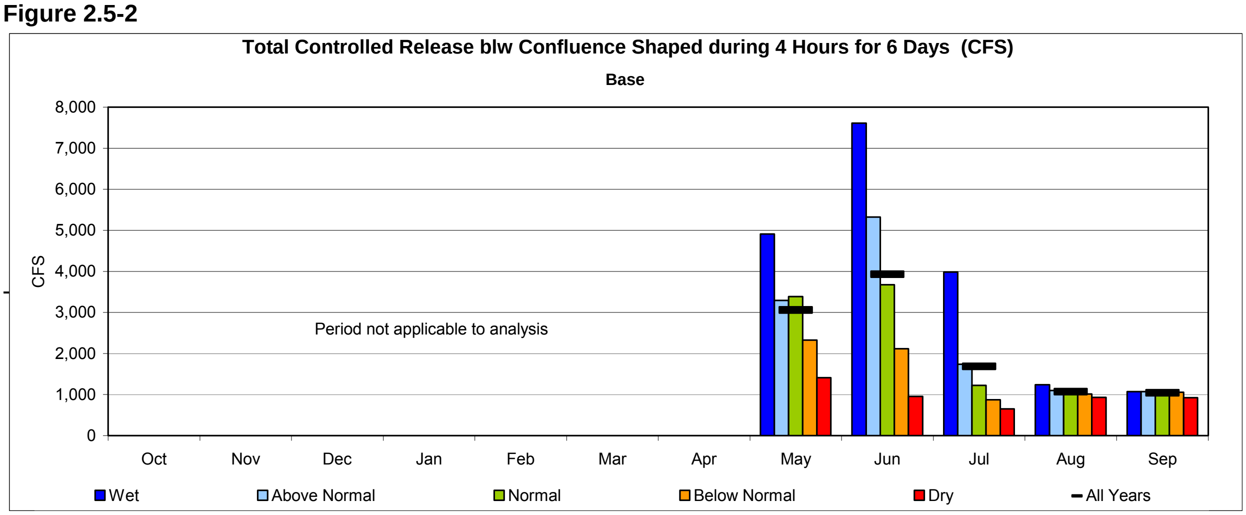
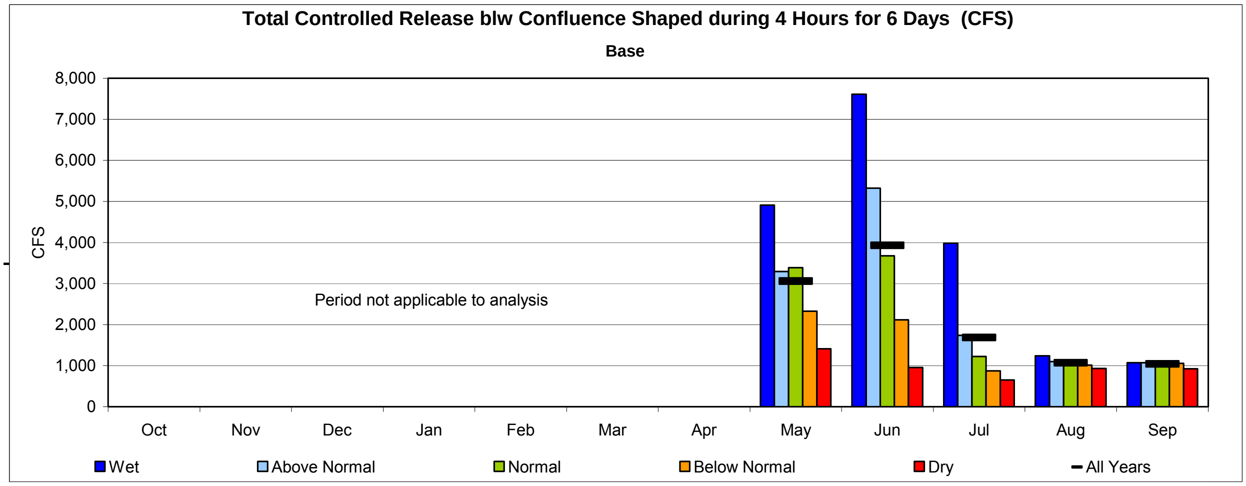


Figure 2.5-3



More detailed review of the 82-year simulation of operations indicates that in only one month of the simulation do circumstances in the WSIP setting result in the shaped flow crossing the threshold to below 1,000 cfs, compared to levels greater than 1,000 cfs in the base setting. In both the WSIP and base settings, in some dry and critical years, circumstances could result in a shaped flow of less than 1,000 cfs; however, results indicate that the WSIP setting would rarely increase the frequency of such an occurrence.

2.6 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities, described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.6-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Figure 2.6-1 presents the results for the WSIP and base settings.

Supplementing the Figure 2.6-1 representation of Don Pedro Reservoir storage are Table 2.6-1, Don Pedro Reservoir Storage (WSIP); Table 2.6-2, Don Pedro Reservoir (Base); and Table 2.6-3, Difference in Don Pedro Reservoir Storage (WSIP minus Base). The results illustrate that, throughout many years, the storage in Don Pedro Reservoir associated with the WSIP setting would differ from the storage in the base setting, and that this difference would almost always be less storage. Compared to the base setting, the differences in storage (reductions) indicate that inflow to Don Pedro Reservoir would decrease due to greater SFPUC demands and SJPL diversions in the WSIP setting. The decreases in inflow typically occur from winter through early summer. Table 2.6-4 illustrates the difference in inflow to Don Pedro Reservoir between the WSIP and base settings. Generally, the difference is an annual amount of about 27,000 acre-feet, approximating the additional delivery of the SFPUC. The season of inflow reduction is associated with the direct increase in diversions to the SJPL and the replenishment operation of Hetch Hetchy Reservoir. Figure 2.6-2 illustrates the seasonal change in Don Pedro Reservoir inflow, averaged by year type.

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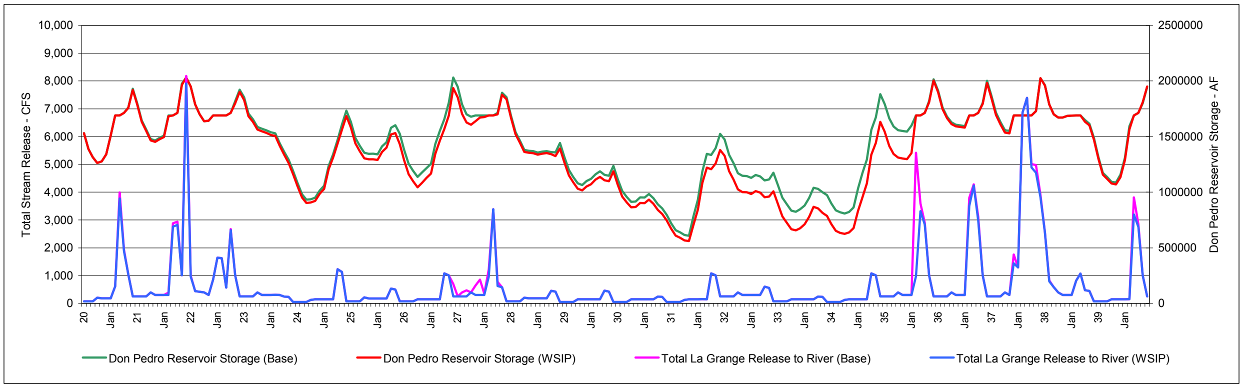
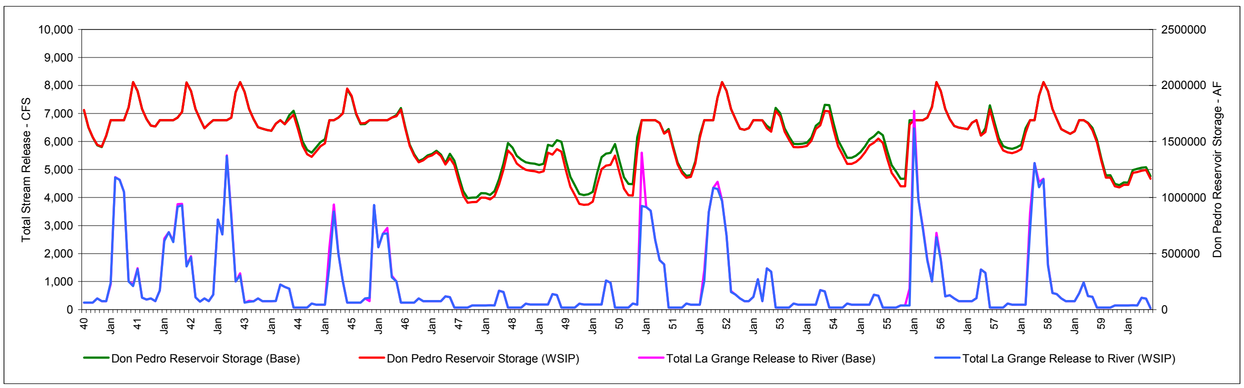
Figure 2.6-1
Don Pedro Reservoir Storage and Release below La Grange Dam

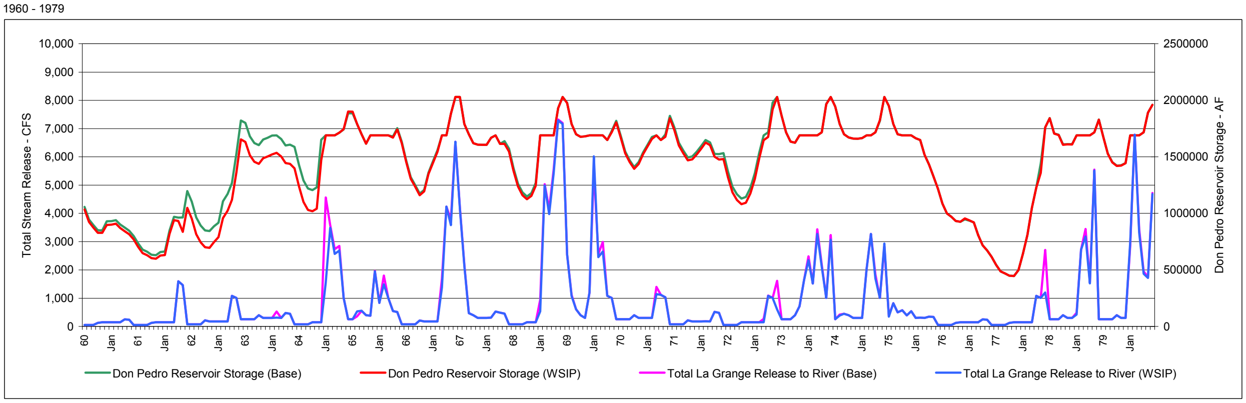
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

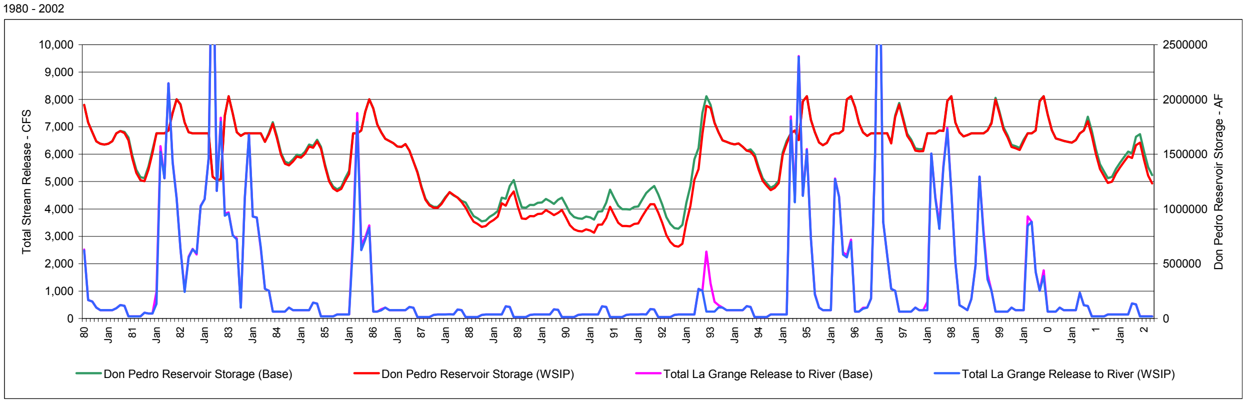


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Table 2.6-1

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O1

Table 2.6-2

Don Pedro Reservoir Storage (Acre-feet) Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,761,443	1,930,520	1,797,950	1,645,718	1,564,274
1922	1,478,898	1,464,086	1,488,379	1,508,546	1,690,000	1,690,000	1,713,000	1,976,410	2,030,000	1,950,099	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,818,377	1,922,031	1,852,026	1,706,504	1,655,352
1924	1,586,104	1,570,766	1,556,748	1,538,346	1,528,938	1,440,484	1,363,083	1,292,124	1,191,623	1,081,942	981,225	933,476
1925	936,035	950,316	1,014,310	1,058,026	1,234,515	1,340,925	1,469,380	1,606,987	1,732,956	1,632,552	1,489,042	1,417,327
1926	1,353,952	1,345,900	1,346,834	1,340,765	1,411,624	1,450,000	1,578,351	1,603,241	1,524,303	1,380,860	1,255,851	1,192,192
1927	1,137,321	1,176,929	1,216,842	1,256,420	1,434,340	1,550,949	1,655,192	1,803,520	2,030,000	1,948,010	1,790,020	1,700,021
1928	1,678,968	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,893,868	1,854,079	1,686,244	1,540,960	1,463,492
1929	1,380,525	1,372,193	1,369,300	1,356,092	1,364,946	1,369,450	1,359,879	1,357,562	1,441,454	1,315,206	1,199,431	1,135,969
1930	1,080,335	1,064,688	1,100,202	1,120,198	1,161,086	1,186,736	1,155,560	1,146,764	1,237,311	1,117,418	1,010,548	958,109
1931	913,983	916,324	953,760	951,937	983,464	946,382	889,375	854,514	796,408	720,530	659,388	640,222
1932	614,427	609,298	782,322	933,923	1,188,819	1,344,750	1,335,842	1,396,503	1,524,497	1,474,909	1,336,173	1,259,546
1933	1,171,011	1,146,531	1,144,232	1,129,714	1,154,369	1,141,676	1,105,123	1,114,013	1,175,047	1,063,689	950,493	891,682
1934	834,658	823,394	847,100	880,225	947,743	1,041,027	1,030,157	998,922	973,445	899,027	837,316	818,914
1935	808,728	822,347	861,895	1,033,870	1,174,138	1,292,343	1,560,572	1,673,269	1,881,369	1,790,532	1,664,245	1,590,449
1936	1,557,918	1,549,822	1,544,402	1,598,351	1,689,990	1,690,000	1,713,000	1,819,283	2,015,519	1,915,146	1,762,372	1,680,135
1937	1,627,437	1,606,733	1,600,208	1,594,139	1,689,993	1,690,000	1,713,000	1,802,168	2,001,518	1,864,836	1,715,862	1,631,586
1938	1,558,064	1,549,496	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,961,552	1,790,078	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,650,408	1,615,820	1,489,897	1,317,931	1,173,414	1,135,182
1940	1,093,582	1,086,647	1,158,651	1,310,792	1,593,586	1,690,000	1,713,000	1,799,130	1,946,542	1,776,728	1,623,757	1,535,806
1941	1,465,850	1,450,503	1,550,425	1,689,995	1,689,991	1,690,000	1,690,000	1,805,604	2,030,000	1,950,161	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,981	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,942,425	2,030,000	1,942,627	1,790,008	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,734,412	1,774,644	1,645,955	1,501,393	1,424,533
1945	1,399,858	1,447,874	1,494,310	1,520,609	1,689,996	1,690,000	1,713,000	1,750,810	1,963,956	1,898,978	1,742,064	1,654,710
1946	1,656,919	1,689,894	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,736,559	1,798,610	1,630,265	1,471,855	1,385,929
1947	1,326,726	1,343,162	1,376,489	1,388,708	1,417,308	1,382,693	1,307,600	1,390,047	1,329,468	1,185,303	1,057,555	994,722
1948	998,763	1,000,028	1,038,651	1,037,778	1,023,891	1,058,045	1,163,183	1,304,143	1,486,478	1,445,913	1,370,936	1,338,946
1949	1,315,198	1,306,449	1,301,616	1,290,529	1,302,222	1,471,520	1,458,479	1,511,598	1,497,458	1,330,411	1,184,072	1,109,277
1950	1,031,592	1,021,777	1,028,650	1,050,184	1,222,375	1,359,716	1,391,720	1,399,065	1,477,392	1,324,696	1,181,161	1,122,890
1951	1,119,993	1,539,064	1,689,993	1,689,971	1,689,993	1,690,000	1,667,236	1,574,454	1,611,255	1,455,849	1,313,240	1,234,363
1952	1,193,348	1,201,057	1,322,649	1,555,350	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,953,233	1,790,056	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,640,000	1,613,175	1,800,540	1,753,758	1,618,034	1,543,646
1954	1,478,460	1,477,656	1,481,299	1,488,102	1,534,544	1,640,488	1,672,460	1,827,599	1,825,423	1,661,146	1,512,334	1,434,329
1955	1,355,528	1,355,273	1,373,558	1,406,138	1,456,410	1,520,077	1,546,024	1,586,167	1,556,323	1,417,207	1,289,673	1,231,406
1956	1,168,990	1,167,616	1,689,999	1,689,941	1,689,992	1,690,000	1,713,000	1,811,927	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,618,901	1,823,527	1,674,205	1,531,403	1,458,122
1958	1,442,046	1,434,810	1,447,519	1,470,486	1,617,058	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,667,741	1,621,443	1,514,375	1,345,045	1,198,869	1,199,076
1960	1,121,788	1,110,981	1,134,209	1,133,898	1,244,574	1,255,319	1,267,382	1,271,165	1,191,272	1,057,161	946,099	897,441
1961	850,125	849,343	929,134	930,826	939,897	901,527	873,853	845,916	800,607	734,095	679,218	660,327
1962	634,752	629,679	657,412	661,349	848,446	969,566	962,118	964,682	1,197,152	1,104,181	964,302	891,870
1963	849,308	843,563	885,959	917,711	1,106,156	1,171,799	1,267,951	1,528,432	1,820,963	1,799,778	1,680,978	1,622,475
1964	1,603,934	1,653,458	1,669,127	1,687,254	1,690,000	1,656,765	1,600,305	1,607,032	1,587,306	1,428,003	1,289,861	1,219,197
1965	1,206,172	1,229,442	1,651,739	1,689,963	1,689,993	1,690,000	1,713,000	1,742,309	1,885,372	1,885,703	1,790,014	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,679,726	1,753,603	1,633,911	1,465,709	1,319,283	1,249,164
1967	1,173,879	1,207,410	1,361,102	1,460,117	1,557,950	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,257	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,637,897	1,572,754	1,401,482	1,263,370	1,186,117
1969	1,149,974	1,179,282	1,268,765	1,689,993	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,977,463	1,790,116	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,956	1,689,996	1,690,000	1,649,691	1,729,567	1,818,530	1,686,532	1,546,693	1,469,043
1971	1,409,639	1,452,554	1,539,602	1,605,510	1,674,702	1,690,000	1,647,943	1,697,455	1,862,918	1,760,768	1,624,350	1,555,368
1972	1,493,760	1,502,304	1,545,901	1,596,374	1,649,831	1,627,771	1,526,087	1,525,014	1,531,842	1,369,860	1,235,617	1,169,376
1973	1,131,276	1,144,274	1,226,345	1,355,146	1,534,763	1,690,000	1,717,600	1,979,879	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,982	1,689,998	1,690,000	1,717,600	1,969,221	2,030,000	1,946,078	1,790,023	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,817,373	2,030,000	1,950,017	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	947,434	935,499	920,302	807,861	717,614	671,985	616,188	544,088	486,063	467,590
1978	447,587	445,349	497,632	642,722	811,608	1,050,474	1,227,234	1,440,282	1,761,000	1,843,342	1,706,593	1,695,403
1979	1,609,844	1,612,921	1,611,978	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,829,909	1,675,929	1,529,138	1,453,040
1980	1,421,988	1,424,705	1,444,739	1,689,978	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,712,431	1,704,973	1,654,052	1,488,840	1,357,486	1,289,752
1982	1,280,862	1,387,769	1,538,513	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,956,901	1,790,106	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,871,320	1,700,118
1984	1,669,984	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,268	1,696,347	1,794,292	1,664,468	1,515,070	1,432,132
1985	1,417,113	1,452,224	1,496,603	1,487,191	1,522,246	1,588,373	1,576,808	1,632,030	1,567,944	1,403,408	1,269,095	1,205,885
1986	1,179,275	1,200,478	1,280,459	1,349,124	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,919,960	1,772,923	1,700,008
1987	1,641,224	1,619,851	1,601,301	1,570,179	1,566,244	1,592,873	1,533,150	1,433,214	1,340,031	1,205,391	1,094,728	1,041,920
1988	1,019,765	1,018,873	1,055,057	1,108,870	1,150,769	1,124,010	1,105,097	1,074,138	1,058,858	995,036	935,643	914,043
1989	887,742	895,237	927,918	951,577	981,136	1,102,792	1,092,141	1,210,143	1,264,389	1,128,410	1,016,022	1,011,279
1990	1,037,824	1,036,456	1,056,513	1,059,232	1,091,823	1,071,159	1,046,896	1,084,276	1,103,876	1,037,040	964,052	926,570
1991	915,957	910,658	930,811	923,793	902,491	977,110	978,586	1,057,934	1,177,077	1,101,096	1,030,307	998,647
1992	998,752	996,218	1,018,377	1,022,977	1,086,311	1,145,594	1,181,922	1,210,224	1,133,188	1,040,230	926,131	862,351
1993	826,188	819,772	853,539	1,058,754	1,208,553	1,454,021	1,556,674	1,878,212	2,030,000	1,950,136	1,790,048	1,700,022
1994	1,627,183	1,612,977	1,599,160	1,589,203	1,599,265	1,567,690	1,531,912	1,544,575	1,501,844	1,379,308	1,279,438	1,233,861
1995	1,194,744	1,214,540	1,259,323	1,516,844	1,621,716	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,816,185	1,700,062
1996	1,608,082	1,583,096	1,604,413	1,672,576	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,932,566	1,784,558	1,700,014
1997	1,667,201	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,610,765	1,854,718	1,968,374	1,829,837	1,687,672	1,633,886
1998	1,552,574	1,546,178	1,547,584	1,689,997	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,793,571	2,015,623	1,887,792	1,745,950	1,671,908
2000	1,585,584	1,573,921	1,558,276	1,634,200	1,689,993	1,690,000	1,717,600	1,992,227	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,691	1,629,054	1,690,000	1,716,911	1,843,113	1,712,149	1,547,470	1,408,517	1,342,971
2002	1,281,127	1,292,736	1,366,211	1,421,647	1,473,814	1,524,332	1,509,107	1,659,494	1,684,266	1,520,880	1,382,342	1,309,452
Avg (21-02)	1,329,553	1,339,687	1,382,998	1,428,244	1,487,547	1,512,057	1,516,647	1,595,597	1,679,130	1,579,451	1,442,804	1,374,329

APPENDIX O1

Table 2.6-3

Difference in Don Pedro Reservoir Storage (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	-3,188	-10,433	-12,571	-12,516	-12,475
1922	-12,449	-12,443	-12,443	-12,446	-7,314	0	0	-11,174	0	-5	0	0
1923	0	0	0	0	0	0	0	-19,014	-21,065	-23,157	-23,056	-22,982
1924	-22,935	-22,924	-22,924	-22,931	-22,933	-22,924	-24,684	-29,519	-29,489	-29,439	-29,370	-29,309
1925	-29,247	-29,231	-29,234	-29,249	-29,253	-29,251	-32,912	-46,419	-48,378	-50,350	-50,122	-49,951
1926	-49,846	-49,818	-50,315	-50,330	-50,531	-49,936	-60,110	-70,803	-94,077	-93,648	-93,216	-92,904
1927	-92,711	-92,659	-87,618	-87,643	-87,650	-87,617	-87,534	-114,797	-93,866	-95,648	-86,302	-72,891
1928	-72,744	-52,440	-17,973	-14,850	1	0	-11,849	-16,583	-18,642	-18,562	-18,479	-18,418
1929	-18,380	-18,369	-18,370	-18,376	-18,377	-18,370	-18,352	-33,941	-48,965	-48,740	-48,519	-48,356
1930	-48,255	-48,228	-48,230	-48,244	-48,248	-48,230	-48,183	-48,546	-50,493	-50,264	-50,033	-49,858
1931	-49,748	-49,719	-49,721	-49,736	-49,739	-49,720	-49,669	-49,534	-49,357	-49,120	-48,891	-48,719
1932	-48,606	-48,575	-77,837	-89,136	-104,447	-123,055	-130,097	-137,473	-145,745	-147,267	-146,583	-146,090
1933	-145,787	-145,705	-145,711	-145,755	-145,766	-145,711	-150,023	-154,107	-167,558	-168,970	-168,157	-167,562
1934	-167,197	-167,099	-170,312	-168,869	-169,775	-172,288	-175,433	-185,869	-186,997	-186,104	-185,207	-184,556
1935	-184,158	-184,050	-184,058	-201,819	-218,063	-212,422	-222,877	-230,972	-248,071	-249,176	-248,066	-247,237
1936	-246,724	-246,586	-246,703	-246,692	9	0	0	-10,344	-12,425	-14,554	-14,491	-14,445
1937	-14,415	-14,407	-14,417	-14,422	1	0	0	-9,338	-19,419	-21,520	-21,425	-21,356
1938	-21,313	-21,300	0	0	0	0	0	0	0	-2,183	-5	0
1939	0	0	0	0	0	0	-15,779	-14,122	-16,188	-16,114	-16,041	-15,988
1940	-15,954	-15,945	-23,947	-22,233	-28,098	0	0	8,878	3,978	3,960	3,943	3,931
1941	3,923	3,920	3,310	-1	0	0	0	-1,370	0	-4	0	0
1942	0	0	0	1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	-2,185	0	-2,183	-4	0
1944	0	0	0	0	0	0	0	-33,804	-35,808	-37,838	-37,667	-37,541
1945	-37,462	-37,441	-37,442	-37,453	1	0	0	-433	9,714	7,488	7,455	7,432
1946	7,417	106	0	0	0	0	0	-10,228	-12,309	-12,256	-12,201	-12,159
1947	-12,134	-12,126	-12,127	-12,131	-12,131	-12,127	-12,114	-38,678	-40,656	-40,473	-40,287	-40,148
1948	-40,063	-40,039	-40,041	-40,053	-40,055	-44,367	-48,897	-53,095	-66,246	-68,046	-67,664	-67,392
1949	-67,232	-67,190	-67,191	-67,203	-67,207	-71,084	-75,364	-78,800	-88,087	-87,683	-87,286	-86,991
1950	-86,808	-86,758	-90,313	-87,678	-102,553	-106,396	-106,462	-107,067	-102,069	-102,984	-102,516	-102,171
1951	-101,957	-116,550	2	0	0	0	-3,151	-4,068	-14,932	-17,047	-16,969	-16,911
1952	-16,876	-16,868	-16,868	-21,355	0	0	0	0	0	-2,184	-5	0
1953	0	0	0	0	0	0	-20,783	-24,843	-26,877	-28,945	-28,819	-28,724
1954	-28,665	-28,648	-28,650	-28,658	-28,660	-28,650	-28,623	-54,058	-55,995	-55,755	-55,504	-55,316
1955	-55,200	-55,169	-55,172	-55,187	-55,192	-55,171	-56,972	-60,371	-69,233	-68,919	-68,597	-68,369
1956	-68,227	-68,189	-38,525	6	1	0	0	-7,229	0	0	0	0
1957	0	0	0	0	0	0	0	-34,827	-36,828	-38,853	-38,680	-38,551
1958	-38,471	-38,449	-38,450	-38,462	-38,465	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	-5,335	-20,965	-20,895	-20,799	-20,704	-20,635
1960	-20,592	-20,580	-20,582	-20,587	-24,035	-26,731	-27,380	-25,335	-23,087	-22,983	-22,873	-22,791
1961	-22,742	-22,728	-31,324	-31,333	-31,336	-31,323	-31,291	-31,207	-31,095	-30,947	-30,795	-30,692
1962	-30,627	-30,610	-30,610	-30,620	-30,621	-30,610	-30,579	-129,058	-148,817	-150,321	-149,603	-149,073
1963	-148,750	-148,661	-140,742	-127,465	-148,735	-148,680	-148,537	-165,164	-166,447	-167,912	-167,172	-166,619
1964	-166,277	-166,186	-166,193	-166,240	-154,478	-154,422	-156,469	-168,455	-190,238	-189,371	-188,499	-187,867
1965	-187,478	-187,372	-179,977	25	0	0	0	1,543	15,495	13,244	24	0
1966	0	0	0	0	1	0	-8,994	-11,156	-13,235	-13,175	-13,114	-13,069
1967	-13,042	-13,035	-13,036	-13,039	-13,040	0	0	0	0	0	-5	0
1968	0	0	0	0	0	0	0	-23,586	-25,621	-25,505	-25,386	-25,302
1969	-25,249	-25,235	-25,236	3	0	0	0	0	0	-2,184	-5	0
1970	0	0	0	-4	0	0	0	-11,491	-13,568	-15,693	-15,623	-15,570
1971	-15,537	-15,529	-15,529	-15,534	-15,535	0	0	-20,599	-22,646	-24,730	-24,624	-24,542
1972	-24,492	-24,478	-24,480	-24,487	-24,489	-24,479	-24,457	-49,064	-51,012	-50,779	-50,543	-50,374
1973	-50,270	-50,241	-50,243	-50,258	-50,261	-43,041	-42,381	-58,368	0	0	0	0
1974	0	0	0	1	0	0	0	-5,036	0	-2,184	-5	0
1975	0	0	0	0	0	0	0	7,481	0	-4	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,218	3,004	-3	-3	-4	-4	-4	-4	-4	-4
1978	-4	-4	-4	-4	-4	-4	-4	-84,008	0	-2,183	-2,174	-2,477
1979	-3,566	-3,564	-3,565	0	0	0	0	0	-2,114	-2,105	-2,096	-2,088
1980	-2,085	-2,083	-2,083	-1	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,116	-10,892	-27,623	-27,500	-27,374	-27,279
1982	-27,222	-27,206	-27,207	4	0	0	0	0	0	-2,184	-9	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	-3,065	0	0	0	0	0	-196	-14,019	-16,087	-18,202	-18,121	-18,061
1985	-18,022	-18,013	-18,013	-18,018	-18,020	-18,013	-17,996	-15,311	-17,374	-17,296	-17,214	-17,157
1986	-17,122	-17,112	-25,509	-29,178	0	0	0	0	0	-2,184	-2,174	-4
1987	-3	-3	-3	-4	-3	-3	-3	-3	-9,443	-9,400	-9,357	-9,326
1988	-9,305	-9,300	-9,301	-9,303	4,356	4,354	-1,227	-10,934	-46,885	-51,655	-51,407	-51,222
1989	-51,110	-51,080	-51,082	-51,098	-51,102	-51,083	-62,482	-99,279	-103,811	-103,341	-102,860	-102,498
1990	-102,277	-102,218	-102,223	-102,253	-102,261	-102,223	-102,121	-119,107	-112,974	-112,452	-111,911	-111,512
1991	-116,465	-116,396	-116,402	-120,253	-120,264	-120,217	-120,110	-140,137	-157,006	-154,266	-155,596	-155,057
1992	-154,722	-154,632	-154,639	-154,686	-154,699	-154,641	-137,570	-166,565	-166,028	-165,300	-164,542	-163,984
1993	-163,639	-163,539	-171,483	-180,798	-180,813	-186,849	-191,394	-193,764	-88,210	-26,861	-4,904	-8
1994	-7	-8	-8	-7	-7	-8	-8	-20,888	-22,931	-22,826	-22,720	-22,644
1995	-22,598	-22,584	-22,586	-22,592	-22,594	0	0	0	0	0	-2,184	-3
1996	-3	-3	-3	-3	0	0	0	0	0	-2,183	-2,174	-4
1997	-3	0	0	1	0	0	-12,576	-14,731	-16,798	-18,908	-18,826	-18,764
1998	-18,726	-18,715	-18,716	3	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-12,321	-17,171	-19,281	-19,198	-19,136
2000	-19,098	-19,087	-19,088	-19,093	1	0	0	-10,376	0	0	0	0
2001	0	0	0	1	0	0	0	-41,731	-43,496	-43,303	-43,106	-42,959
2002	-42,867	-42,843	-42,845	-42,857	-42,860	-42,845	-42,804	-75,937	-77,796	-77,450	-77,093	-76,828
Avg (21-02)	-39,746	-39,707	-37,753	-34,605	-30,552	-29,368	-31,048	-41,810	-41,627	-41,602	-41,115	-40,653

APPENDIX O1

Table 2.6-4

Difference in Don Pedro Reservoir Inflow (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,253	-3,191	-7,268	-2,188	0	0	-29,302
1922	0	0	0	0	0	0	-7,366	-11,189	-4,880	-2,188	0	0	-25,623
1923	0	0	0	0	0	0	-2,117	-19,037	-2,117	-2,188	0	0	-25,459
1924	0	0	0	0	0	0	-1,702	-4,834	0	0	0	0	-6,536
1925	0	0	0	0	0	0	-3,692	-13,608	-2,118	-2,188	0	0	-21,606
1926	0	0	-496	0	-197	576	-10,227	-10,859	-23,557	0	0	0	-44,760
1927	0	0	5,045	0	0	0	0	-27,513	-6,321	-2,188	0	0	-30,977
1928	0	0	0	0	0	0	-20,759	-4,770	-2,118	0	0	0	-27,647
1929	0	0	0	0	0	0	0	-15,658	-15,168	0	0	0	-30,826
1930	0	0	0	0	0	0	0	-487	-2,118	0	0	0	-2,605
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	-29,259	-11,274	-15,304	-18,651	-7,164	-7,727	-8,766	-2,188	0	0	-100,333
1933	0	0	0	0	0	0	-4,456	-4,485	-14,010	-2,188	0	0	-25,139
1934	0	0	-3,206	1,494	-892	-2,580	-3,320	-10,927	-1,802	0	0	0	-21,233
1935	0	0	0	-17,702	-16,228	5,562	-10,668	-8,677	-17,892	-2,188	0	0	-67,793
1936	0	0	-106	82	-329	-16,899	-3,635	-10,357	-2,118	-2,188	0	0	-35,550
1937	0	0	-9	-1	-1,778	-3,195	-8,513	-9,349	-10,129	-2,188	0	0	-35,162
1938	0	0	1,711	0	0	-38	-7,142	-17,015	-4,880	-2,188	0	0	-29,552
1939	0	0	0	0	0	0	-15,786	1,619	-2,118	0	0	0	-16,285
1940	0	0	-8,001	1,721	-5,863	-10,103	-5,679	8,890	-4,880	0	0	0	-23,915
1941	0	0	-610	0	-445	-421	-519	-1,372	-2,168	-2,188	0	0	-7,723
1942	0	0	0	-5,541	0	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	-2,188	-2,118	-2,188	0	0	-15,216
1944	0	0	0	0	0	0	0	-33,846	-2,118	-2,188	0	0	-38,152
1945	0	0	0	0	0	-15,317	-203	-434	10,161	-2,188	0	0	-7,981
1946	0	0	0	0	0	-12,207	-3,612	-10,240	-2,118	0	0	0	-28,177
1947	0	0	0	0	0	0	0	-26,630	-2,118	0	0	0	-28,748
1948	0	0	0	0	0	-4,327	-4,613	-4,372	-13,430	-2,188	0	0	-28,930
1949	0	0	0	6	0	-3,923	-4,351	-3,634	-9,575	0	0	0	-21,477
1950	0	0	-3,551	2,662	-14,868	-3,881	-171	-886	4,635	-1,388	0	0	-17,448
1951	0	-14,654	0	0	0	0	-3,152	-925	-10,896	-2,189	0	0	-31,816
1952	0	0	0	-4,482	0	0	0	-15,879	-2,117	-2,188	0	0	-24,666
1953	0	0	0	0	0	0	-20,792	-4,118	-2,118	-2,188	0	0	-29,216
1954	0	0	0	0	0	0	0	-25,536	-2,118	0	0	0	-27,654
1955	0	0	0	0	0	0	-1,855	-3,549	-9,082	0	0	0	-14,486
1956	0	0	-7,403	0	0	-3,555	-3,068	-7,238	-2,117	-2,188	0	0	-25,569
1957	0	0	0	0	0	0	0	-34,871	-2,117	-2,188	0	0	-39,176
1958	0	0	0	0	0	0	0	-11,490	-1,013	-2,188	0	0	-14,691
1959	0	0	0	0	0	0	-5,337	-15,664	0	0	0	0	-21,001
1960	0	0	0	0	-3,446	-2,707	-674	1,977	2,165	0	0	0	-2,685
1961	0	0	-8,594	0	0	0	0	0	0	0	0	0	-8,594
1962	0	0	0	0	0	0	0	-98,696	-20,248	-2,188	0	0	-121,132
1963	0	0	7,926	13,317	-21,259	0	0	-17,039	-1,841	-2,188	0	0	-21,084
1964	0	0	0	0	0	0	-2,195	-12,402	-22,395	0	0	0	-36,992
1965	0	0	7,403	-5,708	-5,156	-10,711	-9,769	1,545	13,979	-2,188	-2,188	0	-12,793
1966	0	0	-1,152	0	-17,169	0	-8,997	-2,188	-2,118	0	0	0	-31,624
1967	0	0	0	0	0	-5,460	0	-12,427	0	-2,188	-2,188	0	-22,263
1968	0	0	0	0	0	0	0	-23,616	-2,117	0	0	0	-25,733
1969	0	0	0	0	-2,451	-10,837	-7,642	-2,188	-2,118	-2,188	0	0	-27,424
1970	0	0	0	26,592	-5,953	-21,074	0	-11,504	-2,118	-2,188	0	0	-16,245
1971	0	0	0	0	0	0	0	-20,625	-2,117	-2,188	0	0	-24,930
1972	0	0	0	0	0	0	0	-24,703	-2,117	0	0	0	-26,820
1973	0	0	0	0	0	0	0	-16,112	-2,117	0	0	0	-18,229
1974	0	0	0	-8,391	0	-10,465	-4,603	-5,043	-4,879	-2,188	0	0	-35,569
1975	0	0	0	0	0	0	-8,286	7,490	-947	-2,188	0	0	-3,931
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	8,218	-5,216	-3,007	-1	-1	0	0	0	0	0	-7
1978	0	0	0	0	0	0	0	-84,115	-5,616	-2,188	0	-310	-92,229
1979	-1,095	0	0	0	0	-16,218	-2,117	-2,188	-2,118	0	0	0	-23,736
1980	0	0	0	9,723	0	-7,610	-4,880	-2,188	-2,118	-2,188	0	0	-9,261
1981	0	0	0	0	0	0	-2,117	-8,792	-16,794	0	0	0	-27,703
1982	0	0	0	0	-11,554	0	0	-1,902	-1,841	-2,188	-2,188	-2,117	-21,790
1983	-1,047	2,762	-952	0	0	0	0	-9,542	-4,603	-2,188	-2,188	0	-17,758
1984	-3,068	4,603	0	0	0	3,935	-197	-13,841	-2,118	-2,188	0	0	-12,874
1985	0	0	0	0	0	0	0	2,643	-2,117	0	0	0	526
1986	0	0	-8,396	-3,661	12,066	-20,128	-11,300	-5,042	-4,880	-2,188	0	0	-43,529
1987	0	0	0	0	0	0	0	0	-9,457	0	0	0	-9,457
1988	0	0	0	0	13,660	0	-5,580	-9,724	-36,050	-5,001	0	0	-42,695
1989	0	0	0	0	0	0	-11,454	-37,007	-4,880	0	0	0	-53,341
1990	0	0	0	0	0	0	0	-17,279	5,728	0	0	0	-11,551
1991	-5,202	0	0	-3,816	-1	0	0	-20,361	-17,370	2,048	-2,045	0	-46,747
1992	0	0	0	0	0	0	16,950	-29,350	0	0	0	0	-12,400
1993	0	5	-7,936	-9,261	0	-6,104	-4,729	-2,854	-25,296	-2,188	0	0	-58,363
1994	0	0	0	0	0	0	0	-20,907	-2,118	0	0	0	-23,025
1995	0	0	0	0	0	13,327	-9,206	-1,903	-1,841	-2,188	-2,188	0	-3,999
1996	0	0	0	0	-1,690	0	-4,879	-5,042	-4,880	-2,188	0	0	-18,679
1997	0	0	0	-6,207	0	0	-12,582	-2,188	-2,118	-2,188	0	0	-25,283
1998	0	0	0	0	0	-3,118	-11,049	-3,900	-3,775	-2,188	0	0	-24,030
1999	0	0	0	0	0	-8,562	-10,982	-12,335	-4,900	-2,188	0	0	-38,967
2000	0	0	0	0	0	0	0	-10,389	-2,118	0	0	0	-12,507
2001	0	0	0	0	0	0	0	-41,781	-1,904	0	0	0	-43,685
2002	0	0	0	0	0	0	0	-33,284	-2,118	0	0	0	-35,402
Avg (21-02)	-127	-89	-602	-313	-1,242	-2,595	-3,557	-11,996	-4,753	-1,227	-158	-30	-26,689

Figure 2.6-2

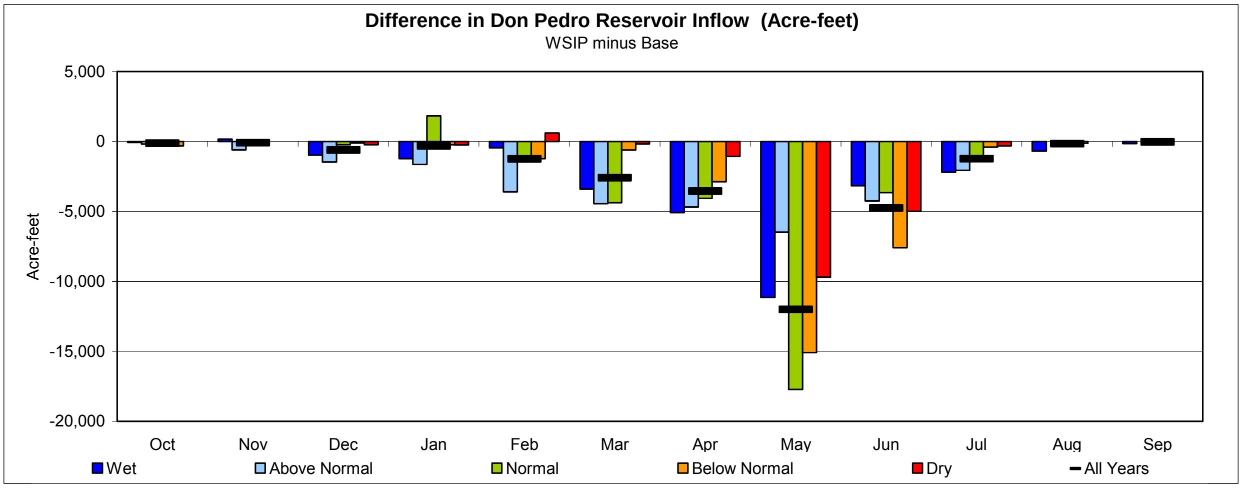

Figure 2.6-1 and Table 2.6-3 illustrate that, during drought sequences, the reduction in inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the WSIP would result in lower Don Pedro Reservoir storage during some part of most years, and more predominantly during multi-year drought periods. Figure 2.6-3 illustrates the Don Pedro Reservoir storage for the WSIP setting, averaged by year type. Figure 2.6-4 illustrates the difference in reservoir storage, averaged by year type, in comparing the WSIP and base-Calaveras constrained settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.6-3 illustrates that, in some years (approximately one-third of the years, i.e., the wettest of years), the storage in Don Pedro Reservoir would not be substantially different, because large inflows to the reservoir during these years would require the management of storage (release of flow above minimum stream requirements) to satisfy flood control requirements. During the other years, the reduction in storage could range from a single year's additional diversions by the SFPUC to over 245,000 acre-feet (1936) from the accumulation of several years of additional diversions by the SFPUC. For example, the greatest draw from reservoir storage occurs during the drought of 1976-1977 (during which the WSIP would not cause an incremental additional draw from storage), and the greatest difference in reservoir draw between the base and the WSIP settings occurs during the years of the 1928-1935 drought.

Figure 2.6-5 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings. The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the WSIP would affect releases from La Grange Dam to the stream. A difference in the amount of available reservoir space in the winter and spring due to the WSIP would lead to a difference in the ability to regulate inflow, thus potentially changing the amount of water released to the stream that is above minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow would directly manifest as a change in releases from La Grange Dam (a change in either more or less flow). Figure 2.6-1 illustrates the stream releases from La Grange Dam for the WSIP and base settings.

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Figure 2.6-3

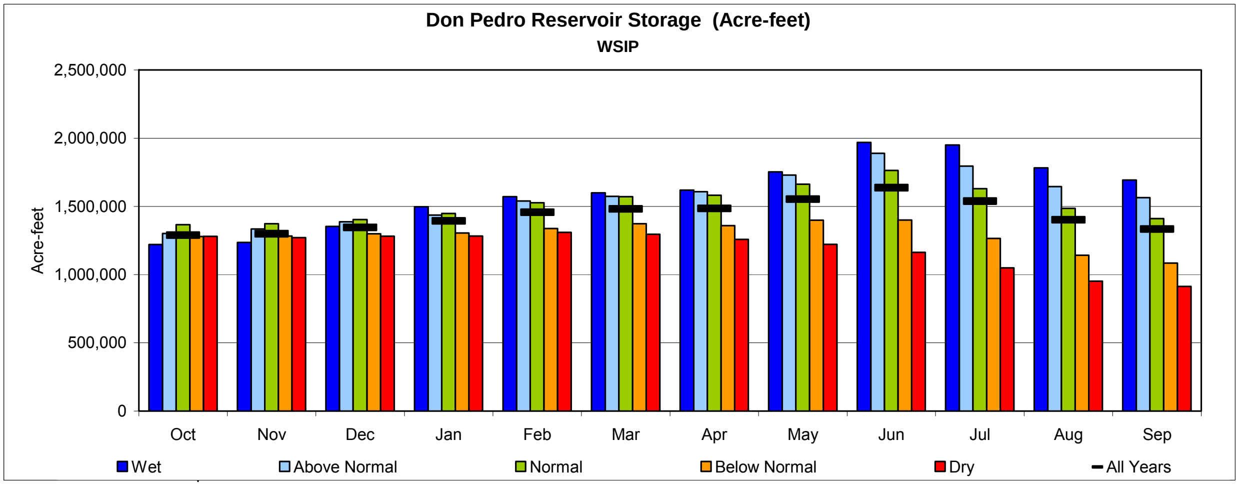


Figure 2.6-4

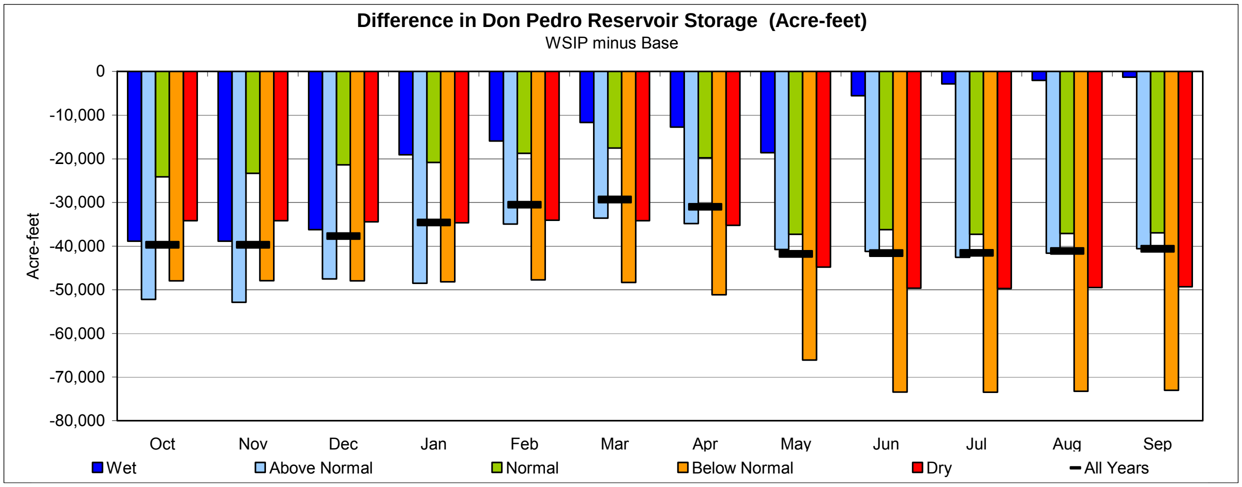
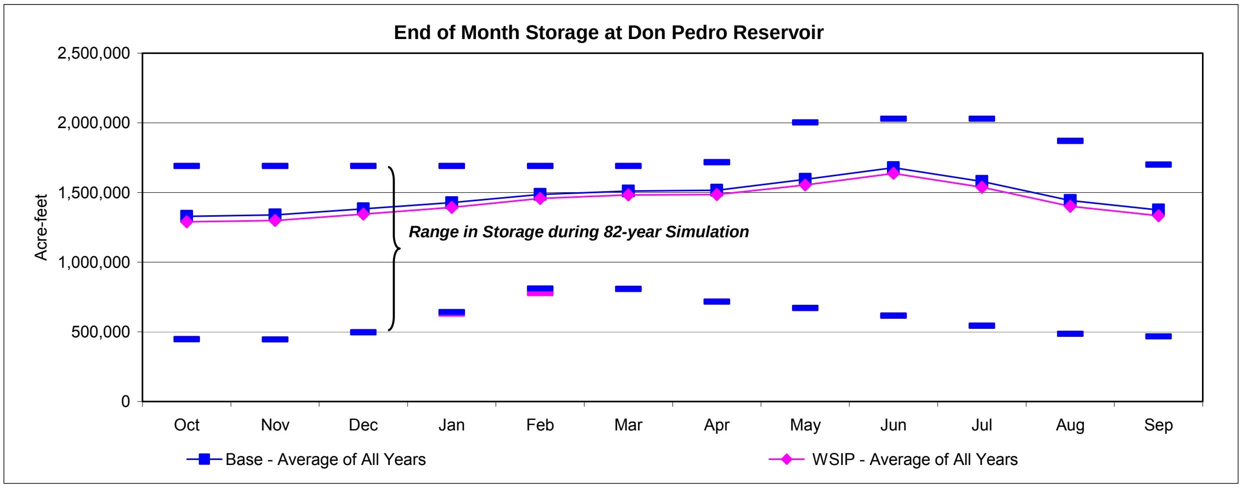


Figure 2.6-5



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Supplementing Figure 2.6-1 are Table 2.6-5 and Table 2.6-6, which illustrate the releases to the Tuolumne River from La Grange Dam for the WSIP and base settings. Table 2.6-7 shows the difference in stream releases between the WSIP and base settings. Consistent with the periods showing changes in Don Pedro Reservoir storage, stream releases following the drawdown periods would indicate a reduction. The additional depletion of reservoir storage would manifest as a reduction in subsequent releases below La Grange Dam to replenish reservoir storage. The same information shown in Table 2.6-7 is illustrated in Table 2.6-8, arranged in descending order based on the San Joaquin River Index. The differences in releases to the Tuolumne River from La Grange Dam would occur only when there would otherwise be releases in excess of minimum Federal Energy Regulatory Commission (FERC) flow requirements, typically during wetter years. Occasional minor reductions in releases would also occur during winter, when the direct diversion of additional water by the SFPUC would lead to a commensurate reduction in inflow to Don Pedro Reservoir. If Don Pedro Reservoir is passing inflow for flood control, a similar commensurate reduction in releases would occur. Table 2.6-7 illustrates the decrease in monthly flow below La Grange Dam that would occur, up to approximately 247,000 acre-feet in one month (February 1936). This reduction is associated with the additional replenishment of Don Pedro Reservoir caused by the additional diversions of the SFPUC during the drought of 1987-1992. The effects of the SFPUC diversions accumulate in Don Pedro Reservoir throughout the drought period. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream releases from La Grange Dam between the WSIP and the base settings would be a delay in releases above minimum FERC flow requirements for a period longer than a month. Normally, the delay in release would not affect the peak stream release rate during a year. However, infrequently (such as in 1993, which followed a lengthy six-year drought), the WSIP's effect on stream releases could lead to an elimination of all flow in excess of FERC requirements in the year. Such a reduction in flow would not be common and would occur only because of multi-year droughts.

Comparing the WSIP and base settings, Table 2.6-9 illustrates the releases to the Tuolumne River below La Grange Dam; their differences are provided in terms of monthly volumetric flow averaged within year types.

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Table 2.6-5

Total La Grange Release to River (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	231,996	111,640	64,123	14,876	15,372	15,372	14,876	547,810
1922	24,397	17,852	18,447	18,447	16,661	169,885	167,789	61,936	470,876	59,363	27,204	24,862	1,077,719
1923	24,397	17,852	52,816	101,025	90,321	34,926	156,958	61,936	14,876	15,372	15,372	14,876	600,727
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	240,822
1928	24,397	17,852	18,447	18,447	53,135	208,209	37,200	35,902	4,463	4,612	4,612	4,463	431,739
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	54,167	204,086	168,811	61,936	14,876	15,372	15,372	14,876	628,639
1937	24,397	17,852	18,447	18,447	194,659	260,123	177,081	61,936	14,876	15,372	15,372	14,876	833,438
1938	24,397	17,852	88,717	79,596	381,104	454,579	291,007	288,864	227,401	156,701	48,636	34,811	2,093,665
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	196,482	163,672	61,936	14,876	15,372	15,372	14,876	527,809
1941	24,397	17,852	18,447	59,195	262,128	284,760	249,836	61,936	49,928	88,796	26,488	21,347	1,165,110
1942	24,397	17,852	41,845	150,525	153,324	148,197	218,453	228,994	91,485	115,177	26,854	17,017	1,234,120
1943	24,397	17,852	32,826	197,464	149,252	336,578	194,801	61,936	72,671	15,372	17,014	17,597	1,137,760
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	86,052	215,383	119,005	61,936	14,876	15,372	15,372	14,876	588,045
1946	24,397	25,160	229,316	136,983	150,231	166,940	68,500	61,936	14,876	15,372	15,372	14,876	923,959
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	227,649	225,258	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,048,093
1952	13,240	10,413	10,760	10,760	56,975	213,745	258,495	264,611	230,309	162,673	38,667	32,093	1,302,741
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	9,223	397,642	218,902	177,380	103,683	61,936	153,608	108,969	29,023	30,608	1,309,123
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	173,384	311,309	268,728	276,764	96,627	36,329	32,935	1,250,968
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	17,256	18,447	28,168	27,263	4,463	4,612	4,612	4,463	188,427
1965	9,223	8,926	9,223	94,896	193,710	157,615	159,589	61,936	14,876	15,372	32,886	32,779	791,031
1966	24,397	22,517	119,607	51,266	82,677	61,610	32,240	31,252	4,463	4,612	4,612	4,463	443,716
1967	12,744	10,711	11,068	11,068	9,997	84,982	252,040	220,298	388,802	257,232	131,931	28,007	1,418,880
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	32,847	276,920	244,541	322,211	447,942	425,936	156,634	66,306	35,885	2,036,594
1970	24,397	17,852	73,665	370,017	136,129	162,608	64,241	61,936	14,876	15,372	15,372	14,876	971,341
1971	24,397	17,852	18,447	18,447	16,661	70,249	66,522	63,363	4,463	4,612	4,612	4,463	314,088
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	35,698	15,372	15,372	14,876	261,644
1974	24,397	42,215	100,199	144,039	84,226	200,904	125,080	61,936	182,580	15,372	23,592	26,455	1,030,995
1975	24,397	17,852	18,447	18,447	112,415	201,425	100,944	61,936	174,642	21,358	50,309	29,597	831,769
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	71,448	15,372	15,372	14,876	295,907
1979	24,397	17,852	18,447	25,892	150,953	195,605	90,635	338,861	14,876	15,372	15,372	14,876	923,138
1980	24,397	17,852	18,447	183,143	376,597	204,132	110,674	105,463	278,671	152,585	41,442	36,580	1,549,983
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	32,535	338,147	314,765	511,142	350,499	260,216	155,711	59,424	132,689	2,189,651
1983	155,278	142,160	252,175	268,145	324,750	929,999	277,685	441,769	223,430	236,135	186,588	171,850	3,609,964
1984	24,397	262,407	413,016	228,905	204,697	159,934	64,241	61,936	14,876	15,372	15,372	14,876	1,480,029
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	156,378	441,405	148,505	177,029	197,577	15,372	15,372	17,744	1,205,977
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	23,914	248,373
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	444,650	252,480	587,468	266,389	378,373	180,518	51,840	2,206,644
1996	24,397	17,852	18,447	18,447	282,350	273,866	138,689	137,214	166,467	15,372	15,372	21,277	1,129,750
1997	24,397	42,957	363,466	949,830	195,855	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,905,139
1998	24,397	17,852	18,447	18,548	334,719	269,674	194,691	338,154	410,419	282,802	127,440	28,820	2,065,963
1999	24,397	17,852	43,763	118,488	288,111	189,381	85,028	61,936	14,876	15,372	15,372	14,876	889,452
2000	24,397	17,852	18,447	18,447	187,912	217,038	100,903	61,936	92,171	15,372	15,372	14,876	784,723
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

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Table 2.6-6

Total La Grange Release to River (Acre-feet) Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	245,398	114,894	64,123	14,876	15,372	15,372	14,876	564,466
1922	24,397	17,852	18,447	18,447	21,795	177,197	175,154	61,936	486,912	61,546	27,209	24,862	1,115,754
1923	24,397	17,852	52,816	101,025	90,321	34,926	159,076	61,936	14,876	15,372	15,372	14,876	602,845
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	41,783	15,372	24,317	28,032	289,830
1928	24,397	38,122	52,916	21,575	67,986	208,208	46,105	35,902	4,463	4,612	4,612	4,463	513,361
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	301,206	220,976	172,446	61,936	14,876	15,372	15,372	14,876	896,203
1937	24,397	17,852	18,447	18,447	210,859	263,318	185,594	61,936	14,876	15,372	15,372	14,876	861,346
1938	24,397	17,852	108,307	79,596	381,104	454,618	298,150	305,878	232,281	156,701	50,809	34,816	2,144,509
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	234,677	169,350	61,936	14,876	15,372	15,372	14,876	571,682
1941	24,397	17,852	18,447	55,884	262,574	285,182	250,355	61,936	53,464	90,980	26,493	21,347	1,168,911
1942	24,397	17,852	41,845	156,067	153,323	150,861	223,977	231,848	94,247	117,365	26,854	17,017	1,255,653
1943	24,397	17,852	32,826	197,464	149,252	338,579	201,522	61,936	76,970	15,372	19,188	17,602	1,152,960
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	123,508	230,698	119,207	61,936	14,876	15,372	15,372	14,876	641,018
1946	24,397	17,852	229,210	136,983	150,231	179,148	72,112	61,936	14,876	15,372	15,372	14,876	932,365
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	344,203	225,255	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,164,644
1952	13,240	10,413	10,760	10,760	78,332	213,745	258,495	280,490	232,426	162,673	40,841	32,097	1,344,272
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	46,291	436,178	218,897	180,935	106,751	61,936	162,942	111,157	29,023	30,608	1,402,867
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	211,842	311,309	280,218	277,777	98,815	36,329	32,935	1,304,117
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	29,030	18,447	28,168	27,263	4,463	4,612	4,612	4,463	200,201
1965	9,223	8,926	9,223	280,632	198,842	168,325	169,358	61,936	14,876	15,372	21,883	32,755	991,351
1966	24,397	22,516	120,759	51,266	99,846	61,610	32,240	31,252	4,463	4,612	4,612	4,463	462,036
1967	12,744	10,711	11,068	11,068	9,997	103,480	252,040	232,725	388,802	259,420	134,115	28,012	1,454,182
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	58,091	279,368	255,378	329,852	450,130	428,053	156,634	68,480	35,889	2,089,247
1970	24,397	17,852	73,665	343,421	142,086	183,682	64,241	61,936	14,876	15,372	15,372	14,876	971,776
1971	24,397	17,852	18,447	18,447	16,661	85,781	66,522	63,363	4,463	4,612	4,612	4,463	329,620
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	16,427	64,861	61,936	96,088	15,372	15,372	14,876	329,858
1974	24,397	42,215	100,199	152,431	84,225	211,369	129,683	61,936	192,487	15,372	25,766	26,460	1,066,540
1975	24,397	17,852	18,447	18,447	112,415	201,425	109,230	61,936	168,121	23,541	50,313	29,597	835,721
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	160,931	15,372	15,372	14,876	385,390
1979	24,397	17,852	18,447	29,457	150,953	211,824	92,753	341,049	14,876	15,372	15,372	14,876	947,228
1980	24,397	17,852	18,447	175,502	376,598	211,743	115,553	107,651	280,789	154,773	41,442	36,580	1,561,327
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	59,750	349,698	314,765	511,142	352,402	262,057	155,711	63,782	134,816	2,238,646
1983	156,324	139,398	253,127	268,146	324,750	929,999	277,685	451,311	228,033	238,323	186,588	174,030	3,627,714
1984	24,397	260,868	413,016	228,905	204,697	155,998	64,241	61,936	14,876	15,372	15,372	14,876	1,474,554
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	173,491	461,532	159,805	182,071	202,457	15,372	15,372	19,911	1,266,606
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	145,263	78,663	37,258	28,803	468,826
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	453,913	261,686	589,371	268,231	380,561	180,518	54,017	2,233,223
1996	24,397	17,852	18,447	18,447	284,044	273,866	143,569	142,256	171,347	15,372	15,372	23,444	1,148,413
1997	24,397	42,960	363,466	956,038	195,854	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,911,349
1998	24,397	17,852	18,447	37,270	334,716	272,793	205,739	342,054	414,193	284,990	127,440	28,820	2,108,711
1999	24,397	17,852	43,763	118,488	288,111	197,943	96,010	61,936	14,876	15,372	15,372	14,876	908,996
2000	24,397	17,852	18,447	18,447	207,006	217,038	100,903	61,936	104,647	15,372	15,372	14,876	816,293
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

APPENDIX O1

Table 2.6-7

Difference in Total La Grange Release to River (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868

APPENDIX O1

Table 2.6-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.6-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type)

												WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,400	21,274	46,524	114,653	173,074	256,125	198,288	189,097	194,963	106,979	51,787	37,222	1,413,386
Above Normal	17,105	28,309	69,075	77,774	95,901	127,962	95,279	80,555	20,035	14,739	14,739	14,263	655,737
Below Normal	17,484	14,199	22,701	17,789	25,120	41,604	58,393	55,751	4,463	4,612	4,612	4,463	271,190
Dry	20,655	15,449	15,964	15,964	17,937	27,291	30,572	29,530	4,349	4,494	4,494	4,349	191,046
Critical	13,260	11,611	12,560	11,644	10,648	11,644	21,061	20,600	2,975	3,074	3,074	2,975	125,127
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type)

												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,443	21,159	48,924	127,347	176,452	262,303	202,891	192,904	207,184	110,618	52,966	37,877	1,464,068
Above Normal	17,105	27,789	75,925	76,419	114,110	136,500	97,174	80,683	25,904	14,739	15,265	15,037	696,650
Below Normal	17,484	15,888	25,669	18,049	27,788	42,899	59,135	55,751	4,463	4,612	4,612	4,463	280,813
Dry	20,655	15,449	15,964	15,964	18,842	27,291	30,572	29,530	4,349	4,494	4,494	4,349	191,951
Critical	13,260	11,611	12,560	11,644	10,648	11,644	21,061	20,600	2,975	3,074	3,074	2,975	125,127
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type)

											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	-44	115	-2,400	-12,694	-3,378	-6,178	-4,603	-3,807	-12,220	-3,639	-1,180	-655	-50,682
Above Normal	0	520	-6,850	1,355	-18,209	-8,537	-1,895	-129	-5,869	0	-526	-774	-40,913
Below Normal	0	-1,689	-2,968	-261	-2,668	-1,294	-742	0	0	0	0	0	-9,623
Dry	0	0	0	0	-906	0	0	0	0	0	0	0	-906
Critical	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868

2.7 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the base setting, Calaveras Reservoir operations would substantively change in the WSIP setting. With the restoration of Calaveras Reservoir operating capacity, the reservoir would operate with a larger storage capacity. Figure 2.7-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.7-1 are the results for the WSIP and base settings.

The current operation of Calaveras Reservoir (base-Calaveras constrained setting) is modeled to be greatly constrained, to vary only within a limited storage range. Although a within-year cyclic operation occurs for the conservation of local watershed runoff, there is relatively little reservoir storage available for year-to-year carryover and multi-year drought use. In the WSIP setting, a greater within-year cyclic operation occurs, providing for a greater use of local watershed runoff. Also, during prolonged periods of drought (i.e., multiple years in duration), reservoir storage would be drawn to supplement runoff available to the regional system and other water supply resources. Figure 2.7-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

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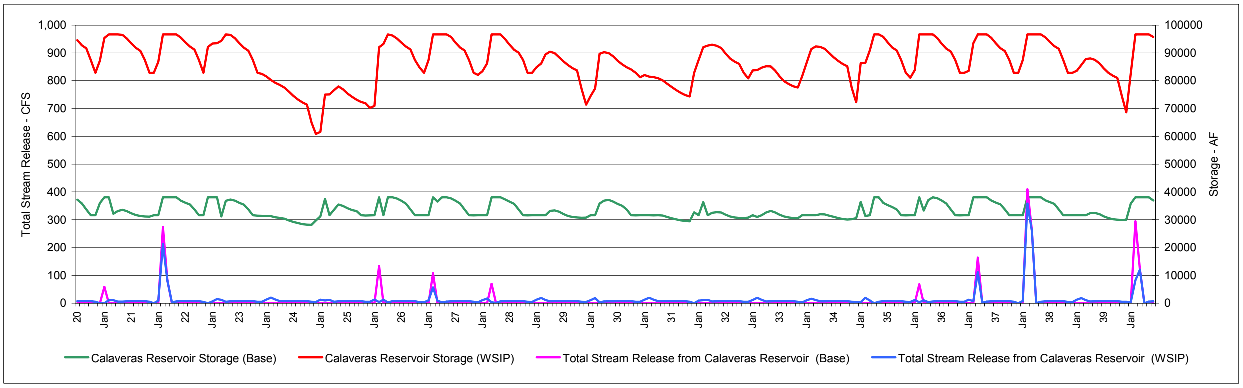
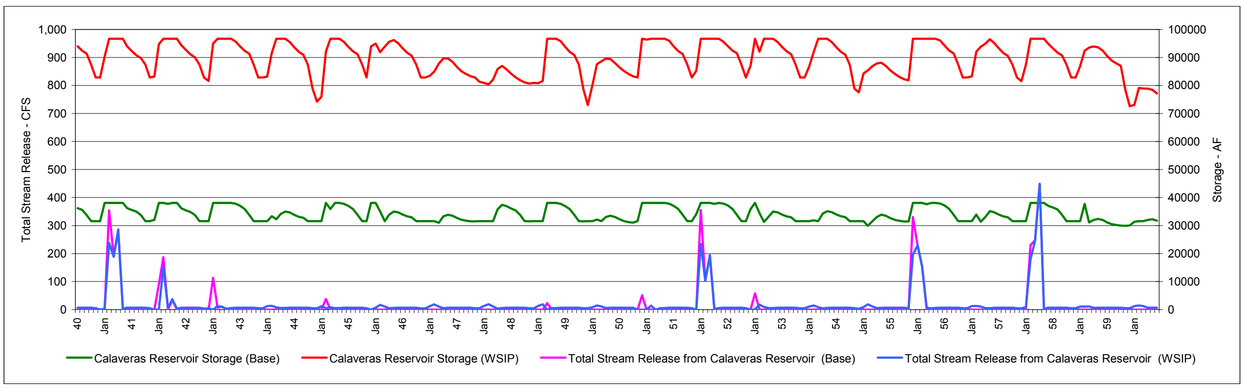
Figure 2.7-1
Calaveras Reservoir Storage and Stream Release

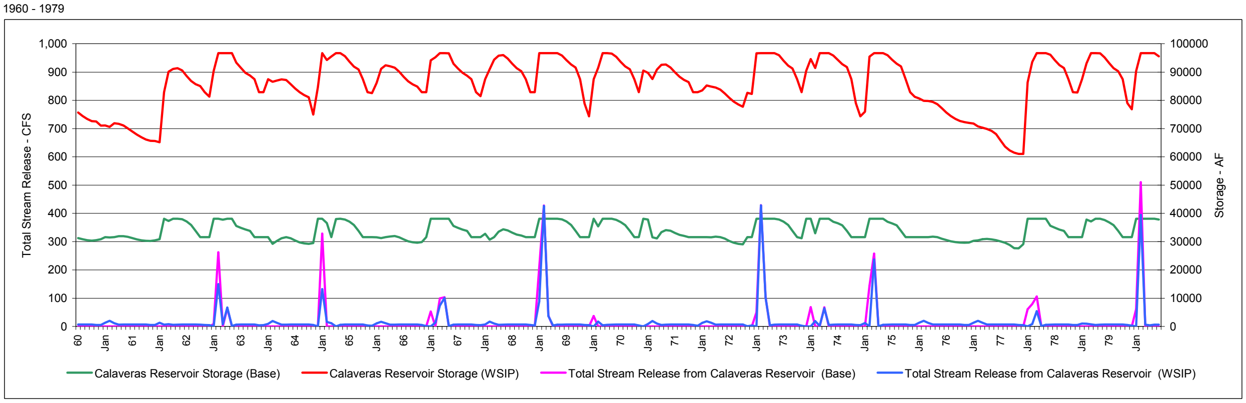
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

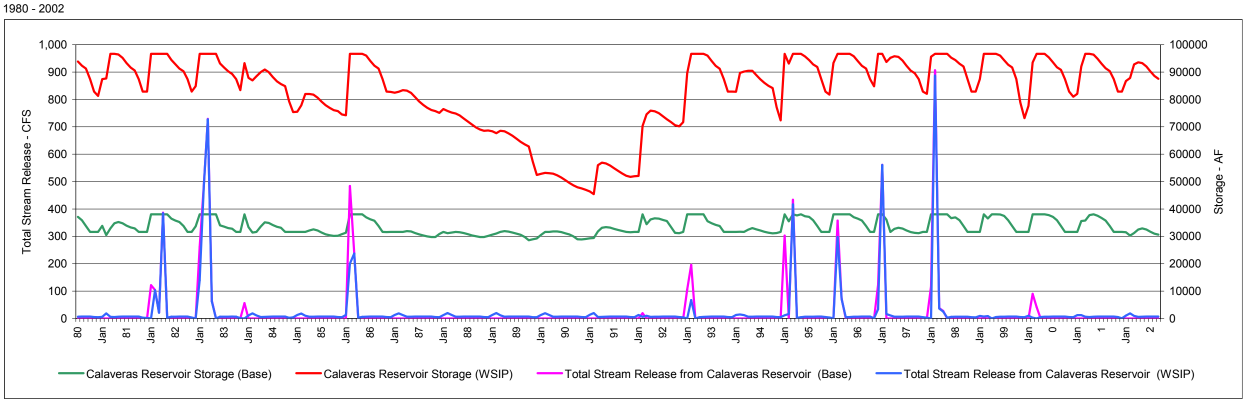


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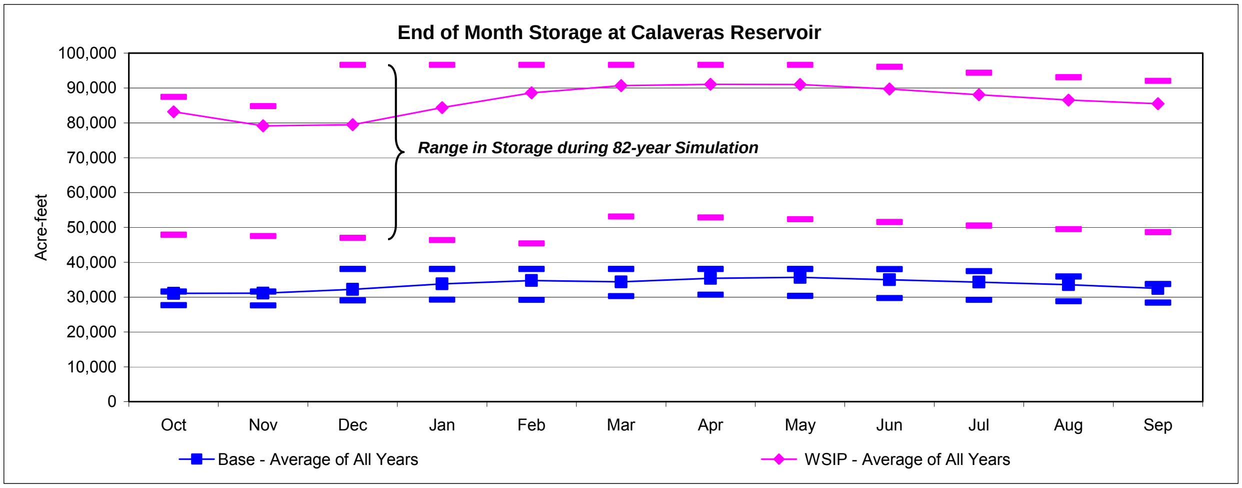
Figure 2.7-2



In the WSIP setting (as compared to the base setting), there would be two categorical changes in releases to Calaveras Creek below Calaveras Dam: the addition of flows representing the flow objectives associated with the 1997 California Department of Fish and Game Memorandum of Understanding (MOU); and the reduction of stream releases during wetter-year/wetter-season flows due to the restored operational capacity of Calaveras Reservoir. Supplementing the Figure 2.7-1 representation of Calaveras Dam stream releases is Table 2.7-1, which illustrates releases for the WSIP and base settings and the difference in releases between the two.

Table 2.7-1

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-744	-4,282	-2,197	-106	61	255	386	417	425	415	-4,694
Above Normal	425	258	-12	-1,939	-2,721	-408	147	327	396	424	428	417	-2,259
Normal	429	275	-22	184	-173	154	265	370	408	428	430	417	3,164
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-46	-910	-641	194	239	350	403	426	428	417	1,556

Compared to the base setting, diversions from Alameda Creek to Calaveras Reservoir would increase in the WSIP setting. With the current constraints on Calaveras Reservoir storage, diversions to Calaveras Creek are rejected. With the restoration of operational storage in the reservoir, the opportunity to divert water into the reservoir would increase.

To provide a context for the amount of water diverted at the Alameda Creek Diversion Dam (ACDD), Table 2.7-2 illustrates the estimated runoff (inflow) to the dam, averaged by year type. Table 2.7-3 compares diversions to Calaveras Reservoir in the WSIP and base settings. An increase in diversions during the winter season due to WSIP operation would generally occur during normal or wetter year types, as reservoir storage space would accommodate diversions. During summer in all years and during all periods in below-normal and normal years, diversions would continue as they do currently. A few exceptions occur when diversions would be reduced from that of the base setting.

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Table 2.7-2

Total Inflow to ACDD (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	156	2,472	7,382	8,284	6,064	3,608	1,035	227	42	18	12	29,308
Above Normal	18	183	1,817	4,394	5,619	3,692	1,976	542	139	23	11	7	18,420
Normal	7	41	1,589	1,840	2,684	2,029	939	332	87	8	5	3	9,564
Below Normal	7	42	554	1,069	1,689	1,271	395	246	64	6	4	3	5,350
Dry	7	16	222	314	531	382	238	124	38	3	3	2	1,880
All Years	9	88	1,327	2,993	3,759	2,683	1,425	454	111	17	8	5	12,880

Table 2.7-3

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	1,113	302	337	649	861	227	42	18	12	4,790
Above Normal	11	159	1,226	1,936	1,883	563	1,017	542	139	23	11	7	7,518
Normal	7	35	1,004	1,580	1,888	1,570	826	332	87	8	5	3	7,345
Below Normal	7	42	536	1,024	1,587	1,042	395	246	64	6	4	3	4,956
Dry	7	16	222	314	473	382	238	124	38	3	3	2	1,823
All Years	8	77	818	1,200	1,239	780	627	421	111	17	8	5	5,310

Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	7	128	1,093	415	185	307	637	904	227	42	18	12	3,977
Above Normal	11	159	691	722	325	596	1,284	542	139	23	11	7	4,510
Normal	7	35	634	972	815	1,123	813	332	87	8	5	3	4,833
Below Normal	7	42	536	1,024	1,587	1,042	395	246	64	6	4	3	4,956
Dry	7	16	222	314	473	382	238	124	38	3	3	2	1,823
All Years	8	77	635	694	684	693	677	429	111	17	8	5	4,037

Difference in Calaveras Reservoir Inflow from Upper Alameda Creek (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	697	117	30	12	-43	0	0	0	0	813
Above Normal	0	0	535	1,215	1,558	-33	-267	0	0	0	0	0	3,008
Normal	0	0	369	608	1,074	447	13	0	0	0	0	0	2,511
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	183	506	555	86	-50	-8	0	0	0	0	1,272

Commensurate with changes in diversions from Alameda Creek to Calaveras Reservoir would be changes in flow below the ACDD. Table 2.7-4 illustrates the flow below the ACDD for the WSIP and base settings. Table 2.7-4 shows that, opposed to diversions to Calaveras Reservoir, flow passing the ACDD would decrease in the WSIP setting. With operational capacity restored at Calaveras Reservoir, there would be more opportunity (and need) to divert Alameda Creek flows; thus, flow passing the dam would be reduced.

Table 2.7-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-697	-117	-30	-12	43	0	0	0	0	-813
Above Normal	0	0	-535	-1,215	-1,558	33	267	0	0	0	0	0	-3,008
Normal	0	0	-369	-608	-1,074	-447	-13	0	0	0	0	0	-2,511
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-183	-506	-555	-86	50	8	0	0	0	0	-1,272

Flow below the confluence of Alameda Creek and Calaveras Creek is affected by releases from Calaveras Dam to the stream, flow passing the ACDD, and unregulated flow below the ACDD and Calaveras Dam. Table 2.7-5 illustrates the flow below the confluence for the WSIP and base settings, and the difference in inflow between the two. The notable differences between the WSIP and the base settings are the addition of stream flows representing the 1997 MOU and the reduction of wetter-year/wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 2.7-5

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

												WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-744	-4,979	-2,314	-136	49	298	386	417	425	415	-5,507
Above Normal	425	258	-547	-3,153	-4,279	-375	414	327	396	424	428	417	-5,267
Normal	429	275	-391	-424	-1,247	-293	251	370	408	428	430	417	653
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-229	-1,417	-1,197	108	289	358	403	426	428	417	283

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the WSIP setting. This facility is assumed to recapture flows explicitly released from Calaveras Dam in the representation of the 1997 MOU. The effect of the recapture is a reduction in the flow that occurs below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir. Flows below this diversion have been estimated and noted as the flow above the Alameda and San Antonio Creek confluence. Table 2.7-6 illustrates the flow at this location for the WSIP and base settings. The flows identified at this location indicate flow occurring below the confluence of Alameda and Calaveras Creeks (described above), with the addition of estimated unregulated stream accretions between the Alameda-Calaveras Creek confluence and the Alameda-San Antonio Creek confluence minus the water assumed to be recaptured (diverted) by the SFPUC from the creek.

Table 2.7-6

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

												WSIP	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

												Base	
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

											WSIP minus Base		
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-860	-5,104	-2,474	-258	-61	43	0	0	0	0	-8,714
Above Normal	0	0	-719	-3,422	-4,646	-596	266	0	0	0	0	0	-9,117
Normal	0	0	-585	-972	-1,972	-788	-13	0	0	0	0	0	-4,331
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-431	-1,895	-1,831	-328	41	8	0	0	0	0	-4,435

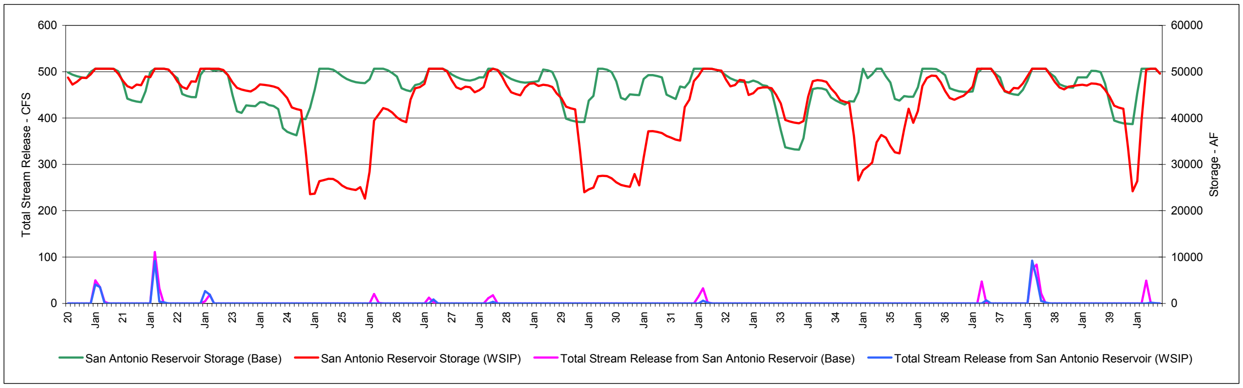
The difference in San Antonio Reservoir storage between the WSIP and base settings is the result of several factors, and is predominantly due to the restoration of the operational capacity of Calaveras Reservoir and the maintenance of Hetch Hetchy conveyance. Figure 2.7-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from the dam. Shown in Figure 2.7-3 are the results for the WSIP and base settings. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that draws relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. The resultant effect is that the WSIP setting would retain more storage in San Antonio Reservoir than occurs in the base setting. The exception to this outcome is during cyclic maintenance of Hetch Hetchy conveyance that would constrain Hetch Hetchy diversions every year, but most dramatically every fifth year. During these periods, additional water would be drawn from San Antonio Reservoir and the other Bay Area reservoirs to serve systemwide deliveries when limited or no water would be available from Hetch Hetchy. The coincidence of wet local Bay Area watershed hydrology, reservoir storage balancing among the Bay Area reservoirs, and maintenance would affect the severity of drawdown and the rate of replenishment of San Antonio Reservoir.

Also affecting the magnitude of draw from San Antonio Reservoir are modeling assumptions for the balancing of total Bay Area reservoir storage among the five major SFPUC reservoirs. The model balances storage among reservoirs by way of an input file by the modeler concerning the relative draw (percentage) from each reservoir under various storage conditions. These are discretionary inputs in the model, and the logic and relative percentages are meant to mimic the current practice and discretion of the system operators based on recognition of the physical conveyance constraints within the system and the ability of each reservoir to provide yield and water delivery security. The logic currently favors the retention of storage in the Peninsula reservoirs for security reasons, and thus the provision of additional water between the settings is balanced between San Antonio and Calaveras Reservoirs. Figure 2.7-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

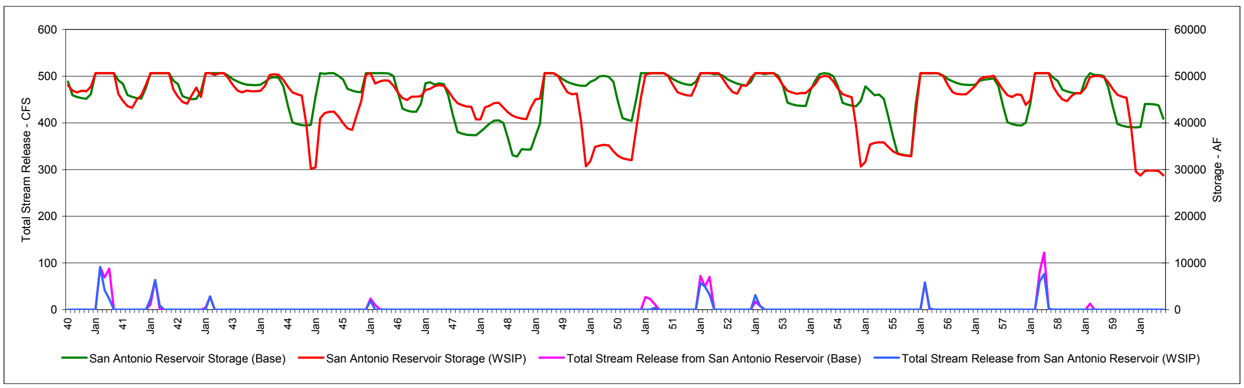
APPENDIX O1

Figure 2.7-3
San Antonio Reservoir Storage and Stream Release

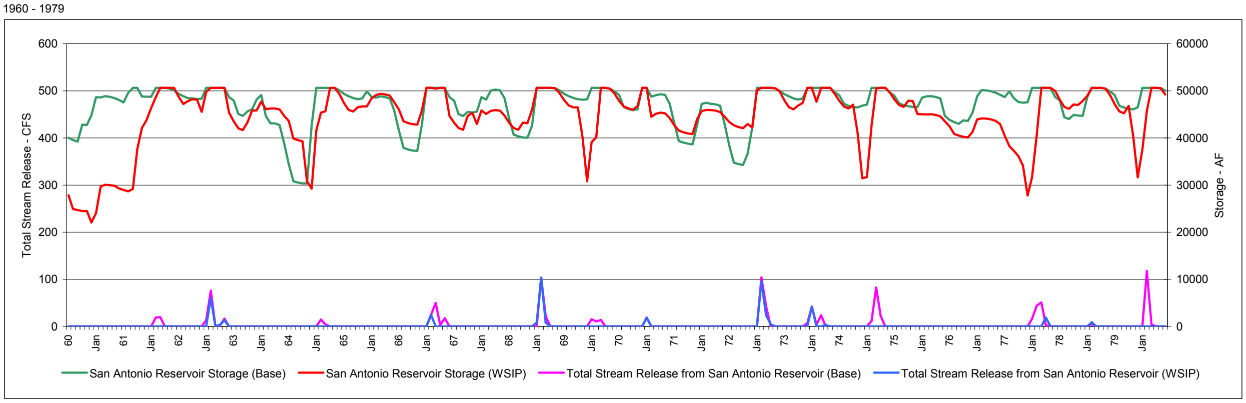
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

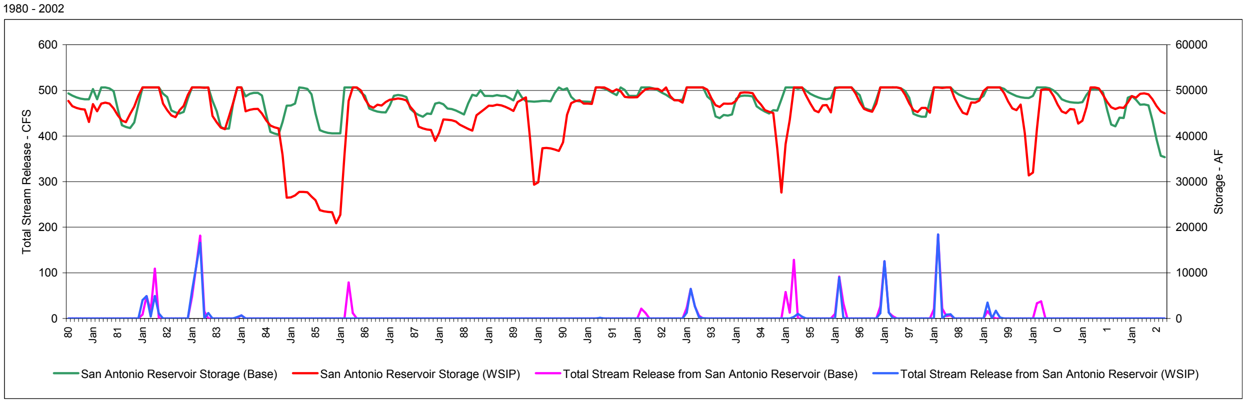
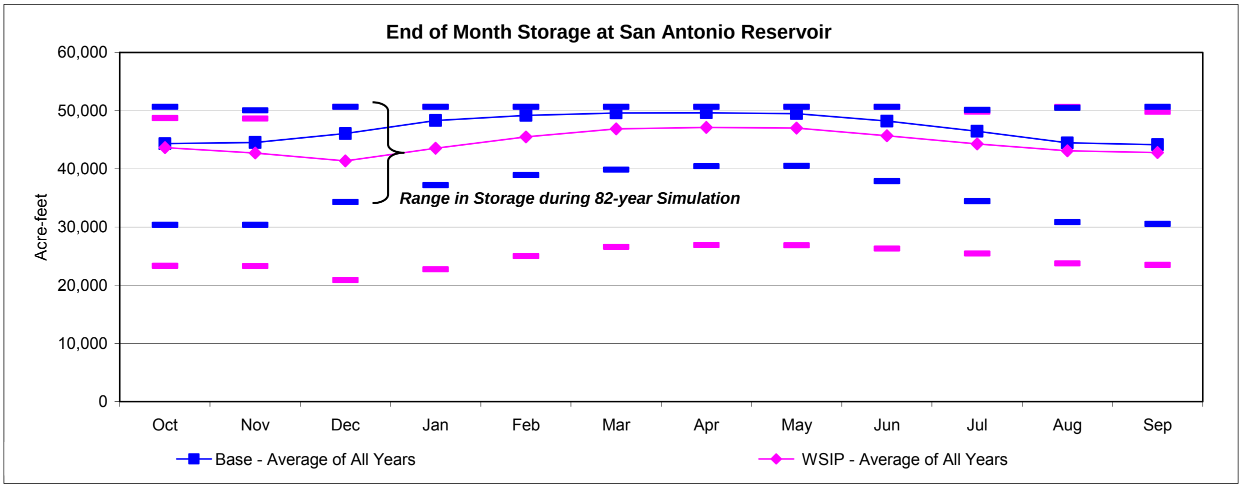


Figure 2.7-4



There would very little change in stream releases below San Antonio Reservoir between the WSIP and base settings. With storage conditions lower at some times and higher at other times, a difference in the ability to regulate reservoir inflow and avoid stream releases is expected. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and difference between releases for the WSIP setting and base setting are shown in Table 2.7-7. The differences between the two settings range from increases to decreases in flow, generally with decreases in releases. This modeled circumstance reflects the different resulting storage operations between the two settings, as seen in Figure 2.7-3. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from San Antonio Reservoir in any setting and the difference between settings are expected to be minor.

Table 2.7-7

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-57	-114	-418	-1,730	-740	57	0	0	0	0	-3,002
Above Normal	0	0	-26	-246	-528	-1,329	77	4	0	0	0	0	-2,048
Normal	0	0	5	-82	-363	-231	-52	0	0	0	0	0	-724
Below Normal	0	0	0	0	-41	0	4	0	0	0	0	0	-37
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-16	-89	-270	-658	-138	12	0	0	0	0	-1,159

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Reservoir and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.7-8 illustrates the flow below the confluence for the WSIP and base settings, and the differences in flow between the two. The differences are particularly due to the effects of restoring Calaveras Reservoir operating capacity in the WSIP setting.

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Table 2.7-8

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	WSIP Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Base Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet) (Average within Year Type - Grouped by 5 Local Reservoir Runoff)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	WSIP minus Base Aug	Sep	WY Total
Wet	0	0	-917	-5,217	-2,892	-1,988	-801	100	0	0	0	0	-11,716
Above Normal	0	0	-745	-3,667	-5,174	-1,925	343	4	0	0	0	0	-11,164
Normal	0	0	-581	-1,054	-2,335	-1,020	-66	0	0	0	0	0	-5,056
Below Normal	0	0	0	0	-41	0	4	0	0	0	0	0	-37
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-447	-1,984	-2,101	-986	-97	20	0	0	0	0	-5,595

2.8 Crystal Springs and San Andreas Reservoirs

Fundamental to the difference in storage operations between the WSIP setting and the base setting is the restoration of reservoir operation capacity in the WSIP setting, which does not occur in the base setting. Full capacity of the restored reservoir is 22,150 million gallons (approximately 67,980 acre-feet), and the current full operating capacity is 18,520 million gallons (approximately 56,840 acre-feet). The result is the operation of Crystal Springs Reservoir at a higher maximum storage in the WSIP setting. Figure 2.8-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.8-1 are the results for the WSIP and base settings.

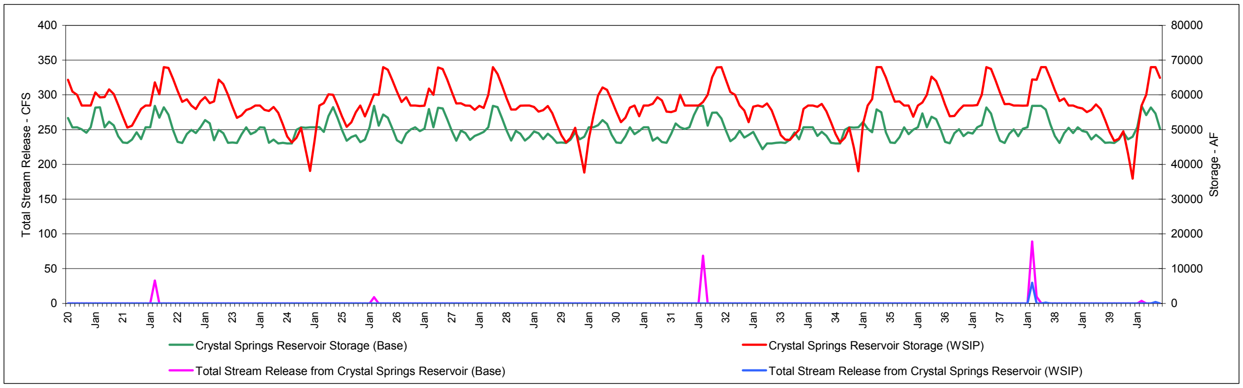
Compared to the base setting, the WSIP setting would generally result in a shifting of the maximum storage level and the normal range of reservoir operation to a greater volume (elevation); the lower end of the monthly operating range would normally be greater in storage than in the base setting. In some years, the variation from maximum storage to minimum storage may increase in the WSIP setting. The cyclic greater draw from storage in the WSIP setting every fifth year is associated with the maintenance of the Hetch Hetchy conveyance system.

Figure 2.8-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings. Consistent with the discussion above, the WSIP setting would result in reservoir storage operating at a higher average and higher upper-range than the base setting. This circumstance predominantly occurs due to the restoration of the operating capacity of Crystal Springs Reservoir.

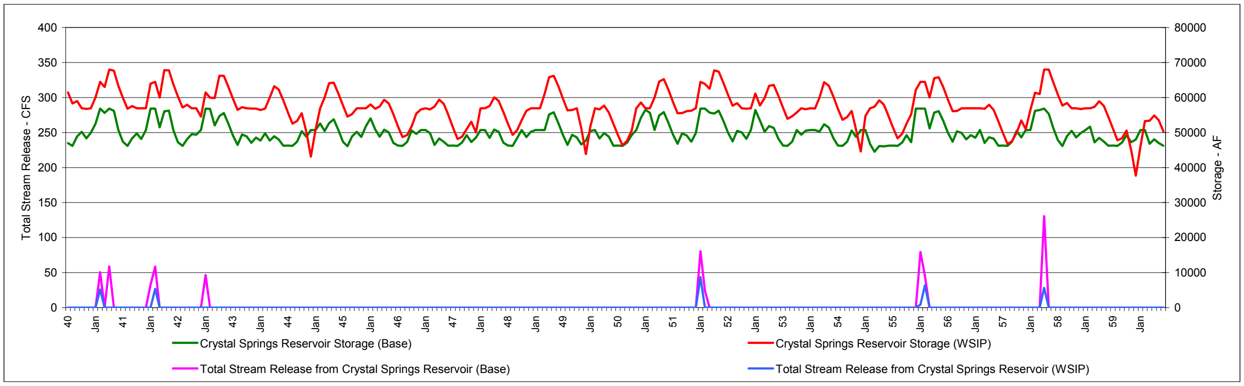
There is minimal difference in stream releases between the WSIP and the base setting (which could be either an increase or decrease in the release). The potential difference is attributed to whether the resulting storage in the reservoir is higher or lower between the two settings. Part of the difference in modeled Crystal Springs Reservoir storage is due to modeling assumptions for the proportionate management of storage among the Bay Area reservoirs, and the coincidence of constrained conveyance flow rates. In actual operations, it is anticipated that system operators would manage the reservoir system such that stream releases would be minimal under any setting and essentially no difference would occur between the WSIP and base settings.

Figure 2.8-1
Crystal Springs Reservoir Storage and Release

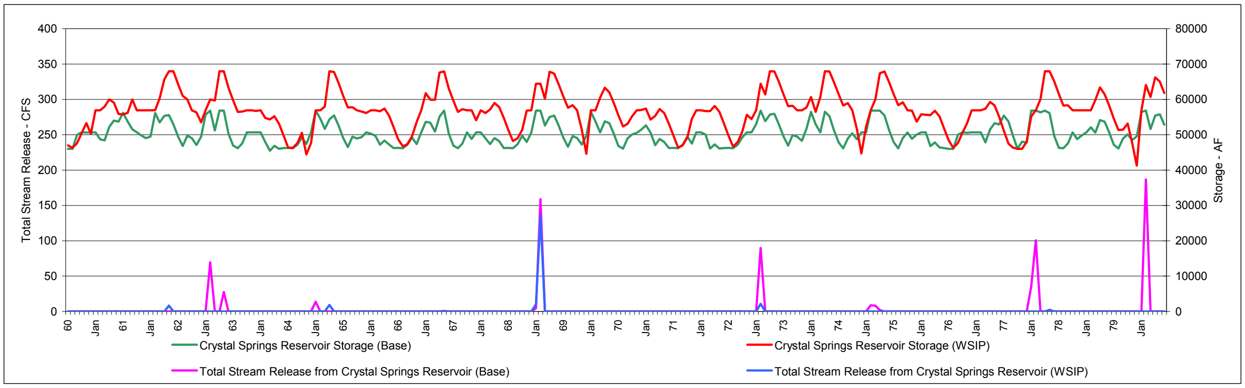
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

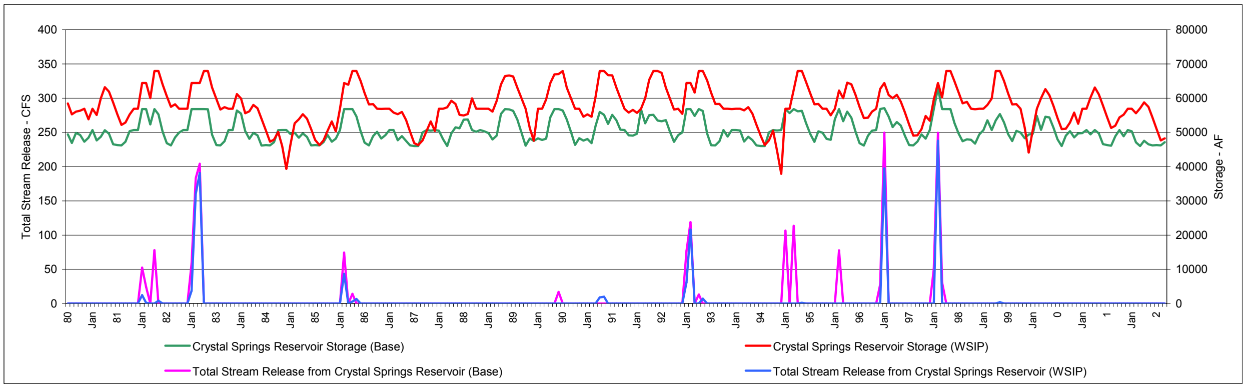


Figure 2.8-2

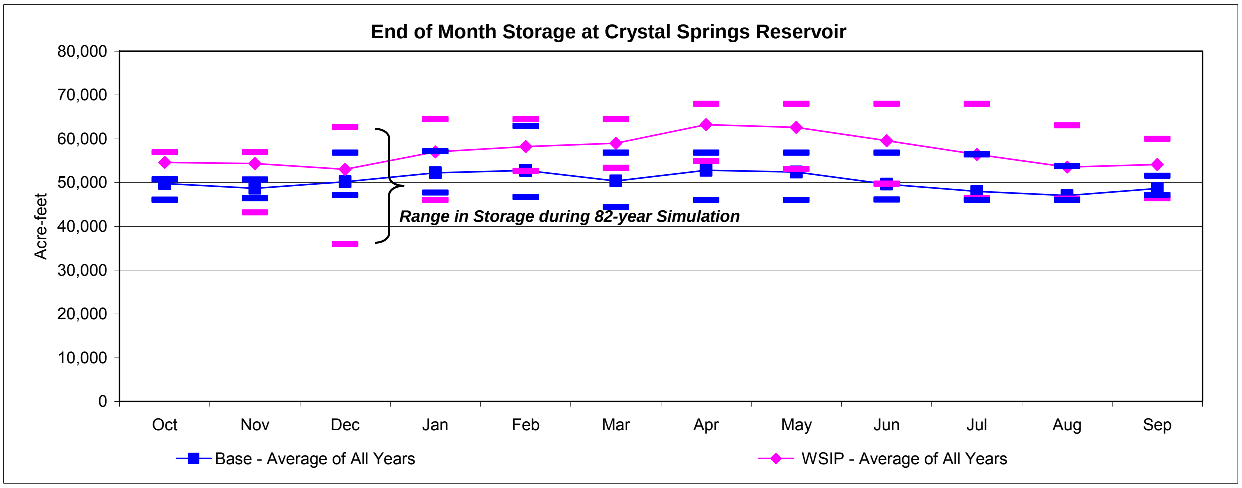


Table 2.8-1 illustrates the stream releases for the WSIP and base settings, and the difference in modeled flows between the two settings. A greater range in Crystal Springs Reservoir operation would lead to an increased potential to regulate reservoir inflow, which would lead to less risk in needing to make stream releases. However, as described above, actual system operations will attempt to minimize releases under any setting; thus, the difference in releases between the WSIP and base setting will be minimal, if any.

Table 2.8-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,098	2,435	732	115	48	0	0	0	0	4,428
Above Normal	0	0	0	111	353	0	32	47	0	0	0	0	544
Normal	0	0	0	0	0	0	0	31	0	0	0	0	31
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP minus Base

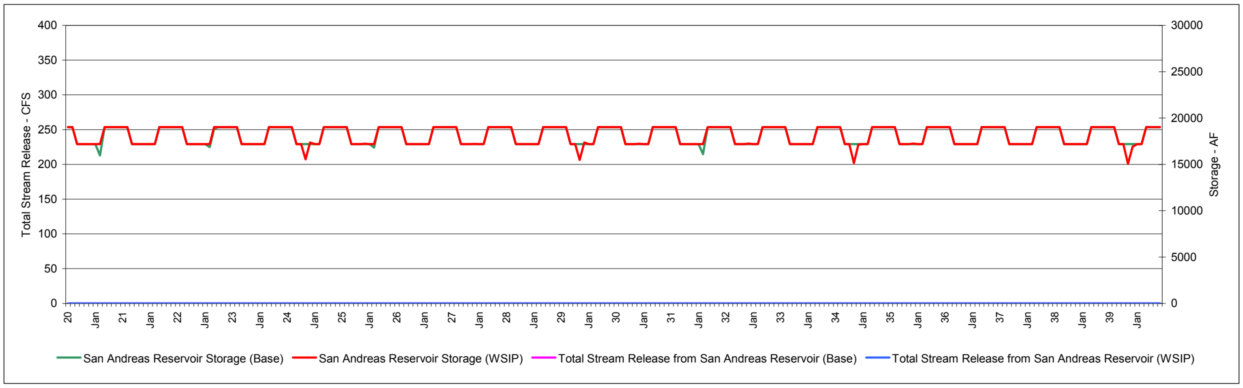
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-107	-1,646	-1,844	-643	-932	46	0	0	0	0	-5,127
Above Normal	0	0	0	-507	-990	-29	-20	-52	0	0	0	0	-1,598
Normal	0	0	0	0	-268	0	0	31	0	0	0	0	-237
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	-62	0	0	0	-62
All Years	0	0	-21	-426	-617	-132	-179	12	-12	0	0	0	-1,376

San Andreas Reservoir operations would generally be the same between the WSIP and base settings. Reservoir storage would follow a systematic filling and lowering each year. Figure 2.8-3 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.8-3 are the results for the WSIP and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Notable in Figure 2.8-3 is the difference in storage operation every fifth year. The WSIP setting storage operation differs from that in the base settings. The differences in operation arise from the assumed difference in Hetch Hetchy conveyance maintenance in each setting. In the WSIP setting, the maintenance occurs systematically every year, and to a greater degree every fifth year, which constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As discussed previously, during these winter periods, the Bay Area reservoir system accommodates the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, the serving of

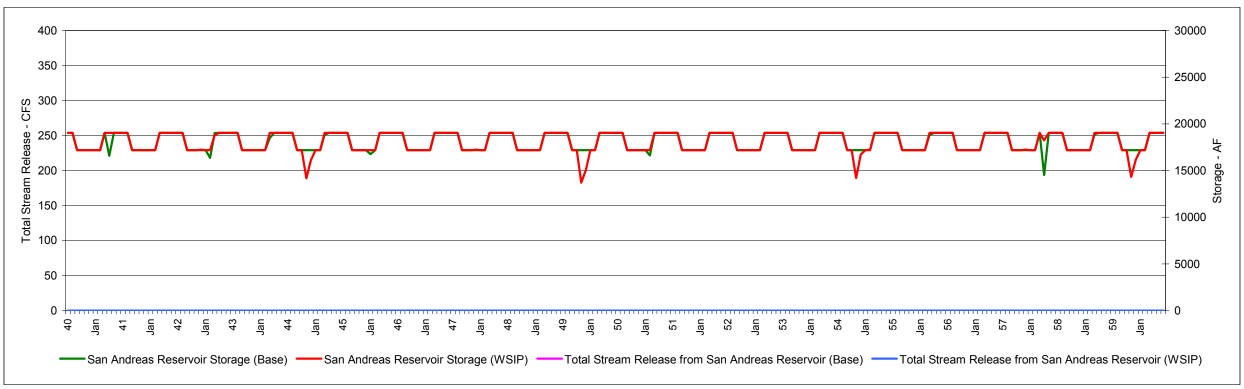
APPENDIX O1

Figure 2.8-3
San Andreas Reservoir Storage and Stream Release

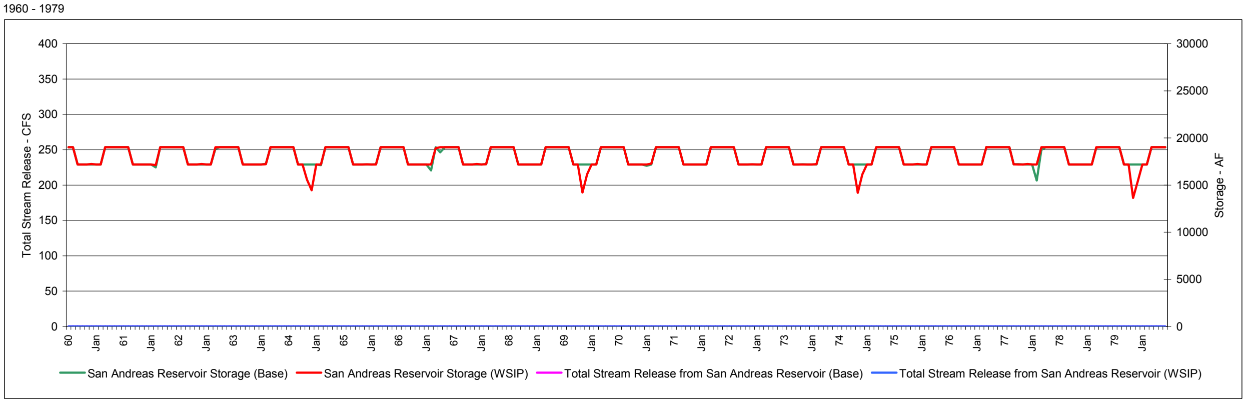
1920 - 1939



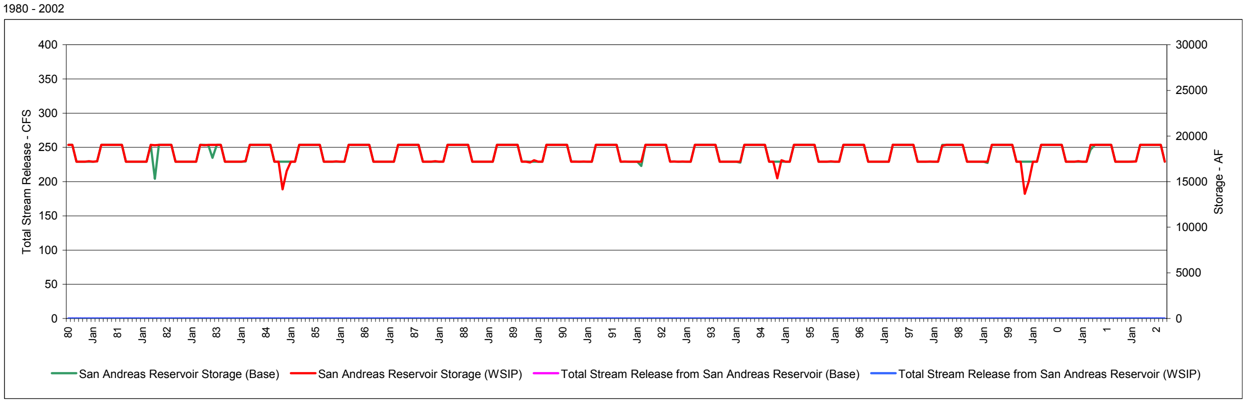
1940 - 1959



1960 - 1979

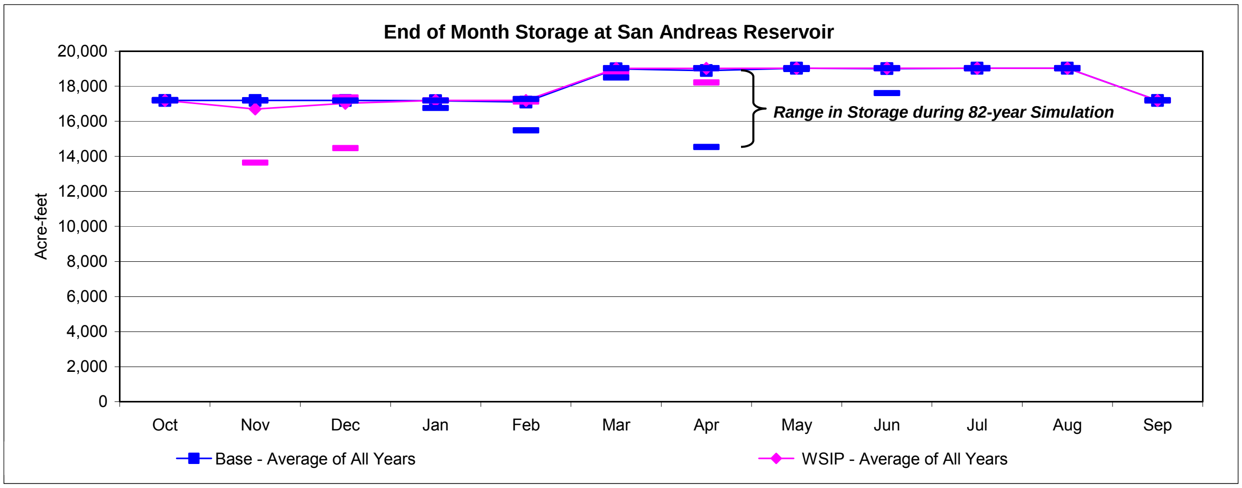


1980 - 2002



water demand affects the reservoir when additional required water production at Harry Tracy Water Treatment Plant (Harry Tracy WTP) associated with the WSIP or the base-Calaveras unconstrained setting exceeds the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. The model assumes that the conveyance capacity from Crystal Springs Reservoir is the same among all of the settings. The additional water demand of the WSIP setting and the current demand of the base-Calaveras unconstrained setting require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir. Figure 2.8-4 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.8-4



2.9 Pilarcitos Reservoir

The Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion has been estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints to deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request (and the resultant potential changes in the operation of SFPUC facilities and their affected environs) are uncertain.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

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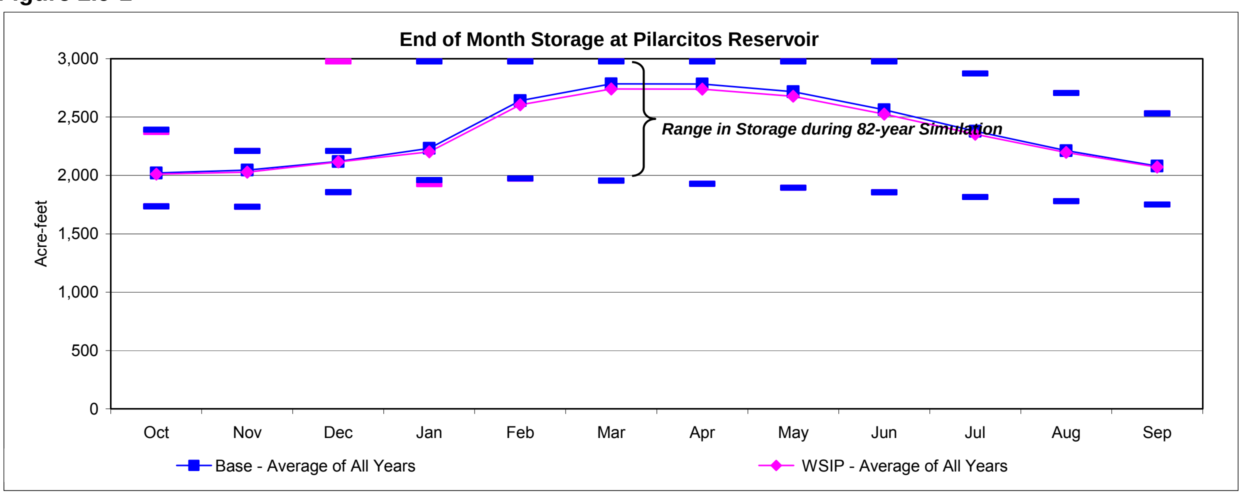
[2] See "Analysis of SFPUC Pilarcitos/Coastside County Water District Operations," Memorandum by Daniel B. Steiner, March 8, 2007.

- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

Figure 2.9-1 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings for one possible outcome of the SFPUC providing deliveries for Coastside CWD's increase in demand. Figure 2.9-2 illustrates a chronological trace of the simulation of Pilacitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in the figures are the results for the WSIP and base settings. Assumed in the operation is an increase in purchase request by Coastside CWD, distributed on a proportionate monthly pattern during the year consistent with historical SFPUC deliveries. Also assumed is a conveyance constraint of 2 mgd to Coastside CWD from the Pilarcitos Creek source of water. When the assumed monthly purchase request of Coastside CWD exceeds this conveyance constraint, Coastside CWD's request is met with deliveries from Crystal Springs Reservoir.

The effect of the assumed Coastside CWD operation in combination with the effects of the rest of the SFPUC regional system operation results in occasional differences in the storage operation of Pilarcitos Reservoir. Overall, there would be a slightly lower average storage at Pilarcitos Reservoir. Several factors contribute to the changes. Additional water is drawn from Pilarcitos Reservoir to the San Mateo Creek watershed in reaction to additional demands being served from the SFPUC system. Pilarcitos Reservoir is at times also drawn to meet the increase in demand from Coastside CWD during months (e.g., spring months) when available conveyance capacity from Stone Dam exists. Both of these additional draws from the reservoir would deplete storage below that experienced in the base setting. Pilarcitos storage would typically replenish at the expense of reservoir spills that would have occurred at a future date, and within a year storage would end the same as in the base setting, as the reservoir would still be subsequently depleted to the minimum level at the spillway crest.

Figure 2.9-1

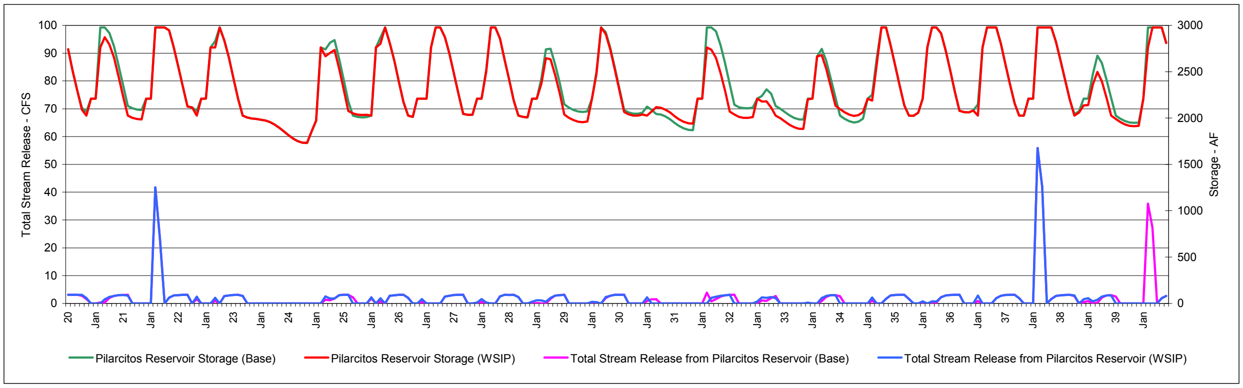


Stream releases from Pilarcitos Dam are also shown in Figure 2.9-2. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the WSIP setting and base setting are shown chronologically in Table 2.9-1 and summarized by monthly averages within year types in Table 2.9-2. The positive changes in flows during the winter and spring are indicative of the additional draw of water from the reservoir to serve the increased demand of Coastside CWD during the period when conveyance capacity exists from Stone Dam. The few reductions in flow during the summer are indicative of years when additional releases earlier in a year lead to the reservoir being depleted to minimum storage earlier in the year, thus reducing the amount of water released in a later month. Reductions in flow during the winter and spring are indicative of the reservoir replenishing additionally depleted storage associated with the WSIP setting.

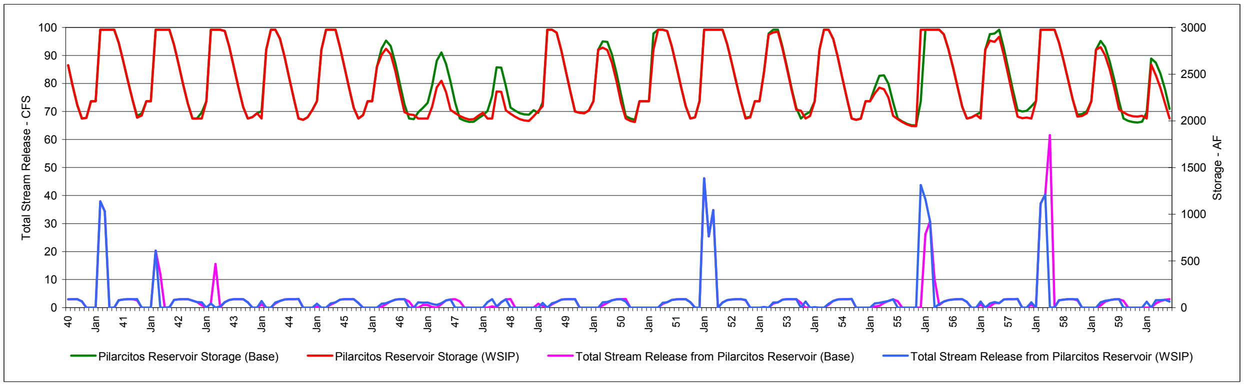
APPENDIX O1

Figure 2.9-2
Pilarcitos Reservoir Storage and Stream Release

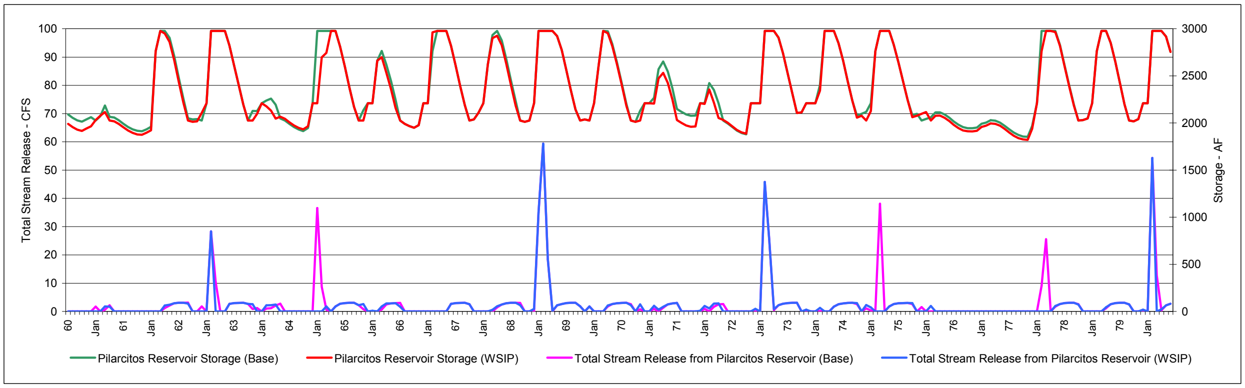
1920 - 1939



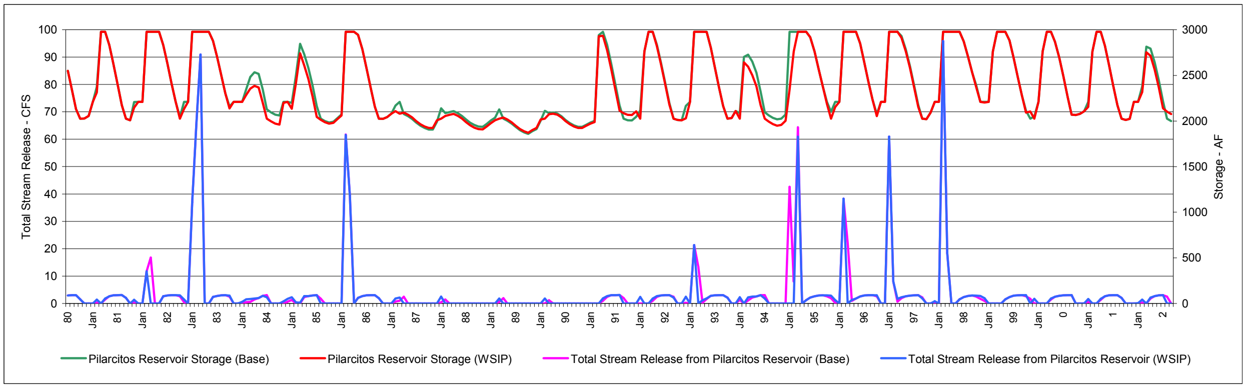
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.9-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet) WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	21	21	0	0	-21	68	21	0	0	0	-15	0	95
1922	0	0	0	3	0	0	0	0	0	0	0	0	3
1923	0	51	0	0	0	68	0	0	0	0	0	0	119
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	75	36	0	0	0	0	-128	-18
1926	0	0	0	24	0	68	0	0	0	0	0	0	92
1927	0	0	64	0	0	0	0	0	0	0	0	0	64
1928	0	0	21	64	18	0	0	0	0	0	0	0	104
1929	0	0	37	64	58	37	21	0	0	0	0	0	217
1930	0	0	0	34	25	0	21	0	0	0	0	0	79
1931	0	0	0	79	-80	-92	0	0	0	0	0	0	-93
1932	0	0	0	0	-211	79	52	17	0	0	-187	0	-250
1933	0	0	0	40	61	68	21	-43	0	0	0	0	146
1934	0	0	15	0	0	68	21	0	0	-157	0	0	-53
1935	0	0	0	0	64	0	0	0	0	0	0	0	64
1936	0	0	0	46	0	46	21	0	0	0	0	0	113
1937	0	0	0	122	0	0	0	0	0	0	0	0	122
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	16	0	64	64	40	68	21	0	-6	-150	0	0	117
1940	0	0	0	0	-1,991	-1,677	0	0	0	0	0	0	-3,668
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	21	0	0	0	0	-734	0	0	0	0	0	0	-713
1943	0	0	64	0	0	-958	21	0	0	0	0	0	-874
1944	0	0	0	77	0	0	21	0	0	0	0	0	98
1945	0	0	0	64	0	0	21	0	0	0	0	0	85
1946	0	0	0	0	0	68	21	0	0	0	0	-128	-40
1947	0	110	48	54	61	58	21	0	0	-187	-136	0	30
1948	0	0	0	0	107	160	21	0	0	-187	0	0	101
1949	0	0	0	-83	61	0	21	0	0	0	0	0	-2
1950	0	0	0	0	0	68	21	0	0	0	-58	0	30
1951	0	0	0	0	0	0	21	0	0	0	0	0	21
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	7	0	0	0	12	0	21	0	0	0	0	0	40
1954	-104	128	0	9	0	0	21	0	0	0	0	0	54
1955	0	0	0	0	61	68	21	0	0	-137	0	0	13
1956	0	0	2,689	766	0	-624	21	0	0	0	0	0	2,851
1957	0	0	0	68	0	68	21	0	0	0	0	0	157
1958	0	0	59	0	0	0	-3,661	0	0	0	0	0	-3,602
1959	21	0	0	0	0	68	21	0	0	0	-148	0	-38
1960	0	0	0	129	0	68	21	0	-49	0	0	0	168
1961	0	0	0	-104	0	75	-30	0	0	0	0	0	-59
1962	0	0	0	0	0	0	52	17	0	0	0	-18	51
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	1	101	-74	0	61	68	21	-166	0	0	0	0	11
1965	0	0	0	-2,248	-485	68	0	0	0	0	0	0	-2,666
1966	0	110	0	15	0	68	21	0	0	-86	0	0	128
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	34	21	0	0	0	0	-49	6
1969	0	0	55	0	0	0	12	0	0	0	0	0	68
1970	0	0	0	0	0	0	21	0	0	0	0	-20	1
1971	0	106	0	0	61	40	21	0	0	0	0	0	227
1972	0	0	15	64	61	68	21	-162	0	0	0	0	67
1973	0	0	55	0	0	0	21	0	0	0	0	0	76
1974	0	37	0	0	61	0	0	0	0	0	0	0	98
1975	21	0	72	64	0	-2,341	0	0	0	0	0	0	-2,184
1976	21	0	-93	0	108	0	0	0	0	0	0	0	36
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-1,569	0	17	0	0	0	0	-2,054
1979	-10	0	0	0	0	0	21	0	0	0	0	0	11
1980	0	0	37	0	0	-783	21	0	0	0	0	0	-726
1981	0	0	0	0	61	0	21	0	0	0	0	0	82
1982	0	62	0	0	0	-1,032	0	0	0	0	0	0	-970
1983	19	62	0	0	0	0	0	0	0	0	0	0	80
1984	21	0	0	34	61	68	21	0	0	-44	0	0	160
1985	0	46	64	64	21	18	21	0	0	0	-106	0	129
1986	0	0	0	0	-12	0	0	0	0	0	0	0	-12
1987	0	0	0	0	61	68	-145	0	0	0	0	0	-16
1988	0	0	0	130	-83	0	0	0	0	0	0	0	47
1989	0	0	0	0	0	75	-116	0	0	0	0	0	-41
1990	0	0	0	0	98	-73	0	0	0	0	0	0	25
1991	0	0	0	0	0	0	52	17	0	0	0	-117	-47
1992	0	0	0	148	0	0	52	17	0	0	0	-17	201
1993	0	0	138	0	0	-820	52	17	0	0	0	0	-613
1994	-1	0	0	62	0	68	21	0	0	-75	0	0	74
1995	0	0	0	-2,620	-442	-213	0	0	0	0	0	0	-3,275
1996	21	53	64	0	0	-1,360	21	0	0	0	0	0	-1,201
1997	21	0	0	0	0	68	21	0	0	0	0	-20	90
1998	0	0	49	0	0	0	0	0	0	0	0	0	49
1999	21	62	64	0	0	0	0	0	0	0	0	0	147
2000	21	-101	104	0	0	0	21	0	0	0	0	0	45
2001	0	0	0	64	0	0	21	0	0	0	0	0	85
2002	0	0	0	6	61	0	21	0	0	0	-155	0	-67
Avg (21-02)	2	10	43	-33	-31	-132	-34	-3	-1	-12	-10	-6	-208

Table 2.9-2

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	11	188	837	2,116	1,563	19	70	152	175	183	176	5,547
Above Normal	63	44	47	15	432	102	31	117	161	181	185	169	1,546
Normal	56	9	8	34	32	32	83	143	171	183	152	116	1,018
Below Normal	52	28	9	39	23	61	126	146	164	149	96	47	940
Dry	38	7	13	59	44	79	61	56	51	7	0	0	416
All Years	53	20	53	193	522	360	64	107	141	140	124	102	1,878

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	4	8	184	-116	-28	-207	-223	0	0	0	0	-1	-380
Above Normal	6	7	27	-121	-173	-539	9	2	0	0	-1	0	-782
Normal	1	7	1	19	8	23	23	3	0	-3	-12	-11	59
Below Normal	-5	23	2	24	17	38	24	-9	0	-22	-28	-17	46
Dry	2	7	2	32	27	38	-9	-13	-3	-37	-8	0	38
All Years	2	10	43	-33	-31	-132	-34	-3	-1	-12	-10	-6	-208

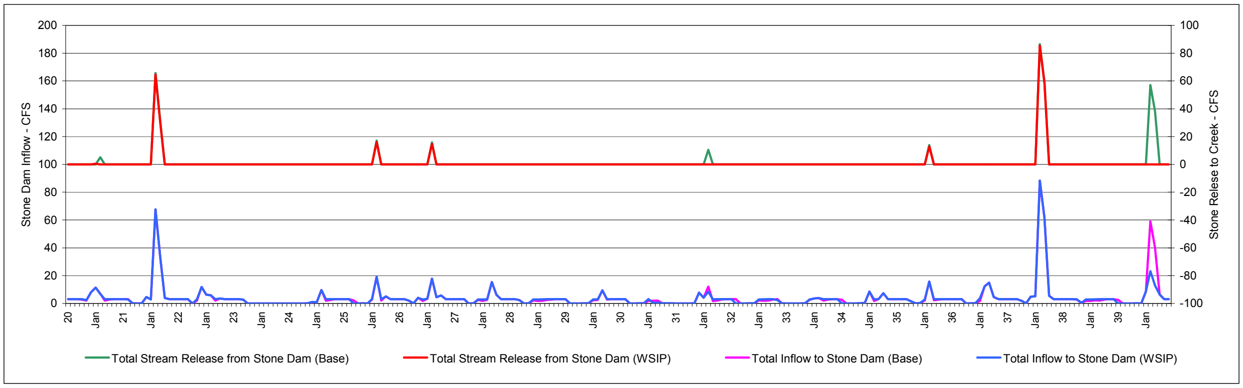
The effect of the WSIP on Pilarcitos Creek flows below Stone Dam is different than the effect on flows below Pilarictos Dam. Figure 2.9-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow occurring to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the WSIP setting and the base setting. The flow past Stone Dam is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam are typically the result of unregulated flow below Pilarcitos Dam exceeding the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed.

The changes in flow below Stone Dam would typically occur during the rainy season between the months of January and March, in at least one month during about half of the years. Table 2.9-3 summarizes the results of the WSIP and base settings in terms of average monthly flows by year type, and the average differences in flow between the two settings.

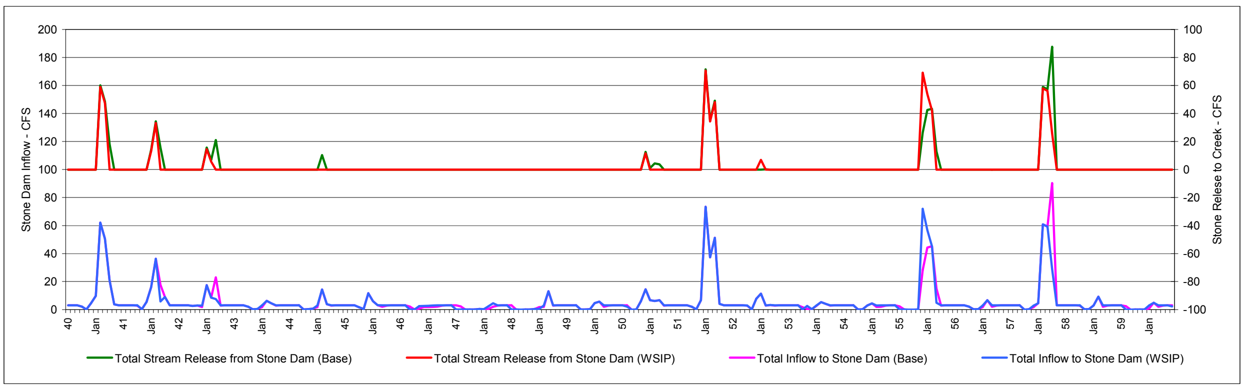
APPENDIX O1

Figure 2.9-3
Stone Dam Stream Release and Inflow

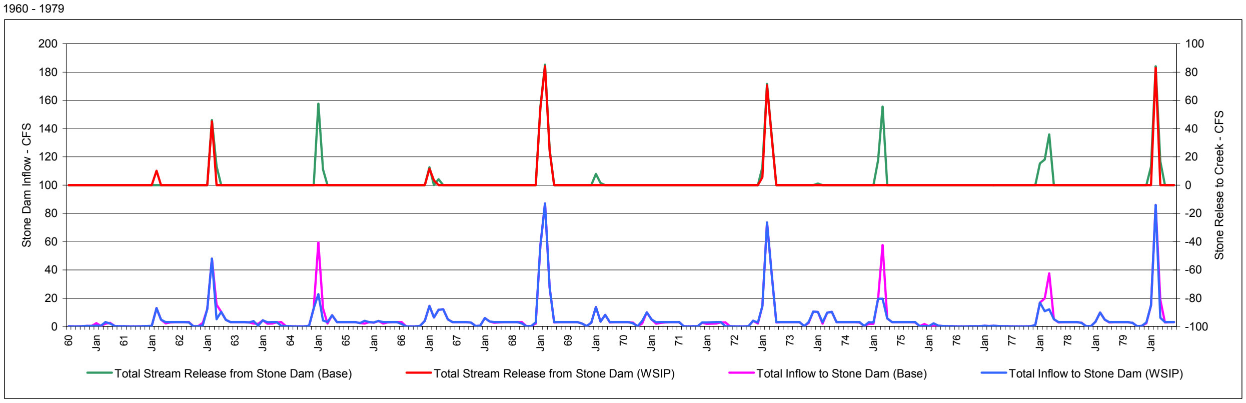
1920 - 1939



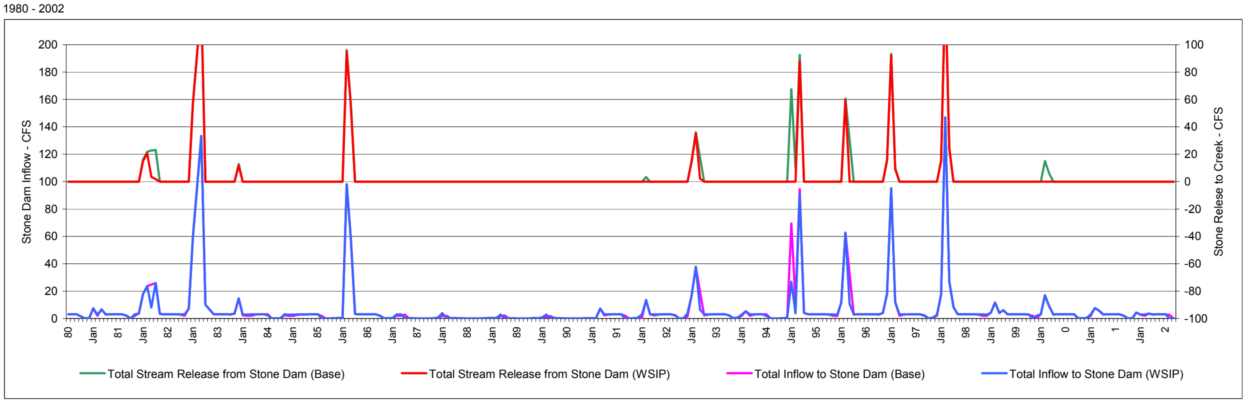
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O1

Table 2.9-3

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	324	1,493	3,176	2,188	103	0	0	0	0	0	7,282
Above Normal	0	0	42	108	734	120	0	0	0	0	0	0	1,003
Normal	0	0	45	27	135	0	0	0	0	0	0	0	208
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	319	798	452	20	0	0	0	0	0	1,669

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)

WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	160	-326	-77	-322	-377	0	0	0	0	0	-941
Above Normal	0	0	-4	-277	-440	-801	0	0	0	0	0	0	-1,522
Normal	0	0	-4	-3	-62	0	0	0	0	0	0	0	-69
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	30	-122	-118	-229	-74	0	0	0	0	0	-513

APPENDIX O2

Memorandum

Subject: **HH/LSM Assumptions and Results – CEQA Alternatives Modified WSIP**
From: **Daniel B. Steiner**
Date: **April 29, 2008**

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1. Introduction

This memorandum summarizes assumptions for, and discusses the interpretation of, the HH/LSM results for the simulation of the CEQA alternative referred to as the Modified WSIP Alternative. The Draft PEIR analyzed six CEQA alternatives: (1) No Program, (2) No Purchase Request Increase, (3) Aggressive Conservation/Water Recycling and Local Groundwater, (4) Lower Tuolumne River Diversion, (5) Year-round Desalination at Oceanside Alternative, and (6) Regional Desalination for Drought. The scenarios represent CEQA program alternatives that vary from the WSIP on key program components in a manner expected to avoid or reduce potentially significant effects of the proposed program. The Modified WSIP Alternative supplements the previously described analyses. Tables 1-1 and 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for the Modified WSIP Alternative in comparison to the modeled existing (2005) base setting (with Calaveras Reservoir constrained by DSOD restrictions) and the WSIP setting.

The hydrology that would result under this alternative is primarily discussed in terms of a comparison to the proposed program and contrasted to the baseline condition of the PEIR, namely the simulated current (2005) operation of the SFPUC regional water system assuming that the Calaveras and Crystal Springs Reservoirs operation are constrained by DSOD restrictions. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters that have been identified as key hydrologic factors that could lead to environmental impacts are illustrated.

APPENDIX O2

Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3] Modified WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030	2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT	ModWSIPLT
System Wide Parameters				
Customer Purchase Request (Demand Level)[6]	MGD	265	300	300
Demand Level Supplied from Other Sources[7]				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	10
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290	280
Average Annual Deliveries and Supplies[9]				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287	277
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10	20
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297	297
Features and Facilities[10]				
Regional Reclaimed Water/Conservation/Groundwater - SF			●	●
Regional Reclaimed Water/Conservation/Groundwater - Other				●
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish			●	●
Calaveras Reservoir Release for Fish & Flow Recapture			●	●
Alameda Creek Diversion Dam Bypass Flow & Recapture				●
Pilarcitos Reservoir Pump for Creek Summer Release				●
Crystal Springs Reservoir - 18.52 BG (Constrained)		●		
Crystal Springs Reservoir - 20.28 BG (Restricted)				●
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●	●
Sunol Valley Water Treatment Plant Expansion			●	●
Sunol Valley Water Treatment Plant Feed from SJPL			●	●
Harry Tracy Water Treatment Plant Expansion			●	●
Bay Division Pipeline Increased Conveyance			●	●
San Joaquin Pipeline Increased Conveyance			●	●
Desalination Project				
Westside Groundwater Project			●	●
Tuolumne River Transfer			**29,350 (From Storage)**	**19,600 (From Conserved Water)**
Water Supply Reliability[11]				
Action	Level	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW	GW
Rationing (Level 1)	2	10	10	10
Rationing (Level 2)	3	20	20	20
Rationing (Level 3)	4	25	25	25
	Years	Action Level	Action Level	Action Level
	1921			
	1924	2	1	1
	1925		1	1
	1926		1	1
	1929		1	1
	1930		1	1
	1931	3	2	2
	1932			
	1933			
	1934	2	1	1
	1935			
	1939			
	1944			
	1946			
	1947			
	1948		1	1
	1949			
	1950		1	
	1953			
	1954			
	1955		1	1
	1957			
	1959			
	1960	2	1	1
	1961	3	2	2
	1962			
	1964		1	1
	1966			
	1968			
	1971			
	1972		1	1
	1976	2	1	1
	1977	3	2	2
	1979			
	1981			
	1984			
	1985		1	1
	1987	2	1	1
	1988	3	2	2
	1989	3	2	2
	1990	3	3	3
	1991	3	2	2
	1992	3	3	3
	1994	2	1	1
	DD1993	4	3	3
	DD1994	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%	20%
	Historical	Incidental 20%	20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
System Wide Parameters				
Incremental Supply - Average[13]				
System Customer Purchase Request Level	MGD	265	300	300
Demand Level Supplied from Other Sources	MGD	0	10	20
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290	280
System Deliveries	MGD	258	287	277
Regional Desalination	MGD	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245	236
Inferred Local Watershed Production	MGD	37	41	40
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD		24	15
Incremental Design Drought Supply[14]				
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10	20
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7	7
Restoration of Crystal Springs Capacity[21]		0	1	0
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25	17
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6	6
Regional Desalination (26 mgd)	MGD	0	0	0
Sum of Incremental Supplies	MGD	0	48	49
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257	248
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267	268
Design Drought Delivery Calculator[15]				
	MGD			
Average Annual Delivery During	Year 1	265	290	280
Average Annual Delivery During	Year 2	239	290	280
Average Annual Delivery During	Year 3	212	261	252
Average Annual Delivery During	Year 4	212	261	252
Average Annual Delivery During	Year 5	212	232	224
Average Annual Delivery During	Year 6	212	261	252
Average Annual Delivery During	Year 7	212	232	224
Average Annual Delivery During	Year 8	199	232	224
Average Annual Delivery During	Last 6 Mo	99	116	112
	DD Ave	219	256	247
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256	247
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	5.4 - 18.52 16.6 - 56.8	5.4 - 22.15 16.6 - 68.0	5.4 - 20.28 16.6 - 62.2
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)	18.28 BG (56.1 TAF)
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG	Up to 600 cfs to not exceed 20.28 BG
Calaveras Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	8.4 - 12.4 25.7 - 38.0	8.4 - 31.5 25.7 - 96.8	Same as
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	WSIP
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300	Same as WSIP
San Andreas Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	3.0 - 6.2 9.2 - 19.0	3.0 - 6.2 9.2 - 19.0	Same as
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)	Baseline and WSIP
San Antonio Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	1.0 - 16.5 3.1 - 50.5	1.0 - 16.5 3.1 - 50.5	Same as
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)	Baseline and WSIP
Pilarcitos Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	0.66 - 0.97 2.0 - 3.0	0.66 - 0.97 2.0 - 3.0	Same as Baseline and WSIP Allowed to draw additional
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)	0.1 BG (0.3 TAF) for summer flow
Water Treatment Plants				
Sunol Valley Water Treatment Plant Maximum	MGD	120	160	Same as WSIP
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture	Same as WSIP
Sunol Valley Water Treatment Plant Minimum	MGD	20	20	Same as Baseline and WSIP
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL	Same as Baseline and WSIP
Harry Tracy Water Treatment Plant Maximum	MGD	120	140	Same as WSIP
Harry Tracy Water Treatment Plant Minimum	MGD	20	20	Same as Baseline and WSIP
Conveyance				
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar	Same as WSIP
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD	Same as WSIP

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	CEQA Alternatives[3]: Modified WSIP
Tuolumne River System Operational Parameters				
Hetch Hetchy Reservoir Operation				
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4	Same as Baseline and WSIP
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer	
1987 Stipulation Minimum Release Flows		Yes	Yes	
1987 Stipulation Supplemental Release Flows		No	No	
Cherry Reservoir Operation				
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3	Same as Baseline and WSIP
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer	
Eleanor Reservoir Operation				
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1	Same as Baseline and WSIP
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor	
New Don Pedro Water Bank Account				
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep	Same as Baseline and WSIP
Conveyance				
San Joaquin Pipelines Maximum	MGD	290	313	Same as WSIP
San Joaquin Pipelines Minimum	MGD	70	70	Same as WSIP
San Joaquin Pipelines Flow Rate Changes		11 Stepwise	17 Stepwise	Same as WSIP
		Surrogate minimum changes by allowing only 7 changes in a year	Allow up to 7 changes in a year (surrogate)	Same as WSIP
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)	Same as WSIP
			Note: Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec	
TID/MID Operational Parameters				
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR	Same as WSIP but reduced by amount of water transfer
Tuolumne River La Grange Flow Releases				
Don Pedro, 1996 FERC		X	X	X
VAMP - considered but not modeled[18]		X	X	X

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Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline		CEQA Alternatives[3]
		Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	Modified WSIP
Design Drought Production & Disposition[19]				
San Joaquin Pipeline Diversion	MGD	208.7	235.0	226.7
Bay-Area Deliveries	MGD	218.3	248.9	240.0
Added Groveland & Coastside Delivery	MGD	2.6	3.6	3.6
Local Reservoir Evaporation	MGD	10.7	12.5	12.5
Inflow from ACDD	MGD	1.3	1.6	0.7
Flow Recapture	MGD	0	5.3	5.4
Local Reservoir Stream Release	MGD	0.6	5.4	4.6
Desalination	MGD	0	0	0
Westside Basin	MGD	0	5.6	5.6
District Transfer to NDP Water Bank	MGD	0	24.7	16.5
Local Storage - Begin	MG	53,854	77,310	75,440
Local Storage - End	MG	18,403	18,495	18,644
Study Average Production & Disposition (1921-02)[20]				
Tuolumne River System				
Reservoirs				
Hetch Hetchy				
Inflow	AF	749,605	749,605	749,605
River	AF	275,255	267,021	270,577
Stream Minimum Release	AF	65,728	65,593	65,595
Tunnel	AF	470,709	478,932	475,373
Evaporation	AF	3,893	3,869	3,872
Reservoir	AF	281,938	275,235	278,130
Cherry				
Inflow	AF	279,293	279,293	279,293
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,316
River	AF	41,636	41,439	41,364
Stream Minimum Release	AF			
Tunnel	AF	352,692	352,915	353,056
Evaporation	AF	3,505	3,501	3,501
Reservoir	AF	239,971	239,309	239,182
Eleanor				
Inflow	AF	169,617	169,617	169,617
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,316
River	AF	49,171	49,148	49,106
Stream Minimum Release	AF			
Evaporation	AF	1,906	1,906	1,906
Reservoir	AF	22,191	22,191	22,191
Don Pedro Reservoir				
Inflow	AF	1,587,517	1,560,828	1,570,640
MID Diversion	AF	302,054	302,055	282,455
TID Diversion	AF	573,164	573,168	573,168
LaGrange Total Stream	AF	668,876	644,009	671,982
LaGrange Minimum Stream Release	AF	221,477	221,477	221,477
Total Evaporation	AF	43,493	42,604	43,474
Reservoir	AF	1,472,337	1,434,872	1,473,248
Water Bank Account				
Balance	AF	514,299	516,733	515,541
Transfer	AF	0	29,350	19,600
San Joaquin Pipelines				
Volume (AF)	AF	247,763	274,450	264,634
Volume (MG)	MG	80,734	89,429	86,231
Rate (MGD)	MGD	221	245	236
Max Rate (MGD)	MGD	290	313	313
Min Rate (MGD)	MGD	70	0	0
East Bay System				
Reservoirs				
Calaveras				
Inflow	MG	12,368	12,368	12,368
From ACDD	MG	1,316	1,730	1,163
Stream	MG	3,660	4,167	3,768
Stream Flow Recapture	MG	0	1,538	1,893
To SVWTP	MG	9,013	8,244	8,068
To San Antonio	MG	0	0	0
Evaporation	MG	1,023	1,704	1,710
Resevoir	MG	10,969	28,170	28,324
San Antonio				
Inflow	MG	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734	1,242
Stream	MG	991	613	805
To SVWTP	MG	1,693	2,628	1,906
Evaporation	MG	1,012	973	1,006
Resevoir	MG	15,323	14,490	15,136
Alameda Creek Diversion Dam				
Inflow	MG	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730	1,163
Spill	MG	2,881	2,467	3,034
Alameda Creek Confluence				
Accretion	MG	625	625	625
From ACDD	MG	2,881	2,467	3,034
From Calaveras Dam	MG	3,660	4,167	3,768
At Confluence	MG	7,167	7,259	7,427
Treatment Plants				
SVWTP Total	MG	13,662	15,738	15,938
From Calaveras	MG	9,013	8,244	8,068
From San Antonio	MG	1,693	2,628	1,906
From SJPL	MG	2,956	3,329	4,070
From Recapture	MG	0	1,538	1,893
SVWTP Total MGD	MGD	37	43	44
SVWTP Max MGD	MGD	120	158	158
SVWTP Min MGD	MGD	20	20	20

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Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline		CEQA Alternatives[3]
		Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	Modified WSIP
Peninsula System				
Reservoirs				
Crystal Springs				
Inflow	MG	3,722	3,722	3,722
From San Andreas	MG	0	0	0
From Pilarcitos and SJPL	MG	8,045	7,643	7,902
Stream	MG	773	325	638
Pump to San Andreas	MG	9,438	9,005	8,958
Pump to Coastside	MG	247	591	576
Evaporation	MG	1,323	1,490	1,471
Reservoir	MG	16,360	18,621	18,384
San Andreas				
Inflow	MG	1,428	1,428	1,428
From other Streams	MG	9,954	9,590	9,508
Stream	MG	0	0	0
To HTWTP	MG	10,851	10,487	10,404
Evaporation	MG	530	531	531
Reservoir	MG	5,892	5,882	5,887
Pilarcitos				
Inflow		1,297	1,297	1,297
To San Andreas	MG	516	584	550
For Stone Diversion	MG	262	280	300
Stream other than Diversion	MG	417	332	349
Evaporation	MG	103	102	101
Reservoir	MG	776	767	752
Stone Dam				
Accretion blw Pilarcitos	MG	167	211	206
Pilarcitos non-diversion Release	MG	417	332	349
Pilarcitos Release for Diversions	MG	584	543	554
Diversion to Coastside	MG	167	211	206
Diversion to Crystal Springs	MG	142	180	157
Spill past Stone	MG	860	695	746
Treatment Plants				
HTWTP Total	MG	10,851	10,487	10,404
HTWTP Total MGD	MGD	30	29	29
HTWTP Max MGD	MGD	149	106	112
HTWTP Min MGD	MGD	20	20	20
Other Facilites				
Westside Basin Net	MG	0	11	11
Desalination Input	MG	0	0	0
Additional Information				
Total Local Reservoir Stream Release	MG	5,842	5,437	5,560
Total Local Reservoir Stream Evaporation	MG	3,991	4,800	4,819
Deliveries				
In-City	MG	29,589	26,686	26,689
South Bay	MG	43,106	52,906	49,876
Crystal Springs	MG	15,120	16,931	16,638
San Andreas	MG	5,400	6,604	6,313
Coastside	MG	675	1,082	1,082
Groveland	MG	365	365	365
Total Deliveries	MG	94,255	104,574	100,963
Total Deliveries	MGD	258	287	277
Storage				
Total Local Storage Begin	MG	49,849	71,363	70,714
Total Local Storage End	MG	43,129	65,197	67,112
Residual Difference during 82-year Simulation	MGD	0.22	0.21	0.12
Westside Storage Begin	MG	0	23,474	23,474
Westside Storage End	MG	0	24,363	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03	-0.03

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<u>Notes for Table 1-1 and Table 1-2</u>

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. These scenarios represent CEQA alternatives that vary from the WSIP on key components in a manner expected to avoid or reduce potentially significant effects of the proposed program.

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030).

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants and alternatives.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the design drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of systemwide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies and does not include supplies from regional water conservation, recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change MID/TID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the MID/TID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. The HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

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2. CEQA Alternative – Modified WSIP

The Modified WSIP Alternative would implement all of the proposed WSIP facility improvement projects, but differs in that it would include measures to reduce or avoid impacts that are associated with implementing the WSIP. The measures being considered are:

- Demand reduction of an additional 10 mgd (all years) through recycled water, groundwater, and conservation projects within the wholesale customer service area
- Restricted reservoir levels at Crystal Springs Reservoir
- Bypass of an amount of flow to Alameda Creek at the Alameda Creek Diversion Dam
- Use of conserved water for the Turlock Irrigation District/Modesto Irrigation District (TID/MID) and/or other water agency transfer to the SFPUC
- Use of Pilarcitos Reservoir storage for maintenance of summer flows below Pilarcitos Dam

There would be an increase in customer demand, from 265 mgd in 2005 to 300 mgd in 2030. With the Modified WSIP Alternative, the increase would be met in part through additional water conservation, water recycling, and groundwater programs beyond those already assumed in the 2030 demand projections. A total of 10 mgd of the demand is assumed to be met through regional recycled water, groundwater, and conservation projects within the regional service area but outside of San Francisco. These projects are in addition to the 10 mgd of groundwater development, recycled water projects, and conservation in San Francisco included in the WSIP and also incorporated into this alternative. This alternative would result in an average annual net demand on the regional system of 280 mgd, compared to a net demand of 290 mgd for the WSIP setting and 265 mgd for the base setting. The net increase in water demand from the regional system would be served through additional Tuolumne River diversions, including a water transfer with the TID/MID similar to the proposed program, increased use of local watershed supplies from restoration of Calaveras Reservoir storage, water associated with restoration of Crystal Springs Reservoir, and implementation of the Westside Basin Groundwater Program.

The restricted operation of Crystal Springs Reservoir involves construction of the dam spillway at elevation 291.8 feet (modeled capacity of 21.15 billion gallons, the same as the proposed program), but operation of the reservoir with a normal maximum water surface elevation of 287.8 feet (modeled capacity of 20.28 billion gallons). The winter operation of the reservoir would provide a 2-billion-gallon storage buffer below the restricted elevation objective. This measure is intended to reduce or avoid inundation impacts of higher reservoir water surface elevations.

The Alameda Creek Diversion Dam (ACDD) bypass measure assumes the passage of up to 10 cfs or inflow, whichever is less, during the months of December through April. It is assumed that this flow to Alameda Creek below the diversion dam would be recaptured from Alameda Creek below the confluence with Calaveras Creek when the flow is utilized to meet 1997 CDFG MOU requirements. The measure is intended to reduce or avoid impacts of reducing winter and spring flows below the ACDD.

It is assumed that the transfer of water to the SFPUC would be developed through water conservation in the service areas of TID/MID and/or other water agency that would in effect reduce the TID/MID diversion of water from Don Pedro Reservoir. The measure is intended to reduce or avoid the impacts of reducing flows in the Tuolumne River below La Grange Dam.

The Pilarcitos Reservoir measure assumes the occasional use (extraction) of water from the reservoir pool below the invert of the spillway outlet at Pilarcitos Dam to maintain flow in Pilarcitos Creek below Pilarcitos Dam during July through September. The release would also maintain deliveries to Coastside CWD from the Pilarcitos Creek watershed during those months. The measure is intended to reduce or avoid the impacts associated with reduced releases to the creek during summer months.

2.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting, the regional system's sources are required to serve a net 280 mgd demand (300 mgd purchase request less 10 mgd of groundwater development, recycled water projects, and conservation and 10 mgd of programs outside of San Francisco) instead of a net 290 mgd demand.

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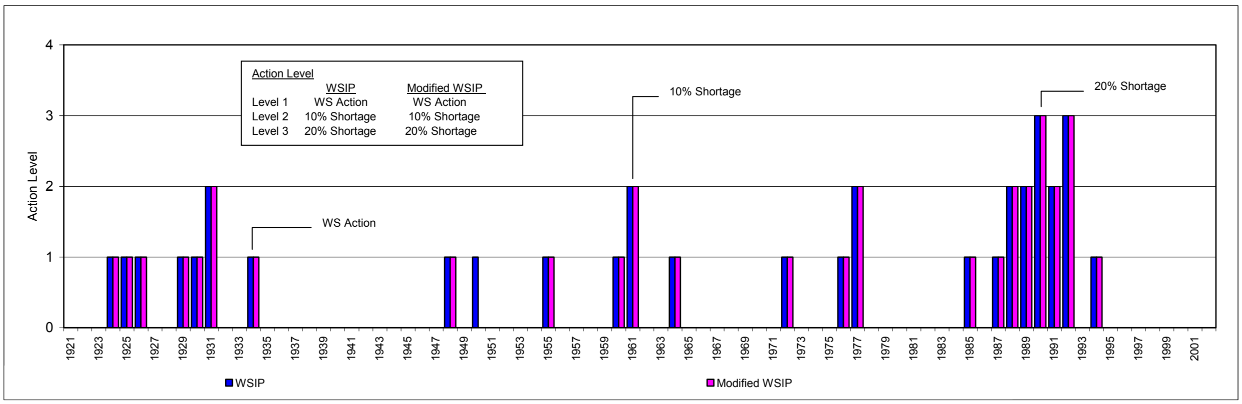
As part of the formulation of this alternative, the water transfer from TID/MID was sized to provide the same frequency and severity of water shortages (percentage-wise) for the alternative as that occurring in the WSIP setting during the design drought, although systemwide water deliveries are a net 280 mgd in the alternative setting as compared to the WSIP setting delivery of a net 290 mgd. This objective required the water transfer to be sized at 19,600 acre-feet per year compared to 29,350 acre-feet per year in the WSIP setting. Factors that change the size of the transfer include the net demand, the change in maximum storage capacity at Crystal Springs Reservoir, and reservoir evaporation. The most substantial factors are net demand and the storage at Crystal Springs Reservoir. With a water supply formulated about comparable to that provided for the WSIP setting (only proportionately smaller for a lesser demand), the implementation of rationing and the severity of rationing from the SFPUC system during drought periods would be the same. Table 1-1 illustrates the comparison of the drought response actions for the proposed program and the alternative. Figure 2.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002) for the WSIP and Modified WSIP settings.

Figure 2.1-1
Drought Response Actions – WSIP and Modified WSIP



In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both settings, the water supply action is the use of the Westside Basin Groundwater Program to supplement SFPUC water deliveries. Also occurring in both settings is the water transfer supplemental supply from TID/MID. An action level greater than “1” indicates the imposition of delivery shortages (rationing) for SFPUC customers. SFPUC customers would experience the same frequency and severity of shortages (percentage-wise) during the design drought in both settings, and the frequency of shortage in other drought periods would the same. The triggering of the Westside Basin Groundwater Program supplemental supply occurred in one less year in comparison to the proposed program.

The same form of information is shown in Figure 2.1-2 for the comparison between the alternative and the base settings. There is not a level 1 action in the base setting. Without supplemental resources, the existing system only has delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the alternative and the base settings for these action levels. During this simulation period, rationing does not need to exceed 20 percent in either setting; however, in the alternative setting, the occurrence of additional water supplies lessens the frequency and severity of water delivery shortages.

Not illustrated in Figure 2.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC design drought. During the design drought, the base setting does not have a viable operation without exceeding the 20 percent shortage level. The base setting exceeds the 20 percent shortage level (requires 25 percent rationing) during the last 18 months of the design drought. The alternative would viably provide deliveries without exceeding the 20 percent shortage level.

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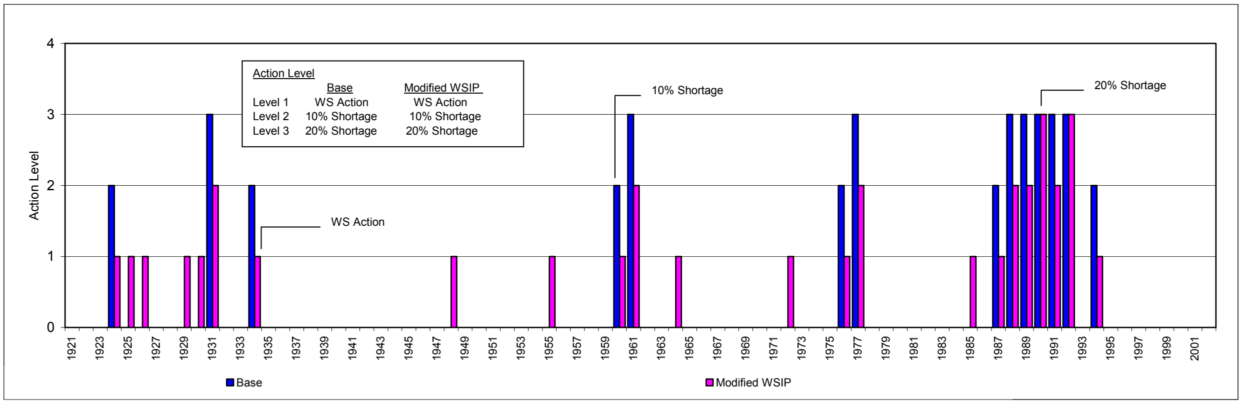
Figure 2.1-2
Drought Response Actions – Base and Modified WSIP



The difference in water deliveries between the proposed program and the alternative is shown chronologically for the 82-year simulation in Table 2.1-1. There would be less water delivered to the region by the SFPUC in all years, a result of serving a lesser net demand of 280 mgd instead of 290 mgd.

Comparing the alternative setting to the base setting, Table 2.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries under the alternative setting occur due to the increase in net demand served by the regional system (280 mgd instead of 265 mgd) and an improvement in water delivery reliability that reduces the severity of water shortages during several drought periods.

2.2 Diversions from the Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent in this alternative is a net water demand that is less than the demand served by the proposed program but greater than the demand served under the base condition. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the alternative settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the alternative and WSIP settings to minimize the drawdown of Bay Area reservoir storage. A few exceptions occur during the summer due to differences in operations for the net demand served. Overall, compared to the WSIP setting, the alternative setting would divert less water from the Tuolumne.

Table 2.2-2 illustrates the difference in diversions to the SJPL between the alternative and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. With the increase in summer diversions to the SJPL and the retention of storage in the Bay Area reservoirs, there would at times be reduced diversions during the late summer and fall as less Tuolumne water would be needed to replenish the Bay Area reservoirs. The differences in December diversions are largely the result of maintenance occurring in the alternative setting (lessening available conveyance capacity) that does not occur in the base setting. The increased diversions during the winter and spring result from the need to replenish Bay Area reservoir storage after the maintenance and then top off Bay Area reservoir storage prior to summer. There would be an overall increase in average annual diversions to the SJPL in the alternative setting associated with the increase in net demand and the improvement in water delivery reliability.

Table 2.2-3 illustrates the average monthly diversions through the SJPL by year type for the 82-year simulation for the proposed program and the alternative settings and the difference between the two settings. Table 2.2-4 shows the same information for the alternative and base settings.

APPENDIX O2

Table 2.1-1

Difference in Total System-wide Delivery (MG)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1922	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1923	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1924	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1925	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1926	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1927	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1928	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1929	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1930	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1931	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1932	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1933	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1934	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1935	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1936	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1937	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1938	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1939	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1940	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1941	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1942	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1943	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1944	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1945	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1946	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1947	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1948	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1949	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1950	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1951	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1952	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1953	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1954	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1955	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1956	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1957	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1958	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1959	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1960	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1961	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1962	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1963	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1964	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1965	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1966	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1967	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1968	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1969	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1970	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1971	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1972	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1973	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1974	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1975	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1976	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1977	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1978	-295	-234	-198	-171	-182	-242	-267	-313	-339	-415	-409	-363	-3,428
1979	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1980	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1981	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1982	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1983	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1984	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1985	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1986	-322	-252	9	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,439
1987	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1988	-322	-252	-208	-183	-193	-260	-300	-360	-390	-369	-360	-318	-3,515
1989	-295	-234	-198	-171	-182	-242	-267	-313	-339	-369	-360	-318	-3,287
1990	-295	-234	-198	-171	-182	-242	-267	-313	-339	-329	-319	-282	-3,170
1991	-260	-207	-177	-152	-168	-214	-240	-279	-297	-369	-360	-318	-3,040
1992	-295	-234	-198	-171	-182	-242	-267	-313	-339	-329	-319	-282	-3,170
1993	-260	-207	-177	-152	-168	-214	-240	-279	-297	-415	-409	-363	-3,182
1994	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1995	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1996	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1997	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1998	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
1999	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2000	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2001	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
2002	-322	-252	-208	-183	-193	-260	-300	-360	-390	-415	-409	-363	-3,656
Avg (21-02)	-319	-250	-204	-181	-192	-258	-296	-354	-384	-410	-403	-358	-3,608

APPENDIX O2

Table 2.1-2

Difference in Total System-wide Delivery (MG) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1922	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1923	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1924	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1925	1,305	946	686	512	676	1,017	1,284	1,576	618	730	686	577	10,613
1926	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1927	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1928	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1929	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1930	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1931	488	359	253	191	244	349	427	547	618	1,640	1,587	1,392	8,095
1932	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	729	686	577	11,943
1933	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1934	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1935	1,305	946	686	512	676	1,017	1,284	1,576	618	729	686	577	10,613
1936	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1937	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1938	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1939	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1940	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1941	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1942	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1943	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1944	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1945	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1946	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1947	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1948	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1949	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1950	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1951	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1952	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1953	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1954	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1955	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1956	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1957	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1958	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1959	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1960	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1961	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1962	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	729	686	577	11,943
1963	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1964	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1965	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1966	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1967	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1968	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1969	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1970	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1971	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1972	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1973	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1974	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1975	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1976	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,807
1977	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1978	1,253	1,025	876	777	824	1,067	1,212	1,408	-602	729	686	577	9,832
1979	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1980	488	359	253	191	244	349	427	547	618	730	686	577	5,468
1981	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1982	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1983	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1984	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1985	488	359	253	191	244	349	427	547	618	730	686	577	5,469
1986	488	359	9	191	244	349	427	547	618	729	686	577	5,224
1987	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1988	1,305	946	686	512	676	1,017	1,284	1,576	1,760	1,640	1,587	1,392	14,381
1989	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	1,640	1,587	1,392	14,569
1990	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	556	526	451	11,483
1991	385	302	226	185	213	289	346	430	478	1,640	1,587	1,392	7,473
1992	1,253	1,025	876	777	824	1,067	1,212	1,408	1,508	556	526	451	11,483
1993	385	302	226	185	213	289	346	430	-1,632	729	686	577	2,736
1994	488	359	253	191	244	349	427	547	618	1,932	1,853	1,546	8,806
1995	1,305	946	686	512	676	1,017	427	547	618	729	686	577	8,727
1996	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1997	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1998	488	359	253	191	244	349	427	547	618	729	686	577	5,468
1999	488	359	253	191	244	349	427	547	618	729	686	577	5,468
2000	488	359	253	191	244	349	427	547	618	729	686	577	5,468
2001	488	359	253	191	244	349	427	547	618	730	686	577	5,468
2002	488	359	253	191	244	349	427	547	618	730	686	577	5,469
Avg (21-02)	601	449	327	258	317	449	535	670	670	880	833	704	6,693

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Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-952	-1,841	0	0	0	-952	0	0	0	0	0	0	-3,745	-3,745
1922	-5,708	-2,762	-1,903	0	0	0	-5,524	0	0	0	0	0	-15,897	-15,897
1923	-2,854	0	0	0	0	-1,047	-3,038	0	0	0	0	0	-6,939	-6,939
1924	-3,805	-921	-1,902	-1,903	-1,719	0	0	0	0	0	0	0	-10,250	-10,250
1925	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	-3,901	-9,452	0	-4,880	0	0	0	0	-1,197	-19,430	-18,233
1927	-4,757	-1,841	-952	-952	0	-3,805	-3,683	0	0	0	0	0	-15,990	-17,187
1928	-1,047	-921	0	0	0	-3,045	-5,524	0	0	0	0	0	-10,537	-10,537
1929	-1,807	-1,841	0	0	0	0	0	0	0	0	0	0	-3,648	-3,648
1930	-1,237	0	0	0	0	0	0	0	0	0	0	0	-1,237	-1,237
1931	0	-2,854	0	-5,803	-5,242	0	0	0	0	0	0	-4,880	-18,779	-13,899
1932	-5,708	-2,762	-1,903	-1,903	0	-1,902	-2,118	-3,140	-3,038	0	0	0	-22,474	-27,354
1933	476	0	0	-1,902	-1,719	0	0	0	0	0	0	0	-3,145	-3,145
1934	0	0	-2,949	-2,854	-2,578	0	0	0	0	0	0	0	-8,381	-8,381
1935	-1,237	0	0	0	0	0	-1,197	-2,189	-2,118	0	0	0	-6,741	-6,741
1936	-5,043	-4,603	0	-2,854	0	-2,949	-2,118	0	0	0	0	0	-17,567	-17,567
1937	-3,806	-1,841	-1,902	0	0	-951	-4,604	0	0	0	0	0	-13,104	-13,104
1938	-1,903	0	0	-1,903	0	0	-4,603	-1,237	-1,197	0	0	0	-10,843	-10,843
1939	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	-5,328	-5,709	-5,524	-1,237	-1,197	0	0	0	-18,995	-18,995
1941	0	0	0	0	0	0	0	-952	-921	0	0	0	-1,873	-1,873
1942	-1,332	0	-1,712	0	0	0	-5,524	0	0	0	0	0	-8,568	-8,568
1943	-1,903	-1,841	0	0	0	-1,142	-3,867	-1,237	-1,197	0	0	0	-11,187	-11,187
1944	-1,902	0	-952	0	0	-2,949	0	0	0	0	0	0	-5,803	-5,803
1945	-4,281	0	0	0	-4,297	0	0	0	0	0	0	0	-8,578	-8,578
1946	-5,043	-2,762	0	0	0	0	0	0	0	0	0	0	-7,805	-7,805
1947	-5,708	-4,603	-952	-1,903	-1,719	0	0	0	0	0	0	0	-14,885	-14,885
1948	-1,237	-1,013	0	-4,756	-2,578	0	0	0	0	0	0	0	-9,584	-9,584
1949	-2,189	-1,013	-3,806	-1,903	-1,719	-2,854	-2,578	-1,237	-1,197	0	0	0	-18,496	-18,496
1950	-1,903	0	0	0	0	0	0	0	0	0	0	0	-1,903	-1,903
1951	0	-3,683	0	0	0	-4,757	-1,197	-1,237	-1,197	0	0	0	-12,071	-12,071
1952	-2,949	-921	-2,663	0	0	0	-5,524	-1,237	-1,197	0	0	0	-14,491	-14,491
1953	-1,902	0	0	0	0	-2,949	0	-1,237	-1,197	0	0	0	-7,285	-7,285
1954	-2,949	-921	-952	0	-860	-1,047	-2,578	0	0	0	0	0	-9,307	-9,307
1955	-3,805	0	0	0	0	0	0	0	0	0	0	0	-3,805	-3,805
1956	0	0	0	0	0	0	-2,578	-1,237	-1,197	0	0	0	-5,012	-5,012
1957	-1,047	-921	-1,902	-1,903	0	0	0	0	0	0	0	0	-5,773	-5,773
1958	-2,759	-2,762	0	-2,855	0	0	0	-1,047	-1,013	0	0	0	-10,436	-10,436
1959	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1960	-3,140	0	0	0	0	0	0	0	0	0	0	0	-3,140	-3,140
1961	0	0	0	-1,047	-3,523	0	0	0	0	0	0	-4,880	-9,450	-4,570
1962	-6,945	-5,616	-952	-3,805	-1,031	-2,854	-2,118	-3,996	-3,867	0	0	0	-31,184	-36,064
1963	1,807	-1,841	0	0	0	-1,902	-5,524	-1,902	-1,841	0	0	0	-11,203	-11,203
1964	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1965	0	0	0	-5,708	-5,156	0	-8,286	0	0	0	0	0	-19,150	-19,150
1966	-1,047	0	0	-1,903	-1,719	0	0	0	0	0	0	0	-4,669	-4,669
1967	0	-3,775	-4,756	0	0	0	-6,445	-952	-921	0	0	0	-16,849	-16,849
1968	-1,237	0	0	0	0	0	0	0	0	0	0	0	-1,237	-1,237
1969	-3,996	-4,603	-1,903	0	0	-951	-4,880	0	0	0	0	0	-16,333	-16,333
1970	-952	0	0	-1,903	-1,719	-1,047	0	0	0	0	0	0	-5,621	-5,621
1971	-4,281	-1,841	0	0	0	0	0	0	0	0	0	0	-6,122	-6,122
1972	0	-5,616	-4,757	-1,903	-1,719	0	0	0	0	0	0	0	-13,995	-13,995
1973	-1,237	-3,775	0	0	0	0	-4,880	-1,237	-1,197	0	0	0	-12,326	-12,326
1974	0	0	0	0	0	-6,659	-4,603	-1,237	-1,197	0	0	0	-13,696	-13,696
1975	0	0	0	0	-1,719	-1,142	-5,524	-1,237	-1,197	0	0	0	-10,819	-10,819
1976	-952	0	0	0	0	0	0	0	0	0	0	0	-952	-952
1977	0	-1,013	-4,756	-2,855	-2,578	0	0	0	0	1,902	1,902	1,841	-5,557	-11,202
1978	1,902	2,762	0	-3,045	-5,156	-10,464	-7,365	-1,047	-1,013	0	0	0	-23,426	-17,781
1979	0	-921	-1,902	0	0	-1,902	0	0	0	0	0	0	-4,725	-4,725
1980	-3,996	0	0	-2,855	0	-4,947	-2,578	0	0	0	0	0	-14,376	-14,376
1981	-1,902	-921	0	-1,902	-1,718	0	0	0	0	0	0	0	-6,443	-6,443
1982	-5,043	-3,682	-1,902	0	0	0	0	-1,902	-1,841	0	0	0	-14,370	-14,370
1983	0	0	-951	0	0	0	-4,787	-1,903	-1,841	0	0	0	-9,482	-9,482
1984	0	-921	0	0	0	0	0	0	0	0	0	0	-921	-921
1985	-2,189	0	0	0	0	0	0	0	0	0	0	0	-2,189	-2,189
1986	0	0	9	-2,949	-3,437	-7,610	-8,286	-1,237	-1,197	0	0	0	-24,707	-24,707
1987	0	-921	-1,902	0	0	0	0	0	0	0	0	0	-2,823	-2,823
1988	0	-1,013	0	-4,756	-2,578	0	0	0	0	0	0	-4,880	-13,227	-8,347
1989	-1,902	-1,841	-1,903	0	0	0	0	-2,664	-2,578	-1,237	-1,427	0	-13,552	-15,768
1990	0	0	0	0	0	0	0	0	0	-3,996	-2,854	-1,841	-8,691	-2,664
1991	0	-1,841	-523	0	0	-2,854	-4,880	-1,902	-1,841	-1,237	951	921	-13,206	-22,532
1992	1,902	-921	-1,903	0	0	-1,902	-2,118	-3,140	-3,038	-1,047	1,902	1,841	-8,424	-10,485
1993	1,903	-1,841	-523	0	0	0	-5,524	-952	-921	0	0	0	-7,858	-5,162
1994	0	-921	0	-1,903	-1,719	0	0	0	0	0	0	0	-4,543	-4,543
1995	-1,237	0	0	-4,947	-4,468	0	-7,365	-856	-829	0	0	0	-19,702	-19,702
1996	0	-921	0	0	0	0	-2,118	0	0	0	0	0	-3,039	-3,039
1997	-3,805	-921	0	0	0	0	0	0	0	0	0	0	-4,726	-4,726
1998	-3,140	-3,683	0	0	0	-951	-6,444	-1,047	-1,013	0	0	0	-16,278	-16,278
1999	-1,902	0	-952	0	0	-1,903	-7,365	0	0	0	0	0	-12,122	-12,122
2000	-1,902	0	0	0	-860	-2,854	0	0	0	0	0	0	-5,616	-5,616
2001	-3,806	-2,762	0	-952	0	-3,901	0	0	0	0	0	0	-11,421	-11,421
2002	-3,806	-921	-1,903	-1,902	-1,718	0	0	0	0	0	0	0	-10,250	-10,250
Avg (21-02)	-1,600	-1,155	-682	-995	-952	-1,096	-2,046	-542	-524	-68	6	-159	-9,815	-9,815

APPENDIX O2

Table 2.2-2

Difference in Total San Joaquin Pipeline (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-952	-2,762	0	0	0	11,416	2,118	2,189	2,118	2,189	2,189	2,118	20,623	23,385
1922	-4,756	-921	-3,805	952	0	0	1,841	5,043	4,880	2,189	2,189	2,118	9,730	9,730
1923	-2,854	-2,762	0	0	0	14,270	-920	2,189	2,118	2,189	2,189	2,118	18,537	18,537
1924	-4,756	-921	0	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,614	7,614
1925	2,189	-19,334	-19,979	5,803	17,272	11,512	2,118	2,189	2,118	2,189	2,189	2,118	10,384	10,384
1926	5,043	5,616	-7,088	1,902	0	15,317	0	2,189	2,118	2,189	2,189	921	30,396	31,593
1927	-2,854	-2,762	-952	3,805	0	2,854	-921	2,189	2,118	2,189	2,189	2,118	9,973	8,776
1928	1,902	-921	-2,331	3,805	4,297	2,663	-921	2,189	2,118	2,189	2,189	2,118	19,297	19,297
1929	2,949	0	1,902	1,902	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	27,195	27,195
1930	952	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	2,118	1,413	1,413
1931	2,189	2,762	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	1,841	16,310	16,587
1932	2,854	0	3,805	3,805	0	13,510	2,762	3,805	3,683	2,189	2,189	2,118	40,720	40,443
1933	-475	0	-7,088	5,709	5,156	5,803	2,118	2,189	2,118	2,189	2,189	2,118	22,026	22,026
1934	2,189	5,616	2,854	3,805	3,437	5,803	2,118	2,189	2,118	2,189	2,189	2,118	36,625	36,625
1935	3,806	-19,334	-19,979	19,122	17,272	10,560	8,286	5,708	5,524	2,189	2,189	2,118	37,461	37,461
1936	-2,854	0	-7,088	4,757	0	12,368	0	2,189	2,118	2,189	2,189	2,118	17,986	17,986
1937	0	0	0	3,805	0	0	1,841	5,043	4,880	2,189	2,189	2,118	22,065	22,065
1938	0	0	0	3,805	0	0	921	3,806	3,683	2,189	2,189	2,118	18,711	18,711
1939	-1,902	-921	-2,855	2,854	2,578	5,803	2,118	2,189	2,118	2,189	2,189	2,118	18,478	18,478
1940	2,189	-19,334	-19,979	15,317	2,406	7,610	2,762	3,806	3,683	2,189	2,189	2,118	4,956	4,956
1941	-1,902	-921	0	0	0	0	0	0	0	2,189	2,189	2,118	3,673	3,673
1942	1,047	0	-2,854	0	0	2,663	0	2,854	2,762	2,189	2,189	2,118	12,968	12,968
1943	0	-2,762	-7,088	0	0	2,663	2,854	952	921	2,189	2,189	2,118	4,036	4,036
1944	0	-921	-952	1,902	7,046	12,368	2,118	2,189	2,118	2,189	2,189	2,118	32,364	32,364
1945	-4,756	-19,334	-19,979	5,803	9,452	15,317	2,118	2,189	2,118	2,189	2,189	2,118	-576	-576
1946	0	-921	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	22,560	22,560
1947	-4,756	-2,762	-952	-2,855	1,718	10,560	2,118	2,189	2,118	2,189	2,189	2,118	13,874	13,874
1948	952	4,603	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	17,191	17,191
1949	0	4,603	-952	-2,855	-2,578	-952	-460	952	921	2,189	2,189	2,118	5,175	5,175
1950	1,902	-19,334	-19,979	16,459	16,413	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,185	14,185
1951	2,189	3,682	0	0	0	3,805	921	952	921	2,189	2,189	2,118	18,966	18,966
1952	0	-921	-951	0	0	0	3,682	952	921	2,189	2,189	2,118	10,179	10,179
1953	0	-921	0	0	0	12,368	2,118	952	921	2,189	2,189	2,118	21,934	21,934
1954	-4,756	-921	-952	2,854	4,468	9,513	-460	2,189	2,118	2,189	2,189	2,118	20,549	20,549
1955	-4,756	-19,334	-15,222	16,459	14,866	5,803	2,118	2,189	2,118	2,189	2,189	2,118	10,737	10,737
1956	2,189	5,616	0	0	0	2,663	-460	952	921	2,189	2,189	2,118	18,377	18,377
1957	1,902	-921	0	1,902	7,046	10,560	2,118	2,189	2,118	2,189	2,189	2,118	33,410	33,410
1958	-1,807	0	-7,088	6,659	0	0	0	0	0	2,189	2,189	2,118	4,260	4,260
1959	0	-921	0	2,854	0	15,317	2,118	2,189	2,118	2,189	2,189	2,118	30,171	30,171
1960	-951	-19,334	-19,979	5,803	10,398	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-5,339	-5,339
1961	2,189	5,616	-7,088	4,756	6,015	5,803	2,118	2,189	2,118	2,189	5,043	4,603	35,551	30,212
1962	2,854	4,603	3,805	0	2,406	15,221	5,524	3,901	3,775	2,189	2,189	2,118	48,585	53,924
1963	4,756	0	-7,088	0	0	5,708	0	0	0	2,189	2,189	2,118	9,872	9,872
1964	2,189	-921	0	7,611	6,875	5,803	2,118	2,189	2,118	2,189	2,189	2,118	34,478	34,478
1965	2,189	-19,334	-14,270	0	0	11,512	4,603	952	921	2,189	2,189	2,118	-6,931	-6,931
1966	1,902	-2,762	-1,379	7,801	7,046	5,803	2,118	2,189	2,118	2,189	2,189	2,118	31,332	31,332
1967	2,189	1,841	-7,611	0	0	0	0	-952	-921	2,189	2,189	2,118	1,042	1,042
1968	952	0	-7,088	8,562	7,734	5,803	2,118	2,189	2,118	2,189	2,189	2,118	28,884	28,884
1969	-1,807	0	-2,855	0	0	0	2,762	2,189	2,118	2,189	2,189	2,118	8,903	8,903
1970	-952	-19,334	-19,979	10,464	9,452	18,075	2,118	2,189	2,118	2,189	2,189	2,118	10,647	10,647
1971	-1,902	-2,762	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	2,118	18,817	18,817
1972	2,189	0	-4,757	-2,855	1,718	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,019	15,019
1973	952	1,841	-7,088	0	0	0	1,841	952	921	2,189	2,189	2,118	5,915	5,915
1974	1,902	0	0	0	0	3,805	0	3,806	3,683	2,189	2,189	2,118	19,692	19,692
1975	-1,902	-19,334	-19,979	11,512	3,437	2,663	2,762	3,806	3,683	2,189	2,189	2,118	-6,856	-6,856
1976	-2,854	-921	-7,088	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,861	7,861
1977	5,043	4,603	0	-2,855	-2,578	5,803	2,118	2,189	2,118	-2,854	0	9,206	22,793	22,937
1978	9,513	1,841	-2,854	2,663	0	0	4,787	4,756	4,603	2,189	2,189	2,118	31,805	31,661
1979	-2,854	-921	0	2,854	0	9,514	2,118	2,189	2,118	2,189	2,189	2,118	21,514	21,514
1980	1,047	-19,334	-15,222	10,464	0	2,663	2,302	2,189	2,118	2,189	2,189	2,118	-7,277	-7,277
1981	0	-921	-7,088	5,708	5,156	11,512	2,118	2,189	2,118	2,189	2,189	2,118	27,288	27,288
1982	-2,854	-4,603	-1,902	0	0	0	0	0	0	2,189	2,189	2,118	-2,863	-2,863
1983	1,047	-2,762	0	0	0	0	0	2,854	2,762	2,189	2,189	2,118	10,397	10,397
1984	952	-5,524	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	2,118	14,152	14,152
1985	0	-19,334	-19,979	10,560	9,538	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-491	-491
1986	2,189	5,616	9	2,854	0	0	-921	3,806	3,683	2,189	2,189	2,118	23,732	23,732
1987	0	-921	0	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	2,118	15,992	15,992
1988	5,043	4,603	-7,088	5,709	5,156	5,803	2,118	2,189	2,118	2,189	2,189	4,603	34,632	32,147
1989	2,854	0	2,854	2,854	2,578	5,803	2,118	2,379	2,302	3,806	2,379	7,365	37,292	32,723
1990	6,659	-19,334	-15,222	10,560	9,538	5,803	2,118	2,189	2,118	1,047	1,902	4,603	11,981	17,979
1991	3,805	-2,762	-2,854	0	0	7,611	0	952	921	952	4,756	2,762	16,143	15,225
1992	1,902	3,682	1,902	952	2,406	16,173	4,603	3,805	3,683	0	0	3,682	42,790	47,578
1993	3,805	-2,762	-1,902	0	0	0	-921	1,902	1,841	2,189	2,189	2,118	8,459	5,645
1994	-2,854	-921	0	-2,855	8,593	5,803	2,118	2,189	2,118	2,189	2,189	2,118	20,687	20,687
1995	3,806	-19,334	-19,979	2,663	2,406	0	1,841	1,047	1,013	2,189	2,189	2,118	-20,041	-20,041
1996	1,902	-921	-2,331	0	0	0	2,762	5,043	4,880	2,189	2,189	2,118	17,831	17,831
1997	-1,902	-921	0	0	0	10,465	2,118	2,189	2,118	2,189	2,189	2,118	20,563	20,563
1998	-951	-921	-7,088	0	0	0	4,604	2,854	2,762	2,189	2,189	4,880	10,518	7,756
1999	0	-921	-952	6,659	0	6,659	1,841	2,189	2,118	2,189	2,189	2,118	24,089	26,851
2000	0	-19,334	-19,979	15,317	6,874	13,319	2,118	2,189	2,118	2,189	2,189	2,118	9,118	9,118
2001	0	0	-7,088	6,659	8,593	11,416	2,118	2,189	2,118	2,189	2,189	2,118	32,501	32,501
2002	-2,854	-921	-3,805	4,757	4,297	10,560	2,118	2,189	2,118	2,189	2,189	2,118	24,955	24,955
Avg (21-02)	506	-3,677	-5,448	3,311	2,882	6,435	1,818	2,255	2,182	2,092	2,201	2,402	16,958	16,992

APPENDIX O2

Table 2.2-3

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,020	15,548	8,898	9,550	6,165	9,318	16,981	25,806	24,973	29,778	29,778	28,817	231,631	229,415
Above Normal	25,166	13,323	8,462	13,566	7,931	14,478	20,888	27,763	26,867	29,778	29,778	28,817	246,816	246,458
Normal	24,159	13,752	9,222	14,824	10,956	20,769	26,901	29,374	28,426	29,778	29,778	28,817	266,755	266,450
Below Normal	25,877	15,007	12,130	19,833	16,852	24,472	28,091	29,140	28,200	29,632	29,493	27,956	286,683	286,598
Dry	25,723	19,115	15,715	18,379	15,516	25,598	28,685	29,582	28,627	28,898	28,832	26,354	291,023	294,014
All Years	25,392	15,320	10,871	15,266	11,506	18,940	24,313	28,336	27,421	29,576	29,534	28,158	264,634	264,634

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-1,564	-1,214	-793	-1,516	-1,139	-1,558	-4,667	-916	-886	0	0	0	-14,252	-13,731
Above Normal	-1,768	-1,246	-437	-336	-667	-1,875	-3,287	-845	-818	0	0	0	-11,279	-11,636
Normal	-2,474	-1,335	-476	-476	-387	-1,166	-1,421	-404	-391	0	0	0	-8,529	-8,834
Below Normal	-1,690	-1,208	-870	-1,237	-1,213	-739	-726	-341	-330	-146	-28	-16	-8,544	-9,153
Dry	-488	-765	-838	-1,439	-1,353	-119	-132	-196	-190	-196	59	-800	-6,458	-5,648
All Years	-1,600	-1,155	-682	-995	-952	-1,096	-2,046	-542	-524	-68	6	-159	-9,815	-9,815

Table 2.2-4

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	26,020	15,548	8,898	9,550	6,165	9,318	16,981	25,806	24,973	29,778	29,778	28,817	231,631	229,415
Above Normal	25,166	13,323	8,462	13,566	7,931	14,478	20,888	27,763	26,867	29,778	29,778	28,817	246,816	246,458
Normal	24,159	13,752	9,222	14,824	10,956	20,769	26,901	29,374	28,426	29,778	29,778	28,817	266,755	266,450
Below Normal	25,877	15,007	12,130	19,833	16,852	24,472	28,091	29,140	28,200	29,632	29,493	27,956	286,683	286,598
Dry	25,723	19,115	15,715	18,379	15,516	25,598	28,685	29,582	28,627	28,898	28,832	26,354	291,023	294,014
All Years	25,392	15,320	10,871	15,266	11,506	18,940	24,313	28,336	27,421	29,576	29,534	28,158	264,634	264,634

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	1,166	-3,499	-5,107	1,819	150	1,706	1,582	1,844	1,784	2,189	2,189	2,291	8,115	7,757
Above Normal	151	-5,199	-6,369	4,220	1,916	5,646	1,771	2,748	2,659	2,189	2,189	2,118	14,040	14,115
Normal	-458	-5,294	-5,643	4,132	4,092	9,710	1,755	2,320	2,245	2,189	2,189	2,118	19,355	19,862
Below Normal	638	-4,327	-6,618	3,906	5,267	7,683	1,717	2,055	1,988	2,211	2,351	2,394	19,266	19,014
Dry	1,047	69	-3,372	2,384	2,895	7,403	2,273	2,290	2,216	1,666	2,076	3,107	24,053	24,265
All Years	506	-3,677	-5,448	3,311	2,882	6,435	1,818	2,255	2,182	2,092	2,201	2,402	16,958	16,992

2.3 Hetch Hetchy Reservoir and Releases

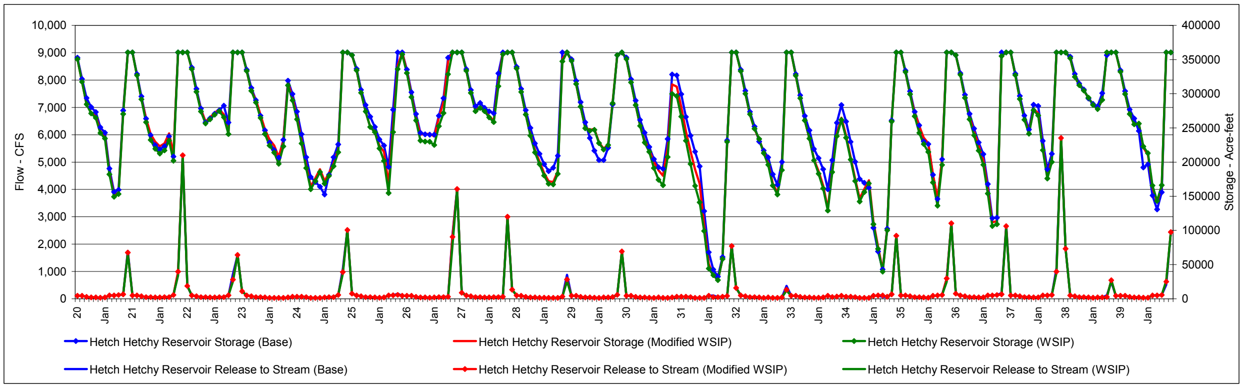
Compared to the WSIP setting, the alternative setting draws less water from the Tuolumne due to the lesser demand. This circumstance leads to less draw from Hetch Hetchy Reservoir in the alternative setting in all years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, Modified WSIP, and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (Modified WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (WSIP); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (Modified WSIP minus WSIP). Table 2.3-4 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and alternative settings.

Table 2.3-3 shows that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the alternative setting would at times (about 20 percent of the years) be greater than the storage in the WSIP setting, albeit typically less than 5,000 acre-feet more in two-thirds of those years. In about one-third of the years, storage would be greater by 5,000 acre-feet or more. The relatively minor increases in storage are attributable to years when summer diversions would be the same in both settings (SJPL operating at maximum capacity) but less water would be diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods during which the differences in underlying demand and water delivery shortages between the WSIP and alternative settings are greater.

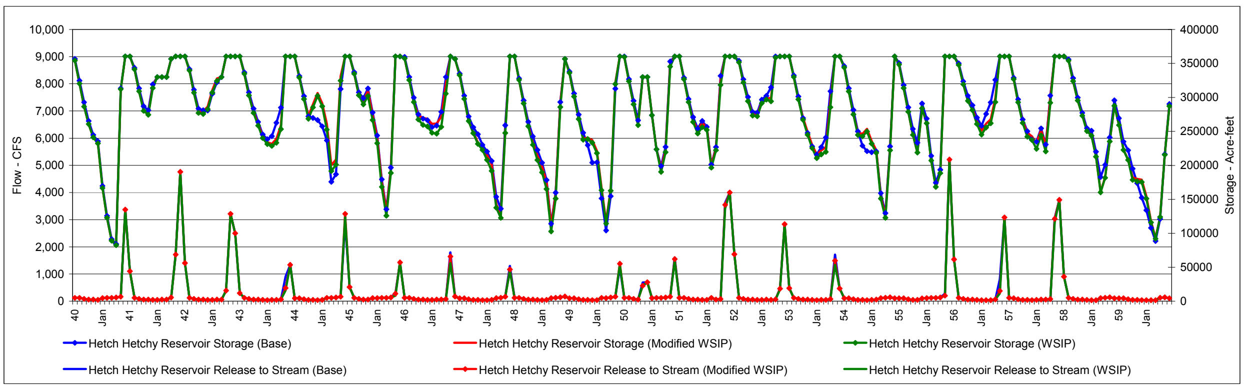
APPENDIX O2

Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

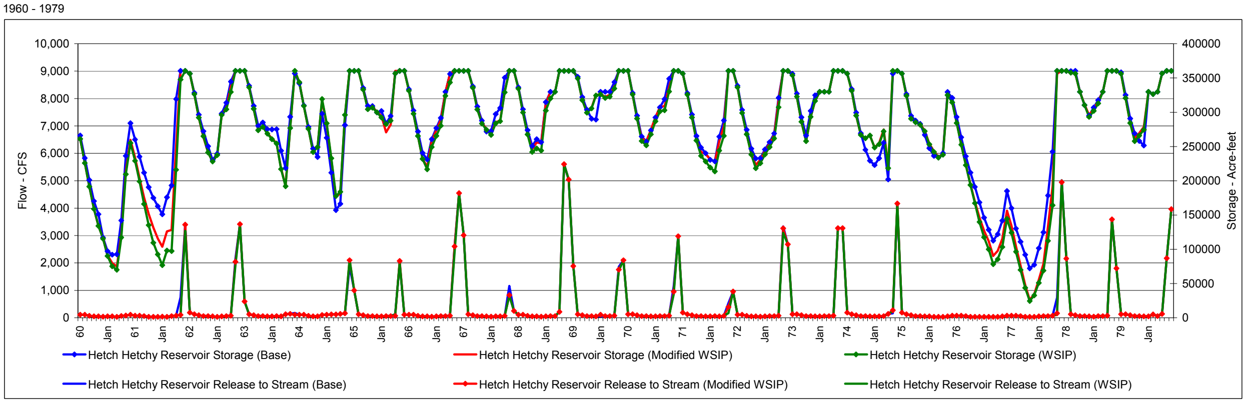
1920 - 1939



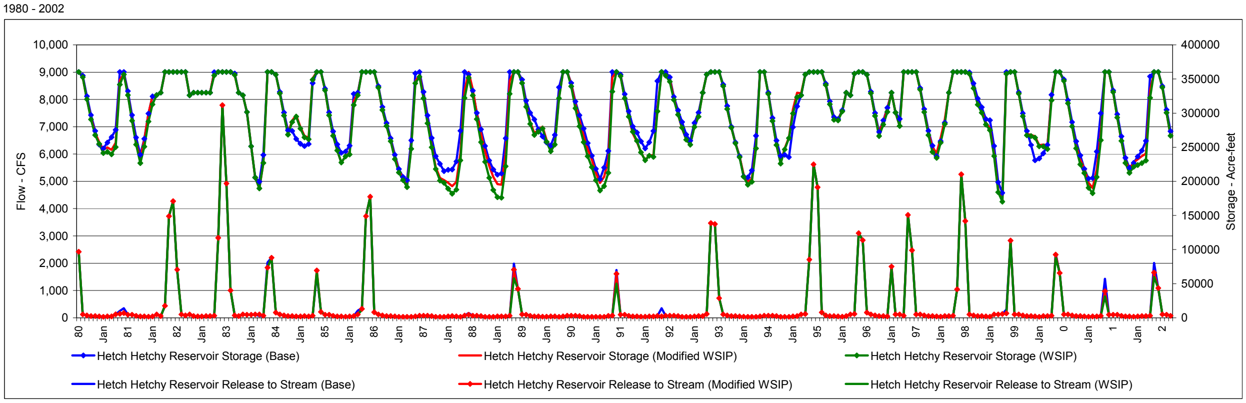
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	272,117	267,600	245,425	237,477	184,880	151,635	155,378	272,083	360,400	360,400	326,811	291,828
1922	264,009	240,850	229,925	222,889	227,355	241,931	212,244	360,400	360,400	360,400	336,082	302,853
1923	276,771	259,318	265,395	272,108	277,250	269,581	244,936	360,400	360,400	360,400	333,186	304,241
1924	291,045	269,331	247,848	232,772	224,247	207,679	230,953	316,199	294,455	266,511	231,247	195,381
1925	164,353	176,388	189,425	172,356	183,982	197,973	217,942	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	223,816	215,011	167,920	254,870	341,671	360,400	333,232	297,804	265,052
1927	240,402	240,834	241,471	237,633	265,210	288,103	348,469	360,400	360,400	360,400	333,718	301,231
1928	275,534	281,108	276,467	267,489	260,490	315,995	360,400	360,400	360,400	337,096	302,689	269,444
1929	240,564	217,758	200,750	183,877	171,934	170,901	186,458	350,991	360,400	348,102	314,426	281,237
1930	250,730	247,160	248,490	228,984	219,554	226,031	287,394	356,465	360,400	350,768	316,726	283,424
1931	252,998	231,531	217,838	200,068	188,024	180,141	221,426	313,697	310,427	280,515	245,249	215,920
1932	189,694	168,170	107,849	50,958	34,482	27,308	58,255	229,674	360,400	360,400	333,089	299,918
1933	269,682	248,173	233,407	214,696	199,250	168,700	155,172	190,490	360,400	360,400	326,593	293,382
1934	260,961	234,344	203,627	187,022	165,494	132,277	188,731	241,241	265,046	238,814	206,804	175,554
1935	146,803	160,526	173,314	112,695	76,273	42,113	101,853	260,501	360,400	360,400	331,788	299,322
1936	272,128	252,344	235,929	227,373	182,196	146,688	204,673	360,400	360,400	356,465	327,853	294,110
1937	266,299	244,805	224,465	203,469	160,719	111,931	113,680	358,909	360,400	360,400	327,212	292,471
1938	263,822	243,421	277,700	271,790	220,879	179,376	203,214	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	221,050	210,272	163,190	141,158	164,479	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	281,577	275,798	316,735	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	279,067	279,524	286,435	310,865	327,956	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	279,144	260,348	243,060	234,243	231,461	239,086	259,161	360,400	360,400	360,400	329,290	297,445
1945	272,731	289,623	306,527	291,374	261,135	200,352	208,439	331,150	360,400	360,400	334,928	303,168
1946	294,621	309,813	274,380	240,447	175,982	132,453	194,360	360,400	360,400	357,267	325,581	293,235
1947	273,292	269,800	268,501	261,131	261,603	271,410	320,357	360,400	356,592	332,847	297,991	265,329
1948	248,495	233,768	224,880	215,217	201,484	142,832	127,092	251,309	360,400	360,400	325,774	291,062
1949	259,625	233,526	214,785	198,641	175,769	111,718	158,012	291,712	356,592	336,040	301,328	268,173
1950	239,630	240,600	237,275	221,334	166,741	117,129	164,953	321,680	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	195,259	223,591	349,555	360,400	360,400	326,780	293,203
1952	266,669	250,901	262,778	255,361	199,922	225,629	326,959	360,400	360,400	360,400	351,651	322,211
1953	296,329	275,128	274,206	293,261	298,723	298,998	360,400	360,400	360,400	360,400	330,136	297,172
1954	269,967	248,958	230,167	215,472	221,810	226,543	294,921	360,400	360,400	343,956	308,827	274,943
1955	248,389	246,440	253,658	235,826	222,104	154,790	126,043	224,815	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	296,127	283,218	264,874	251,129	261,402	267,702	298,964	360,400	360,400	360,400	326,823	292,697
1958	265,056	247,735	242,715	232,722	252,235	228,728	300,531	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,939	251,438	244,519	213,789	161,220	182,310	235,602	288,072	259,627	223,044	208,219
1960	182,150	179,994	178,838	154,435	117,972	92,922	124,515	215,838	287,602	261,361	226,158	191,940
1961	159,106	134,295	115,531	91,188	79,972	74,855	121,896	214,131	259,832	233,750	203,767	175,689
1962	151,614	131,596	115,495	103,774	126,062	128,199	248,844	360,400	360,400	356,465	326,379	292,131
1963	263,237	241,315	228,196	237,544	296,171	306,227	337,046	360,400	360,400	360,400	336,396	305,026
1964	273,668	279,416	269,775	261,624	255,213	217,991	192,707	277,310	360,400	343,750	309,409	275,896
1965	241,813	249,120	317,459	282,122	231,160	175,820	182,106	294,713	360,400	360,400	360,400	333,188
1966	305,400	307,762	300,466	294,821	270,870	282,135	360,400	360,400	360,400	331,450	297,972	265,321
1967	231,906	220,533	257,784	274,012	288,947	330,000	355,978	360,400	360,400	360,400	360,400	335,768
1968	305,290	284,733	275,763	268,094	285,055	288,111	330,318	360,400	360,400	334,325	299,837	267,451
1969	246,142	255,844	254,565	312,954	330,000	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	300,247	306,610	325,386	326,065	322,564	325,562	337,435	360,400	360,400	360,400	326,016	290,760
1971	262,245	257,685	273,909	292,784	307,506	309,059	336,451	360,400	360,400	356,465	325,764	292,446
1972	258,839	241,986	238,534	231,634	227,827	258,038	279,502	360,400	360,400	336,426	299,001	267,965
1973	239,426	223,220	230,637	243,487	254,169	266,817	317,146	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	254,951	274,815	221,223	360,400	360,400	356,465	324,162	290,479
1976	286,336	282,468	273,429	254,167	243,006	234,707	239,057	325,890	315,337	285,266	253,563	223,665
1977	194,726	169,242	146,459	127,236	111,968	90,372	97,632	115,367	156,470	134,474	104,623	76,248
1978	47,981	26,093	34,215	55,672	78,891	132,593	191,898	356,465	360,400	360,400	357,869	356,406
1979	329,957	311,201	295,960	304,862	315,745	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	261,721	269,873	278,531	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	292,699	270,564	257,688	246,138	249,541	246,043	256,667	348,346	357,910	327,697	290,144	255,269
1982	233,101	260,819	299,676	324,807	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	359,897	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	270,560	289,092	297,165	279,546	266,664	263,877	351,018	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	242,290	318,179	328,413	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	259,670	235,533	215,773	204,621	194,313	250,463	346,631	356,070	324,438	287,928	252,729
1988	220,942	205,017	201,762	197,791	193,001	199,093	241,954	333,447	360,400	334,539	299,756	270,997
1989	243,894	222,400	206,450	196,014	195,062	241,083	347,606	360,400	360,400	345,211	312,004	286,902
1990	270,594	275,314	280,094	260,723	246,741	256,550	324,250	360,400	360,400	343,158	313,975	289,321
1991	266,124	247,271	231,814	212,668	197,662	206,866	231,107	352,428	360,400	355,666	321,999	294,243
1992	270,096	257,535	242,695	231,201	237,833	238,182	306,823	360,400	358,060	350,325	321,621	298,034
1993	277,178	261,430	254,452	280,385	295,700	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	256,620	236,501	209,680	199,537	203,831	252,688	360,400	360,400	328,106	288,504	253,299
1995	227,345	247,933	264,532	305,772	330,000	329,098	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	291,101	290,319	303,304	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	270,191	287,926	306,502	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	270,887	249,933	241,331	263,526	290,769	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	314,282	302,448	286,043	277,753	239,946	186,761	172,767	359,716	360,400	360,400	328,523	295,405
2000	269,417	268,330	265,806	253,104	253,852	253,003	324,308	360,400	360,400	347,257	314,429	280,432
2001	252,172	231,383	218,839	198,018	190,076	217,611	271,582	360,400	360,186	330,828	293,698	259,268
2002	230,712	217,058	227,783	232,464	236,893	240,595	332,813	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	258,433	250,236	247,365	239,541	231,061	224,148	259,518	335,006	351,584	341,888	314,659	284,123

APPENDIX O2

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

APPENDIX O2

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	952	2,792	2,793	2,794	2,796	2,452	2,073	1,736	0	0	0	0
1922	5,708	8,471	10,373	10,378	10,385	10,385	10,385	0	0	0	0	0
1923	2,855	2,854	2,854	2,856	2,858	3,904	3,904	0	0	0	0	0
1924	3,806	4,726	6,629	8,535	10,258	10,259	8,053	4,022	4,019	4,014	4,006	4,002
1925	4,000	4,000	3,999	4,002	4,005	4,005	3,527	0	0	0	0	0
1926	0	0	0	3,900	13,233	13,233	11,165	5,575	2,846	2,843	2,839	4,034
1927	8,788	10,630	11,581	12,539	12,547	16,352	20,035	0	0	0	0	0
1928	1,046	1,967	1,967	1,968	1,970	5,014	2,582	0	0	0	0	0
1929	1,808	3,649	3,649	3,651	3,654	3,653	3,653	3,651	0	0	0	0
1930	1,237	1,237	1,237	1,237	1,239	1,238	1,238	0	0	0	0	0
1931	0	2,854	2,854	8,659	13,906	13,905	13,905	13,897	13,886	13,869	13,847	18,710
1932	24,408	27,170	8,695	6,601	5	3	1	1	0	0	0	0
1933	-475	-476	-476	1,427	3,146	3,147	2,643	2,215	0	0	0	0
1934	0	0	1,029	4,127	3,890	3,275	3,275	3,273	3,270	3,264	3,258	3,254
1935	4,489	4,489	4,489	3,759	3,184	2,363	1,519	1,155	0	0	0	0
1936	5,042	9,645	9,584	12,489	12,167	10,476	8,837	0	0	0	0	0
1937	3,806	5,647	7,540	7,544	6,696	5,607	4,547	3,763	0	0	0	0
1938	1,903	1,903	1,585	3,489	3,491	3,452	3,048	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	-1,710	-2,740	-2,426	-2,042	-1,724	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0
1942	1,332	1,332	3,045	0	0	0	0	0	0	0	0	0
1943	1,903	3,744	3,744	3,746	3,747	0	0	0	0	0	0	0
1944	1,903	1,903	2,854	2,856	2,857	5,807	5,807	0	0	0	0	0
1945	4,281	4,281	4,281	4,283	8,581	8,582	7,555	6,598	0	0	0	0
1946	5,042	7,804	7,804	7,809	7,814	6,577	5,537	0	0	0	0	0
1947	5,708	10,312	11,263	13,172	14,899	14,898	14,898	0	0	0	0	0
1948	1,237	2,249	2,250	7,008	9,590	5,262	4,435	3,712	0	0	0	0
1949	2,188	3,201	7,006	8,943	10,667	8,950	7,082	5,931	0	0	0	0
1950	1,902	1,903	4,155	3,446	3,447	2,885	2,402	2,021	0	0	0	0
1951	0	0	0	0	0	4,757	4,178	4,176	0	0	0	0
1952	2,950	3,870	6,534	3,271	3,273	3,273	8,796	0	0	0	0	0
1953	1,903	1,903	1,902	1,904	1,904	4,854	1,931	0	0	0	0	0
1954	2,949	3,870	4,821	4,824	5,686	6,733	9,311	0	0	0	0	0
1955	3,805	3,805	3,806	3,808	3,810	3,810	3,217	2,694	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0
1957	1,047	1,967	3,870	5,775	5,779	5,778	5,778	0	0	0	0	0
1958	2,758	5,521	5,521	8,378	8,383	8,383	8,383	0	0	0	0	0
1959	0	920	920	922	922	921	782	391	390	390	389	388
1960	3,527	3,528	3,528	3,530	2,006	808	615	307	306	306	305	305
1961	305	305	152	1,199	4,724	4,723	4,723	4,717	4,712	4,703	4,695	9,569
1962	16,508	22,124	23,076	26,911	27,969	30,822	32,941	12,616	0	0	0	0
1963	-1,807	34	34	34	34	1,937	7,460	0	0	0	0	0
1964	0	921	920	921	922	922	844	422	0	0	0	0
1965	0	0	-1,802	-1,803	-1,804	-1,803	-1,593	-1,395	0	0	0	0
1966	1,047	1,046	524	2,426	-11,944	-5,493	3,808	0	0	0	0	0
1967	0	3,775	8,532	8,537	8,541	5,986	12,432	0	0	0	0	0
1968	1,237	1,237	1,236	1,237	1,238	1,238	1,238	0	0	0	0	0
1969	3,995	8,599	10,502	10,508	9,886	0	0	0	0	0	0	0
1970	951	951	951	0	1,718	2,765	2,765	0	0	0	0	0
1971	4,281	6,122	6,123	6,126	6,128	6,129	6,129	0	0	0	0	0
1972	0	5,616	10,372	12,281	14,008	14,007	14,007	0	0	0	0	0
1973	1,236	5,012	5,011	5,014	5,018	5,018	9,897	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,718	2,860	2,860	0	0	0	0	0
1976	951	951	951	952	952	953	953	952	952	950	949	948
1977	947	1,960	6,717	9,579	12,169	12,170	12,170	12,157	12,124	10,187	8,243	6,380
1978	4,474	1,711	1,712	4,757	9,916	20,381	27,746	-3,935	0	0	0	0
1979	0	921	2,823	2,824	2,826	0	0	0	0	0	0	0
1980	3,996	3,996	3,995	0	0	0	0	0	0	0	0	0
1981	1,903	2,823	2,823	4,728	6,449	6,449	6,449	6,446	1,318	1,316	1,315	1,314
1982	6,355	10,038	11,941	11,946	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	4,787	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0
1985	2,188	2,188	2,188	2,189	2,190	2,190	2,190	0	0	0	0	0
1986	0	0	9	2,949	6,388	2,348	0	0	0	0	0	0
1987	0	921	2,823	2,825	2,827	2,827	2,826	2,825	2,822	2,819	2,816	2,813
1988	2,812	3,824	3,825	8,583	11,166	11,166	11,166	11,159	8,669	8,659	8,649	13,521
1989	15,416	17,258	19,160	19,171	19,182	19,182	19,182	0	0	1,237	2,663	2,660
1990	2,659	2,658	2,659	2,660	2,662	2,662	2,662	0	0	3,996	6,845	8,681
1991	8,677	10,519	11,041	11,048	11,054	13,908	18,788	20,680	0	1,237	284	-637
1992	-2,540	-1,619	284	285	284	2,187	4,304	0	3,038	4,081	2,174	331
1993	-1,572	269	792	793	793	0	0	0	0	0	0	0
1994	0	921	921	2,824	4,544	4,544	4,545	0	0	0	0	0
1995	1,237	1,237	1,237	6,184	6,674	3,033	0	0	0	0	0	0
1996	0	921	920	921	0	0	0	0	0	0	0	0
1997	3,806	4,726	4,726	0	0	0	0	0	0	0	0	0
1998	3,140	6,822	6,823	6,826	6,830	0	0	0	0	0	0	0
1999	1,903	1,902	2,854	2,855	2,857	2,857	2,514	2,101	0	0	0	0
2000	1,903	1,903	1,903	1,904	2,764	5,619	5,618	0	0	0	0	0
2001	3,806	6,568	6,567	7,523	7,527	11,427	11,427	0	0	0	0	0
2002	3,805	4,726	6,629	8,535	10,259	10,258	10,259	0	0	0	0	0
Avg (21-02)	2,530	3,629	3,999	4,599	4,864	4,954	5,347	1,632	712	779	772	930

APPENDIX O2

Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	-8,294	-5,533	-5,532	-5,535	-5,538	-4,849	-4,092	-3,420	0	0	-2,188	-4,304
1922	455	1,376	5,181	4,232	4,235	4,235	4,235	0	0	0	-2,188	-4,304
1923	-1,448	1,314	1,314	1,315	1,316	-12,955	-12,955	0	0	0	-2,188	-4,304
1924	455	1,375	1,375	4,230	6,810	1,007	-1,614	-2,994	-5,109	-7,291	-9,466	-11,573
1925	-13,755	5,579	25,557	19,771	2,515	-8,996	-7,900	0	0	0	-2,188	-4,304
1926	-9,344	-14,961	-7,378	-9,285	-9,215	-25,108	-21,829	-18,729	0	-2,188	-4,374	-5,291
1927	-2,434	328	1,280	-2,525	-2,526	-5,381	-4,459	0	0	0	-2,188	-4,304
1928	-6,205	-5,285	-2,953	-6,760	-11,060	-13,724	0	0	0	-2,188	-4,373	-6,487
1929	-9,433	-9,434	-11,336	-13,245	-14,971	-20,775	-22,892	-9,409	0	-2,188	-4,374	-6,488
1930	-7,436	11,898	31,876	26,091	16,569	5,057	2,939	0	0	-2,188	-4,373	-6,488
1931	-8,673	-11,435	-4,348	-4,350	-4,352	-10,156	-12,273	-14,454	-16,560	-18,728	-20,891	-22,708
1932	-25,549	-25,549	-20,473	-17,041	-8,349	-5,112	-2,830	-2,046	0	0	-2,188	-4,304
1933	-3,826	-3,827	3,261	-2,445	-7,603	-13,405	-11,571	-9,691	0	0	-2,188	-4,304
1934	-6,490	-12,107	-15,365	-18,739	-24,113	-27,951	-14,010	-16,190	-18,288	-20,447	-22,600	-24,692
1935	-28,483	-9,149	10,830	8,685	7,072	-978	-636	-483	0	0	-2,188	-4,304
1936	-1,448	-1,448	5,685	894	895	786	664	0	0	0	-2,188	-4,304
1937	-4,302	-4,302	-4,302	-8,110	-7,189	-6,035	-5,027	-1,491	0	0	-2,188	-4,304
1938	-4,302	-4,302	-6,331	-10,139	-10,144	-10,145	-8,931	0	0	0	-2,188	-4,304
1939	-2,399	-1,479	1,375	-1,478	-4,057	-9,861	3,808	0	0	-2,188	-4,373	-6,488
1940	-8,672	10,662	29,005	13,704	12,156	10,199	8,612	0	0	-2,188	-4,374	-6,488
1941	-4,582	-3,661	-3,051	-3,053	-2,610	-2,189	-1,670	-1,249	0	0	-2,188	-4,304
1942	-5,349	-5,349	-2,494	0	0	0	0	0	0	0	-2,188	-4,304
1943	-4,302	-1,540	5,547	5,550	5,552	0	0	0	0	0	-2,188	-4,304
1944	-4,302	-3,381	-2,430	-4,334	-11,383	-23,750	-25,868	0	0	0	-2,188	-4,304
1945	455	19,789	39,767	33,983	24,548	24,549	21,607	18,887	0	0	-2,188	-4,304
1946	-4,302	-3,381	-3,382	-3,383	-3,385	-2,974	-2,520	0	0	-2,188	-4,374	-6,487
1947	-1,728	1,034	1,985	4,840	3,125	-7,436	-9,553	0	0	-2,188	-4,374	-6,487
1948	-7,435	-12,039	-4,951	-4,953	-4,956	-10,760	-9,091	-7,614	0	0	-2,188	-4,304
1949	-4,303	-8,905	-7,954	-5,080	-2,505	-2,202	-1,836	-1,533	0	-2,188	-4,374	-6,488
1950	-8,387	10,947	33,308	16,918	15,382	12,899	10,469	8,780	0	-800	-2,988	-5,103
1951	-7,289	0	0	0	0	-3,806	-3,349	-3,347	0	0	-2,188	-4,304
1952	-4,302	-3,381	-2,430	-1,216	-1,217	-1,217	-4,900	0	0	0	-2,188	-4,304
1953	-4,302	-3,381	-3,382	-3,383	-3,385	-15,752	0	0	0	0	-2,188	-4,304
1954	454	1,376	2,327	-526	-4,995	-14,508	-14,048	0	0	-2,188	-4,373	-6,487
1955	-1,728	17,606	32,828	16,389	1,532	-4,271	-3,598	-3,006	0	-2,188	-4,374	-6,488
1956	-8,673	-14,289	-6,886	-6,890	-6,894	-6,002	-5,052	0	0	0	-2,188	-4,304
1957	-6,205	-5,284	-5,284	-7,190	-14,240	-24,801	-26,918	0	0	0	-2,188	-4,304
1958	-2,495	-2,495	4,593	-2,064	-2,065	-2,065	-2,065	0	0	0	-2,188	-4,304
1959	-4,302	-3,382	-3,382	-6,237	-6,241	-21,558	-18,478	-5,383	-7,495	-9,672	-11,844	-13,948
1960	-12,988	6,346	26,325	20,542	10,165	4,457	3,400	-493	-2,610	-4,794	-6,974	-9,084
1961	-11,267	-16,883	-1,354	-6,112	-12,134	-17,938	-20,055	-22,217	-24,309	-26,458	-31,454	-36,022
1962	-38,855	-43,459	-47,263	-47,317	-49,784	-65,006	-70,529	0	0	0	-2,188	-4,304
1963	-9,059	-9,059	-1,971	-1,972	-1,973	-7,681	-7,682	0	0	0	-2,188	-4,304
1964	-6,490	-5,569	-5,570	-13,184	-20,065	-25,869	-25,869	-16,063	3,808	1,616	-574	-2,692
1965	-4,878	14,456	19,521	19,529	19,539	18,739	15,829	13,518	0	0	0	-2,118
1966	-4,019	-1,258	751	-7,050	-13,021	-12,373	3,808	0	0	-2,188	-4,373	-6,488
1967	-8,672	-10,513	-2,902	-2,904	-2,906	0	0	0	0	0	0	-2,118
1968	-3,068	-3,068	4,019	-4,541	-12,276	-18,080	-20,198	0	0	-2,188	-4,374	-6,488
1969	-4,677	-4,676	-1,822	-1,823	0	0	0	0	0	0	-2,188	-4,304
1970	-3,351	15,983	35,961	-3,935	-7,436	-4,438	-6,555	0	0	0	-2,188	-4,304
1971	-2,400	363	363	363	363	-10,197	-12,315	0	0	0	-2,188	-4,304
1972	-6,490	-6,490	-1,734	1,119	-598	-6,402	-8,519	0	0	-2,188	-4,373	-6,487
1973	-7,435	-9,276	-2,189	-2,191	-2,191	-2,191	-4,033	0	0	-2,188	-4,374	-6,487
1974	-8,388	-8,387	-8,388	0	0	0	0	0	0	0	-2,188	-4,304
1975	-2,400	16,935	36,914	25,423	22,001	19,337	19,337	3,935	0	0	-2,188	-4,304
1976	-1,448	-527	6,560	6,565	6,568	765	-1,352	-3,540	-5,654	-7,836	-10,013	-12,119
1977	-17,155	-21,758	-21,757	-18,921	-16,367	-22,170	-24,288	-26,442	-28,490	-25,577	-25,498	-34,635
1978	-44,111	-45,953	-43,099	-45,790	-45,825	-45,825	-50,612	-3,935	0	0	-2,188	-3,994
1979	-43	878	877	-1,976	-1,977	0	0	0	0	-2,188	-4,373	-6,488
1980	-7,531	11,803	27,024	0	0	0	0	0	0	0	-2,188	-4,304
1981	-4,302	-3,382	3,706	-2,000	-7,157	-18,669	-18,668	-12,054	-2,490	-4,676	-6,858	-8,970
1982	-6,110	-1,507	396	396	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	-2,118
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-4,304
1985	-4,302	15,032	35,010	24,468	14,943	9,141	7,023	0	0	-2,188	-4,374	-6,487
1986	-8,672	-14,288	9	-10,059	-10,064	-1,587	0	0	0	0	-2,188	-4,304
1987	-4,302	-3,382	-3,382	-2,432	-1,574	-7,377	-9,495	-11,677	-4,330	-6,513	-8,693	-10,803
1988	-15,839	-20,442	-13,354	-19,071	-24,236	-30,040	-32,158	-26,953	3,808	1,616	-574	-5,177
1989	-8,028	-8,028	-10,882	-13,743	-16,328	-22,131	-12,794	0	0	-3,805	-6,179	-13,540
1990	-20,193	-860	14,363	3,810	-5,725	-11,529	-13,647	0	0	-1,046	-2,948	-7,549
1991	-11,351	-8,589	-5,735	-5,738	-5,742	-13,353	-13,352	-7,972	0	-951	-5,707	-8,465
1992	-10,364	-14,046	-15,949	-16,909	-19,326	-35,498	-40,102	0	-2,340	-2,337	-2,334	-6,015
1993	-9,818	-7,056	-5,153	-5,156	-5,159	0	0	0	0	0	-2,188	-4,304
1994	-1,448	-527	-527	2,326	-6,265	-12,068	-14,186	0	0	-2,188	-4,374	-6,487
1995	-10,289	9,046	29,024	26,377	20,001	3,033	0	0	0	0	0	-2,118
1996	-4,020	-3,099	-768	-769	0	0	0	0	0	0	-2,188	-4,304
1997	-2,399	-1,478	-1,479	0	0	-10,465	0	0	0	0	-2,188	-4,304
1998	-3,350	-2,430	4,658	4,660	4,663	0	0	0	0	0	-2,188	-7,066
1999	-7,063	-6,143	-5,191	-11,853	-11,858	-11,859	-10,426	-684	0	0	-2,188	-4,304
2000	-4,302	15,032	35,011	19,714	12,851	-468	-2,586	0	0	-2,188	-4,373	-6,488
2001	-6,484	-6,484	603	-6,056	-14,652	-26,069	-28,186	0	-214	-2,402	-4,587	-6,701
2002	-3,843	-2,922	883	-3,873	-8,171	-18,732	-20,850	0	0	-2,188	-4,374	-6,488
Avg (21-02)	-7,145	-3,435	2,378	-1,115	-3,451	-8,198	-7,785	-2,292	-1,345	-2,242	-4,305	-6,672

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or higher under the alternative setting as compared to the WSIP setting. Hetch Hetchy Reservoir would fill by the end of May or June during approximately 80 percent of the years, which would prevent any difference in storage from affecting the next summer's reservoir storage. Figure 2.3-2 illustrates the difference in reservoir storage, averaged by year type, between the alternative and the WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the alternative and base settings. Immediately after filling Hetch Hetchy Reservoir (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 10,000 acre-feet. This is indicative of the same amount of water being passed through the reservoir regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage and serve a slightly greater demand. Some of this additional Hetch Hetchy Reservoir storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to less Bay Area reservoir replenishment needs and conveyance system maintenance. Average storage is incidentally about the same in November and December for the alternative and base settings due to the assumed systemwide maintenance that would occur in the alternative setting but not in the base setting. After December, the storage gain occurring in the alternative setting would again be affected as replenishment of Bay Area reservoir storage resumes. In non-wet years, there is a difference in storage between the alternative and base settings; the alternative setting results in a lower storage in the reservoir by the end of April. Figure 2.3-3 illustrates the difference in reservoir storage, averaged by year type, between the alternative and base settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the alternative would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, alternative, and base settings. Table 2.3-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally greater stream release, predominately during May or June, which is reflective of the months when releases to the stream are made in excess of minimum release requirements in anticipation of filling the reservoir. The few exceptions to this circumstance, during which incremental reductions in releases to the stream occur, are considered anomalous within the modeling and are simply the result of shifting releases from one month to the next. The increase in releases is the result of a less-depleted reservoir to replenish, which is the result of lesser SFPUC demands (and Tuolumne River diversions) between the settings.

Table 2.3-6 illustrates the difference in stream releases between the alternative and base settings. In this comparison, releases would be predominately less than depicted for the base setting, and these differences would typically occur during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wet years, leading to a reduction in stream releases during non-wet years if a release occurs. The few instances of stream flow increases are a result of a coincidence of several operational parameters affecting the release of water from the reservoir, including systemwide water demands, conveyance capacity and maintenance assumptions, and the watershed's hydrology.

Table 2.3-5 illustrates the difference in stream releases between the alternative and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-7 illustrates the same information and the average monthly stream releases for the alternative and WSIP settings, expressed in average monthly flow (cfs). Table 2.3-5 shows an increase in monthly flow below O'Shaughnessy Dam of up to approximately 20,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of

APPENDIX O2

Figure 2.3-2

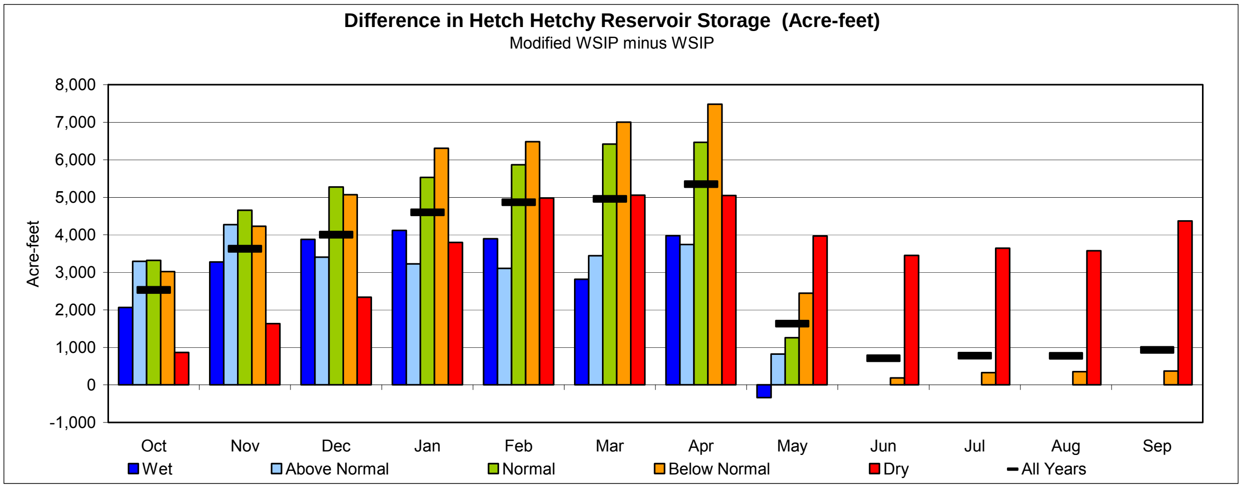


Figure 2.3-3

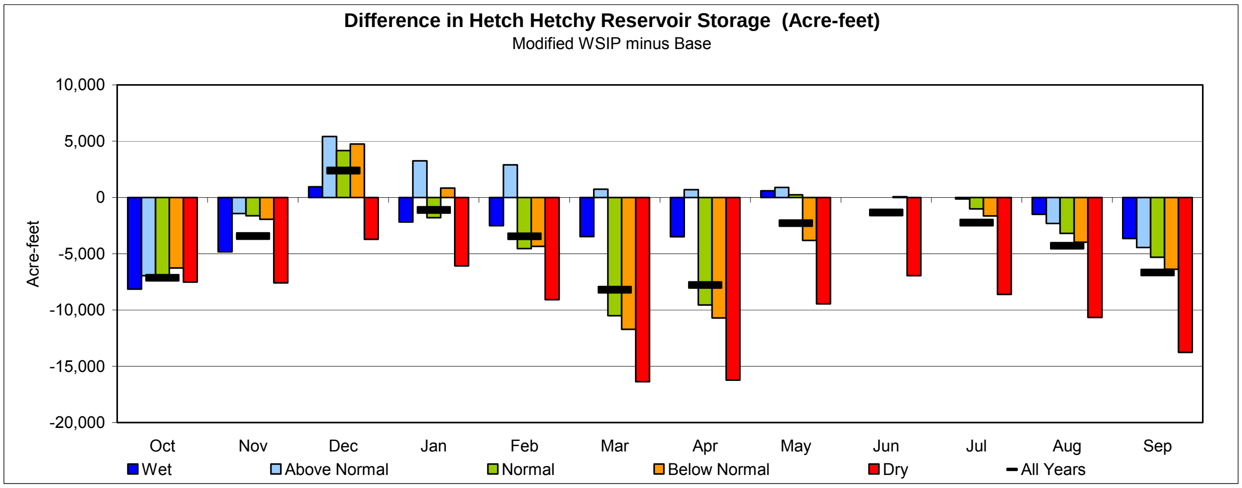
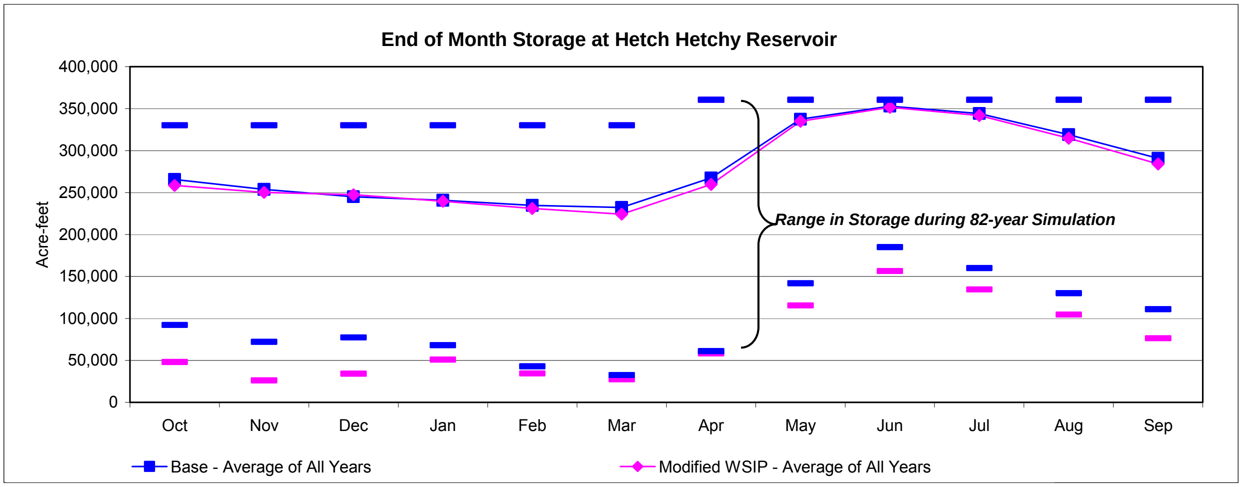


Figure 2.3-4



APPENDIX O2

Table 2.3-5

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) — Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	1,735	0	0	0	1,735
1922	0	0	0	0	0	0	0	9,066	0	0	0	0	9,066
1923	0	0	0	0	0	0	0	3,901	0	0	0	0	3,901
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	3,099	0	0	0	0	3,099
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	20,335	0	0	0	0	20,335
1928	0	0	0	0	0	0	0	2,741	0	0	0	0	2,741
1929	0	0	0	0	0	0	0	0	3,887	0	0	0	3,887
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	1	0	0	0	1
1933	0	0	0	0	0	0	0	0	1,944	0	0	0	1,944
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	1,153	0	0	0	1,153
1936	0	0	0	0	0	0	0	7,725	0	0	0	0	7,725
1937	0	0	0	0	0	0	0	0	3,992	0	0	0	3,992
1938	0	0	0	0	0	0	0	2,663	0	0	0	0	2,663
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	-1,449	0	0	0	0	-1,449
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	5,804	0	0	0	0	5,804
1945	0	0	0	0	0	0	0	0	6,593	0	0	0	6,593
1946	0	0	0	0	0	0	0	4,837	0	0	0	0	4,837
1947	0	0	0	0	0	0	0	14,892	0	0	0	0	14,892
1948	0	0	0	0	0	0	0	0	3,707	0	0	0	3,707
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	2,020	0	0	0	2,020
1951	0	0	0	0	0	0	0	0	4,451	0	0	0	4,451
1952	0	0	0	0	0	0	0	8,793	0	0	0	0	8,793
1953	0	0	0	0	0	0	0	2,049	0	0	0	0	2,049
1954	0	0	0	0	0	0	0	9,306	0	0	0	0	9,306
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	5,776	0	0	0	0	5,776
1958	0	0	0	0	0	0	0	8,379	0	0	0	0	8,379
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	13,398	0	0	0	13,398
1963	0	0	0	0	0	0	0	7,458	0	0	0	0	7,458
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	-1,394	0	0	0	-1,394
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	13,229	0	0	0	0	13,229
1968	0	0	0	0	0	0	0	1,237	0	0	0	0	1,237
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	2,764	0	0	0	0	2,764
1971	0	0	0	0	0	0	0	6,127	0	0	0	0	6,127
1972	0	0	0	0	0	0	0	14,000	0	0	0	0	14,000
1973	0	0	0	0	0	0	0	9,893	0	0	0	0	9,893
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	2,858	0	0	0	0	2,858
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	3,935	-4,171	0	0	0	-236
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	5,090	0	0	0	0	5,090
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	2,336	0	0	0	0	2,336
1986	0	0	9	0	0	0	2,349	0	0	0	0	0	2,358
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	19,424	0	0	0	0	19,424
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	21,217	0	0	0	21,217
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	4,728	0	0	0	0	0	0	0	0	4,728
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	2,228	0	0	0	2,228
2000	0	0	0	0	0	0	0	5,616	0	0	0	0	5,616
2001	0	0	0	0	0	0	0	11,421	0	0	0	0	11,421
2002	0	0	0	0	0	0	0	10,254	0	0	0	0	10,254
Avg (21-02)	0	0	0	58	0	0	-18	2,776	741	0	0	0	3,557

APPENDIX O2

Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	-3,416	0	0	0	-3,416
1922	0	0	0	0	0	0	0	3,696	0	0	0	0	3,696
1923	0	0	0	0	0	0	0	-12,948	0	0	0	0	-12,948
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	-7,896	0	0	0	0	-7,896
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	-4,755	0	0	0	0	-4,755
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	-9,985	0	0	0	-9,985
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	-2,044	0	0	0	-5,598
1933	0	0	0	0	0	0	0	0	-8,509	0	0	0	-8,509
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	-483	0	0	0	3,452
1936	0	0	0	0	0	0	0	580	0	0	0	0	580
1937	0	0	0	0	0	0	0	-2,659	-1,578	0	0	0	-4,237
1938	0	0	0	0	0	0	0	-7,797	0	0	0	0	-7,797
1939	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1940	0	0	0	0	0	0	0	7,223	0	0	0	0	7,223
1941	0	0	0	0	0	0	0	0	-1,248	0	0	0	-1,248
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-25,854	0	0	0	0	-25,854
1945	0	0	0	0	0	0	0	0	18,872	0	0	0	18,872
1946	0	0	0	0	0	0	0	-2,208	0	0	0	0	-2,208
1947	0	0	0	0	0	0	0	-9,549	0	0	0	0	-9,549
1948	0	0	0	0	0	0	0	0	-7,605	0	0	0	-7,605
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	8,772	0	0	0	8,772
1951	0	-7,289	0	0	0	0	0	0	-3,559	0	0	0	-10,848
1952	0	0	0	0	0	0	0	-4,898	0	0	0	0	-4,898
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	-14,042	0	0	0	0	-14,042
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	-4,412	0	0	0	0	-4,412
1957	0	0	0	0	0	0	0	-26,907	0	0	0	0	-26,907
1958	0	0	0	0	0	0	0	-2,064	0	0	0	0	-2,064
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-39,538	0	0	0	0	-39,538
1963	0	0	0	0	0	0	0	-7,727	0	0	0	0	-7,727
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	13,506	0	0	0	13,506
1966	0	0	0	0	0	0	-3,808	4,045	0	0	0	0	237
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	-20,636	0	0	0	0	-20,636
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	0	0	-6,553	0	0	0	0	-2,618
1971	0	0	0	0	0	0	0	-12,638	0	0	0	0	-12,638
1972	0	0	0	0	0	0	0	-8,515	0	0	0	0	-8,515
1973	0	0	0	0	0	0	0	-4,031	0	0	0	0	-4,031
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	6,881	4,171	0	0	0	11,052
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-35,170	-4,171	0	0	-310	-39,651
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	-6,603	-10,310	0	0	0	-16,913
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	7,499	0	0	0	0	7,499
1986	0	0	9	0	0	-8,478	-1,586	0	0	0	0	0	-10,055
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1989	0	0	0	0	0	0	0	-13,620	0	0	0	0	-13,620
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	-8,458	0	0	0	-8,458
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-1,480	0	0	0	0	0	0	0	0	-1,480
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	-8,369	-722	0	0	0	-9,091
2000	0	0	0	0	0	0	0	-2,585	0	0	0	0	-2,585
2001	0	0	0	0	0	0	0	-28,173	0	0	0	0	-28,173
2002	0	0	0	0	0	0	0	-21,494	0	0	0	0	-21,494
Avg (21-02)	0	-89	0	30	-43	-7	-112	-4,155	-297	0	0	-4	-4,677

Table 2.3-7

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	171	89	84	146	2,455	4,544	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,236	3,107	379	125	89
Normal	54	54	50	55	74	74	98	1,315	1,912	167	122	86
Below Normal	55	55	46	43	51	63	88	624	735	113	111	73
Dry	53	53	44	40	44	50	56	157	143	86	86	65
All Years	54	61	56	74	70	73	104	1,152	2,084	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,550	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,192	3,093	379	125	89
Normal	54	54	50	55	74	74	98	1,253	1,890	167	122	86
Below Normal	55	55	46	43	51	63	91	550	709	113	111	73
Dry	53	53	44	40	44	50	56	156	139	86	86	65
All Years	54	61	56	73	70	73	104	1,107	2,072	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	5	0	0	2	43	-6	0	0	0
Above Normal	0	0	0	0	0	0	0	44	14	0	0	0
Normal	0	0	0	0	0	0	0	62	22	0	0	0
Below Normal	0	0	0	0	0	0	-4	74	27	0	0	0
Dry	0	0	0	0	0	0	0	1	4	0	0	0
All Years	0	0	0	1	0	0	0	45	12	0	0	0

average monthly flow (cfs).[1] When comparing the alternative to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the release being delayed or initiated earlier by a matter of days. Typical springtime releases, when initiated, amount to a release of up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Using the assumption that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day means that the difference in stream release between the alternative and WSIP would be up to an added three days of release. Normally, this change in release would not affect the peak stream release rate during a year. Table 2.3-8 illustrates the average monthly stream release for the alternative and base settings, and the differences, expressed in average monthly flow (cfs). Table 2.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the alternative and base settings could range from an increase of approximately 18,000 acre-feet to a decrease of approximately 39,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the alternative could lead to an effect ranging from an increase of three days of release to a decrease of up to seven days compared to the base setting.

Table 2.3-8

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	171	89	84	146	2,455	4,544	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,236	3,107	379	125	89
Normal	54	54	50	55	74	74	98	1,315	1,912	167	122	86
Below Normal	55	55	46	43	51	63	88	624	735	113	111	73
Dry	53	53	44	40	44	50	56	157	143	86	86	65
All Years	54	61	56	74	70	73	104	1,152	2,084	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	173	89	93	148	2,510	4,534	2,034	184	90
Above Normal	55	96	88	66	93	86	131	1,249	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,443	1,909	167	122	86
Below Normal	55	55	46	43	51	63	91	723	763	113	111	73
Dry	53	53	44	40	44	50	60	199	168	86	86	65
All Years	54	62	56	74	70	73	106	1,219	2,089	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	-2	0	-9	-2	-55	10	0	0	0
Above Normal	0	-7	0	0	-4	8	0	-14	15	0	0	0
Normal	0	0	0	4	0	0	0	-129	4	0	0	0
Below Normal	0	0	0	0	0	0	-4	-99	-28	0	0	0
Dry	0	0	0	0	0	0	-4	-42	-25	0	0	0
All Years	0	-1	0	0	-1	0	-2	-68	-5	0	0	0

[1] See *Estimated Affect of WSIP on Daily Releases below Hetch Hetchy Reservoir*, Memorandum by Daniel B. Steiner, December 31, 2006.

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the alternative. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, alternative, and base settings. The operation resulting from the alternative is essentially the same as the WSIP setting, including during drought. The level of delivery between the alternative and base settings is larger during the 1987-1992 drought, and water delivery reliability has been improved in the alternative setting; as a result, the drawdown of Lake Lloyd during this period looks similar to that in the WSIP setting. Although there is less water delivered during this period in the alternative setting compared to the WSIP setting, more water is delivered in the alternative setting than in the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the alternative setting, which, in order to satisfy TID/MID entitlements to inflow, was met with additional releases from Lake Lloyd, similar to the WSIP setting. The additional release from Lake Lloyd associated with the alternative appears to be approximately the same as in the WSIP setting in this instance, which is partially a factor of modeling discretion in that the HH/LSM makes release decisions in the form of block amounts of releases. Additional refinement of modeling assumptions would likely produce a result that places Lake Lloyd storage during this drought period between the base setting and WSIP setting results. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP and alternative settings.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the alternative and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more likely the result of modeling discretion as opposed to any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates releases for the alternative and WSIP settings, and the difference in releases between the two settings. Table 2.4-2 provides the same form of information for the alternative and base settings. With essentially no change in reservoir operations, stream releases will not be different.

2.5 Don Pedro Reservoir and La Grange Releases

A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir and the releases from the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 2.5-1 are the results for the WSIP, alternative, and base settings. Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1, Don Pedro Reservoir Storage (Modified WSIP); Table 2.5-2, Don Pedro Reservoir Storage (WSIP); and Table 2.5-3, Difference in Don Pedro Reservoir Storage (Modified WSIP minus WSIP). Table 2.5-4 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and alternative settings.

Table 2.5-3 shows that, throughout many years, the storage in Don Pedro Reservoir associated with the alternative setting would differ from the storage in the WSIP setting, and this difference would almost always be more storage. Table 2.5-4 illustrates that Don Pedro Reservoir storage for the alternative is close to the storage depicted for the base setting; storage is either higher or lower, but is typically higher than in the base setting. Compared to the WSIP setting, the differences in storage are indicative of the increase in inflow to Don Pedro Reservoir that is due to lesser SFPUC demands and SJPL diversions in the alternative setting. The increases in storage are also due to a decrease in TID/MID canal diversions from the assumption that conserved water would be developed for the SFPUC transfer. Compared to the base setting, the alternative would result in typically less inflow to Don Pedro Reservoir during non-wet years and particularly during drought periods when more water is diverted

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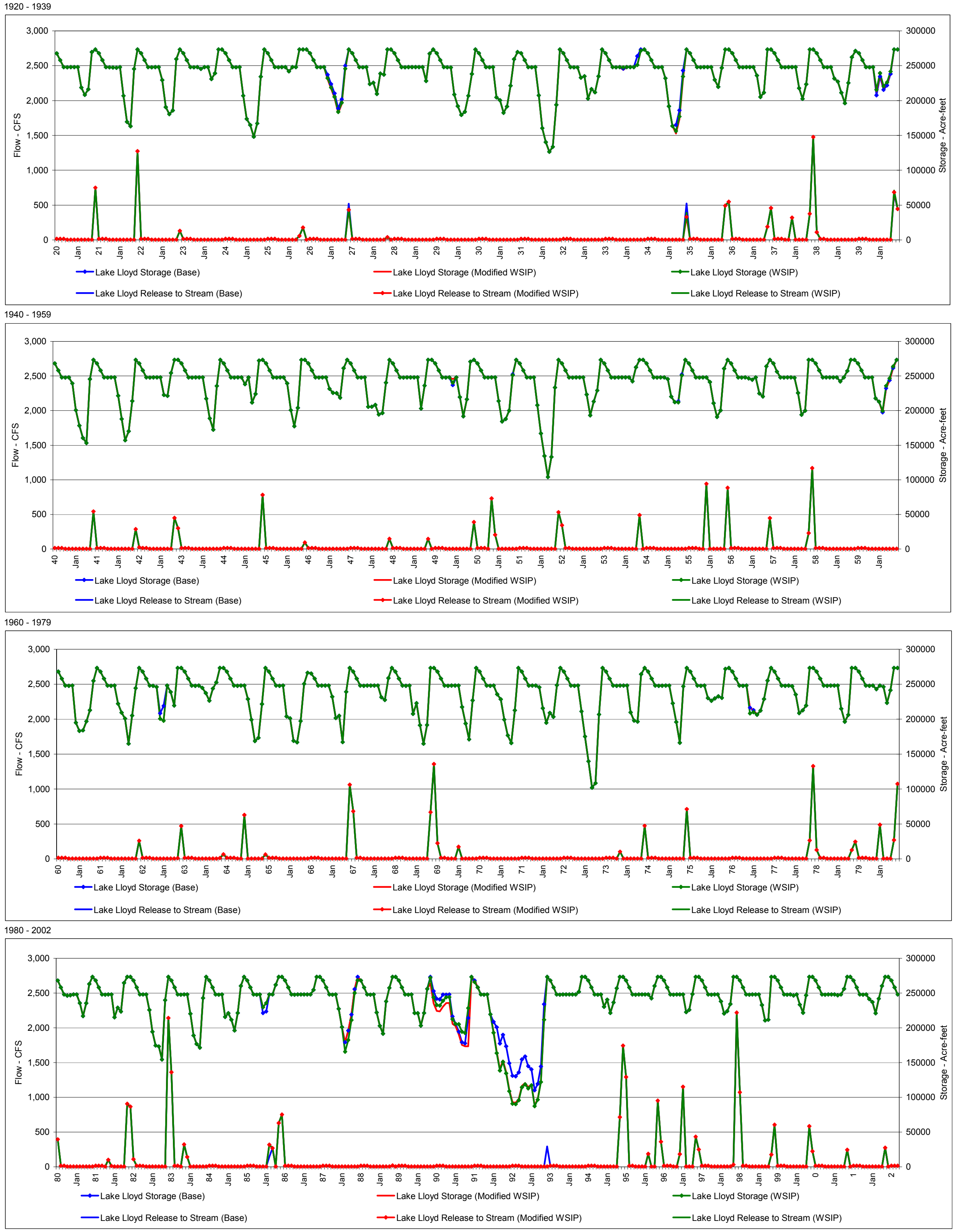
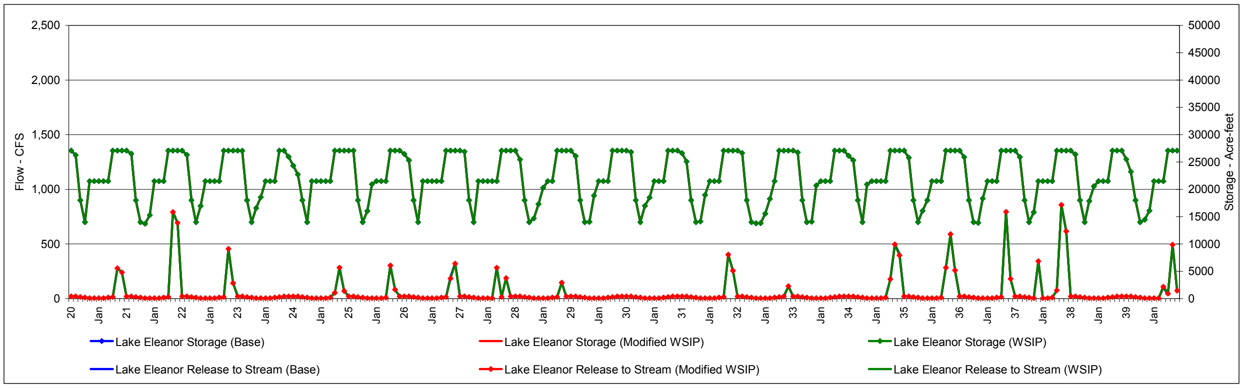
Figure 2.4-1
Lake Lloyd Storage and Stream Release



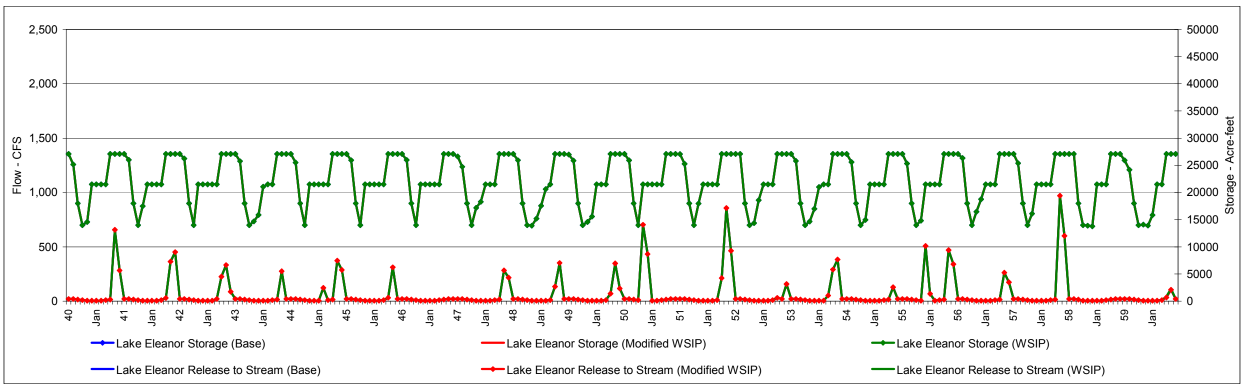
APPENDIX O2

Figure 2.4-2
Lake Eleanor Storage and Stream Release

1920 - 1939

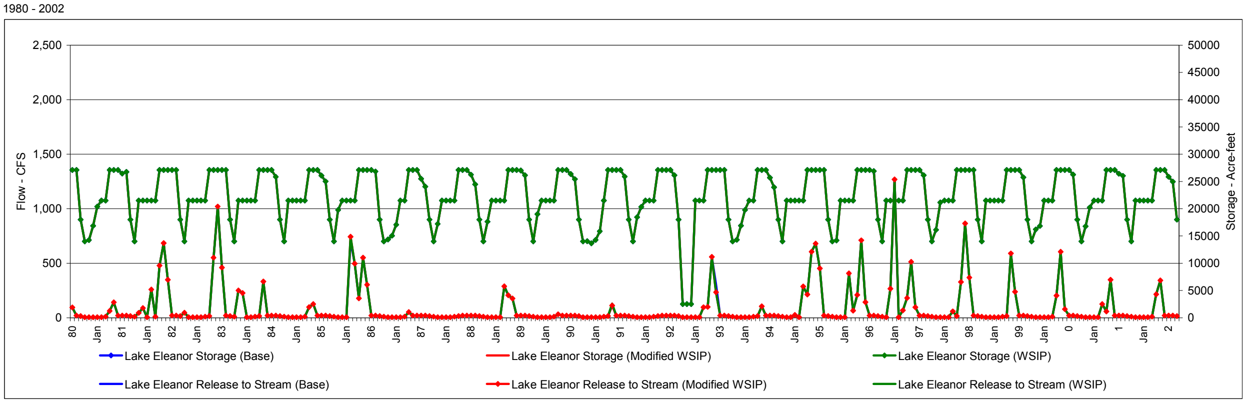


1940 - 1959



1960 - 1979

1980 - 2002



APPENDIX O2

Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	121	341	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-5	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-1	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	14	21	5	284	1,076	363	15	15
Above Normal	5	72	25	5	16	5	5	164	462	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	9	8	6	120	347	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	1	0	11	0	0	0	-18	0	0	0
Above Normal	0	0	0	0	0	0	0	2	-16	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	2	0	0	0	-7	0	0	0

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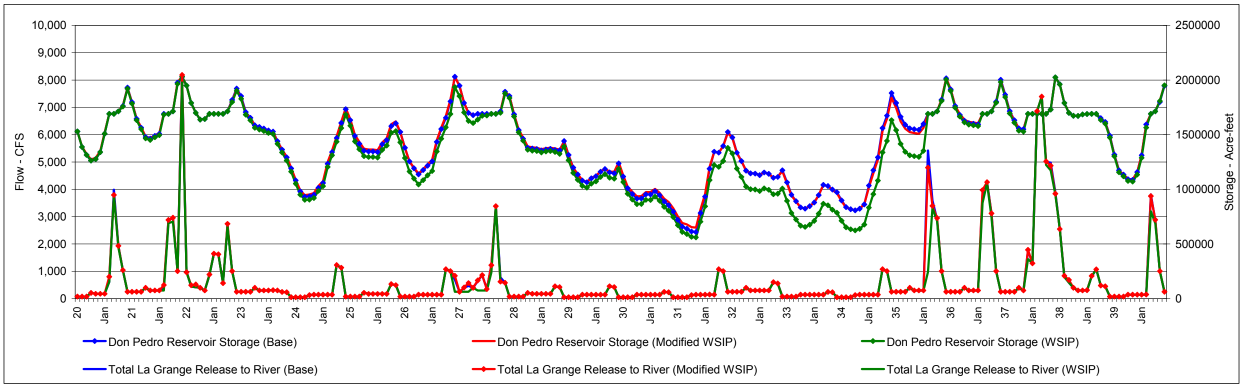
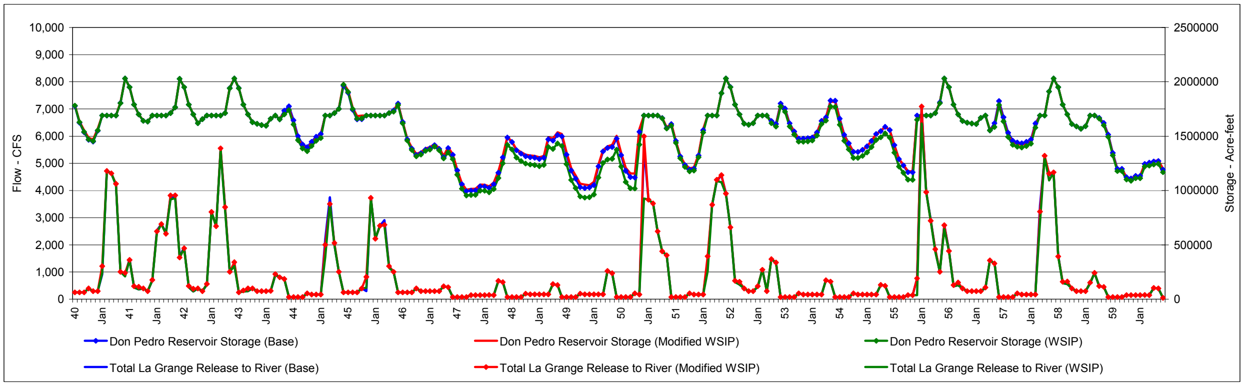
Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

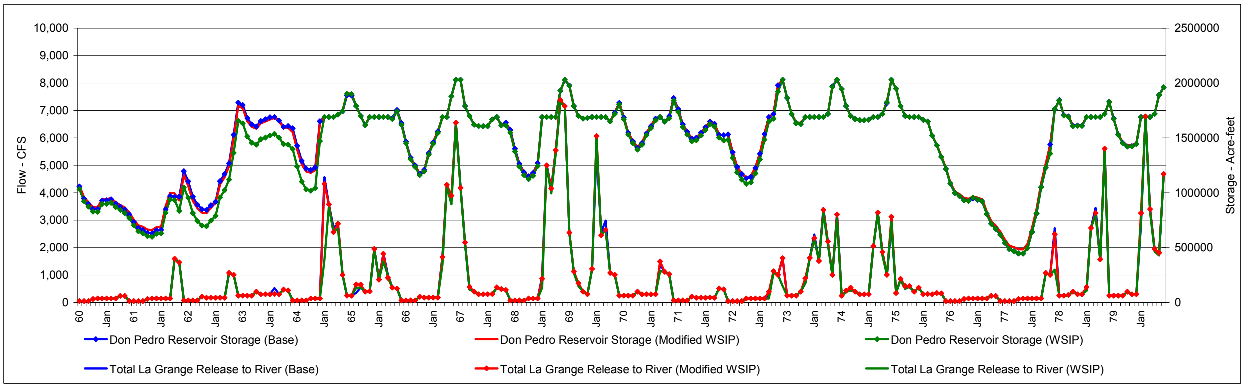
1920 - 1939



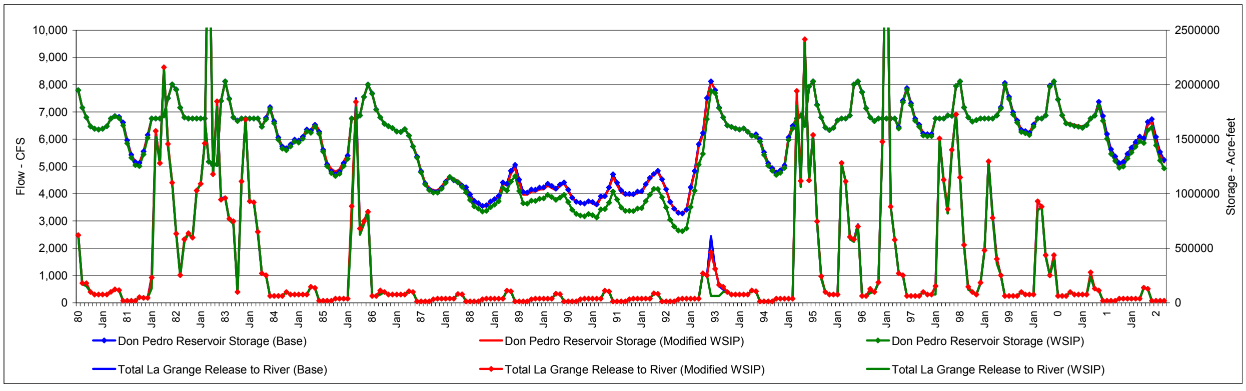
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,273,412	1,287,911	1,350,890	1,519,425	1,689,999	1,690,000	1,713,000	1,764,582	1,928,125	1,793,382	1,644,164	1,568,714
1922	1,484,928	1,470,112	1,494,406	1,514,575	1,690,000	1,690,000	1,713,000	1,981,594	2,030,000	1,950,094	1,790,033	1,700,025
1923	1,639,636	1,644,971	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,809,253	1,910,823	1,838,683	1,696,213	1,651,084
1924	1,583,443	1,568,106	1,554,088	1,535,685	1,526,277	1,437,824	1,363,847	1,297,999	1,197,407	1,087,616	989,798	947,967
1925	952,090	966,360	1,030,353	1,074,067	1,250,556	1,356,951	1,485,177	1,618,665	1,742,482	1,639,854	1,499,304	1,433,545
1926	1,371,735	1,363,673	1,364,112	1,358,048	1,428,833	1,467,778	1,595,835	1,621,402	1,521,608	1,378,176	1,256,173	1,198,503
1927	1,145,218	1,184,820	1,231,334	1,270,916	1,448,838	1,565,441	1,672,669	1,819,245	2,030,000	1,945,826	1,790,022	1,700,030
1928	1,680,577	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,712,101	1,896,779	1,854,866	1,687,028	1,544,734	1,473,242
1929	1,391,853	1,383,515	1,380,623	1,367,418	1,376,273	1,380,772	1,374,189	1,362,189	1,434,565	1,308,348	1,195,598	1,138,139
1930	1,084,099	1,068,449	1,103,964	1,123,960	1,164,849	1,190,498	1,162,317	1,160,244	1,248,631	1,128,688	1,024,759	978,260
1931	935,689	938,016	975,453	973,637	1,005,166	968,076	914,045	885,107	826,891	750,869	692,570	679,280
1932	655,003	649,851	813,996	958,339	1,204,535	1,343,718	1,332,766	1,394,846	1,517,130	1,465,392	1,329,693	1,259,078
1933	1,172,142	1,147,661	1,145,363	1,130,844	1,155,499	1,142,807	1,105,300	1,116,128	1,165,377	1,051,880	941,733	888,942
1934	833,523	822,259	848,250	879,054	948,498	1,039,816	1,028,627	992,475	965,223	890,844	832,166	819,771
1935	811,181	824,799	864,347	1,019,351	1,143,970	1,272,214	1,534,838	1,647,473	1,837,424	1,744,595	1,621,500	1,553,835
1936	1,522,978	1,514,901	1,509,433	1,563,410	1,689,991	1,690,000	1,713,000	1,823,753	2,017,860	1,915,294	1,765,512	1,689,256
1937	1,638,138	1,617,428	1,610,904	1,604,838	1,689,993	1,690,000	1,713,000	1,799,600	1,992,600	1,853,772	1,707,841	1,629,580
1938	1,557,660	1,549,094	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,080	1,700,041
1939	1,673,850	1,673,416	1,687,280	1,690,000	1,689,999	1,690,000	1,637,628	1,610,682	1,482,662	1,310,729	1,169,238	1,137,009
1940	1,097,004	1,090,067	1,158,149	1,313,069	1,595,012	1,690,000	1,713,000	1,811,854	1,955,548	1,785,694	1,635,678	1,553,678
1941	1,485,284	1,469,925	1,569,238	1,689,992	1,689,991	1,690,000	1,690,000	1,811,177	2,030,000	1,950,157	1,790,031	1,700,020
1942	1,643,070	1,635,778	1,690,000	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,032	1,700,013
1943	1,620,906	1,658,587	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,947,467	2,030,000	1,940,444	1,790,010	1,700,014
1944	1,629,260	1,616,113	1,604,369	1,597,321	1,661,304	1,690,000	1,657,800	1,715,388	1,753,568	1,622,786	1,481,321	1,410,518
1945	1,387,471	1,435,493	1,481,929	1,508,224	1,689,996	1,690,000	1,713,000	1,757,322	1,987,173	1,919,912	1,765,899	1,684,461
1946	1,688,208	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,737,850	1,797,783	1,629,442	1,474,028	1,394,084
1947	1,336,463	1,352,894	1,386,221	1,398,442	1,427,043	1,392,425	1,320,321	1,397,004	1,334,287	1,190,101	1,065,324	1,008,455
1948	1,014,064	1,015,321	1,053,944	1,053,075	1,039,190	1,073,338	1,177,714	1,321,022	1,493,664	1,450,965	1,379,025	1,353,038
1949	1,330,876	1,322,122	1,317,291	1,306,186	1,317,882	1,487,841	1,477,877	1,535,687	1,519,017	1,351,872	1,208,426	1,139,539
1950	1,063,390	1,053,556	1,049,430	1,079,544	1,236,869	1,370,886	1,406,190	1,418,984	1,503,885	1,349,683	1,209,026	1,156,651
1951	1,155,283	1,563,365	1,689,992	1,689,971	1,689,993	1,690,000	1,668,858	1,582,375	1,613,633	1,456,033	1,316,416	1,243,518
1952	1,204,083	1,211,785	1,333,378	1,564,867	1,689,997	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,058	1,700,037
1953	1,616,383	1,606,458	1,620,797	1,689,998	1,689,998	1,688,681	1,625,138	1,603,392	1,789,870	1,740,950	1,608,274	1,539,909
1954	1,476,329	1,475,526	1,479,169	1,485,971	1,532,414	1,638,358	1,673,331	1,818,250	1,813,990	1,649,762	1,503,995	1,432,008
1955	1,354,810	1,354,555	1,372,840	1,405,420	1,455,692	1,519,360	1,546,240	1,589,483	1,553,915	1,414,809	1,290,280	1,238,000
1956	1,177,169	1,175,791	1,689,999	1,689,942	1,689,993	1,690,000	1,713,000	1,811,926	2,030,000	1,950,170	1,790,037	1,700,034
1957	1,641,432	1,626,099	1,618,146	1,612,587	1,670,021	1,690,000	1,556,123	1,598,826	1,801,403	1,649,993	1,510,292	1,443,072
1958	1,428,625	1,421,397	1,434,106	1,457,068	1,603,639	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,053	1,700,038
1959	1,612,670	1,591,335	1,569,440	1,593,880	1,689,999	1,690,000	1,665,544	1,609,991	1,502,961	1,333,683	1,190,553	1,196,778
1960	1,121,093	1,110,287	1,133,514	1,133,204	1,243,879	1,254,530	1,268,532	1,280,002	1,200,080	1,065,928	957,818	915,107
1961	869,350	868,557	939,907	941,603	950,674	912,300	887,613	865,631	820,251	753,646	701,666	688,684
1962	664,649	659,559	687,294	691,239	878,339	999,447	994,968	929,139	1,157,964	1,062,988	926,294	859,987
1963	819,092	813,366	863,687	908,751	1,075,936	1,141,590	1,240,769	1,499,645	1,792,271	1,769,028	1,653,355	1,600,932
1964	1,584,033	1,633,568	1,649,236	1,667,358	1,681,876	1,648,645	1,593,074	1,593,847	1,552,228	1,393,083	1,258,097	1,193,529
1965	1,182,155	1,205,439	1,636,940	1,689,965	1,689,993	1,690,000	1,713,000	1,749,649	1,905,253	1,903,314	1,790,055	1,700,038
1966	1,617,344	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,664,434	1,745,959	1,624,177	1,456,019	1,312,631	1,248,525
1967	1,174,839	1,208,370	1,362,062	1,461,077	1,558,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,258	1,700,030
1968	1,621,428	1,609,232	1,607,367	1,607,567	1,670,478	1,690,000	1,617,394	1,624,530	1,557,318	1,386,116	1,251,069	1,179,846
1969	1,145,315	1,174,626	1,264,108	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,118	1,700,043
1970	1,677,722	1,683,160	1,689,999	1,689,952	1,689,996	1,690,000	1,652,690	1,729,821	1,816,669	1,682,496	1,545,668	1,474,011
1971	1,416,196	1,459,106	1,546,155	1,612,064	1,681,258	1,690,000	1,650,942	1,691,959	1,855,325	1,751,026	1,617,643	1,554,674
1972	1,494,665	1,503,209	1,546,806	1,597,278	1,650,736	1,628,676	1,529,989	1,524,210	1,528,926	1,366,957	1,235,721	1,175,469
1973	1,138,955	1,151,949	1,234,020	1,362,823	1,542,441	1,690,000	1,717,600	1,980,895	2,030,000	1,863,873	1,719,884	1,643,118
1974	1,635,668	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,971,412	2,030,000	1,943,894	1,790,025	1,700,028
1975	1,673,228	1,663,339	1,661,792	1,667,126	1,689,996	1,690,000	1,717,600	1,834,937	2,030,000	1,950,013	1,790,083	1,700,033
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,435,154	1,335,053	1,225,747	1,094,002	1,010,365	986,545
1977	952,025	944,903	966,794	954,865	939,669	827,221	739,953	700,254	644,360	572,116	516,939	504,316
1978	485,812	483,545	535,831	680,933	849,823	1,088,674	1,268,395	1,435,989	1,761,000	1,841,159	1,707,412	1,700,003
1979	1,614,939	1,618,013	1,617,070	1,689,998	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,530,035	1,459,925
1980	1,430,456	1,433,169	1,453,204	1,689,974	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,064	1,700,044
1981	1,619,550	1,597,811	1,590,013	1,597,563	1,621,214	1,690,000	1,713,313	1,703,065	1,640,497	1,475,345	1,347,046	1,285,338
1982	1,278,056	1,384,964	1,535,708	1,689,994	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,718	1,790,104	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,668,518	1,690,000	1,689,992	1,689,971	1,689,993	1,690,000	1,617,070	1,691,312	1,787,159	1,655,182	1,508,819	1,431,891
1985	1,418,471	1,453,581	1,497,960	1,488,549	1,523,603	1,589,731	1,581,163	1,647,192	1,580,941	1,416,347	1,284,966	1,227,694
1986	1,202,637	1,223,827	1,295,413	1,360,422	1,689,993	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,773,743	1,700,019
1987	1,642,834	1,621,459	1,602,910	1,571,788	1,567,853	1,594,481	1,537,756	1,443,801	1,341,141	1,206,495	1,098,820	1,051,988
1988	1,031,411	1,030,512	1,066,696	1,120,513	1,162,412	1,135,649	1,119,724	1,087,355	1,039,228	975,497	919,189	903,638
1989	878,958	886,458	919,139	942,795	972,353	1,094,012	1,074,919	1,183,810	1,235,848	1,099,998	990,733	992,068
1990	1,020,252	1,018,894	1,038,950	1,041,663	1,074,254	1,053,596	1,032,349	1,069,546	1,094,915	1,028,120	958,167	926,695
1991	912,484	907,187	925,968	911,152	888,346	962,970	967,443	1,049,028	1,155,267	1,079,363	1,011,649	986,032
1992	987,759	985,230	1,007,389	1,011,985	1,075,318	1,134,604	1,186,520	1,201,189	1,124,146	1,031,185	920,084	862,293
1993	827,714	821,296	847,126	1,044,089	1,193,886	1,434,056	1,540,529	1,866,198	2,030,000	1,950,131	1,790,055	1,700,032
1994	1,628,791	1,614,584	1,600,767	1,590,811	1,600,873	1,569,297	1,536,516	1,538,815	1,493,989	1,371,490	1,274,649	1,235,078
1995	1,197,556	1,217,352	1,262,134	1,519,656	1,628,511	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,068
1996	1,609,687	1,584,700	1,606,017	1,674,181	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,785,378	1,700,025
1997	1,668,811	1,690,000	1,689,993	1,689,874	1,689,994	1,690,000	1,601,187	1,848,971	1,960,531	1,819,845	1,680,717	1,632,944
1998	1,553,232	1,546,836	1,548,242	1,689,997	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,249	1,700,032
1999	1,663,622	1,676,910	1,689,999	1,689,986	1,689,990	1,690,000	1,717,600	1,787,654	2,006,930	1,876,953	1,738,151	1,670,125
2000	1,585,402	1,573,740	1,558,095	1,634,018	1,689,993	1,690,000	1,717,600	1,993,453	2,030,000	1,864,407	1,722,358	1,653,656
2001	1,645,283	1,632,780	1,624,256	1,616,244	1,639,607	1,690,000	1,717,600	1,819,469	1,686,681	1,522,115	1,386,270	1,326,789
2002	1,266,578	1,278,195	1,351,669	1,407,102	1,459,267	1,509,791	1,497,578	1,630,986	1,653,740	1,490,489	1,355,084	1,288,277
Avg (21-02)	1,333,860	1,343,308	1,385,822	1,430,632	1,489,306	1,513,290	1,518,362	1,595,419	1,675,890	1,575,354	1,440,908	1,376,829

APPENDIX O2

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O2

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	10,552	10,546	10,546	10,549	0	0	0	6,327	8,038	8,003	10,962	16,915
1922	18,479	18,469	18,470	18,475	7,314	0	0	16,358	0	0	7	9
1923	1,608	1,607	0	0	0	0	0	9,890	9,857	9,814	12,765	18,714
1924	20,274	20,264	20,264	20,270	20,272	20,264	25,448	35,394	35,273	35,113	37,943	43,800
1925	45,302	45,275	45,277	45,290	45,294	45,277	48,709	58,097	57,904	57,652	60,384	66,169
1926	67,629	67,591	67,593	67,613	67,740	67,714	77,594	88,964	91,382	90,964	93,538	99,215
1927	100,608	100,550	102,110	102,139	102,148	102,109	105,011	130,522	93,866	93,464	86,304	72,900
1928	74,353	52,440	17,973	14,850	-1	0	10,950	19,494	19,429	19,346	22,253	28,168
1929	29,708	29,691	29,693	29,702	29,704	29,692	32,662	38,568	42,076	41,882	44,686	50,526
1930	52,019	51,989	51,992	52,006	52,011	51,992	54,940	62,026	61,813	61,534	64,244	70,009
1931	71,454	71,411	71,414	71,436	71,441	71,414	74,339	80,127	79,840	79,459	82,073	87,777
1932	89,182	89,128	109,511	113,552	120,163	122,023	127,021	135,816	138,378	137,750	140,103	145,622
1933	146,918	146,835	146,842	146,885	146,896	146,842	150,200	156,222	157,888	157,161	159,397	164,822
1934	166,062	165,964	171,462	167,698	170,530	171,077	173,903	179,422	178,775	177,921	180,057	185,413
1935	186,611	186,502	186,510	187,300	187,895	192,293	197,143	205,176	204,126	203,239	205,321	210,623
1936	211,784	211,665	211,734	211,751	-8	0	0	14,814	14,766	14,702	17,631	23,566
1937	25,116	25,102	25,113	25,121	-1	0	0	6,770	10,501	10,456	13,404	19,350
1938	20,909	20,898	0	0	0	0	0	0	0	0	7	9
1939	1,608	1,607	1,607	976	0	0	2,999	8,984	8,953	8,912	11,865	17,815
1940	19,376	19,365	23,445	24,510	29,524	0	0	3,846	5,028	5,006	7,978	13,941
1941	15,511	15,502	15,503	-2	0	0	0	6,943	0	0	7	10
1942	1,608	1,607	1	0	0	0	0	0	0	0	7	9
1943	1,608	1,607	0	0	0	0	0	7,227	0	0	6	10
1944	1,608	1,607	1,607	1,608	1,608	0	2,998	14,780	14,732	14,669	17,595	23,526
1945	25,075	25,060	25,061	25,068	-1	0	0	6,945	13,503	13,446	16,380	22,319
1946	23,872	0	0	0	0	0	0	11,519	11,482	11,433	14,374	20,314
1947	21,871	21,858	21,859	21,865	21,866	21,859	24,835	45,635	45,475	45,271	48,056	53,881
1948	55,364	55,332	55,334	55,350	55,354	59,660	63,428	69,974	73,432	73,098	75,753	81,484
1949	82,910	82,863	82,866	82,860	82,867	87,405	94,762	102,889	109,646	109,144	111,640	117,253
1950	118,606	118,537	111,093	117,038	117,047	117,566	120,932	126,986	128,562	127,971	130,381	135,932
1951	137,247	140,851	-3	0	0	0	4,773	11,989	17,310	17,231	20,145	26,066
1952	27,611	27,596	27,597	30,872	-1	0	0	0	0	0	7	10
1953	1,608	1,608	1,607	-1	0	0	5,921	15,060	16,207	16,137	19,059	24,987
1954	26,534	26,518	26,520	26,527	26,530	26,520	29,494	44,709	44,562	44,371	47,165	52,995
1955	54,482	54,451	54,454	54,469	54,474	54,454	57,188	63,687	66,825	66,521	69,204	74,963
1956	76,406	76,364	38,525	-5	0	0	0	7,228	0	0	7	9
1957	1,607	1,607	1,607	1,608	1,608	0	2,999	14,752	14,704	14,641	17,569	23,501
1958	25,050	25,036	25,037	25,044	25,046	0	0	0	0	0	7	9
1959	1,608	1,607	1,607	1,607	0	0	3,138	9,513	9,481	9,437	12,388	18,337
1960	19,897	19,886	19,887	19,893	23,340	25,942	28,530	34,172	31,895	31,750	34,592	40,457
1961	41,967	41,942	42,097	42,110	42,113	42,096	45,051	50,922	50,739	50,498	53,243	59,049
1962	60,524	60,490	60,492	60,510	60,514	60,491	63,429	93,515	109,629	109,128	111,595	117,190
1963	118,534	118,464	118,470	118,505	118,515	118,471	121,355	136,377	137,755	137,162	139,549	145,076
1964	146,376	146,296	146,302	146,344	146,354	146,302	149,238	155,270	155,160	154,451	156,735	162,199
1965	163,461	163,369	165,178	-23	0	0	0	5,797	4,386	4,367	17	10
1966	1,608	0	0	0	-1	0	-6,298	3,512	3,501	3,485	6,462	12,430
1967	14,002	13,995	13,996	13,999	14,000	0	0	0	0	0	6	9
1968	1,608	1,608	1,607	1,608	1,608	0	2,998	10,219	10,185	10,139	13,085	19,031
1969	20,590	20,579	20,579	-2	0	0	0	0	0	0	7	10
1970	1,608	1,607	0	0	0	0	2,999	11,745	11,707	11,657	14,598	20,538
1971	22,094	22,081	22,082	22,088	22,091	0	2,999	15,103	15,053	14,988	17,917	23,848
1972	25,397	25,383	25,385	25,391	25,394	25,384	28,359	48,260	48,096	47,876	50,647	56,467
1973	57,949	57,916	57,918	57,935	57,939	43,041	42,381	59,384	0	0	2,993	8,974
1974	10,554	0	0	0	0	0	0	7,227	0	0	7	10
1975	1,608	1,607	1,607	1,607	0	0	0	10,083	0	0	6	9
1976	0	0	0	0	0	0	2,998	8,983	8,951	8,910	11,863	17,811
1977	19,371	19,360	11,142	16,362	19,370	19,363	22,343	28,273	28,176	28,032	30,880	36,730
1978	38,229	38,200	38,203	38,215	38,219	38,204	41,165	79,715	0	0	2,993	7,077
1979	8,661	8,656	8,657	-1	0	0	0	0	0	0	2,993	8,973
1980	10,553	10,547	10,548	-3	0	0	0	0	0	0	7	9
1981	1,608	1,607	1,607	1,608	1,607	0	2,998	8,984	14,068	14,005	16,934	22,865
1982	24,416	24,401	24,402	-3	0	0	0	0	0	1	7	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	1,599	0	0	-1	0	0	2,998	8,984	8,954	8,916	11,870	17,820
1985	19,380	19,370	19,370	19,376	19,377	19,371	22,351	30,473	30,371	30,235	33,085	38,966
1986	40,484	40,461	9	40,476	-1	0	0	0	0	0	2,994	15
1987	1,613	1,611	1,612	1,613	1,612	1,611	4,609	10,590	10,553	10,504	13,449	19,394
1988	20,951	20,939	20,940	20,946	7,287	7,285	15,854	24,151	27,255	32,116	34,953	40,817
1989	42,326	42,301	42,303	42,316	42,319	42,303	45,260	72,946	75,270	74,929	77,571	83,287
1990	84,705	84,656	84,660	84,684	84,692	84,660	87,574	104,377	104,013	103,532	106,026	111,637
1991	112,992	112,925	111,559	107,612	106,119	106,077	108,967	131,231	135,196	132,533	136,938	142,442
1992	143,729	143,644	143,651	143,694	143,706	143,651	142,168	157,530	156,986	156,255	158,495	163,926
1993	165,165	165,063	165,070	166,133	166,146	166,884	175,249	181,750	88,210	26,856	4,911	18
1994	1,615	1,615	1,615	1,615	1,615	1,615	4,612	15,128	15,076	15,008	17,931	23,861
1995	25,410	25,396	25,397	25,404	29,389	0	0	0	0	0	0	9
1996	1,608	1,607	1,607	1,608	0	0	0	0	0	0	2,994	15
1997	1,613	0	0	-1	0	0	2,998	8,984	8,955	8,916	11,871	17,822
1998	19,384	19,373	19,374	-3	0	0	0	0	0	0	7	10
1999	1,608	1,607	-1	0	0	0	0	6,404	8,478	8,442	11,399	17,353
2000	18,916	18,906	18,907	18,911	-1	0	0	11,602	0	0	2,994	8,974
2001	10,555	10,548	10,550	10,552	10,553	0	689	18,087	18,028	17,948	20,859	26,777
2002	28,318	28,302	28,303	28,312	28,313	28,304	31,275	47,429	47,270	47,059	49,835	55,653
Avg (21-02)	44,053	43,327	40,084	36,993	32,311	30,600	32,763	41,632	38,387	37,505	39,219	43,153

APPENDIX O2

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	10,552	10,546	10,546	10,549	0	0	0	3,139	-2,395	-4,568	-1,554	4,440
1922	6,030	6,026	6,027	6,029	0	0	0	5,184	0	-5	7	9
1923	1,608	1,607	0	0	0	0	0	-9,124	-11,208	-13,343	-10,291	-4,268
1924	-2,661	-2,660	-2,660	-2,661	-2,661	-2,660	764	5,875	5,784	5,674	8,573	14,491
1925	16,055	16,044	16,043	16,041	16,041	16,026	15,797	11,678	9,526	7,302	10,262	16,218
1926	17,783	17,773	17,278	17,283	17,209	17,778	17,484	18,161	-2,695	-2,684	322	6,311
1927	7,897	7,891	14,492	14,496	14,498	14,492	17,477	15,725	0	-2,184	2	9
1928	1,609	0	0	0	0	0	-899	2,911	787	784	3,774	9,750
1929	11,328	11,322	11,323	11,326	11,327	11,322	14,310	4,627	-6,889	-6,858	-3,833	2,170
1930	3,764	3,761	3,762	3,762	3,763	3,762	6,757	13,480	11,320	11,270	14,211	20,151
1931	21,706	21,692	21,693	21,700	21,702	21,694	24,670	30,593	30,483	30,339	33,182	39,058
1932	40,576	40,553	31,674	24,416	15,716	-1,032	-3,076	-1,657	-7,367	-9,517	-6,480	-468
1933	1,131	1,130	1,131	1,130	1,130	1,131	177	2,115	-9,670	-11,809	-8,760	-2,740
1934	-1,135	-1,135	1,150	-1,171	755	-1,211	-1,530	-6,447	-8,222	-8,183	-5,150	857
1935	2,453	2,452	2,452	-14,519	-30,168	-20,129	-25,734	-25,796	-43,945	-45,937	-42,745	-36,614
1936	-34,940	-34,921	-34,969	-34,941	1	0	0	4,470	2,341	148	3,140	9,121
1937	10,701	10,695	10,696	10,699	0	0	0	-2,568	-8,918	-11,064	-8,021	-2,006
1938	-404	-402	0	0	0	0	0	0	0	-2,183	2	9
1939	1,608	1,607	1,607	976	0	0	-12,780	-5,138	-7,235	-7,202	-4,176	1,827
1940	3,422	3,420	-502	2,277	1,426	0	0	12,724	9,006	8,966	11,921	17,872
1941	19,434	19,422	18,813	-3	0	0	0	5,573	0	-4	7	10
1942	1,608	1,607	1	1	0	0	0	0	0	0	7	9
1943	1,608	1,607	0	0	0	0	0	5,042	0	-2,183	2	10
1944	1,608	1,607	1,607	1,608	1,608	0	2,998	-19,024	-21,076	-23,169	-20,072	-14,015
1945	-12,387	-12,381	-12,381	-12,385	0	0	0	6,512	23,217	20,934	23,835	29,751
1946	31,289	106	0	0	0	0	0	1,291	-827	-823	2,173	8,155
1947	9,737	9,732	9,732	9,734	9,735	9,732	12,721	6,957	4,819	4,798	7,769	13,733
1948	15,301	15,293	15,293	15,297	15,299	15,293	14,531	16,879	7,186	5,052	8,089	14,092
1949	15,678	15,673	15,675	15,657	15,660	16,321	19,398	24,089	21,559	21,461	24,354	30,262
1950	31,798	31,779	20,780	29,360	14,494	11,170	14,470	19,919	26,493	24,987	27,865	33,761
1951	35,290	24,301	-1	0	0	0	1,622	7,921	2,378	184	3,176	9,155
1952	10,735	10,728	10,729	9,517	-1	0	0	0	0	-2,184	2	10
1953	1,608	1,608	1,607	-1	0	0	-14,862	-9,783	-10,670	-12,808	-9,760	-3,737
1954	-2,131	-2,130	-2,130	-2,131	-2,130	-2,130	871	-9,349	-11,433	-11,384	-8,339	-2,321
1955	-718	-718	-718	-718	-718	-717	216	3,316	-2,408	-2,398	607	6,594
1956	8,179	8,175	0	1	1	0	0	-1	0	0	7	9
1957	1,607	1,607	1,607	1,608	1,608	0	2,999	-20,075	-22,124	-24,212	-21,111	-15,050
1958	-13,421	-13,413	-13,413	-13,418	-13,419	0	0	0	0	0	7	9
1959	1,608	1,607	1,607	1,607	0	0	-2,197	-11,452	-11,414	-11,362	-8,316	-2,298
1960	-695	-694	-695	-694	-695	-789	1,150	8,837	8,808	8,767	11,719	17,666
1961	19,225	19,214	10,773	10,777	10,777	10,773	13,760	19,715	19,644	19,551	22,448	28,357
1962	29,897	29,880	29,882	29,890	29,893	29,881	32,850	-35,543	-39,188	-41,193	-38,008	-31,883
1963	-30,216	-30,197	-22,272	-8,960	-30,220	-30,209	-27,182	-28,787	-28,692	-30,750	-27,623	-21,543
1964	-19,901	-19,890	-19,891	-19,896	-8,124	-8,120	-7,231	-13,185	-35,078	-34,920	-31,764	-25,668
1965	-24,017	-24,003	-14,799	2	0	0	0	7,340	19,881	17,611	41	10
1966	1,608	0	0	0	0	0	-15,292	-7,644	-9,734	-9,690	-6,652	-639
1967	960	960	960	960	960	0	0	0	0	0	1	9
1968	1,608	1,608	1,607	1,608	1,608	0	2,998	-13,367	-15,436	-15,366	-12,301	-6,271
1969	-4,659	-4,656	-4,657	1	0	0	0	0	0	-2,184	2	10
1970	1,608	1,607	0	-4	0	0	2,999	254	-1,861	-4,036	-1,025	4,968
1971	6,557	6,552	6,553	6,554	6,556	0	2,999	-5,496	-7,593	-9,742	-6,707	-694
1972	905	905	905	904	905	905	3,902	-804	-2,916	-2,903	104	6,093
1973	7,679	7,675	7,675	7,677	7,678	0	0	1,016	0	0	2,993	8,974
1974	10,554	0	0	1	0	0	0	2,191	0	-2,184	2	10
1975	1,608	1,607	1,607	1,607	0	0	0	17,564	0	-4	6	9
1976	0	0	0	0	0	0	2,998	8,983	8,951	8,910	11,863	17,811
1977	19,371	19,360	19,360	19,366	19,367	19,360	22,339	28,269	28,172	28,028	30,876	36,726
1978	38,225	38,196	38,199	38,211	38,215	38,200	41,161	-4,293	0	-2,183	819	4,600
1979	5,095	5,092	5,092	-1	0	0	0	0	-2,114	-2,105	897	6,885
1980	8,468	8,464	8,465	-4	0	0	0	0	0	0	7	9
1981	1,608	1,607	1,607	1,608	1,607	0	882	-1,908	-13,555	-13,495	-10,440	-4,414
1982	-2,806	-2,805	-2,805	1	0	0	0	0	0	-2,183	-2	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	-1,466	0	0	-1	0	0	2,802	-5,035	-7,133	-9,286	-6,251	-241
1985	1,358	1,357	1,357	1,358	1,357	1,358	4,355	15,162	12,997	12,939	15,871	21,809
1986	23,362	23,349	9	11,298	-1	0	0	0	0	-2,184	820	11
1987	1,610	1,608	1,609	1,609	1,609	1,608	4,606	10,587	1,110	1,104	4,092	10,068
1988	11,646	11,639	11,639	11,643	11,643	11,639	14,627	13,217	-19,630	-19,539	-16,454	-10,405
1989	-8,784	-8,779	-8,779	-8,782	-8,783	-8,780	-17,222	-26,333	-28,541	-28,412	-25,289	-19,211
1990	-17,572	-17,562	-17,563	-17,569	-17,569	-17,563	-14,547	-14,730	-8,961	-8,920	-5,885	125
1991	-3,473	-3,471	-4,843	-12,641	-14,145	-14,140	-11,143	-8,906	-21,810	-21,733	-18,658	-12,615
1992	-10,993	-10,988	-10,988	-10,992	-10,993	-10,990	4,598	-9,035	-9,042	-9,045	-6,047	-58
1993	1,526	1,524	-6,413	-14,665	-14,667	-19,965	-16,145	-12,014	0	-5	7	10
1994	1,608	1,607	1,607	1,608	1,608	1,607	4,604	-5,760	-7,855	-7,818	-4,789	1,217
1995	2,812	2,812	2,811	2,812	6,795	0	0	0	0	0	-2,184	6
1996	1,605	1,604	1,604	1,605	0	0	0	0	0	-2,183	820	11
1997	1,610	0	0	0	0	0	-9,578	-5,747	-7,843	-9,992	-6,955	-942
1998	658	658	658	0	0	0	0	0	0	0	7	10
1999	1,608	1,607	-1	0	0	0	0	-5,917	-8,693	-10,839	-7,799	-1,783
2000	-182	-181	-181	-182	0	0	0	1,226	0	0	2,994	8,974
2001	10,555	10,548	10,550	10,553	10,553	0	689	-23,644	-25,468	-25,355	-22,247	-16,182
2002	-14,549	-14,541	-14,542	-14,545	-14,547	-14,541	-11,529	-28,508	-30,526	-30,391	-27,258	-21,175
Avg (21-02)	4,307	3,621	2,642	2,388	1,759	1,233	1,715	-177	-3,240	-4,096	-1,896	2,500

to the SJPL in the alternative setting. Less inflow leads to less reservoir storage. Figure 2.5-1 illustrates that during drought sequences, a reduction to inflow to Don Pedro Reservoir can accumulate from year to year, particularly in the comparison of the WSIP and base settings. Compared to the base setting, storage in Don Pedro Reservoir in the alternative setting would be nearly the same. Figure 2.5-2 illustrates the difference in reservoir storage averaged by year type for the alternative and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 illustrates the same information for the alternative and base settings.

Figure 2.5-2

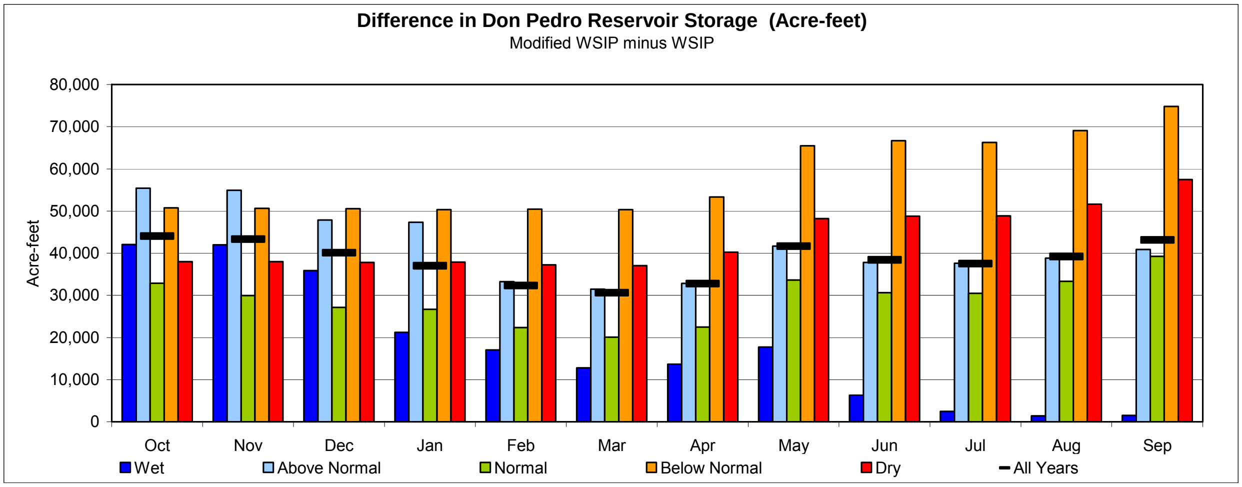


Figure 2.5-3

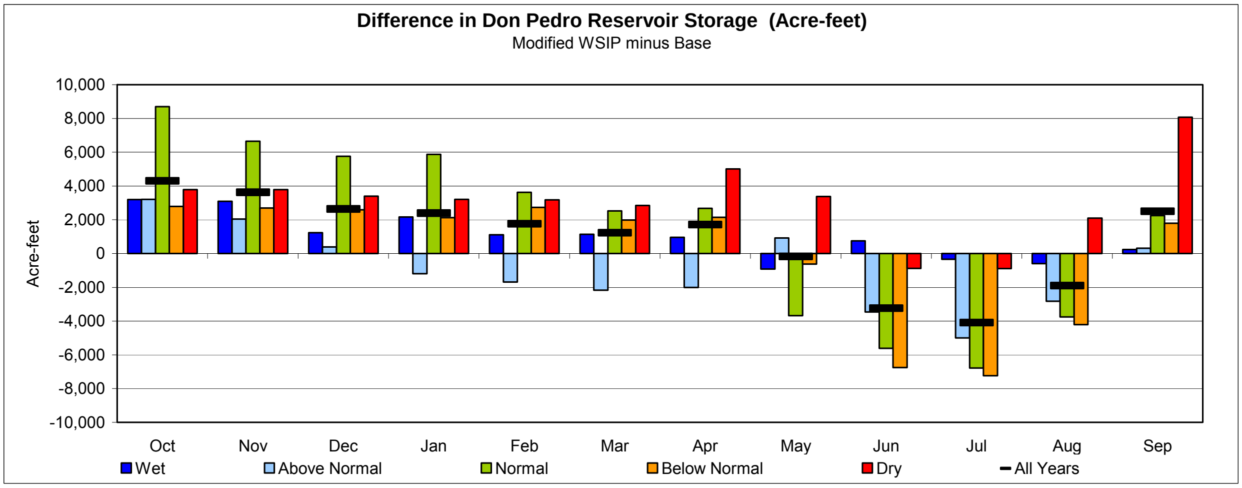
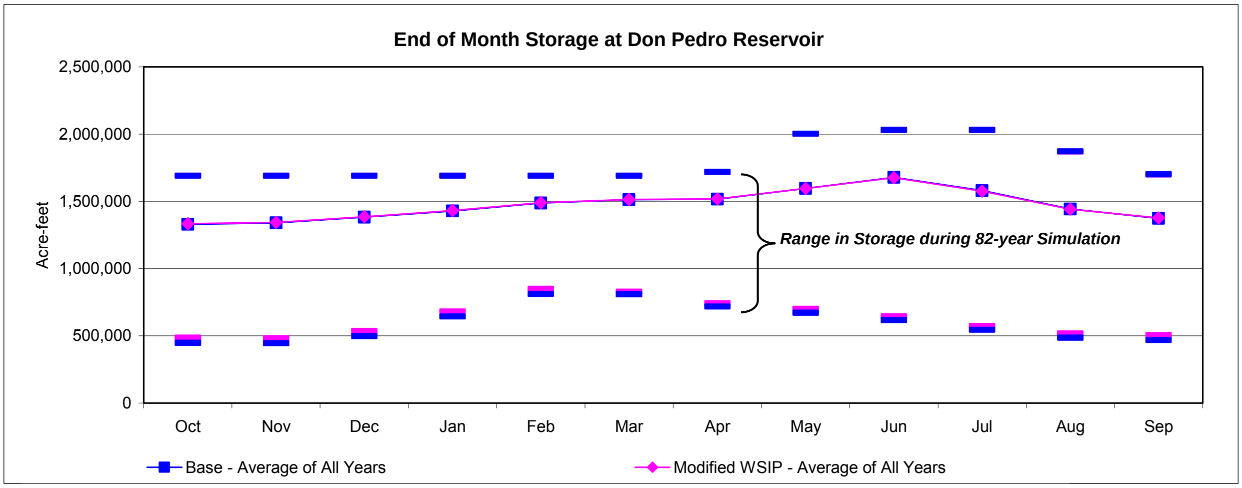


Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

The simulation shows that the occasional large storage depletions in Don Pedro Reservoir associated with the WSIP would be largely ameliorated by the use of conserved water for the transfer. In the alternative setting, the SJPL diverts an average of 17,000 acre-feet more than in the base setting, and the transfer is an annual average of 19,600 acre-feet for design drought yield purposes. It is assumed that the conservation of water for the transfer is also 19,600 acre-feet every year to satisfy the SFPUC's need for yield during the design drought sequence. Because the conserved water transfer (occurring each year) would be greater than the SJPL/inflow effect, Don Pedro Reservoir storage, and the La Grange release to the Tuolumne River as described below, could be slightly larger at times than in the base setting. In a few other instances, Don Pedro Reservoir storage and La Grange releases could be lower. The development and transfer of conserved water is not a perfect match (total elimination of effect) each year due to several factors, particularly the fact that the year-to-year and average numbers do not always coincide.

Figure 2.5-4



Sometimes a portion of the conserved water would be developed prior to an ensuing reservoir spill and could not be used to reduce an accumulating inflow deficit that occurred subsequent to the spill. Also, the additional SJPL diversion and its effect on Don Pedro Reservoir inflow would not occur at a constant year-to-year rate; sometimes more than the average effect, and sometimes less than the average effect, would occur. This circumstance could lead to a larger storage deficit in a year than the amount of water conserved in a year, and vise versa. Depending on the coincidence of the hydrologic sequence of Don Pedro Reservoir replenishment and the running accumulation of the inflow effect, the storage deficit might not be totally ameliorated during all hydrologic sequences.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the alternative and the countering reduction in the TID/MID canal diversions would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the alternative would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. During periods when inflow or canal diversions differ and Don Pedro Reservoir is at maximum capacity within the flood control storage limitation, a change in inflow or canal diversions directly manifests as a change in releases from La Grange Dam (a change of either more or less flow). Figure 2.5-1 illustrates the stream releases from La Grange Dam for the WSIP, alternative, and base settings.

Table 2.5-5 illustrates the difference in stream releases between the alternative and WSIP settings. Compared to the WSIP setting, the alternative exhibits an incrementally larger stream release, predominately during some months of the early winter through June period, which is reflective of the months when releases to the stream are made in excess of minimum release requirements due to flood control or in anticipation of filling the reservoir. Table 2.5-6 shows the same information for the alternative and WSIP settings, arranged by ranking the years in descending order of the San Joaquin River Index (an index indicating the wetness of the Tuolumne River Basin and the San Joaquin River Basin). The table illustrates the finding that differences in releases to the Tuolumne River from La Grange Dam occur only when there are releases in excess of minimum FERC flow requirements. This circumstance typically occurs only in above-normal and wet years, and predominately during early winter through June. During late summer of above-normal and wet years (August and September) there may also be releases in excess of minimum FERC flow requirements. These releases are associated with the drawdown of Don Pedro Reservoir during antecedent wetter years in anticipation of fall-time flood control objectives. During other year types and typically during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large potential reduction in flow following an extended drought period is reduced with the alternative, since the amount of water delivered by the SFPUC during these periods is somewhat less than that delivered in the WSIP setting, and the water for additional deliveries is derived from conserved water in Don Pedro Reservoir.

APPENDIX O2

As described above concerning Don Pedro Reservoir inflow, releases, and storage, compared to the base setting the alternative setting would lead to a mixed effect on La Grange releases. Table 2.5-7 illustrates the difference in stream releases between the alternative and base settings. Table 2.5-8 shows the same information ranked in descending order of the San Joaquin River Index. Overall, releases below La Grange Dam are very similar between the alternative and base settings. This circumstance is the intended result of the mitigation measure under this alternative to use conserved water to offset the Don Pedro Reservoir inflow effect of the SFPUC's additional diversion of water from the Tuolumne River. As seen in some months, such as August and September, there are occasional increases in La Grange releases. These are instances when developing conserved water every year sometimes only adds to the water that would be released in excess of FERC requirements during a drawdown of storage prior to the fall flood control level at Don Pedro. Also, some positive values occur when early-season conserved water only adds to Don Pedro spills prior to filling.

In year-to-year operations, the conserved water could be adjusted if it would merely turn into an unneeded spill. However, outside of flood events, additional flow during the summer as a result of the conserved could be welcomed. For purposes of this analysis, the conserved water is assumed to be developed each year. However, it should be noted that the additional flow that occurs due to the conserved water was not explicitly patterned for any purpose except to draw Don Pedro Reservoir down to flood control objectives.

Table 2.5-5 and Table 2.5-7 illustrate the difference in stream releases among the alternative, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-9 presents the same information and the average monthly stream releases for the alternative and WSIP settings, expressed in total monthly flow (acre-feet), and Table 2.5-10 shows the same information for the alternative and base settings. For the comparison of the alternative to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 212,000 acre-feet to a decrease of approximately 6,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly flow (cfs). Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely delay or accelerate the initiation of the release by a matter of days. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream release from La Grange Dam between the alternative and WSIP would be an additional day of delay in releases or up to almost an added month of releases. Normally, a change in release would not affect the peak stream release rate during a year. Compared to the base setting, the alternative's effect on stream flow ranges from a reduction in releases (a potential delay in release of five days) to an increase in releases (a potential additional five days of release). In either direction, the maximum difference in La Grange releases between the alternative and base settings was reduced to about 30,000 acre-feet as the result of the conserved water measure.

APPENDIX O2

Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	10,550	1,295	3,379	0	0	0	0	0	15,224
1922	0	0	0	0	11,163	7,312	8,524	0	16,332	0	2,994	5,997	52,322
1923	0	0	1,607	0	0	0	6,038	0	0	0	0	0	7,645
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	34,956	0	9,765	19,149	63,870
1928	0	21,878	34,469	3,128	14,851	-1	0	0	0	0	0	0	74,325
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	212,095	4,633	6,756	0	0	0	0	0	223,484
1937	0	0	0	0	25,974	2,039	8,664	0	0	0	0	0	36,677
1938	0	0	21,216	0	0	39	8,009	10,282	1,197	0	2,993	5,997	49,733
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1940	0	0	0	0	0	34,432	7,881	0	0	0	0	0	42,313
1941	0	0	0	15,508	-2	0	3,000	0	7,853	0	2,994	5,997	35,350
1942	0	0	1,607	3,047	-1	0	8,524	6,000	0	0	2,994	5,997	28,168
1943	0	0	1,606	0	0	4,889	6,867	0	8,413	0	2,994	5,997	30,766
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1945	0	0	0	0	25,070	-1	4,026	0	0	0	0	0	29,095
1946	0	23,867	0	0	0	1,237	4,040	0	0	0	0	0	29,144
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	140,857	-3	0	0	0	0	0	0	0	0	140,854
1952	0	0	0	0	30,875	-1	3,000	16,030	1,197	0	2,994	5,997	60,092
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	37,840	38,536	-5	0	5,578	0	8,413	0	2,994	5,997	99,353
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1958	0	0	0	0	0	25,042	3,001	15,426	1,013	0	2,993	5,997	53,472
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	170,933	5,134	0	11,075	0	0	0	7,341	6,007	200,490
1966	0	1,607	523	0	16,091	-6,452	0	0	0	0	0	0	11,769
1967	0	0	0	0	0	16,553	3,000	19,378	921	0	2,994	5,997	48,843
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1969	0	0	0	20,586	624	10,837	7,879	6,000	0	0	2,993	5,997	54,916
1970	0	0	1,608	2,855	-1	0	0	0	0	0	0	0	4,462
1971	0	0	0	0	0	22,086	0	0	0	0	0	0	22,086
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	14,881	3,620	0	60,484	0	0	0	78,985
1974	0	10,551	0	0	0	6,659	7,603	0	8,413	0	2,993	5,997	42,216
1975	0	0	0	0	1,608	0	8,524	0	11,264	0	2,993	5,996	30,385
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	76,662	0	0	1,901	78,563
1979	0	0	0	8,659	-1	4,729	3,000	6,000	0	0	0	0	22,387
1980	0	0	0	17,403	-3	4,947	5,577	6,000	0	0	2,994	5,997	42,915
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1982	0	0	0	24,409	11,947	0	3,000	7,903	1,841	0	2,994	6,006	58,100
1983	1,600	0	952	1	0	0	3,001	12,688	1,841	0	3,000	6,000	29,083
1984	0	2,518	1	0	0	0	0	0	0	0	0	0	2,519
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	9	0	40,478	11,649	13,634	7,236	1,197	0	0	8,974	83,177
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	95,016	61,107	24,874	10,886	191,883
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	33,024	13,398	6,857	829	0	3,000	5,991	63,099
1996	0	0	0	0	2,529	0	5,118	6,000	0	0	0	8,974	22,621
1997	0	1,612	0	4,729	-1	0	0	0	0	0	0	0	6,340
1998	0	0	0	19,380	-3	7,782	9,445	7,046	1,012	0	2,993	5,997	53,652
1999	0	0	1,607	0	0	1,902	10,708	0	0	0	0	0	14,217
2000	0	0	0	0	18,913	0	3,000	0	11,583	0	0	0	33,496
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	39	757	2,974	4,042	5,250	2,762	2,453	1,620	4,274	745	1,133	1,925	27,973

APPENDIX O2

Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	1,600	0	952	1	0	0	3,001	12,688	1,841	0	3,000	6,000	29,083
1995	0	0	0	0	0	33,024	13,398	6,857	829	0	3,000	5,991	63,099
1969	0	0	0	20,586	624	10,837	7,879	6,000	0	0	2,993	5,997	54,916
1982	0	0	0	24,409	11,947	0	3,000	7,903	1,841	0	2,994	6,006	58,100
1938	0	0	21,216	0	0	39	8,009	10,282	1,197	0	2,993	5,997	49,733
1998	0	0	0	19,380	-3	7,782	9,445	7,046	1,012	0	2,993	5,997	53,652
1997	0	1,612	0	4,729	-1	0	0	0	0	0	0	0	6,340
1956	0	0	37,840	38,536	-5	0	5,578	0	8,413	0	2,994	5,997	99,353
1967	0	0	0	0	0	16,553	3,000	19,378	921	0	2,994	5,997	48,843
1980	0	0	0	17,403	-3	4,947	5,577	6,000	0	0	2,994	5,997	42,915
1986	0	0	9	0	40,478	11,649	13,634	7,236	1,197	0	0	8,974	83,177
1952	0	0	0	0	30,875	-1	3,000	16,030	1,197	0	2,994	5,997	60,092
1978	0	0	0	0	0	0	0	0	76,662	0	0	1,901	78,563
1965	0	0	0	170,933	5,134	0	11,075	0	0	0	7,341	6,007	200,490
1958	0	0	0	0	0	25,042	3,001	15,426	1,013	0	2,993	5,997	53,472
1993	0	0	0	0	0	0	0	0	95,016	61,107	24,874	10,886	191,883
1941	0	0	0	15,508	-2	0	3,000	0	7,853	0	2,994	5,997	35,350
1951	0	0	140,857	-3	0	0	0	0	0	0	0	0	140,854
1922	0	0	0	0	11,163	7,312	8,524	0	16,332	0	2,994	5,997	52,322
1984	0	2,518	1	0	0	0	0	0	0	0	0	0	2,519
1943	0	0	1,606	0	0	4,889	6,867	0	8,413	0	2,994	5,997	30,766
1942	0	0	1,607	3,047	-1	0	8,524	6,000	0	0	2,994	5,997	28,168
1996	0	0	0	0	2,529	0	5,118	6,000	0	0	0	8,974	22,621
1974	0	10,551	0	0	0	6,659	7,603	0	8,413	0	2,993	5,997	42,216
1940	0	0	0	0	0	34,432	7,881	0	0	0	0	0	42,313
1936	0	0	0	0	212,095	4,633	6,756	0	0	0	0	0	223,484
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	1,607	0	0	1,902	10,708	0	0	0	0	0	14,217
1945	0	0	0	0	25,070	-1	4,026	0	0	0	0	0	29,095
1927	0	0	0	0	0	0	0	0	34,956	0	9,765	19,149	63,870
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,608	0	8,524	0	11,264	0	2,993	5,996	30,385
1973	0	0	0	0	0	14,881	3,620	0	60,484	0	0	0	78,985
1921	0	0	0	0	10,550	1,295	3,379	0	0	0	0	0	15,224
1937	0	0	0	0	25,974	2,039	8,664	0	0	0	0	0	36,677
1970	0	0	1,608	2,855	-1	0	0	0	0	0	0	0	4,462
2000	0	0	0	0	18,913	0	3,000	0	11,583	0	0	0	33,496
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	8,659	-1	4,729	3,000	6,000	0	0	0	0	22,387
1946	0	23,867	0	0	0	1,237	4,040	0	0	0	0	0	29,144
1923	0	0	1,607	0	0	0	6,038	0	0	0	0	0	7,645
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	22,086	0	0	0	0	0	0	22,086
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1928	0	21,878	34,469	3,128	14,851	-1	0	0	0	0	0	0	74,325
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1,607	523	0	16,091	-6,452	0	0	0	0	0	0	11,769
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

APPENDIX O2

Table 2.5-7

Difference in Total La Grange Release to River (Acre-feet) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	10,550	-12,107	125	0	0	0	0	0	-1,432
1922	0	0	0	0	6,029	0	1,159	0	296	-2,183	2,989	5,997	14,287
1923	0	0	1,607	0	0	0	3,920	0	0	0	0	0	5,527
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	8,049	0	820	5,993	14,862
1928	0	1,608	0	0	0	0	-8,905	0	0	0	0	0	-7,297
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-34,944	-12,257	3,121	0	0	0	0	0	-44,080
1937	0	0	0	0	9,774	-1,156	151	0	0	0	0	0	8,769
1938	0	0	1,626	0	0	0	866	-6,732	-3,683	0	820	5,992	-1,111
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1940	0	0	0	0	0	-3,763	2,203	0	0	0	0	0	-1,560
1941	0	0	0	18,819	-448	-422	2,481	0	4,317	-2,184	2,989	5,997	31,549
1942	0	0	1,607	-2,495	0	-2,664	3,000	3,146	-2,762	-2,188	2,994	5,997	6,635
1943	0	0	1,606	0	0	2,888	146	0	4,114	0	820	5,992	15,566
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1945	0	0	0	0	-12,386	-15,316	3,824	0	0	0	0	0	-23,878
1946	0	31,175	106	0	0	-10,971	428	0	0	0	0	0	20,738
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	24,303	0	0	0	0	0	0	0	0	0	24,303
1952	0	0	0	0	9,518	-1	3,000	151	-920	0	820	5,993	18,561
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	772	0	0	-3,555	2,510	0	-921	-2,188	2,994	5,997	5,609
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1958	0	0	0	0	0	-13,416	3,001	3,936	0	-2,188	2,993	5,997	323
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-14,803	2	-10,710	1,306	0	0	0	18,344	6,031	170
1966	0	1,608	-629	0	-1,078	-6,452	0	0	0	0	0	0	-6,551
1967	0	0	0	0	0	-1,945	3,000	6,951	921	-2,188	810	5,992	13,541
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1969	0	0	0	-4,658	-1,824	0	238	3,812	-2,117	0	819	5,993	2,263
1970	0	0	1,608	29,451	-5,958	-21,074	0	0	0	0	0	0	4,027
1971	0	0	0	0	0	6,554	0	0	0	0	0	0	6,554
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	7,677	3,000	0	94	0	0	0	10,771
1974	0	10,551	0	-8,392	1	-3,806	3,000	0	-1,494	0	819	5,992	6,671
1975	0	0	0	0	1,608	0	238	0	17,785	-2,183	2,989	5,996	26,433
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-12,821	0	0	1,901	-10,920
1979	0	0	0	5,094	-1	-11,490	882	3,812	0	0	0	0	-1,703
1980	0	0	0	25,044	-4	-2,664	698	3,812	-2,118	-2,188	2,994	5,997	31,571
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1982	0	0	0	-2,806	396	0	3,000	6,000	0	0	-1,364	3,879	9,105
1983	554	2,762	0	0	0	0	3,001	3,146	-2,762	-2,188	3,000	3,820	11,333
1984	0	4,057	1	0	0	3,936	0	0	0	0	0	0	7,994
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	9	0	23,365	-8,478	2,334	2,194	-3,683	0	0	6,807	22,548
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-35,371	-2,184	2,988	5,997	-28,570
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	23,761	4,192	4,954	-1,013	-2,188	3,000	3,814	36,520
1996	0	0	0	0	835	0	238	958	-4,880	0	0	6,807	3,958
1997	0	1,609	0	-1,479	0	0	0	0	0	0	0	0	130
1998	0	0	0	658	0	4,663	-1,603	3,146	-2,762	-2,188	2,993	5,997	10,904
1999	0	0	1,607	0	0	-6,660	-274	0	0	0	0	0	-5,327
2000	0	0	0	0	-181	0	3,000	0	-893	0	0	0	1,926
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	26	651	417	569	-48	-1,005	605	479	-520	-320	678	1,573	3,106

APPENDIX O2

Table 2.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	554	2,762	0	0	0	0	3,001	3,146	-2,762	-2,188	3,000	3,820	11,333
1995	0	0	0	0	0	23,761	4,192	4,954	-1,013	-2,188	3,000	3,814	36,520
1969	0	0	0	-4,658	-1,824	0	238	3,812	-2,117	0	819	5,993	2,263
1982	0	0	0	-2,806	396	0	3,000	6,000	0	0	-1,364	3,879	9,105
1938	0	0	1,626	0	0	0	866	-6,732	-3,683	0	820	5,992	-1,111
1998	0	0	0	658	0	4,663	-1,603	3,146	-2,762	-2,188	2,993	5,997	10,904
1997	0	1,609	0	-1,479	0	0	0	0	0	0	0	0	130
1956	0	0	772	0	0	-3,555	2,510	0	-921	-2,188	2,994	5,997	5,609
1967	0	0	0	0	0	-1,945	3,000	6,951	921	-2,188	810	5,992	13,541
1980	0	0	0	25,044	-4	-2,664	698	3,812	-2,118	-2,188	2,994	5,997	31,571
1986	0	0	9	0	23,365	-8,478	2,334	2,194	-3,683	0	0	6,807	22,548
1952	0	0	0	0	9,518	-1	3,000	151	-920	0	820	5,993	18,561
1978	0	0	0	0	0	0	0	0	-12,821	0	0	1,901	-10,920
1965	0	0	0	-14,803	2	-10,710	1,306	0	0	0	18,344	6,031	170
1958	0	0	0	0	0	-13,416	3,001	3,936	0	-2,188	2,993	5,997	323
1993	0	0	0	0	0	0	0	0	-35,371	-2,184	2,988	5,997	-28,570
1941	0	0	0	18,819	-448	-422	2,481	0	4,317	-2,184	2,989	5,997	31,549
1951	0	0	24,303	0	0	0	0	0	0	0	0	0	24,303
1922	0	0	0	0	6,029	0	1,159	0	296	-2,183	2,989	5,997	14,287
1984	0	4,057	1	0	0	3,936	0	0	0	0	0	0	7,994
1943	0	0	1,606	0	0	2,888	146	0	4,114	0	820	5,992	15,566
1942	0	0	1,607	-2,495	0	-2,664	3,000	3,146	-2,762	-2,188	2,994	5,997	6,635
1996	0	0	0	0	835	0	238	958	-4,880	0	0	6,807	3,958
1974	0	10,551	0	-8,392	1	-3,806	3,000	0	-1,494	0	819	5,992	6,671
1940	0	0	0	0	0	-3,763	2,203	0	0	0	0	0	-1,560
1936	0	0	0	0	-34,944	-12,257	3,121	0	0	0	0	0	-44,080
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	1,607	0	0	-6,660	-274	0	0	0	0	0	-5,327
1945	0	0	0	0	-12,386	-15,316	3,824	0	0	0	0	0	-23,878
1927	0	0	0	0	0	0	0	0	8,049	0	820	5,993	14,862
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	1,608	0	238	0	17,785	-2,183	2,989	5,996	26,433
1973	0	0	0	0	0	7,677	3,000	0	94	0	0	0	10,771
1921	0	0	0	0	10,550	-12,107	125	0	0	0	0	0	-1,432
1937	0	0	0	0	9,774	-1,156	151	0	0	0	0	0	8,769
1970	0	0	1,608	29,451	-5,958	-21,074	0	0	0	0	0	0	4,027
2000	0	0	0	0	-181	0	3,000	0	-893	0	0	0	1,926
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	5,094	-1	-11,490	882	3,812	0	0	0	0	-1,703
1946	0	31,175	106	0	0	-10,971	428	0	0	0	0	0	20,738
1923	0	0	1,607	0	0	0	3,920	0	0	0	0	0	5,527
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	6,554	0	0	0	0	0	0	6,554
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	1,607	0	0	0	0	0	0	0	0	1,607
1928	0	1,608	0	0	0	0	-8,905	0	0	0	0	0	-7,297
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1,608	-629	0	-1,078	-6,452	0	0	0	0	0	0	-6,551
1944	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	10,551	2,311	0	0	0	0	0	12,862
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	1,607	0	0	0	0	0	0	1,607
1968	0	0	0	0	0	1,608	0	0	0	0	0	0	1,608
1959	0	0	0	0	1,607	0	0	0	0	0	0	0	1,607
1939	0	0	0	631	977	0	0	0	0	0	0	0	1,608
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	1,610	0	0	0	0	0	0	0	0	0	0	0	1,610
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,001	21,563	56,842	151,415	186,738	273,821	217,239	244,709	227,921	142,651	69,115	50,878	1,665,894
Above Normal	18,683	31,026	67,978	74,978	128,547	166,616	131,514	79,097	84,366	27,869	21,031	21,212	852,917
Normal	18,264	17,579	35,872	51,349	74,834	104,445	85,081	78,304	20,306	9,992	9,992	9,670	515,686
Below Normal	17,105	13,863	19,925	15,874	17,549	21,794	34,964	33,554	4,025	4,160	4,160	4,025	190,997
Dry	17,340	13,842	14,866	13,990	15,673	20,873	21,732	21,240	3,347	3,459	3,459	3,347	153,168
All Years	18,855	19,645	39,215	61,129	84,385	116,941	97,743	90,526	67,413	37,099	21,333	17,699	671,982

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,901	21,463	53,092	132,916	181,173	266,954	211,640	237,532	215,975	138,831	65,042	45,019	1,592,538
Above Normal	18,683	30,258	59,409	73,887	113,696	163,096	126,954	78,391	79,235	27,869	19,400	17,441	808,318
Normal	18,264	14,720	33,517	50,334	70,441	101,554	83,097	77,929	15,802	9,992	9,992	9,670	495,309
Below Normal	17,105	13,768	19,894	15,874	16,603	21,364	34,828	33,554	4,025	4,160	4,160	4,025	189,359
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	100	101	3,751	18,499	5,565	6,867	5,600	7,178	11,946	3,819	4,072	5,859	73,357
Above Normal	0	769	8,569	1,091	14,851	3,519	4,561	706	5,131	0	1,631	3,771	44,599
Normal	0	2,859	2,355	1,016	4,393	2,892	1,984	375	4,504	0	0	0	20,377
Below Normal	0	95	31	0	947	430	136	0	0	0	0	0	1,638
Dry	101	0	0	39	162	201	0	0	0	0	0	0	503
All Years	39	757	2,974	4,042	5,250	2,762	2,453	1,620	4,274	745	1,133	1,925	27,973

Table 2.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,001	21,563	56,842	151,415	186,738	273,821	217,239	244,709	227,921	142,651	69,115	50,878	1,665,894
Above Normal	18,683	31,026	67,978	74,978	128,547	166,616	131,514	79,097	84,366	27,869	21,031	21,212	852,917
Normal	18,264	17,579	35,872	51,349	74,834	104,445	85,081	78,304	20,306	9,992	9,992	9,670	515,686
Below Normal	17,105	13,863	19,925	15,874	17,549	21,794	34,964	33,554	4,025	4,160	4,160	4,025	190,997
Dry	17,340	13,842	14,866	13,990	15,673	20,873	21,732	21,240	3,347	3,459	3,459	3,347	153,168
All Years	18,855	19,645	39,215	61,129	84,385	116,941	97,743	90,526	67,413	37,099	21,333	17,699	671,982

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,967	21,290	56,692	151,293	184,772	274,592	215,643	242,749	232,124	143,744	66,539	45,865	1,658,271
Above Normal	18,683	30,167	66,265	74,511	130,859	168,855	130,389	78,856	82,871	28,383	20,182	18,343	848,363
Normal	18,264	15,530	35,664	49,090	73,947	107,106	84,918	78,066	20,356	9,992	9,992	9,670	512,593
Below Normal	17,105	13,768	19,962	15,874	18,305	21,364	34,828	33,554	4,025	4,160	4,160	4,025	191,130
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	35	273	150	122	1,966	-772	1,596	1,961	-4,203	-1,094	2,576	5,013	7,624
Above Normal	0	859	1,713	467	-2,312	-2,239	1,126	241	1,496	-514	848	2,869	4,554
Normal	0	2,049	208	2,260	887	-2,660	163	238	-50	0	0	0	3,093
Below Normal	0	95	-37	0	-756	430	136	0	0	0	0	0	-132
Dry	101	0	0	39	162	201	0	0	0	0	0	0	503
All Years	26	651	417	569	-48	-1,005	605	479	-520	-320	678	1,573	3,106

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the WSIP setting, the operation of Calaveras Reservoir in the alternative setting is almost identical. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, alternative, and base settings. In recognition of the different levels of systemwide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings is an indication that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The slight differences in reservoir operation are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation during actual operations would be minimal, if any difference occurred at all. The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the alternative and WSIP settings, the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

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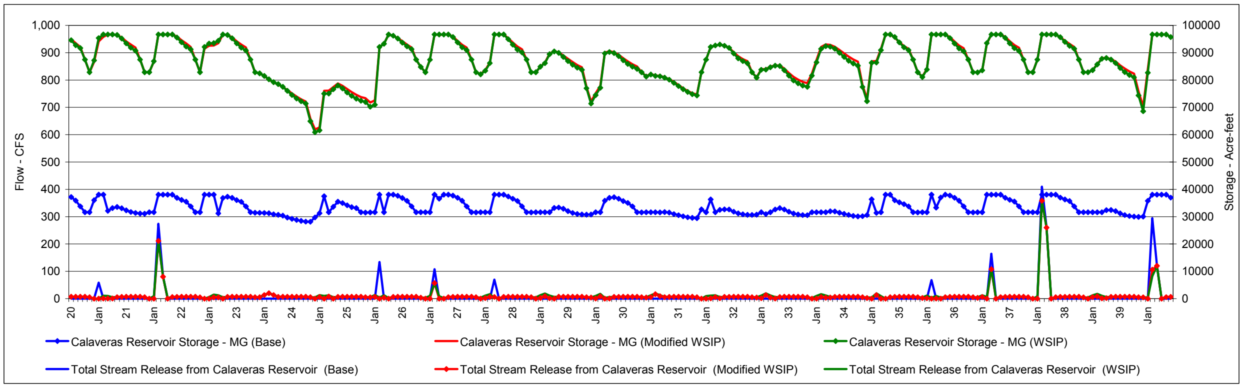
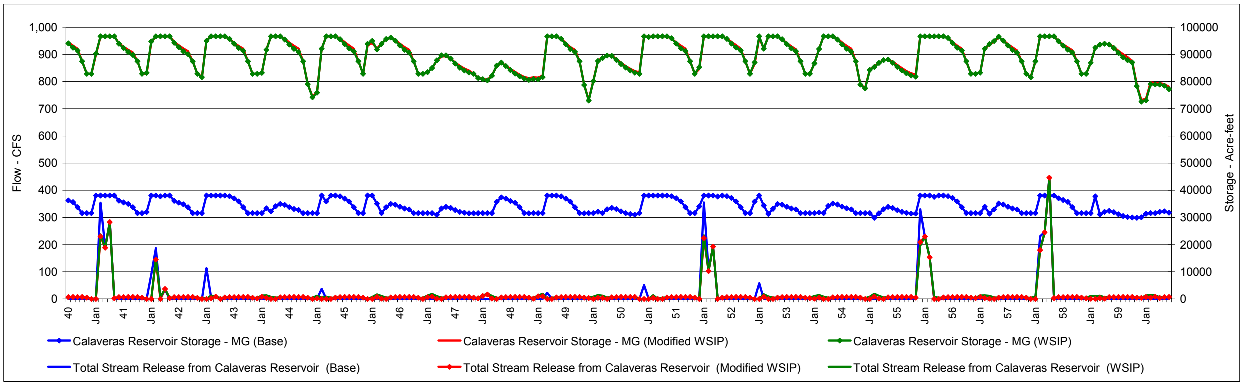
Figure 2.6-1
Calaveras Reservoir Storage and Stream Release

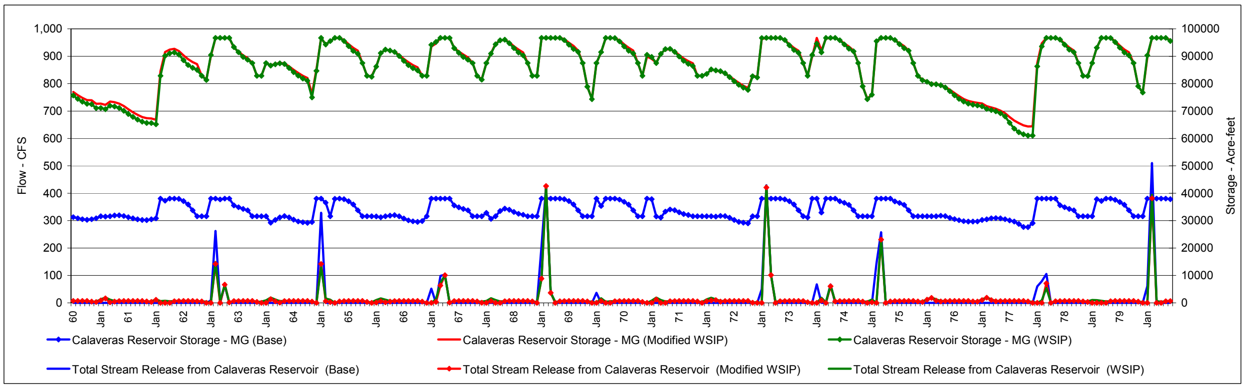
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

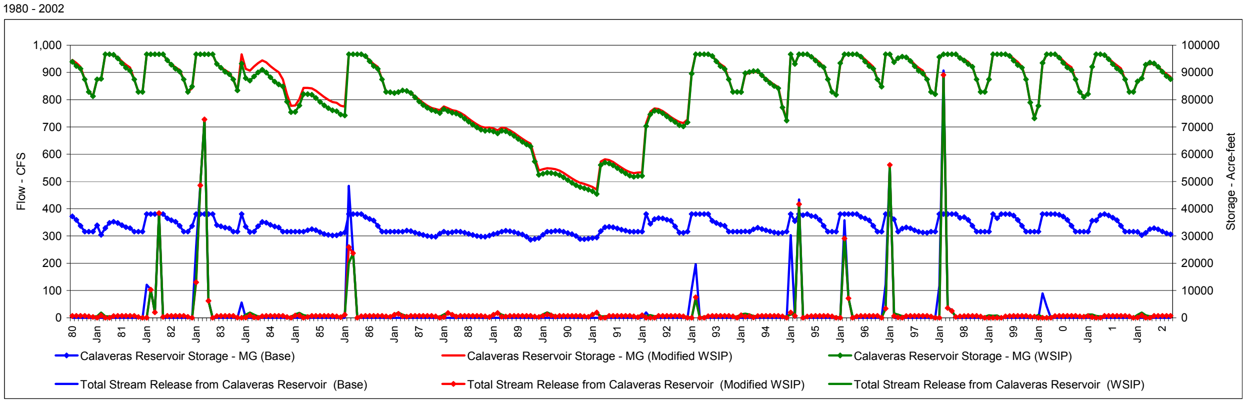
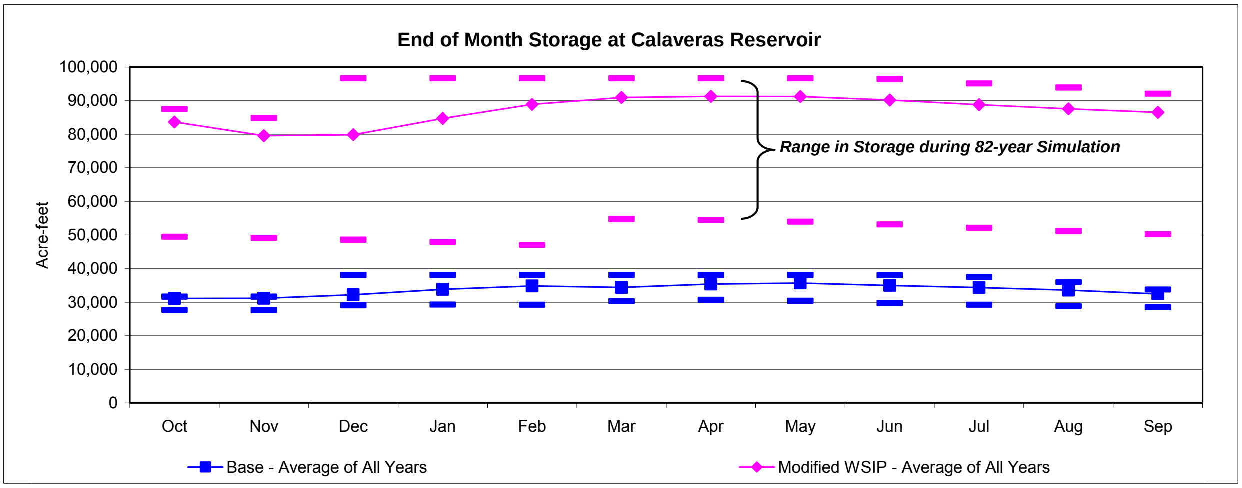


Figure 2.6-2



There would be almost identical spills from Calaveras Reservoir for the alternative and WSIP settings. Both the alternative and WSIP settings have fishery releases (1997 CDFG MOU) that are not included in the base setting. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the alternative and WSIP settings. The difference in flow (for the reach below Calaveras Reservoir to the confluence with Alameda Creek) during December through April is due to the flow bypass measure at ACDD that is associated with the Modified WSIP setting. The reductions in flow in this reach of stream are an indication that bypass flow is being provided at the diversion dam and is subsequently used to contribute to the 1997 MOU flow requirement at the confluence. The bypass flow does not exist in the WSIP setting, and additional releases would be required from Calaveras Reservoir to meet the 1997 MOU flow requirement. Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, which illustrates releases for the alternative and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the alternative and base settings. The notable difference in releases between the alternative and base settings is the addition of the required flows to satisfy the 1997 MOU and the reduction of stream releases during wetter-year, wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

The bypass flow measure at the ACDD is modeled as a release at the diversion dam of 10 cfs or inflow to the diversion dam, whichever is less, for the months December through April. Table 2.6-4 illustrates the flow past the ACDD for the alternative setting, which includes the bypass measure. Table 2.6-5 illustrates the flow for the WSIP setting, and Table 2.6-6 illustrates the difference in flow below the ACDD between the alternative and WSIP settings. As seen in Table 2.6-4, flow past the diversion dam occurs regularly during the December through April period, its magnitude either as an explicit bypass of up to 10 cfs (approximately 600 acre-feet per month), or more during rain-runoff events when either Calaveras Reservoir is not receiving water from Alameda Creek or the runoff at the diversion dam exceeds the diversion tunnel capacity. Table 2.6-6 illustrates the difference in flow below the diversion dam between the two settings. The positive values (up to 10 cfs) indicate the measure’s passage of flow that would otherwise not occur in the WSIP setting. The few exceptions of reduced flow indicate periods when the alternative setting would divert more water to Calaveras Reservoir from the diversion dam; however, review of the remaining flow below the diversion dam (Table 2.6-4) shows that it would still be in excess of the minimum bypass flow.

Table 2.6-7 illustrates the difference in flow below the ACDD between the alternative and base settings. The seasonal increase in flow past the diversion dam in the alternative setting is again apparent. The reductions in flow below the diversion dam are due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 2.6-8 and Table 2.6-9 illustrate the flow past the ACDD, comparing the alternative, WSIP, and base settings by year type and the average of all years.

APPENDIX O2

Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	-555	-614	-301	0	0	0	0	0	-1,470
1922	0	0	-9	-568	-71	0	-196	0	0	0	0	0	-845
1923	0	0	0	-381	-555	-466	-307	0	0	0	0	0	-1,709
1924	0	0	0	0	0	-3	-9	0	0	0	0	0	-12
1925	0	0	-270	-396	-528	-255	-301	0	0	0	0	0	-1,749
1926	0	0	-9	-411	-236	-552	-157	0	0	0	0	0	-1,366
1927	0	0	-224	-614	11	-543	-138	0	0	0	0	0	-1,508
1928	0	0	-212	-540	-555	191	-58	0	0	0	0	0	-1,175
1929	0	0	-267	-614	-555	-614	-402	0	0	0	0	0	-2,452
1930	0	0	-34	-614	-555	-175	-325	0	0	0	0	0	-1,703
1931	0	0	-61	-430	-184	-221	-74	0	0	0	0	0	-970
1932	0	0	0	-562	-555	-390	-276	0	0	0	0	0	-1,783
1933	0	0	-49	-614	-325	-470	-319	0	0	0	0	0	-1,777
1934	0	0	-166	-611	-555	-491	-147	0	0	0	0	0	-1,970
1935	0	0	-126	-252	-335	-580	0	0	0	0	0	0	-1,292
1936	0	0	-129	-614	-206	-614	-230	0	0	0	0	0	-1,792
1937	0	0	-92	-402	-377	-178	-92	0	0	0	0	0	-1,141
1938	0	0	-12	-491	0	0	-31	0	0	0	0	0	-534
1939	0	0	-239	-424	-555	-614	-255	0	0	0	0	0	-2,087
1940	0	0	-34	-249	1,330	0	0	0	0	0	0	0	1,047
1941	0	0	-34	-166	-429	0	0	0	0	0	0	0	-629
1942	0	0	0	0	-355	-405	0	0	0	0	0	0	-760
1943	0	0	-261	0	-555	0	-221	0	0	0	0	0	-1,037
1944	0	0	-163	-307	-555	-482	-319	0	0	0	0	0	-1,826
1945	0	0	-264	-614	-279	-528	-288	0	0	0	0	0	-1,973
1946	0	0	0	-430	-555	-614	-301	0	0	0	0	0	-1,900
1947	0	0	-264	-399	-555	-614	-301	0	0	0	0	0	-2,133
1948	0	0	-138	-132	-184	-614	-218	0	0	0	0	0	-1,286
1949	0	0	-178	-193	-500	0	-298	0	0	0	0	0	-1,169
1950	0	0	-104	-531	-555	-513	-338	0	0	0	0	0	-2,041
1951	0	0	0	0	-555	0	-307	0	0	0	0	0	-862
1952	0	0	0	-613	0	0	-123	0	0	0	0	0	-736
1953	0	0	0	-64	-555	-574	-316	0	0	0	0	0	-1,510
1954	0	0	-107	-614	-555	-516	-279	0	0	0	0	0	-2,072
1955	0	0	-147	-543	-555	-611	-335	0	0	0	0	0	-2,191
1956	0	0	830	0	0	-460	-273	0	0	0	0	0	97
1957	0	0	-104	-331	-555	-614	-331	0	0	0	0	0	-1,936
1958	0	0	-264	-537	0	0	0	0	0	0	0	0	-801
1959	0	0	-120	-614	-555	-531	-285	0	0	0	0	0	-2,105
1960	0	0	-46	-347	-555	-221	-172	0	0	0	0	0	-1,341
1961	0	0	-107	-252	-193	-586	-132	0	0	0	0	0	-1,271
1962	0	0	-89	-107	-344	-473	-338	0	0	0	0	0	-1,350
1963	0	0	-270	-12	-410	-454	0	0	0	0	0	0	-1,147
1964	0	0	-279	-552	-350	-396	-307	0	0	0	0	0	-1,884
1965	0	0	0	605	-555	-559	0	0	0	0	0	0	-509
1966	0	0	-132	-614	-555	-592	-114	0	0	0	0	0	-2,007
1967	0	0	-71	0	-555	-613	0	0	0	0	0	0	-1,239
1968	0	0	-258	-436	-555	-614	-316	0	0	0	0	0	-2,179
1969	0	0	-212	0	0	0	-203	0	0	0	0	0	-414
1970	0	0	-270	0	-555	-239	-335	0	0	0	0	0	-1,399
1971	0	0	0	-506	-390	-614	-304	0	0	0	0	0	-1,814
1972	0	0	-166	-390	-555	-160	-114	0	0	0	0	0	-1,384
1973	0	0	-212	0	-369	0	-239	0	0	0	0	0	-820
1974	0	0	0	0	-555	-132	-220	0	0	0	0	0	-907
1975	0	0	-273	-614	-28	-360	-25	0	0	0	0	0	-1,299
1976	0	0	-107	-98	-110	-270	-110	0	0	0	0	0	-697
1977	0	0	-37	-169	-71	-150	-77	0	0	0	0	0	-503
1978	0	0	-261	0	-470	1,050	-64	0	0	0	0	0	255
1979	0	0	-80	-614	-528	-470	-292	0	0	0	0	0	-1,983
1980	0	0	-190	0	-718	-381	-236	0	0	0	0	0	-1,525
1981	0	0	-110	-335	-555	-347	-316	0	0	0	0	0	-1,663
1982	0	0	-95	0	0	0	0	0	0	0	0	0	-95
1983	0	0	0	-613	0	0	0	0	0	0	0	0	-613
1984	0	0	0	-614	-555	-614	-316	0	0	0	0	0	-2,099
1985	0	0	-252	-285	-513	-602	-209	0	0	0	0	0	-1,860
1986	0	0	9	-147	3,242	0	-178	0	0	0	0	0	2,926
1987	0	0	-86	-147	-252	-408	-138	0	0	0	0	0	-1,031
1988	0	0	-273	-583	-132	-95	-120	0	0	0	0	0	-1,203
1989	0	0	-132	-144	-129	-485	-129	0	0	0	0	0	-1,019
1990	0	0	-107	-347	-408	-233	-117	0	0	0	0	0	-1,212
1991	0	0	-71	-64	-61	-325	-341	0	0	0	0	0	-862
1992	0	0	-160	-233	-322	-586	-322	0	0	0	0	0	-1,623
1993	0	0	-242	0	435	0	-267	0	0	0	0	0	-75
1994	0	0	-273	-212	-555	-368	-267	0	0	0	0	0	-1,676
1995	0	0	-288	481	-555	0	-123	0	0	0	0	0	-486
1996	0	0	-230	-40	-382	0	-273	0	0	0	0	0	-926
1997	0	0	0	0	-555	-614	-331	0	0	0	0	0	-1,501
1998	0	0	-203	0	191	0	0	0	0	0	0	0	-12
1999	0	0	-264	-555	-402	-528	0	0	0	0	0	0	-1,749
2000	0	0	-46	-614	-157	0	-313	0	0	0	0	0	-1,129
2001	0	0	-37	-390	-555	-408	-307	0	0	0	0	0	-1,697
2002	0	0	-46	-614	-555	-559	-344	0	0	0	0	0	-2,118
Avg (21-02)	0	0	-112	-298	-298	-318	-197	0	0	0	0	0	-1,223

APPENDIX O2

Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	941	4,855	14,418	9,708	4,977	255	386	417	425	415	37,472
Above Normal	425	258	42	543	2,970	2,524	446	327	396	424	428	417	9,199
Normal	429	275	93	168	286	69	6	370	408	428	430	417	3,377
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	260	1,228	3,706	2,532	1,117	350	403	426	428	417	11,563

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-46	-130	-7	-155	-109	0	0	0	0	0	-446
Above Normal	0	0	-130	-203	-227	-164	-160	0	0	0	0	0	-883
Normal	0	0	-102	-381	-439	-438	-259	0	0	0	0	0	-1,618
Below Normal	0	0	-150	-478	-510	-488	-294	0	0	0	0	0	-1,921
Dry	0	0	-130	-293	-298	-344	-159	0	0	0	0	0	-1,225
All Years	0	0	-112	-298	-298	-318	-197	0	0	0	0	0	-1,223

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	941	4,855	14,418	9,708	4,977	255	386	417	425	415	37,472
Above Normal	425	258	42	543	2,970	2,524	446	327	396	424	428	417	9,199
Normal	429	275	93	168	286	69	6	370	408	428	430	417	3,377
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	260	1,228	3,706	2,532	1,117	350	403	426	428	417	11,563

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-808	-4,412	-2,203	-260	-48	255	386	417	425	415	-5,159
Above Normal	425	258	-142	-2,141	-2,948	-572	-13	327	396	424	428	417	-3,142
Normal	429	275	-123	-196	-613	-284	6	370	408	428	430	417	1,545
Below Normal	428	275	95	194	366	108	51	389	411	430	430	417	3,594
Dry	429	292	151	485	746	402	215	407	416	430	430	417	4,819
All Years	428	269	-162	-1,208	-939	-124	42	350	403	426	428	417	329

APPENDIX O2

Table 2.6-4

Flow Passing Alameda Creek Diversion Dam (Acre-feet) Modified WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	1,043	2,826	555	614	301	0	0	0	0	0	5,340
1922	0	0	1,083	614	9,857	4,591	595	0	0	0	0	0	16,741
1923	0	0	2,581	841	666	466	595	0	0	0	0	0	5,150
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	1,117	255	552	0	0	0	0	0	2,741
1926	0	0	9	411	4,671	552	1,086	0	0	0	0	0	6,730
1927	0	396	494	614	6,184	614	648	0	0	0	0	0	8,949
1928	0	0	1,062	540	746	6,500	1,248	0	0	0	0	0	10,095
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	3,545	325	0	0	0	0	0	5,073
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	1,786	614	595	390	276	0	0	0	0	0	3,661
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	878	555	491	147	0	0	0	0	0	2,685
1935	0	0	126	614	335	614	721	0	0	0	0	0	2,409
1936	0	0	129	614	3,579	614	595	0	0	0	0	0	5,531
1937	0	0	92	402	1,013	6,291	595	0	0	0	0	0	8,393
1938	0	0	872	614	12,362	8,289	595	0	0	0	0	0	22,731
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	663	8,820	5,414	1,840	0	0	0	0	0	16,770
1941	0	0	614	792	9,188	6,816	8,525	0	0	0	0	0	25,935
1942	0	0	829	6,779	6,104	1,878	3,646	0	0	0	0	0	19,236
1943	0	0	396	7,519	1,426	3,201	595	0	0	0	0	0	13,137
1944	0	0	163	307	555	691	528	0	0	0	0	0	2,243
1945	0	0	264	614	1,602	614	595	0	0	0	0	0	3,689
1946	0	0	614	614	555	614	595	0	0	0	0	0	2,992
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	638	595	0	0	0	0	0	2,105
1950	0	0	104	614	786	513	411	0	0	0	0	0	2,427
1951	0	0	3,110	3,155	1,303	3,149	595	0	0	0	0	0	11,313
1952	0	0	804	11,527	4,542	6,905	595	0	0	0	0	0	24,373
1953	0	0	829	853	555	614	534	0	0	0	0	0	3,385
1954	0	0	107	614	761	614	595	0	0	0	0	0	2,691
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	11,877	7,608	5,484	614	595	0	0	0	0	0	26,178
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	911	9,047	7,979	11,775	0	0	0	0	0	30,072
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	1,117	221	172	0	0	0	0	0	1,903
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	2,010	614	408	0	0	0	0	0	3,228
1963	123	0	313	3,578	7,442	614	4,198	0	0	0	0	0	16,268
1964	0	0	282	905	350	396	307	0	0	0	0	0	2,240
1965	0	0	3,683	9,673	555	559	3,250	0	0	0	0	0	17,720
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	5,064	555	4,959	4,916	0	0	0	0	0	16,109
1968	0	0	258	826	555	614	537	0	0	0	0	0	2,790
1969	0	0	614	9,333	10,551	3,695	595	0	0	0	0	0	24,787
1970	0	0	335	2,197	555	1,433	427	0	0	0	0	0	4,947
1971	0	0	1,172	614	390	614	595	0	0	0	0	0	3,385
1972	0	0	617	390	562	160	114	0	0	0	0	0	1,841
1973	0	43	614	2,053	11,109	5,275	595	0	0	0	0	0	19,690
1974	0	0	2,185	1,766	555	4,324	4,373	0	0	0	0	0	13,203
1975	0	0	307	614	2,851	8,286	595	0	0	0	0	0	12,653
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	3,578	1,234	5,082	595	0	0	0	0	0	10,876
1979	0	0	80	740	1,473	614	595	0	0	0	0	0	3,502
1980	0	0	614	3,566	12,125	1,452	595	0	0	0	0	0	18,352
1981	0	0	110	2,185	555	614	528	0	0	0	0	0	3,993
1982	0	0	902	7,660	4,628	3,419	10,720	0	0	0	0	0	27,329
1983	0	52	2,170	9,811	11,751	18,057	4,168	2,774	0	0	0	0	48,783
1984	0	101	3,533	614	555	614	595	0	0	0	0	0	6,013
1985	0	0	580	285	1,200	614	209	0	0	0	0	0	2,888
1986	0	0	153	147	13,847	7,820	595	0	0	0	0	0	22,563
1987	0	0	86	147	463	408	138	0	0	0	0	0	1,243
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	1,267	399	0	0	0	0	0	1,863
1992	0	0	160	233	2,345	614	500	0	0	0	0	0	3,851
1993	0	0	568	2,820	6,251	1,943	595	0	0	0	0	0	12,177
1994	0	0	273	212	694	368	267	0	0	0	0	0	1,814
1995	0	0	417	14,528	555	12,954	598	0	0	0	0	0	29,053
1996	0	0	614	4,944	14,372	7,807	595	0	0	0	0	0	28,332
1997	0	353	7,681	14,593	552	614	331	0	0	0	0	0	24,125
1998	0	0	614	9,151	16,968	3,127	3,284	0	0	0	0	0	33,144
1999	0	0	288	1,436	2,668	614	1,877	0	0	0	0	0	6,883
2000	0	0	46	1,792	3,502	4,192	562	6	0	0	0	0	10,100
2001	0	0	37	390	611	850	473	0	0	0	0	0	2,360
2002	0	0	911	614	552	614	353	0	0	0	0	0	3,044
Avg (21-02)	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

APPENDIX O2

Table 2.6-5

Flow Passing Alameda Creek Diversion Dam (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	430	2,213	393	0	0	0	0	0	0	0	3,035
1922	0	0	470	0	9,857	4,591	0	0	0	0	0	0	14,918
1923	0	0	1,967	227	110	0	0	0	0	0	0	0	2,305
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	562	0	0	0	0	0	0	0	562
1926	0	0	0	0	4,115	0	491	0	0	0	0	0	4,606
1927	0	396	0	0	6,184	0	287	0	0	0	0	0	6,867
1928	0	0	476	0	190	6,500	1,189	0	0	0	0	0	8,355
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	2,931	0	0	0	0	0	0	2,931
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	1,172	0	40	0	0	0	0	0	0	0	1,212
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	264	0	0	0	0	0	0	0	0	264
1935	0	0	0	0	0	0	126	0	0	0	0	0	126
1936	0	0	0	0	3,182	0	0	0	0	0	0	0	3,182
1937	0	0	0	0	457	6,291	0	0	0	0	0	0	6,749
1938	0	0	258	0	12,362	8,289	321	0	0	0	0	0	21,229
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	49	8,820	5,414	1,840	0	0	0	0	0	16,122
1941	0	0	0	178	9,188	6,816	8,525	0	0	0	0	0	24,708
1942	0	0	215	6,779	6,104	1,264	3,646	0	0	0	0	0	18,008
1943	0	0	0	7,519	680	3,201	0	0	0	0	0	0	11,400
1944	0	0	0	0	0	77	0	0	0	0	0	0	77
1945	0	0	0	0	1,046	0	0	0	0	0	0	0	1,046
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	25	0	0	0	0	0	0	25
1950	0	0	0	0	230	0	0	0	0	0	0	0	230
1951	0	0	2,537	3,155	748	3,149	0	0	0	0	0	0	9,589
1952	0	0	190	11,527	4,542	6,905	0	0	0	0	0	0	23,164
1953	0	0	215	884	0	0	0	0	0	0	0	0	1,098
1954	0	0	0	0	206	0	0	0	0	0	0	0	206
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	11,877	7,608	5,484	0	0	0	0	0	0	0	24,969
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	298	9,047	7,979	11,775	0	0	0	0	0	29,099
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	562	0	0	0	0	0	0	0	562
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	1,455	0	0	0	0	0	0	0	1,455
1963	123	0	0	2,965	7,442	0	4,198	0	0	0	0	0	14,728
1964	0	0	0	292	0	0	0	0	0	0	0	0	292
1965	0	0	3,069	9,673	0	0	3,250	0	0	0	0	0	15,992
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	4,450	0	4,959	4,916	0	0	0	0	0	14,326
1968	0	0	0	212	0	0	0	0	0	0	0	0	212
1969	0	0	0	9,333	10,551	3,695	0	0	0	0	0	0	23,578
1970	0	0	0	1,584	0	819	0	0	0	0	0	0	2,403
1971	0	0	559	0	0	0	0	0	0	0	0	0	559
1972	0	0	3	0	6	0	0	0	0	0	0	0	9
1973	0	43	0	1,439	11,109	5,275	0	0	0	0	0	0	17,867
1974	0	0	1,571	4,474	0	2,482	4,373	0	0	0	0	0	12,901
1975	0	0	0	0	2,296	8,286	486	0	0	0	0	0	11,068
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	2,965	678	5,082	0	0	0	0	0	0	8,725
1979	0	0	0	126	918	0	0	0	0	0	0	0	1,043
1980	0	0	0	2,952	12,125	1,071	0	0	0	0	0	0	16,149
1981	0	0	0	1,571	0	0	0	0	0	0	0	0	1,571
1982	0	0	288	7,660	4,628	3,419	10,720	0	0	0	0	0	26,715
1983	0	52	1,556	9,811	11,751	18,057	4,168	2,774	0	0	0	0	48,169
1984	0	101	6,939	0	0	0	0	0	0	0	0	0	7,040
1985	0	0	0	0	687	0	0	0	0	0	0	0	687
1986	0	0	0	0	13,847	7,820	0	0	0	0	0	0	21,666
1987	0	0	0	0	212	0	0	0	0	0	0	0	212
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	654	0	0	0	0	0	0	654
1992	0	0	0	0	1,789	0	0	0	0	0	0	0	1,789
1993	0	0	0	2,207	6,251	2,694	0	0	0	0	0	0	11,152
1994	0	0	0	0	138	0	0	0	0	0	0	0	138
1995	0	0	0	14,528	0	12,954	3	0	0	0	0	0	27,485
1996	0	0	0	4,330	14,372	7,807	0	0	0	0	0	0	26,509
1997	0	353	7,681	14,593	0	0	0	0	0	0	0	0	22,627
1998	0	0	0	9,151	16,968	3,127	3,284	0	0	0	0	0	32,530
1999	0	0	0	822	2,266	0	1,877	0	0	0	0	0	4,965
2000	0	0	0	1,178	2,946	4,192	0	6	0	0	0	0	8,323
2001	0	0	0	0	55	236	0	0	0	0	0	0	292
2002	0	0	298	0	0	0	0	0	0	0	0	0	298
Avg (21-02)	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

APPENDIX O2

Table 2.6-6

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	614	614	163	614	301	0	0	0	0	0	2,305
1922	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1923	0	0	614	614	555	466	595	0	0	0	0	0	2,845
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	555	255	552	0	0	0	0	0	2,179
1926	0	0	9	411	555	552	595	0	0	0	0	0	2,124
1927	0	0	494	614	0	614	361	0	0	0	0	0	2,082
1928	0	0	586	540	555	0	58	0	0	0	0	0	1,740
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	614	325	0	0	0	0	0	2,142
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	614	614	555	390	276	0	0	0	0	0	2,449
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	614	555	491	147	0	0	0	0	0	2,421
1935	0	0	126	614	335	614	595	0	0	0	0	0	2,283
1936	0	0	129	614	397	614	595	0	0	0	0	0	2,348
1937	0	0	92	402	555	0	595	0	0	0	0	0	1,645
1938	0	0	614	614	0	0	275	0	0	0	0	0	1,502
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	614	0	0	0	0	0	0	0	0	648
1941	0	0	614	614	0	0	0	0	0	0	0	0	1,228
1942	0	0	614	0	0	614	0	0	0	0	0	0	1,228
1943	0	0	396	0	746	0	595	0	0	0	0	0	1,738
1944	0	0	163	307	555	614	528	0	0	0	0	0	2,167
1945	0	0	264	614	555	614	595	0	0	0	0	0	2,642
1946	0	0	614	614	555	614	595	0	0	0	0	0	2,992
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	614	595	0	0	0	0	0	2,081
1950	0	0	104	614	555	513	411	0	0	0	0	0	2,197
1951	0	0	573	0	555	0	595	0	0	0	0	0	1,724
1952	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1953	0	0	614	-30	555	614	534	0	0	0	0	0	2,287
1954	0	0	107	614	555	614	595	0	0	0	0	0	2,486
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	0	0	0	614	595	0	0	0	0	0	1,209
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	614	0	0	0	0	0	0	0	0	973
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	555	221	172	0	0	0	0	0	1,341
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	555	614	408	0	0	0	0	0	1,774
1963	0	0	313	614	0	614	0	0	0	0	0	0	1,541
1964	0	0	282	614	350	396	307	0	0	0	0	0	1,949
1965	0	0	614	0	555	559	0	0	0	0	0	0	1,728
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	614	555	0	0	0	0	0	0	0	1,783
1968	0	0	258	614	555	614	537	0	0	0	0	0	2,578
1969	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1970	0	0	335	614	555	614	427	0	0	0	0	0	2,544
1971	0	0	614	614	390	614	595	0	0	0	0	0	2,826
1972	0	0	614	390	555	160	114	0	0	0	0	0	1,832
1973	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1974	0	0	614	-2,709	555	1,842	0	0	0	0	0	0	302
1975	0	0	307	614	555	0	109	0	0	0	0	0	1,585
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	614	555	0	595	0	0	0	0	0	2,151
1979	0	0	80	614	555	614	595	0	0	0	0	0	2,458
1980	0	0	614	614	0	381	595	0	0	0	0	0	2,203
1981	0	0	110	614	555	614	528	0	0	0	0	0	2,421
1982	0	0	614	0	0	0	0	0	0	0	0	0	614
1983	0	0	614	0	0	0	0	0	0	0	0	0	614
1984	0	0	-3,406	614	555	614	595	0	0	0	0	0	-1,027
1985	0	0	580	285	513	614	209	0	0	0	0	0	2,200
1986	0	0	9	147	0	0	595	0	0	0	0	0	752
1987	0	0	86	147	252	408	138	0	0	0	0	0	1,031
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	614	399	0	0	0	0	0	1,209
1992	0	0	160	233	555	614	500	0	0	0	0	0	2,062
1993	0	0	568	614	0	-752	595	0	0	0	0	0	1,025
1994	0	0	273	212	555	368	267	0	0	0	0	0	1,676
1995	0	0	417	0	555	0	595	0	0	0	0	0	1,568
1996	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1997	0	0	0	0	552	614	331	0	0	0	0	0	1,498
1998	0	0	614	0	0	0	0	0	0	0	0	0	614
1999	0	0	288	614	402	614	0	0	0	0	0	0	1,918
2000	0	0	46	614	555	0	562	0	0	0	0	0	1,777
2001	0	0	37	390	555	614	473	0	0	0	0	0	2,068
2002	0	0	614	614	552	614	353	0	0	0	0	0	2,747
Avg (21-02)	0	0	296	362	356	375	351	0	0	0	0	0	1,739

APPENDIX O2

Table 2.6-7

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	614	-1,946	-1,783	614	301	0	0	0	0	0	-2,200
1922	0	0	614	614	0	0	595	0	0	0	0	0	1,823
1923	0	0	-2,242	-1,074	-448	466	595	0	0	0	0	0	-2,702
1924	0	0	0	0	0	3	9	0	0	0	0	0	12
1925	0	0	420	396	555	255	552	0	0	0	0	0	2,179
1926	0	0	9	411	-2,655	552	595	0	0	0	0	0	-1,086
1927	0	0	494	614	0	614	595	0	0	0	0	0	2,317
1928	0	0	586	540	555	0	-156	0	0	0	0	0	1,526
1929	0	0	614	614	555	614	448	0	0	0	0	0	2,845
1930	0	0	34	614	555	614	325	0	0	0	0	0	2,142
1931	0	0	61	430	184	221	74	0	0	0	0	0	970
1932	0	0	614	614	555	390	276	0	0	0	0	0	2,449
1933	0	0	49	614	325	470	319	0	0	0	0	0	1,777
1934	0	0	614	614	555	491	147	0	0	0	0	0	2,421
1935	0	0	126	614	335	614	595	0	0	0	0	0	2,283
1936	0	0	129	614	-2,473	614	595	0	0	0	0	0	-521
1937	0	0	92	402	-3,409	0	595	0	0	0	0	0	-2,319
1938	0	0	614	614	0	0	88	0	0	0	0	0	1,316
1939	0	0	605	424	555	614	255	0	0	0	0	0	2,452
1940	0	0	34	614	0	0	-156	0	0	0	0	0	492
1941	0	0	614	-584	0	0	0	0	0	0	0	0	30
1942	0	0	614	0	0	614	0	0	0	0	0	0	1,228
1943	0	0	396	0	-1,366	0	595	0	0	0	0	0	-375
1944	0	0	163	307	555	614	528	0	0	0	0	0	2,167
1945	0	0	264	614	-3,916	614	595	0	0	0	0	0	-1,829
1946	0	0	-4,037	-908	555	614	595	0	0	0	0	0	-3,181
1947	0	0	390	399	555	614	595	0	0	0	0	0	2,553
1948	0	0	138	132	184	614	595	0	0	0	0	0	1,663
1949	0	0	178	193	500	-4,910	595	0	0	0	0	0	-3,443
1950	0	0	104	614	555	513	411	0	0	0	0	0	2,197
1951	0	0	-3,709	209	-520	301	595	0	0	0	0	0	-3,124
1952	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1953	0	0	614	-3,986	555	614	534	0	0	0	0	0	-1,669
1954	0	0	107	614	555	614	595	0	0	0	0	0	2,486
1955	0	0	614	614	555	611	439	0	0	0	0	0	2,833
1956	0	0	0	0	0	614	595	0	0	0	0	0	1,209
1957	0	0	104	331	555	614	454	0	0	0	0	0	2,059
1958	0	0	359	614	0	0	0	0	0	0	0	0	973
1959	0	0	120	614	555	531	285	0	0	0	0	0	2,105
1960	0	0	46	347	555	221	172	0	0	0	0	0	1,341
1961	0	0	107	252	193	586	132	0	0	0	0	0	1,271
1962	0	0	89	107	-2,719	614	408	0	0	0	0	0	-1,501
1963	0	0	313	-1,605	0	614	0	0	0	0	0	0	-678
1964	0	0	282	614	350	396	307	0	0	0	0	0	1,949
1965	0	0	-550	0	555	559	3,250	0	0	0	0	0	3,814
1966	0	0	614	614	555	592	114	0	0	0	0	0	2,489
1967	0	0	614	-1,062	-1,317	0	0	0	0	0	0	0	-1,765
1968	0	0	258	614	555	614	537	0	0	0	0	0	2,578
1969	0	0	614	0	0	0	595	0	0	0	0	0	1,209
1970	0	0	335	-3,634	555	-1,009	427	0	0	0	0	0	-3,326
1971	0	0	-646	614	390	614	595	0	0	0	0	0	1,567
1972	0	0	614	390	555	160	114	0	0	0	0	0	1,832
1973	0	0	614	-4,312	0	0	595	0	0	0	0	0	-3,103
1974	0	0	-178	-2,709	555	1,444	0	0	0	0	0	0	-887
1975	0	0	307	614	-4,640	0	-72	0	0	0	0	0	-3,791
1976	0	0	107	98	110	270	110	0	0	0	0	0	697
1977	0	0	37	169	71	150	77	0	0	0	0	0	503
1978	0	0	387	-3,538	-2,848	0	595	0	0	0	0	0	-5,404
1979	0	0	80	614	555	614	595	0	0	0	0	0	2,458
1980	0	0	614	-2,747	0	-101	595	0	0	0	0	0	-1,639
1981	0	0	110	614	555	614	528	0	0	0	0	0	2,421
1982	0	0	614	0	0	0	0	0	0	0	0	0	614
1983	0	0	614	0	0	0	0	687	0	0	0	0	1,301
1984	0	0	-3,406	614	555	614	595	0	0	0	0	0	-1,027
1985	0	0	580	285	513	614	209	0	0	0	0	0	2,200
1986	0	0	9	147	0	0	595	0	0	0	0	0	752
1987	0	0	86	147	252	408	138	0	0	0	0	0	1,031
1988	0	0	304	583	132	95	120	0	0	0	0	0	1,234
1989	0	0	132	144	129	485	129	0	0	0	0	0	1,019
1990	0	0	107	347	408	233	117	0	0	0	0	0	1,212
1991	0	0	71	64	61	614	399	0	0	0	0	0	1,209
1992	0	0	160	233	-2,799	614	500	0	0	0	0	0	-1,292
1993	0	0	568	-4,385	0	-101	595	0	0	0	0	0	-3,324
1994	0	0	273	212	555	368	267	0	0	0	0	0	1,676
1995	0	0	417	0	555	0	595	0	0	0	0	0	1,568
1996	0	0	614	-4,625	0	0	595	0	0	0	0	0	-3,416
1997	0	0	0	0	552	614	331	0	0	0	0	0	1,498
1998	0	0	614	0	0	0	0	0	0	0	0	0	614
1999	0	0	288	614	-2,821	614	1,392	0	0	0	0	0	87
2000	0	0	46	614	-4,011	0	562	0	0	0	0	0	-2,790
2001	0	0	37	390	555	614	473	0	0	0	0	0	2,068
2002	0	0	614	614	552	614	353	0	0	0	0	0	2,747
Avg (21-02)	0	0	113	-144	-200	289	401	8	0	0	0	0	467

APPENDIX O2

Table 2.6-8

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,859	6,509	8,086	5,866	3,258	173	0	0	0	0	25,779
Above Normal	7	23	1,013	2,755	4,074	3,398	1,318	0	0	0	0	0	12,589
Normal	0	6	655	735	1,314	1,017	618	0	0	0	0	0	4,345
Below Normal	0	0	332	547	614	790	387	0	0	0	0	0	2,669
Dry	0	0	191	293	355	344	201	0	0	0	0	0	1,385
All Years	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	471	239	104	139	298	0	0	0	0	0	1,252
Above Normal	0	0	422	298	339	269	359	0	0	0	0	0	1,686
Normal	0	0	70	475	518	558	506	0	0	0	0	0	2,125
Below Normal	0	0	315	501	512	560	387	0	0	0	0	0	2,275
Dry	0	0	191	293	298	344	201	0	0	0	0	0	1,328
All Years	0	0	296	362	356	375	351	0	0	0	0	0	1,739

Table 2.6-9

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,859	6,509	8,086	5,866	3,258	173	0	0	0	0	25,779
Above Normal	7	23	1,013	2,755	4,074	3,398	1,318	0	0	0	0	0	12,589
Normal	0	6	655	735	1,314	1,017	618	0	0	0	0	0	4,345
Below Normal	0	0	332	547	614	790	387	0	0	0	0	0	2,669
Dry	0	0	191	293	355	344	201	0	0	0	0	0	1,385
All Years	1	12	807	2,155	2,875	2,278	1,149	34	0	0	0	0	9,311

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	471	-458	-13	109	287	43	0	0	0	0	438
Above Normal	0	0	-112	-917	-1,220	301	626	0	0	0	0	0	-1,322
Normal	0	0	-300	-133	-556	111	492	0	0	0	0	0	-386
Below Normal	0	0	315	501	512	560	387	0	0	0	0	0	2,275
Dry	0	0	191	293	298	344	201	0	0	0	0	0	1,328
All Years	0	0	113	-144	-200	289	401	8	0	0	0	0	467

Comparing the alternative and WSIP settings, differences in releases from Calaveras Dam to the stream and differences in spills and bypass flows at the ACDD result in differences in flow below the Alameda Creek and Calaveras Creek confluence between the settings. Table 2.6-10 illustrates the flow below the confluence for the alternative and WSIP settings. The flow would be generally the same, with slightly additional flow occurring during December and April due to the bypass flows. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 2.6-11 provides the same form of information for the alternative and base settings. The notable differences between the alternative and base settings (comparable to the differences between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year, wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 2.6-10

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	3,145	12,372	23,692	16,559	8,836	605	417	429	429	417	67,658
Above Normal	437	326	1,299	3,896	7,820	6,484	2,075	430	418	430	429	417	24,461
Normal	429	304	974	1,171	1,985	1,413	782	430	417	429	430	417	9,182
Below Normal	429	297	488	882	1,215	1,118	510	430	417	430	430	417	7,063
Dry	429	298	368	813	1,168	816	460	430	417	430	430	417	6,475
All Years	431	310	1,246	3,792	7,111	5,242	2,502	464	417	430	429	417	22,792

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	424	109	97	-16	190	0	0	0	0	0	805
Above Normal	0	0	293	95	112	105	198	0	0	0	0	0	803
Normal	0	0	-32	94	79	120	246	0	0	0	0	0	507
Below Normal	0	0	164	23	1	72	93	0	0	0	0	0	354
Dry	0	0	61	0	0	0	42	0	0	0	0	0	103
All Years	0	0	183	64	58	57	154	0	0	0	0	0	516

Table 2.6-11

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	3,145	12,372	23,692	16,559	8,836	605	417	429	429	417	67,658
Above Normal	437	326	1,299	3,896	7,820	6,484	2,075	430	418	430	429	417	24,461
Normal	429	304	974	1,171	1,985	1,413	782	430	417	429	430	417	9,182
Below Normal	429	297	488	882	1,215	1,118	510	430	417	430	430	417	7,063
Dry	429	298	368	813	1,168	816	460	430	417	430	430	417	6,475
All Years	431	310	1,246	3,792	7,111	5,242	2,502	464	417	430	429	417	22,792

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-337	-4,871	-2,216	-152	239	298	386	417	425	415	-4,721
Above Normal	425	258	-254	-3,058	-4,168	-270	612	327	396	424	428	417	-4,465
Normal	429	275	-423	-330	-1,168	-173	498	370	408	428	430	417	1,160
Below Normal	428	275	410	695	877	668	438	389	411	430	430	417	5,869
Dry	429	292	342	778	1,044	747	417	407	416	430	430	417	6,147
All Years	428	269	-49	-1,353	-1,139	165	443	358	403	426	428	417	796

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the alternative and WSIP settings. This facility is assumed to recapture flows explicitly released for the 1997 MOU. The effect of the recapture would be a reduction in the flow below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda Creek and San Antonio Creek confluence. Table 2.6-12 illustrates the flow at this location for the alternative and WSIP settings. The flows identified at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above) with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek. The flow changes at this location for the comparison of the WSIP and alternative settings are considered insubstantial and may not occur. The differences during the December through April period of wetter years indicate that too much of the spills/releases past the diversion dam were counted as 1997 MOU releases and were subsequently recaptured. The modeled accounting tends to overstate the amount of water allowed to be recaptured. A more precise accounting method would tend to minimize the differences between the alternative and WSIP settings. Table 2.6-13 provides the same form of information for the alternative and base settings.

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Table 2.6-12

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,088	13,218	24,845	17,207	9,016	556	76	33	15	9	68,224
Above Normal	19	150	1,201	4,082	8,259	6,568	1,897	217	54	20	9	6	22,482
Normal	7	64	880	869	1,730	1,192	432	128	28	9	4	3	5,344
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,075	3,698	7,083	5,129	2,286	207	38	14	7	4	19,638

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-24	-392	-354	-513	-281	0	0	0	0	0	-1,564
Above Normal	0	0	-2	-268	-163	-303	-230	0	0	0	0	0	-967
Normal	0	0	-251	-40	-10	-26	-34	0	0	0	0	0	-361
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-54	-140	-105	-168	-109	0	0	0	0	0	-576

Table 2.6-13

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,088	13,218	24,845	17,207	9,016	556	76	33	15	9	68,224
Above Normal	19	150	1,201	4,082	8,259	6,568	1,897	217	54	20	9	6	22,482
Normal	7	64	880	869	1,730	1,192	432	128	28	9	4	3	5,344
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,075	3,698	7,083	5,129	2,286	207	38	14	7	4	19,638

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-885	-5,496	-2,828	-771	-341	43	0	0	0	0	-10,278
Above Normal	0	0	-722	-3,690	-4,809	-899	35	0	0	0	0	0	-10,084
Normal	0	0	-837	-1,012	-1,982	-815	-47	0	0	0	0	0	-4,693
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-485	-2,035	-1,936	-496	-68	8	0	0	0	0	-5,012

Compared to the WSIP setting, the alternative's San Antonio Reservoir operation would draw less from storage on an annual basis, particularly during cyclic maintenance. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 2.6-3 are the results for the WSIP, alternative, and base settings. The difference in San Antonio Reservoir storage between the alternative and WSIP settings is mostly caused by the lesser demand of the alternative. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage is indicative of the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the alternative setting compared to the WSIP setting.

The difference in storage between the alternative and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the alternative and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year, in the WSIP and alternative settings.

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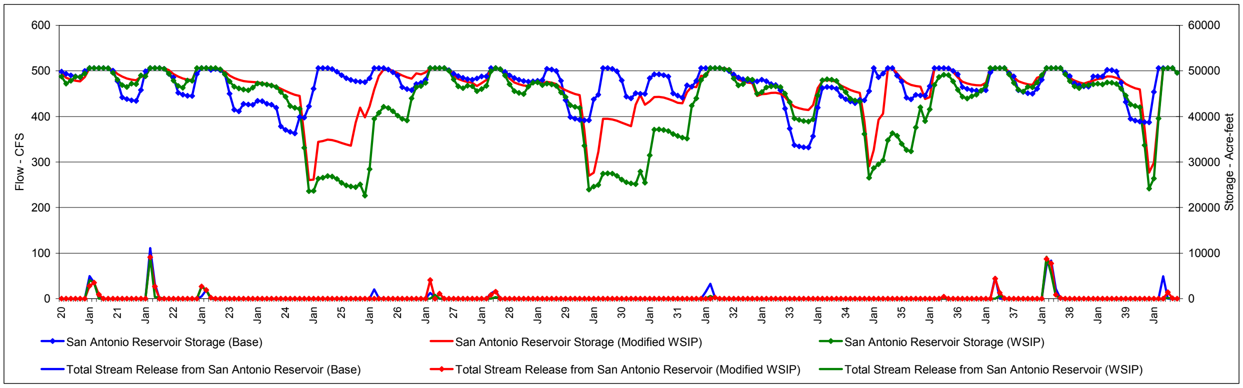
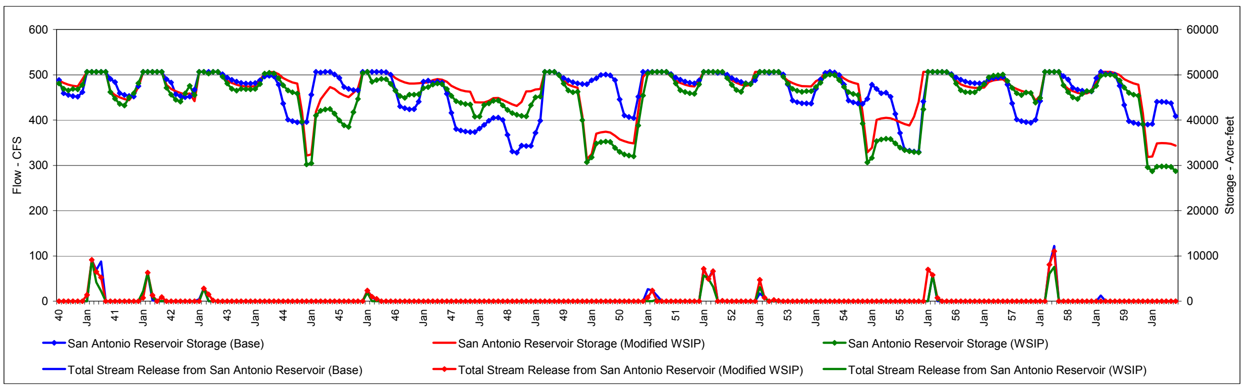
Figure 2.6-3
San Antonio Reservoir Storage and Stream Release

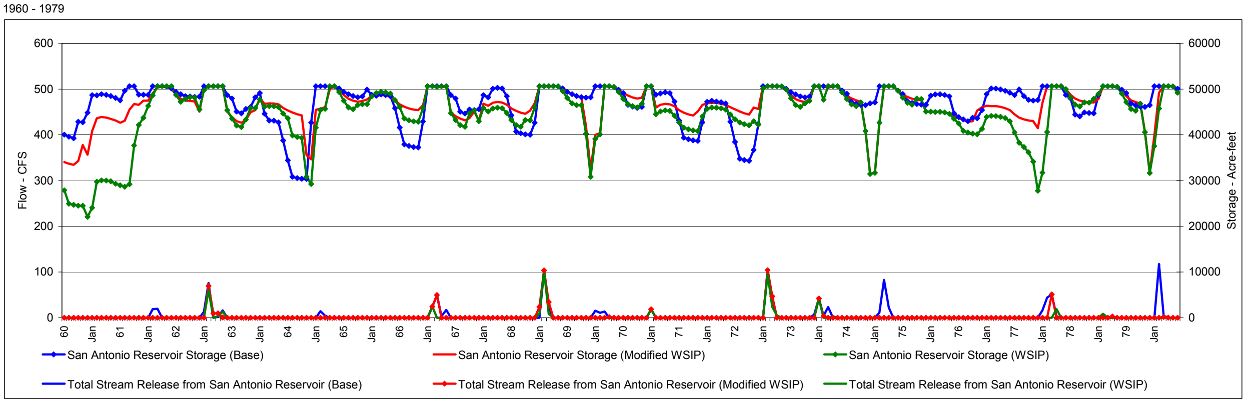
1920 - 1939



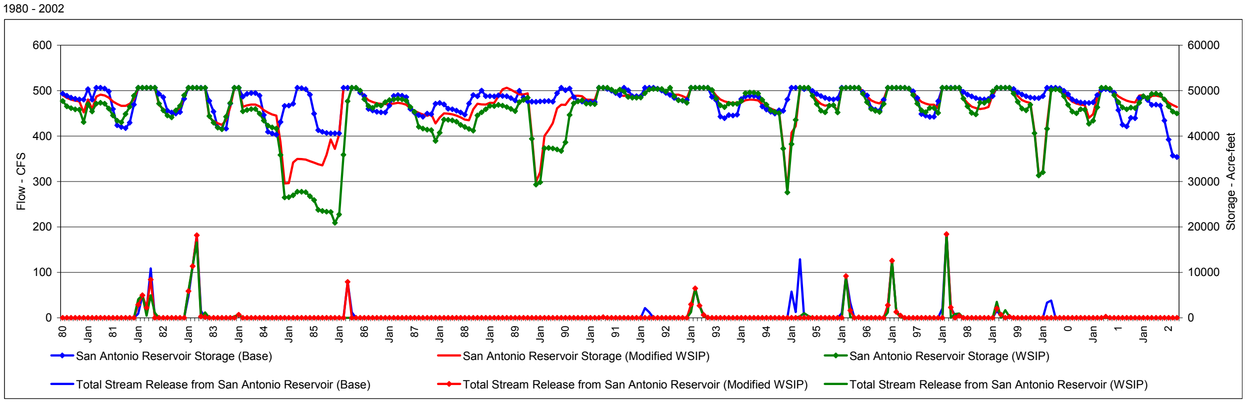
1940 - 1959



1960 - 1979

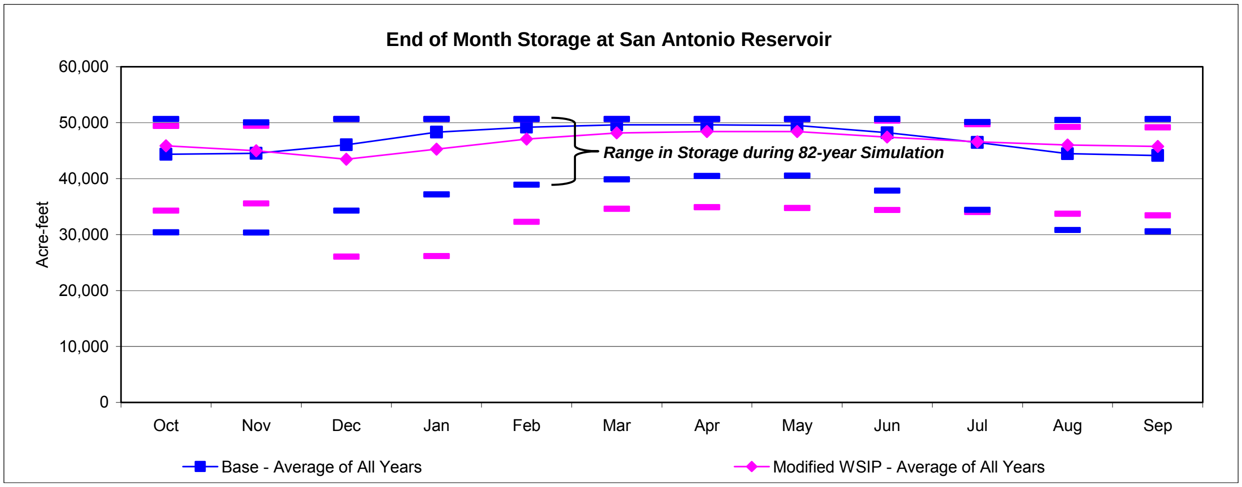


1980 - 2002



The reduction in diversions from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation is evident in the tracing of San Antonio Reservoir storage for the alternative and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. Compared to the base setting, the alternative would draw less storage from San Antonio Reservoir during many years, typically retaining a fuller reservoir, but would draw more storage during the every-fifth-year maintenance cycle.

Figure 2.6-4



There is very little anticipated change in stream releases below San Antonio Reservoir between the alternative and WSIP settings. Table 2.6-14 illustrates the modeled releases to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a fuller reservoir operation at times, as seen in Figure 2.6-3, it is expected that there would be a decrease in the ability to regulate reservoir inflow and avoid stream releases. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and the difference between releases for the alternative and base settings are shown in Table 2.6-15. The differences between the two settings reflect a general decrease in modeled releases in the alternative setting. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In most instances, the alternative setting storage at San Antonio Reservoir during a period would be equal to or lower than that projected for the base setting during the same period. This circumstance could lead to an occasionally greater modeled release for the base setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from the reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-16 illustrates the flow below the confluence for the alternative and WSIP settings, and the differences in flow between the two. The differences in flow between the alternative and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and from San Antonio Creek. The difference in flow from upstream in Alameda Creek was previously identified as insubstantial. Along with the conclusion that flow differences in San Antonio Creek would not be substantial, modeled differences below the confluence are also considered insubstantial.

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Table 2.6-14

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	106	1,534	3,265	2,891	960	66	0	0	0	0	8,823
Above Normal	0	0	0	487	1,593	748	193	22	0	0	0	0	3,043
Normal	0	0	0	368	62	61	99	3	0	0	0	0	594
Below Normal	0	0	0	0	0	0	12	0	0	0	0	0	12
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	21	472	980	731	249	18	0	0	0	0	2,471

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	62	326	14	1,333	302	-85	0	0	0	0	1,953
Above Normal	0	0	0	45	212	590	1	-40	0	0	0	0	808
Normal	0	0	-11	81	-16	56	86	3	0	0	0	0	199
Below Normal	0	0	0	0	0	0	8	0	0	0	0	0	8
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	10	89	44	393	78	-24	0	0	0	0	589

Table 2.6-15

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	106	1,534	3,265	2,891	960	66	0	0	0	0	8,823
Above Normal	0	0	0	487	1,593	748	193	22	0	0	0	0	3,043
Normal	0	0	0	368	62	61	99	3	0	0	0	0	594
Below Normal	0	0	0	0	0	0	12	0	0	0	0	0	12
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	21	472	980	731	249	18	0	0	0	0	2,471

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	5	213	-404	-398	-438	-28	0	0	0	0	-1,049
Above Normal	0	0	-26	-200	-316	-739	78	-36	0	0	0	0	-1,240
Normal	0	0	-7	-1	-379	-176	34	3	0	0	0	0	-525
Below Normal	0	0	0	0	-41	0	12	0	0	0	0	0	-29
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-6	0	-227	-265	-60	-12	0	0	0	0	-570

Table 2.6-16

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,753	28,110	20,097	9,977	622	76	33	15	9	77,046
Above Normal	19	150	1,201	4,569	9,852	7,316	2,090	239	54	20	9	6	25,526
Normal	7	64	880	1,237	1,792	1,253	531	131	28	9	4	3	5,939
Below Normal	7	56	183	404	678	717	167	91	20	5	3	2	2,334
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,095	4,170	8,063	5,860	2,536	225	38	14	7	4	22,109

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	37	-65	-339	819	22	-85	0	0	0	0	389
Above Normal	0	0	-2	-223	49	287	-230	-40	0	0	0	0	-159
Normal	0	0	-263	41	-26	29	53	3	0	0	0	0	-162
Below Normal	0	0	0	0	0	0	8	0	0	0	0	0	8
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-44	-51	-61	225	-31	-24	0	0	0	0	13

Table 2.6-17 illustrates the same information for the alternative and base settings. Table 2.6-17 illustrates the larger differences in flow that would occur between the alternative and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity.

Table 2.6-17

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,194	14,753	28,110	20,097	9,977	622	76	33	15	9	77,046
Above Normal	19	150	1,201	4,569	9,852	7,316	2,090	239	54	20	9	6	25,526
Normal	7	64	880	1,237	1,792	1,253	531	131	28	9	4	3	5,939
Below Normal	7	56	183	404	678	717	167	91	20	5	3	2	2,334
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,095	4,170	8,063	5,860	2,536	225	38	14	7	4	22,109

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-880	-5,283	-3,232	-1,169	-779	15	0	0	0	0	-11,327
Above Normal	0	0	-747	-3,890	-5,125	-1,638	113	-36	0	0	0	0	-11,323
Normal	0	0	-843	-1,014	-2,361	-991	-13	3	0	0	0	0	-5,218
Below Normal	0	0	0	0	-41	0	12	0	0	0	0	0	-29
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-491	-2,035	-2,162	-761	-128	-4	0	0	0	0	-5,582

2.7 Crystal Springs and San Andreas Reservoirs

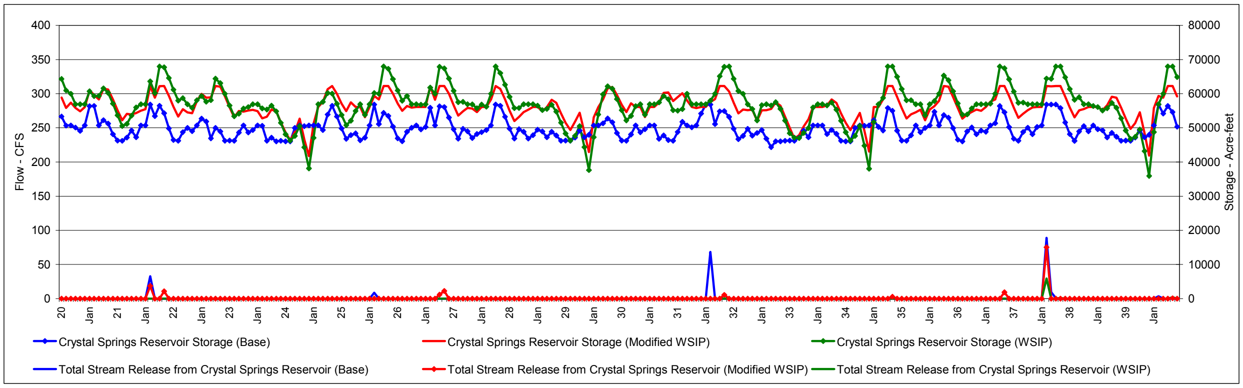
There are differences in Crystal Springs Reservoir operations between the WSIP setting and the alternative and base settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.7-1 are the results for the WSIP, alternative, and base settings. Fundamental to the difference in storage operations between the WSIP and alternative settings and the base setting is the restoration of reservoir operation capacity, which does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the base setting. The alternative setting differs from the WSIP setting in that the restored capacity of the Crystal Springs Reservoir is not fully used in the alternative setting. The Crystal Springs Reservoir restricted storage measure affects the maximum storage attained in the reservoir. Rather than having the full reservoir capacity of 22.15 billion gallons to regulate and store water, the reservoir is operationally constrained to a maximum of 20.28 billion gallons.

The operation of Crystal Springs Reservoir storage is generally consistent for the alternative and WSIP settings, except in the alternative setting the reservoir is not filled to the same level of storage. The annual drawdown of the reservoir occurs to about the same level. The alternative setting would provide less carryover storage at Crystal Springs Reservoir into periods of drought and would thereby cause additional draw from other resources to serve the same delivery. The magnitude of the draw of storage from Crystal Springs Reservoir is partially dependent on the discretionary assumptions of the model that proportions the use of storage among the Bay Area system reservoirs. In actual operations, some of these differences may not occur, as system operations and prevailing hydraulic and hydrologic conditions may result in a different apportionment of effect among the reservoirs. However, the operational strategy prefers the retention of storage in the Peninsula reservoirs, similar to the strategy used by the model. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and WSIP settings.

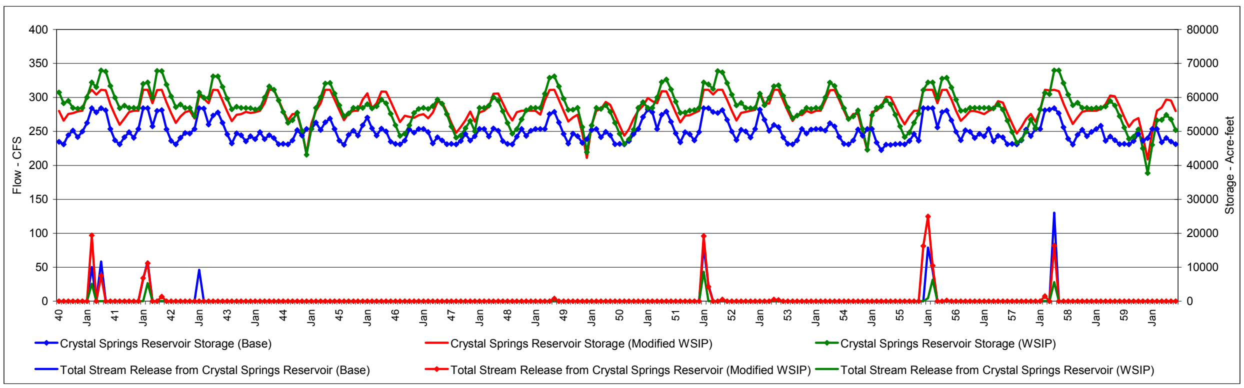
APPENDIX O2

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

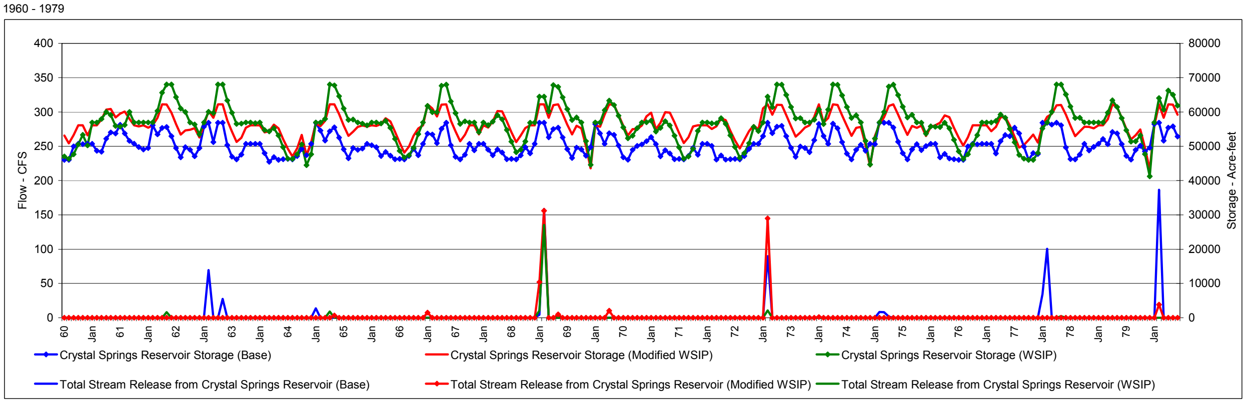
1920 - 1939



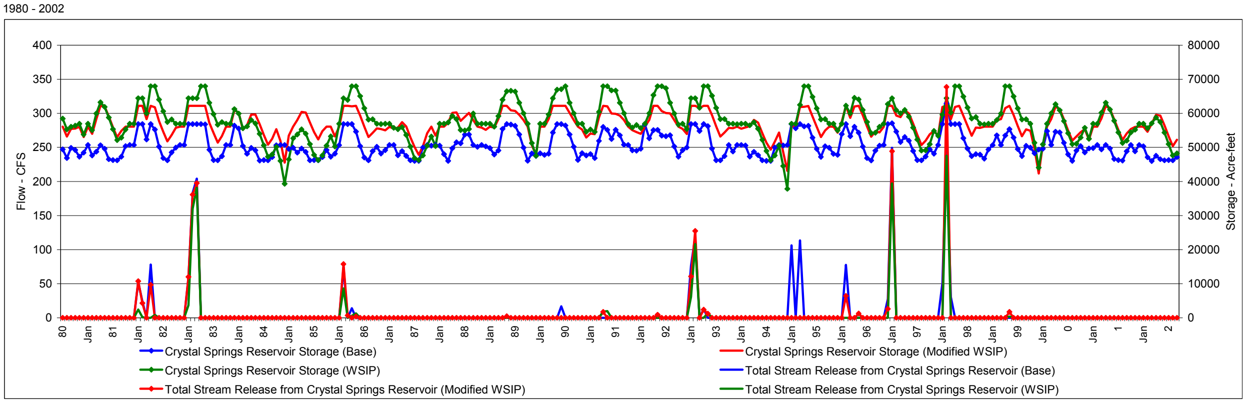
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Figure 2.7-2

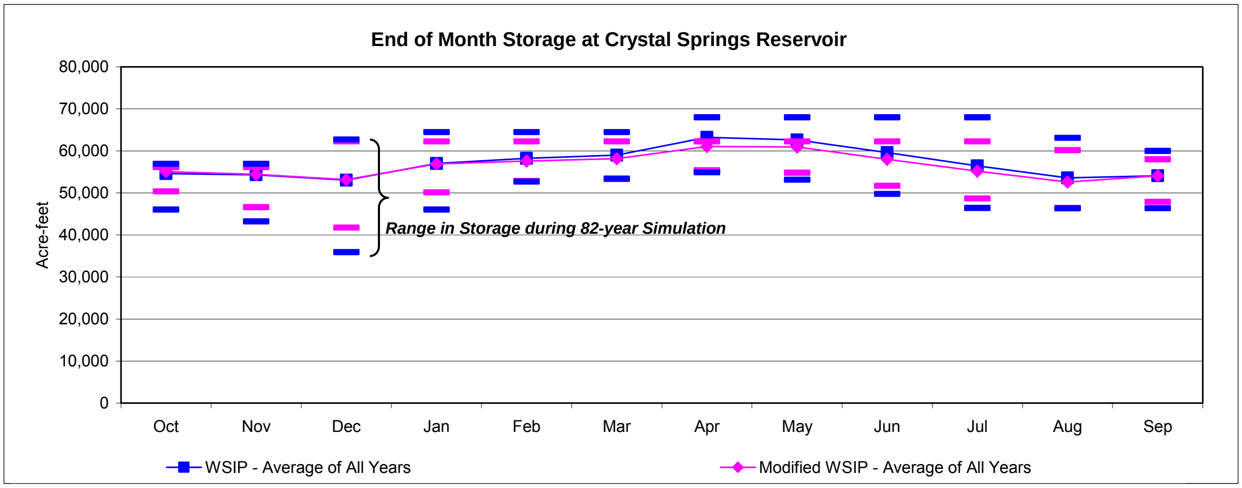


Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings. The alternative setting would result in reservoir storage operating at a slightly higher average level during all months, and the range of operating storage would typically be smaller in the alternative setting, except during the system maintenance cycle.

Figure 2.7-3

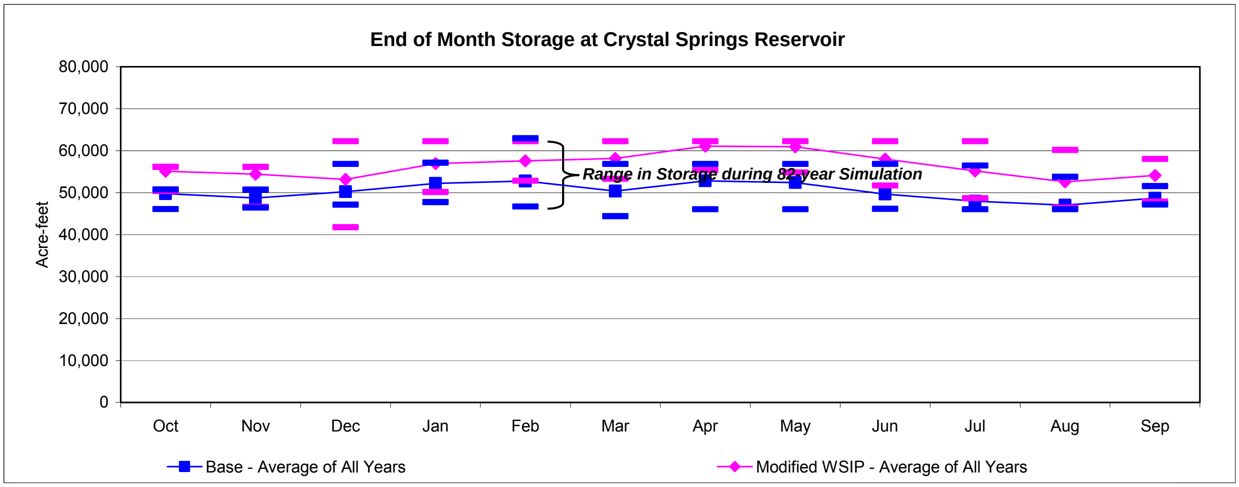


Table 2.7-1 illustrates the modeled alternative and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase in the occasional release could occur. The potential difference is attributed to a narrower operating range of reservoir storage in the alternative setting. This narrower range in storage would lead to a greater potential for stream releases. In actual operations, it is anticipated that system operators would manage the reservoir system whereby stream releases would be minimal under any setting, and the effect would be essentially no difference between the alternative and WSIP settings. Similarly, Table 2.7-2 illustrates the stream releases for the alternative and base settings, and the difference in modeled flows between the two settings. A lesser drawdown in Crystal Springs Reservoir storage associated with the alternative setting would lead to a decreased potential to regulate reservoir inflow, which would lead to additional risk in needing to make stream releases. However, as described above, actual system operations attempt to minimize releases under any setting, and thus the difference in releases between the alternative and base setting is minimal, if any.

APPENDIX O2

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	242	1,880	2,967	515	445	135	0	0	0	0	6,185
Above Normal	0	0	0	0	473	0	56	104	0	0	0	0	634
Below Normal	0	0	0	0	0	0	12	29	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	32	26	0	0	0	0	59
All Years	0	0	71	550	967	151	150	71	0	0	0	0	1,959

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	811	1,849	488	99	55	0	0	0	0	3,303
Above Normal	0	0	0	0	35	0	0	14	0	0	0	0	49
Below Normal	0	0	0	0	0	0	0	42	0	0	0	0	42
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	33	38	0	0	0	0	71
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by SJR Index Year Type) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	242	1,069	1,118	27	346	80	0	0	0	0	2,882
Above Normal	0	0	0	0	438	0	56	90	0	0	0	0	585
Below Normal	0	0	0	0	0	0	12	-13	0	0	0	0	-1
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
Critical	0	0	0	0	0	0	-1	-11	0	0	0	0	-12
All Years	0	0	71	313	418	8	114	38	0	0	0	0	962

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	363	2,583	4,335	772	624	65	0	0	0	0	8,743
Above Normal	0	0	0	223	582	0	62	204	0	0	0	0	1,071
Normal	0	0	0	0	0	0	47	71	0	0	0	0	118
Below Normal	0	0	0	0	0	0	30	0	0	0	0	0	30
Dry	0	0	0	0	0	0	0	9	0	0	0	0	9
All Years	0	0	71	550	967	151	150	71	0	0	0	0	1,959

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

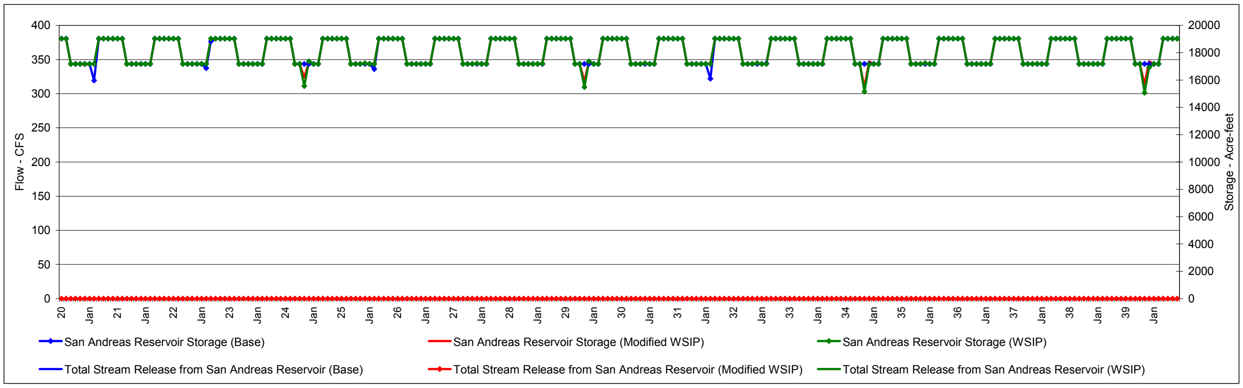
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	256	-161	56	-603	-423	63	0	0	0	0	-812
Above Normal	0	0	0	-396	-761	-29	10	104	0	0	0	0	-1,071
Normal	0	0	0	0	-268	0	47	71	0	0	0	0	-150
Below Normal	0	0	0	0	0	0	30	0	0	0	0	0	30
Dry	0	0	0	0	0	0	0	9	-62	0	0	0	-54
All Years	0	0	50	-113	-199	-124	-65	50	-12	0	0	0	-414

Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in drawdown between the alternative and WSIP settings, primarily due to the coincidence of the effects of different systemwide maintenance and water demands within each setting. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, alternative, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, as Figure 2.7-4 illustrates, there would be a difference in storage operation every fifth year for the WSIP and alternative settings. These differences would be the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the alternative and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As previously discussed, during these winter periods the Bay Area reservoir system would accommodate the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, serving this water demand would affect the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the alternative exceeded the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and alternative require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

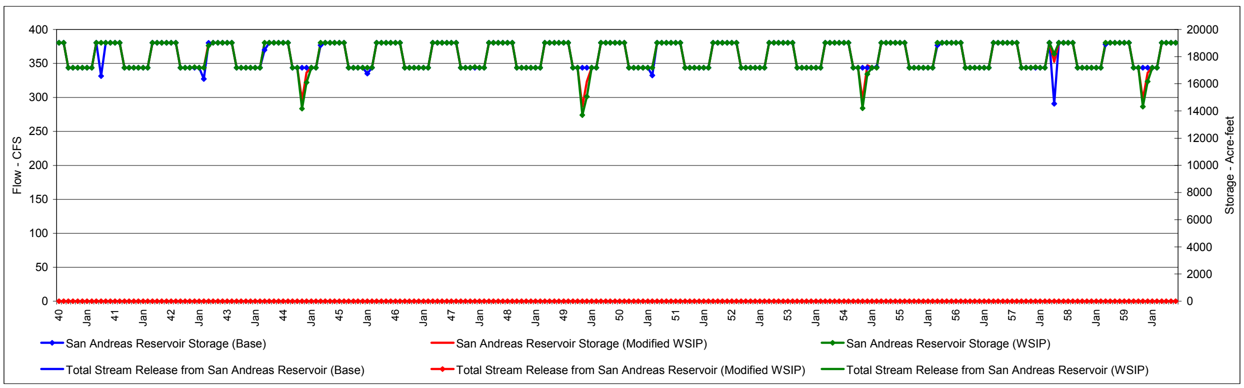
APPENDIX O2

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

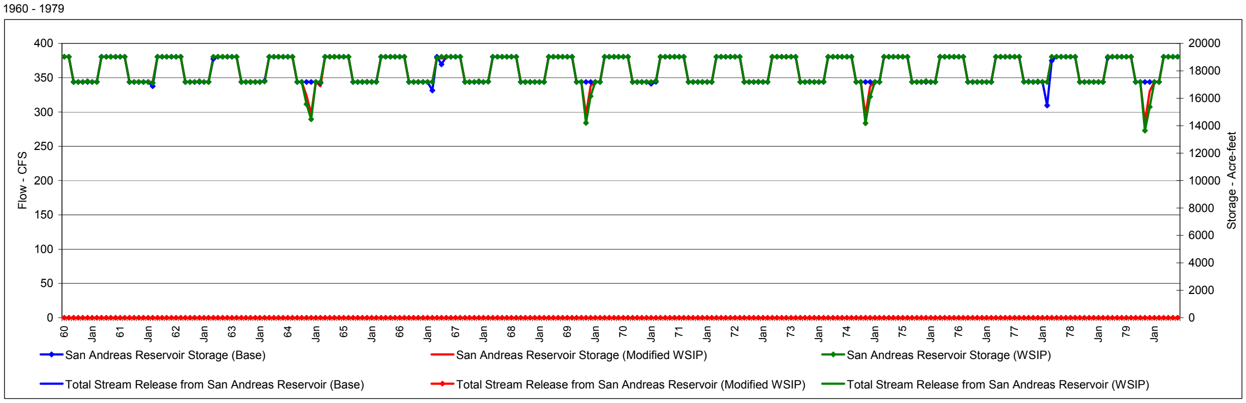
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

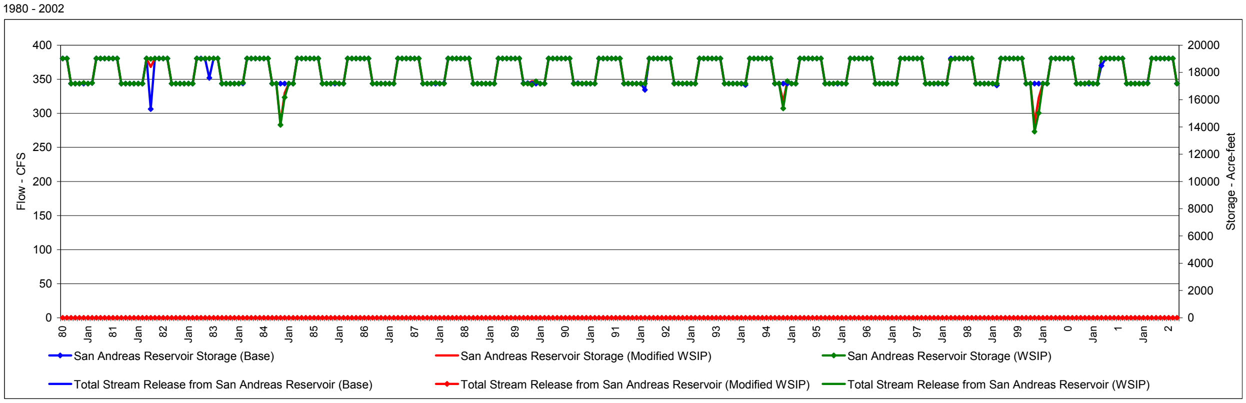
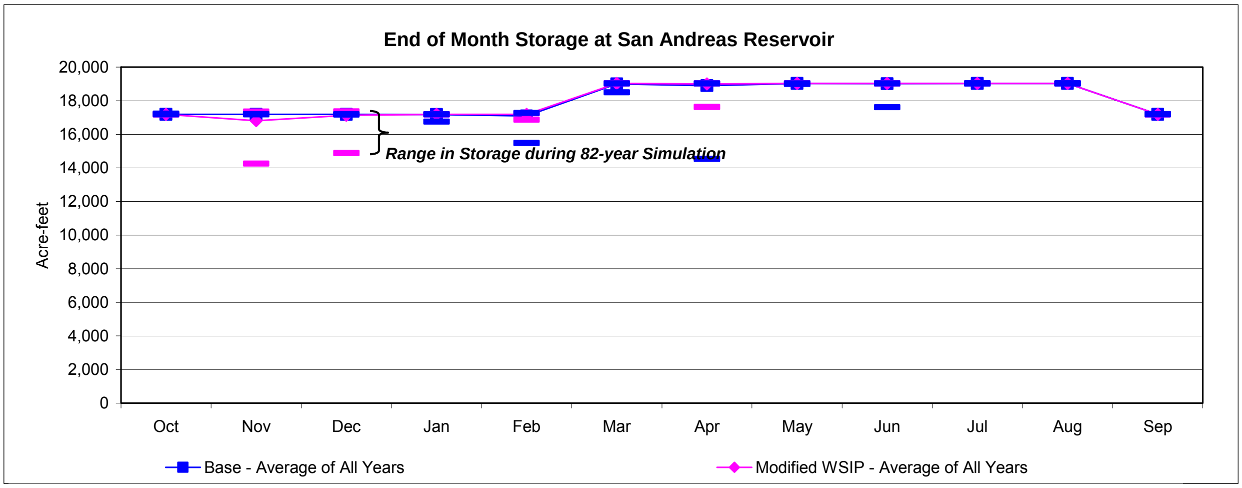


Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the alternative and base settings.

Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion is estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints on deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request, and the resultant potential changes in the operation of SFPUC facilities and their affected environs, are uncertain.[2]

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the fall/winter/spring seasons, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional fall/spring/winter deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

In the WSIP setting, Coastside CWD is assumed to increase its SFPUC demand from 1.8 mgd (average annual purchase request) to 3 mgd. It is also assumed that the month-to-month shape of Coastside CWD's future purchase request to the SFPUC system would follow the existing monthly shape. Currently,

[2] See *Analysis of SFPUC PIlarcitos/Coastside County Water District Operations*, Memorandum by Daniel B. Steiner, March 8, 2007.

Coastside CWD can only receive a maximum of 2 mgd from the Pilarcitos Creek system due to the capacity of the connection to the Stone Tunnel, and it reaches its maximum delivery rate during the summer in the base setting. It is assumed that Coastside CWD would increase its delivery from Stone Dam following the shape of its increase in demand during the months when it currently does not reach the 2 mgd capacity (e.g., fall/winter/spring). By taking delivery of additional Pilarcitos Creek water in the fall/winter/spring, there are times when Pilarcitos Reservoir would not fill during the ensuing winter and thus the additional delivery would affect the carryover of reservoir storage into the summer. The effect is that the reservoir could empty to the spillway invert earlier in the summer than in the base setting. The effect would then cause the creek below Pilarcitos Reservoir to experience only reservoir inflow as compared to a controlled release (larger) out of the reservoir. A way to avoid or reduce this effect would be to provide extraction (pumping) of reservoir storage during the summer to maintain controlled releases to the creek in excess of reservoir inflow. The measure is modeled by allowing the Coastside CWD delivery to be met from Pilarcitos Reservoir storage even if the spillway crest has been reached, inferring pumping out water below the spillway invert.

The summer flow reduction in the WSIP setting (compared to the base setting) occurs in about 25 percent of the years, during one or more of the months of July through September. There are a few exceptions of years when the effect occurs in months prior to July. The effect typically manifests as one additional month of flow reduction in a year, amounting to about 150 to 190 acre-feet. The worst event was a reduction in two months of a year (1947), amounting to about 300 acre-feet.

The July through September flow reduction effect could be ameliorated by allowing water to be extracted from the reservoir below the spillway invert to meet the Coastside CWD delivery request during the summer. The model allows Pilarcitos Reservoir to operate at a lower minimum storage for the months of July through September. Figure 2.8-1 illustrates a chronological trace of the simulation of Pilarcitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in Figure 2.8-1 are the results for the WSIP, alternative, and base settings. The alternative setting includes an allowance to draw up to 300 acre-feet from Pilarcitos Reservoir below the spillway invert to maintain July through September flows in Pilarcitos Creek.

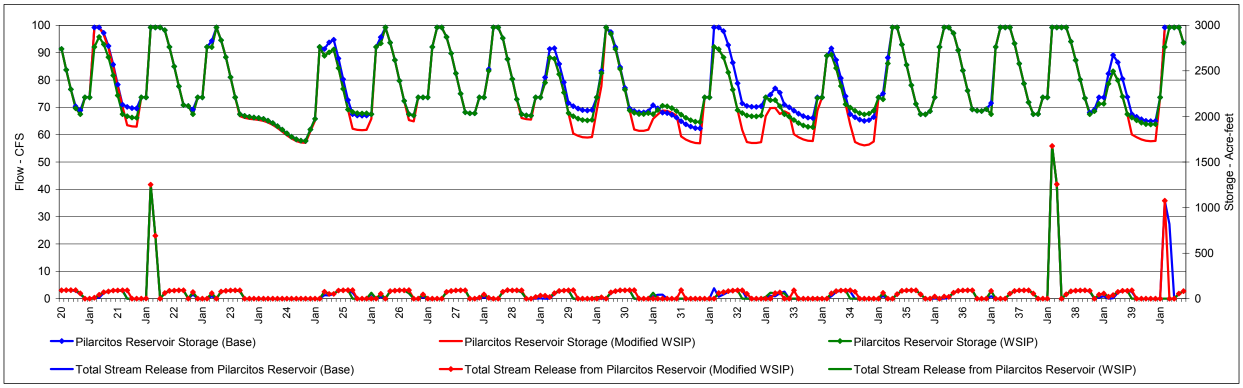
The effect of the assumed Coastside CWD operation in combination with the effects of the overall SFPUC regional system operations would be occasional differences in the storage operation of Pilarcitos Reservoir. Overall, there would be a slightly lower average storage at Pilarcitos Reservoir. Figure 2.8-2 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the WSIP and base settings.

Figure 2.8-1 illustrates the result of allowing the reservoir to go below the spillway invert during July through September in the alternative setting. The 300-acre-foot value is representative of the largest effect of the WSIP in a year (1947) for the July through September period. The hydrograph illustrates that the measure is not needed every year, and the full 300 acre-feet of the measure is rarely used. In effect, the measure assures controlled flow during the July through September period, even if the base did not have controlled flow. Several factors contribute to other changes in Pilarcitos Reservoir storage. At times, additional water is drawn from Pilarcitos Reservoir to the San Mateo Creek watershed in reaction to additional demands being served from the SFPUC system. Pilarcitos Reservoir is at times also drawn to meet the increase in demand from Coastside CWD during months (e.g., spring months) when available conveyance capacity from Stone Dam exists. Both of these additional draws from the reservoir would deplete storage below that experienced in the base setting. Pilarcitos storage would typically replenish at the expense of future reservoir spills, or within a year storage would end the same and the reservoir would still reach the minimum level at the spillway invert.

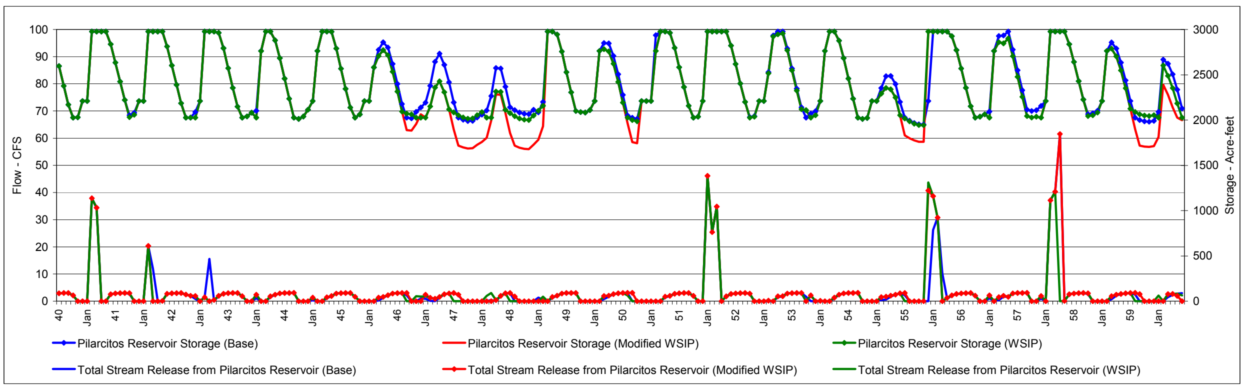
APPENDIX O2

Figure 2.8-1
Pilarcitos Reservoir Storage and Stream Release

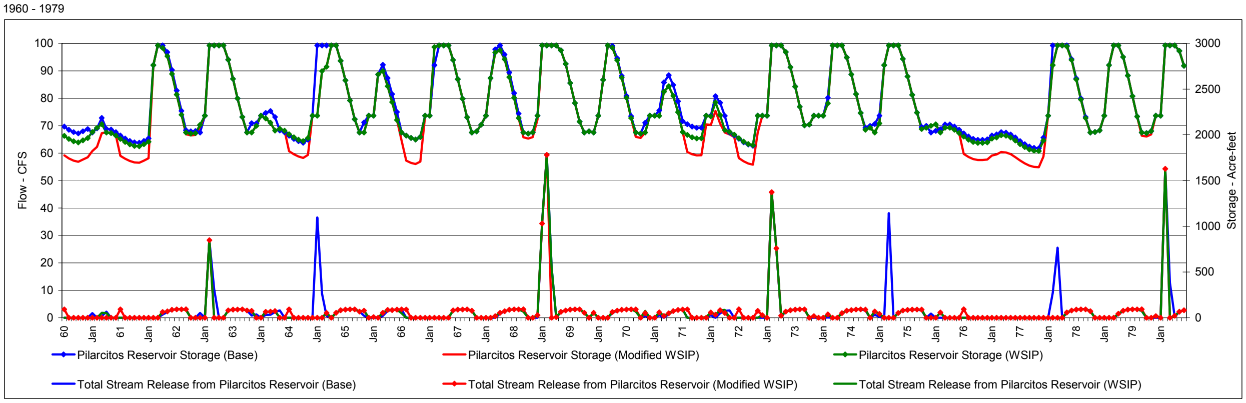
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

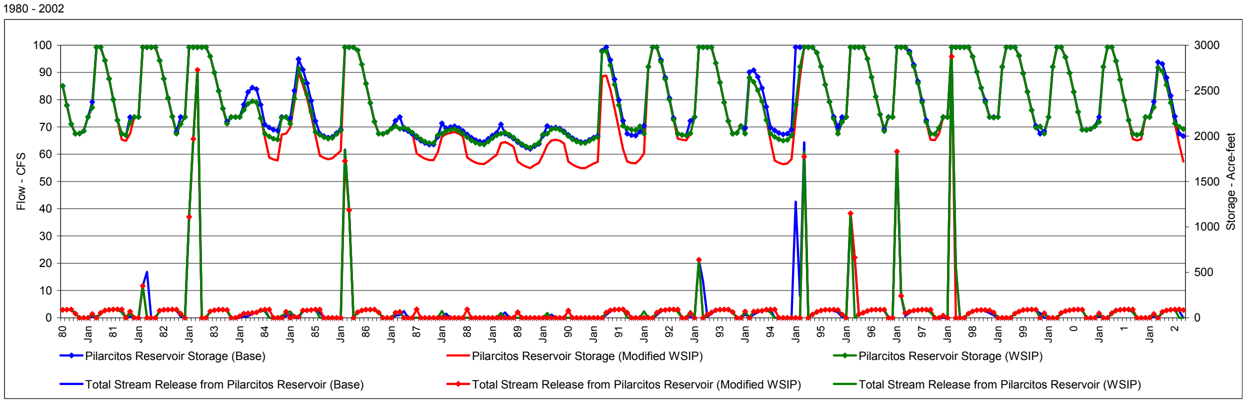
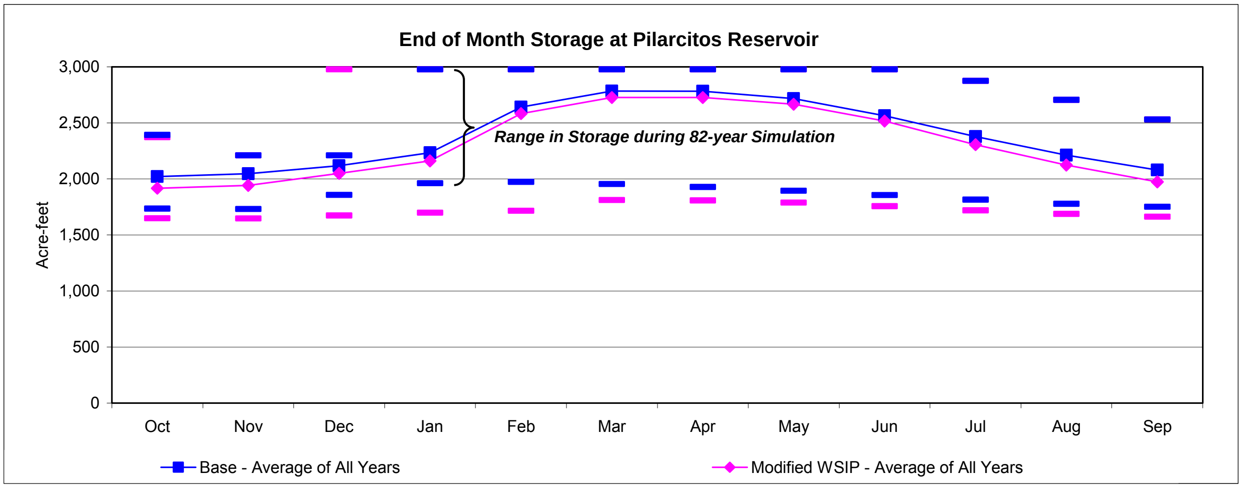


Figure 2.8-2



Stream releases from Pilarcitos Dam are also shown in Figure 2.8-1. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the alternative and WSIP settings are shown chronologically in Table 2.8-1. The differences in flow between the alternative and base settings are shown chronologically in Table 2.8-2. The results shown in these two tables illustrate that the alternative's flow measure would ameliorate all summer (July through September) flow reductions associated with the WSIP, and at times would provide flow in excess of the flow occurring in the base setting.

Table 2.8-3 summarizes monthly average flow within year types for the comparison of the alternative and WSIP settings. Table 2.8-4 provides the same information for the alternative and base settings. When compared to the base setting, the alternative setting would result in positive changes in flows during the winter and spring, which are indicative of the additional draw of water from the reservoir to serve the increased demand of Coastside CWD during the period when conveyance capacity to Coastside CWD exists from Stone Dam. In this same comparison, the few reductions in flow during the early summer are indicative of years when additional releases earlier in a year would lead to the reservoir being depleted to minimum storage earlier in the year, thus reducing the amount of water released in a later month. During the summer, the increased releases are indicative of the alternative's flow measure. Reductions in flow during the winter and spring are indicative of the reservoir replenishing additionally depleted storage associated with the alternative setting.

The effect of the WSIP on Pilarcitos Creek flows below Stone Dam differs from the effect on flows below Pilarcitos Dam. Figure 2.8-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the alternative, WSIP, and base settings. The flow past Stone Dam in all the settings is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam typically occur when unregulated flow below Pilarcitos Dam exceeds the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed. During times when inflow to Stone Dam is reduced due to reduced spills from Pilarcitos Reservoir, there are still substantial spills from Stone Dam to Pilarcitos Creek from the unregulated flow below Pilarcitos Dam.

In comparison to the base setting, the changes in flow below Stone Dam in the alternative setting would typically occur during the rainy season between the months of January and March, in at least one month during about half of the years. Tables 2.8-5 and 2.8-6 summarize the results of the alternative, WSIP, and base settings in terms of average monthly flows by year type, and the average differences in flow among the settings.

APPENDIX O2

Table 2.8-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet) Modified WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	21	0	0	0	0	0	15	181	217
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	21	21
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	184	184
1926	0	0	0	-131	0	0	0	0	0	0	0	66	-66
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	42	42
1929	0	0	0	0	0	0	0	0	0	0	190	0	190
1930	0	0	0	-34	0	0	0	0	0	0	0	184	150
1931	0	0	0	-131	0	0	0	0	0	190	0	0	59
1932	0	0	0	0	0	0	0	0	0	0	187	108	295
1933	0	0	0	-40	-120	0	0	-116	0	187	0	0	-89
1934	0	0	-15	0	0	0	0	0	0	187	158	0	330
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	187	0	0	187
1940	0	0	0	0	1,991	0	0	0	0	0	0	0	1,991
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	1	1
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	181	181
1947	0	-110	-107	37	0	0	0	0	0	187	148	0	155
1948	0	0	0	0	-107	-187	0	0	0	187	108	0	1
1949	0	0	0	0	-92	0	0	0	0	0	0	0	-92
1950	0	0	0	0	0	0	0	0	0	0	58	184	242
1951	0	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	1	1
1955	0	0	0	0	0	0	0	0	0	187	0	0	187
1956	0	0	-184	0	0	0	0	0	0	0	0	0	-184
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	3,661	0	0	0	0	0	3,661
1959	0	0	0	0	0	0	0	0	0	0	190	155	346
1960	0	0	0	-129	0	0	0	-51	-129	187	0	0	-121
1961	0	0	0	0	0	-110	-100	0	0	187	0	0	-23
1962	0	0	0	0	0	0	0	0	0	0	0	18	18
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	187	0	0	187
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	88	185	0	273
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	53	53
1969	0	0	0	-42	0	-1,136	0	0	0	0	0	0	-1,179
1970	0	0	0	0	0	0	0	0	0	0	0	48	48
1971	0	-47	0	0	0	0	0	0	0	0	187	0	140
1972	0	0	-15	0	0	0	-66	0	0	190	0	0	109
1973	0	149	0	0	0	0	0	0	0	0	0	0	149
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	190	0	0	190
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	36	36
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	63	63
1982	0	58	0	0	0	0	0	0	0	0	0	0	58
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	44	187	0	232
1985	0	-46	31	-141	0	0	0	0	0	0	187	0	31
1986	0	0	9	0	-224	0	0	0	0	0	0	0	-215
1987	0	0	0	0	0	0	0	0	0	190	0	0	190
1988	0	0	0	-153	0	0	0	0	0	190	0	0	37
1989	0	0	0	0	0	-111	0	0	0	126	0	0	15
1990	0	0	0	0	-98	0	0	0	0	162	0	0	64
1991	0	0	0	0	0	0	0	0	0	0	0	111	111
1992	0	0	0	-148	0	0	0	0	0	0	0	54	-94
1993	0	0	-50	0	0	0	0	0	0	0	0	0	-50
1994	0	0	0	0	0	0	0	0	0	75	187	0	262
1995	0	0	0	0	0	-107	0	0	0	0	0	0	-107
1996	0	0	0	0	0	1,360	0	0	0	0	0	0	1,360
1997	0	0	0	0	0	0	0	0	0	0	0	67	67
1998	0	0	0	0	0	-1,133	0	0	0	0	0	0	-1,133
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	60	60
2002	0	0	0	0	0	0	0	0	0	0	190	169	359
Avg (21-02)	0	0	-4	-11	17	-17	43	-2	-2	38	27	24	112

APPENDIX O2

Table 2.8-2

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)

Modified WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	21	21	0	0	0	68	21	0	0	0	0	181	312
1922	0	0	0	3	0	0	0	0	0	0	0	0	3
1923	0	51	0	0	0	68	0	0	0	0	0	21	140
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	75	36	0	0	0	0	56	166
1926	0	0	0	-107	0	68	0	0	0	0	0	66	26
1927	0	0	64	0	0	0	0	0	0	0	0	0	64
1928	0	0	21	64	18	0	0	0	0	0	0	42	146
1929	0	0	37	64	58	37	21	0	0	0	190	0	407
1930	0	0	0	0	25	0	21	0	0	0	0	184	230
1931	0	0	0	-52	-80	-92	0	0	0	190	0	0	-34
1932	0	0	0	0	-211	79	52	17	0	0	0	108	45
1933	0	0	0	0	-59	68	21	-160	0	187	0	0	57
1934	0	0	0	0	0	68	21	0	0	30	158	0	277
1935	0	0	0	0	64	0	0	0	0	0	0	0	64
1936	0	0	0	46	0	46	21	0	0	0	0	0	113
1937	0	0	0	122	0	0	0	0	0	0	0	0	122
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	16	0	64	64	40	68	21	0	-6	37	0	0	304
1940	0	0	0	0	0	-1,677	0	0	0	0	0	0	-1,677
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	21	0	0	0	0	-734	0	0	0	0	0	0	-713
1943	0	0	64	0	0	-958	21	0	0	0	0	0	-874
1944	0	0	0	77	0	0	21	0	0	0	0	1	99
1945	0	0	0	64	0	0	21	0	0	0	0	0	85
1946	0	0	0	0	0	68	21	0	0	0	0	53	141
1947	0	0	-59	91	61	58	21	0	0	0	12	0	185
1948	0	0	0	0	0	-27	21	0	0	0	108	0	102
1949	0	0	0	-83	-31	0	21	0	0	0	0	0	-94
1950	0	0	0	0	0	68	21	0	0	0	0	184	273
1951	0	0	0	0	0	0	21	0	0	0	0	0	21
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	7	0	0	0	12	0	21	0	0	0	0	0	40
1954	-104	128	0	9	0	0	21	0	0	0	0	1	55
1955	0	0	0	0	61	68	21	0	0	50	0	0	200
1956	0	0	2,505	766	0	-624	21	0	0	0	0	0	2,668
1957	0	0	0	68	0	68	21	0	0	0	0	0	157
1958	0	0	59	0	0	0	0	0	0	0	0	0	59
1959	21	0	0	0	0	68	21	0	0	0	42	155	307
1960	0	0	0	0	0	68	21	-51	-178	187	0	0	47
1961	0	0	0	-104	0	-36	-130	0	0	187	0	0	-83
1962	0	0	0	0	0	0	52	17	0	0	0	0	70
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	1	101	-74	0	61	68	21	-166	0	187	0	0	199
1965	0	0	0	-2,248	-485	68	0	0	0	0	0	0	-2,666
1966	0	110	0	15	0	68	21	0	0	3	185	0	401
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	34	21	0	0	0	0	4	59
1969	0	0	55	-42	0	-1,136	12	0	0	0	0	0	-1,111
1970	0	0	0	0	0	0	21	0	0	0	0	28	49
1971	0	59	0	0	61	40	21	0	0	0	187	0	367
1972	0	0	0	64	61	68	-45	-162	0	190	0	0	176
1973	0	149	55	0	0	0	21	0	0	0	0	0	226
1974	0	37	0	0	61	0	0	0	0	0	0	0	98
1975	21	0	72	64	0	-2,341	0	0	0	0	0	0	-2,184
1976	21	0	-93	0	108	0	0	0	0	190	0	0	226
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-1,569	0	17	0	0	0	0	-2,054
1979	-10	0	0	0	0	0	21	0	0	0	0	36	47
1980	0	0	37	0	0	-783	21	0	0	0	0	0	-726
1981	0	0	0	0	61	0	21	0	0	0	0	63	145
1982	0	120	0	0	0	-1,032	0	0	0	0	0	0	-912
1983	19	62	0	0	0	0	0	0	0	0	0	0	80
1984	21	0	0	34	61	68	21	0	0	0	187	0	392
1985	0	0	95	-77	21	18	21	0	0	0	81	0	160
1986	0	0	9	0	-236	0	0	0	0	0	0	0	-227
1987	0	0	0	0	61	68	-145	0	0	190	0	0	174
1988	0	0	0	-24	-83	0	0	0	0	190	0	0	83
1989	0	0	0	0	0	-36	-116	0	0	126	0	0	-25
1990	0	0	0	0	0	-73	0	0	0	162	0	0	89
1991	0	0	0	0	0	0	52	17	0	0	0	-6	64
1992	0	0	0	0	0	0	52	17	0	0	0	37	106
1993	0	0	88	0	0	-820	52	17	0	0	0	0	-662
1994	-1	0	0	62	0	68	21	0	0	0	187	0	336
1995	0	0	0	-2,620	-442	-320	0	0	0	0	0	0	-3,383
1996	21	53	64	0	0	0	21	0	0	0	0	0	159
1997	21	0	0	0	0	68	21	0	0	0	0	47	157
1998	0	0	49	0	0	-1,133	0	0	0	0	0	0	-1,084
1999	21	62	64	0	0	0	0	0	0	0	0	0	147
2000	21	-101	104	0	0	0	21	0	0	0	0	0	45
2001	0	0	0	64	0	0	21	0	0	0	0	60	145
2002	0	0	0	6	61	0	21	0	0	0	35	169	292
Avg (21-02)	2	10	39	-44	-14	-150	9	-5	-2	26	17	18	-96

APPENDIX O2

Table 2.8-3

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	24	176	834	2,102	1,414	248	70	152	175	183	180	5,616
Above Normal	63	44	44	15	550	182	31	117	161	181	186	181	1,754
Normal	56	6	8	16	26	32	83	143	171	185	187	155	1,069
Below Normal	52	25	10	28	23	61	126	146	164	187	165	112	1,099
Dry	38	0	6	33	24	54	51	46	43	159	28	0	481
All Years	53	20	48	181	539	343	107	105	139	178	150	126	1,990

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	11	188	837	2,116	1,563	19	70	152	175	183	176	5,547
Above Normal	63	44	47	15	432	102	31	117	161	181	185	169	1,546
Normal	56	9	8	34	32	32	83	143	171	183	152	116	1,018
Below Normal	52	28	9	39	23	61	126	146	164	149	96	47	940
Dry	38	7	13	59	44	79	61	56	51	7	0	0	416
All Years	53	20	53	193	522	360	64	107	141	140	124	102	1,878

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	13	-11	-3	-14	-149	229	0	0	0	0	4	70
Above Normal	0	0	-3	0	118	80	0	0	0	0	1	12	208
Normal	0	-3	0	-17	-6	0	0	0	0	3	35	38	50
Below Normal	0	-3	1	-10	0	0	0	0	0	38	68	65	159
Dry	0	-7	-8	-26	-20	-26	-10	-10	-8	152	28	0	65
All Years	0	0	-4	-11	17	-17	43	-2	-2	38	27	24	112

Table 2.8-4

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	57	24	176	834	2,102	1,414	248	70	152	175	183	180	5,616
Above Normal	63	44	44	15	550	182	31	117	161	181	186	181	1,754
Normal	56	6	8	16	26	32	83	143	171	185	187	155	1,069
Below Normal	52	25	10	28	23	61	126	146	164	187	165	112	1,099
Dry	38	0	6	33	24	54	51	46	43	159	28	0	481
All Years	53	20	48	181	539	343	107	105	139	178	150	126	1,990

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

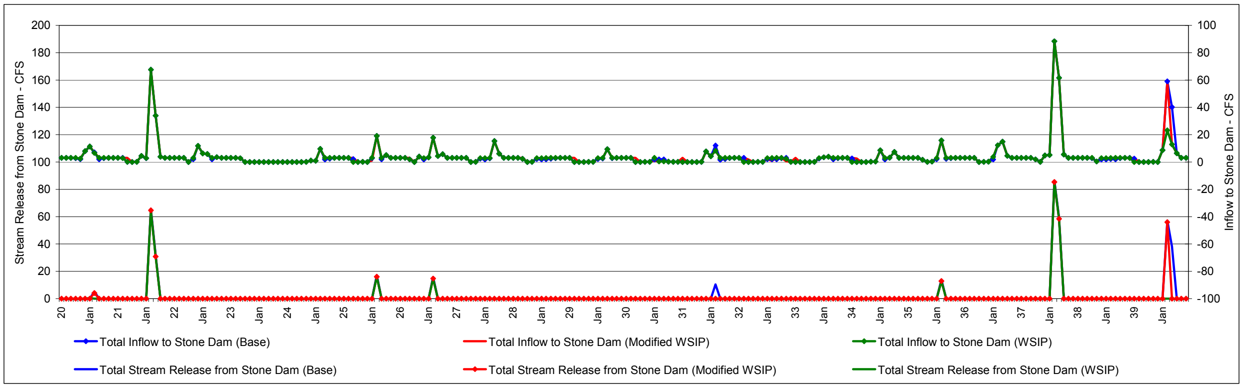
Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	4	21	173	-119	-42	-356	6	0	0	0	0	3	-310
Above Normal	6	7	24	-121	-55	-459	9	2	0	0	0	12	-574
Normal	1	4	1	1	2	23	23	3	0	0	23	27	109
Below Normal	-5	20	3	13	17	38	24	-9	0	16	41	48	205
Dry	2	0	-5	6	7	13	-19	-23	-11	115	19	0	102
All Years	2	10	39	-44	-14	-150	9	-5	-2	26	17	18	-96

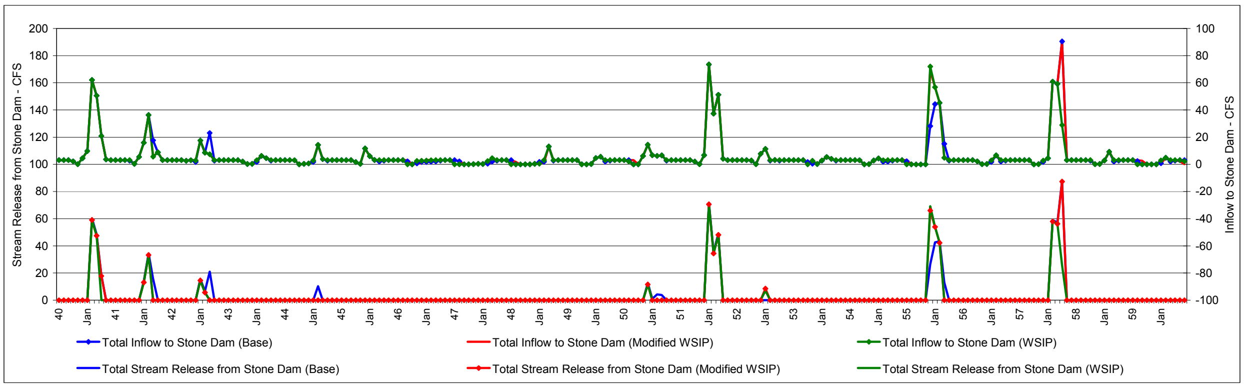
APPENDIX O2

Figure 2.8-3
Stone Dam Stream Release and Inflow

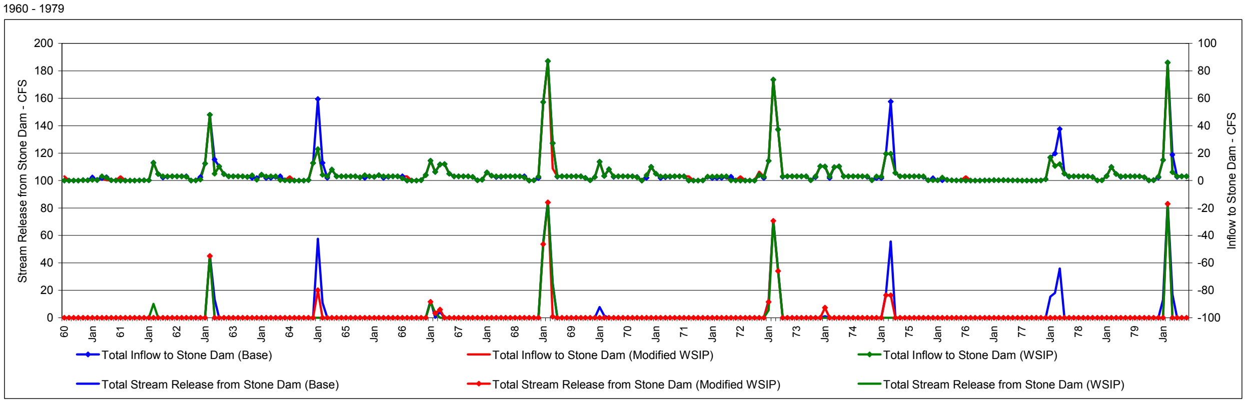
1920 - 1939



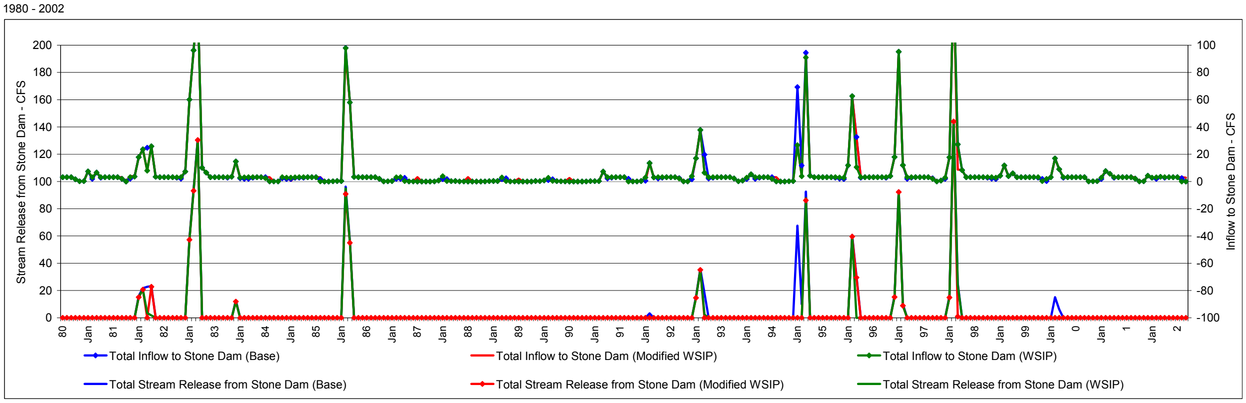
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O2

Table 2.8-5

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	312	1,514	3,162	2,011	475	0	0	0	0	0	7,474
Above Normal	0	0	42	205	985	278	0	0	0	0	0	0	1,509
Normal	0	0	45	33	100	0	0	0	0	0	0	0	179
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	78	344	841	450	93	0	0	0	0	0	1,806

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	324	1,493	3,176	2,188	103	0	0	0	0	0	7,282
Above Normal	0	0	42	108	734	120	0	0	0	0	0	0	1,003
Normal	0	0	45	27	135	0	0	0	0	0	0	0	208
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	81	319	798	452	20	0	0	0	0	0	1,669

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-11	21	-14	-176	373	0	0	0	0	0	193
Above Normal	0	0	0	97	250	158	0	0	0	0	0	0	505
Normal	0	0	0	6	-35	0	0	0	0	0	0	0	-29
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-2	25	42	-2	73	0	0	0	0	0	137

Table 2.8-6

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	312	1,514	3,162	2,011	475	0	0	0	0	0	7,474
Above Normal	0	0	42	205	985	278	0	0	0	0	0	0	1,509
Normal	0	0	45	33	100	0	0	0	0	0	0	0	179
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	78	344	841	450	93	0	0	0	0	0	1,806

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Modified WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	149	-305	-91	-498	-4	0	0	0	0	0	-748
Above Normal	0	0	-4	-180	-190	-643	0	0	0	0	0	0	-1,017
Normal	0	0	-4	3	-97	0	0	0	0	0	0	0	-98
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	28	-96	-76	-230	-1	0	0	0	0	0	-376

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Memorandum

Subject: **HH/LSM Assumptions and Results – WSIP Variants 2018 WSIP**
From: **Daniel B. Steiner**
Date: **May 6, 2008**

1. Introduction

This memorandum summarizes assumptions for and describes the interpretation of HH/LSM results for the simulation of the WSIP variant referenced as the "2018 WSIP." The PEIR analyzed three WSIP variants described as: WSIP Variant 1 - All Tuolumne; WSIP Variant 2 - Regional Desalination for Drought; and WSIP Variant 3 - 10% Rationing. The major difference between the variants and the proposed program (WSIP) was either in the proposed source(s) of water supply or in the drought-year rationing level of service (LOS). The 2018 WSIP variant supplements the previously described analyses. Tables 1-1 and 1-2 summarize the components, various modeling assumptions, and performance and hydrologic results for the 2018 WSIP variant in comparison to the modeled existing (2005) base setting (with Calaveras Reservoir constrained by DSOD restrictions) and the WSIP setting.

The hydrology that would result under this variant is primarily discussed in terms of a comparison to the WSIP and contrasted to the baseline condition of the PEIR, namely the simulated current (2005) operation of the SFPUC regional water system assuming that the Calaveras and Crystal Springs Reservoirs operation are constrained by DSOD restrictions. Only primary hydrologic parameters such as projected water deliveries, reservoir storage, and stream flows are compared, and only those parameters that have been identified as key hydrologic factors that lead to environmental impacts are illustrated.

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 1/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Time Horizon for Setting of Analysis / Date[4]		2005	2030	2018 / 2030
HH/LSM Simulation Study Name[5]		Base1LT	WSIP1LT	2018WSIPLT
System Wide Parameters				
Customer Purchase Request (Demand Level)[6]	MGD	265	300	275 / 300
Demand Level Supplied from Other Sources[7]				
Regional Recycled Water/Conservation/Groundwater in SF	MGD	0	10	10
Other Regional Recycled Water/Conservation/Groundwater	MGD	0	0	0
Demand Level Supplied from Tuolumne + Local Watersheds[8]	MGD	265	290	265
Average Annual Deliveries and Supplies[9]				
Deliveries from Tuolume + Local Watersheds (Average Annual)	MGD	258	287	
Supply or Deliveries from Other Sources - Regional Recl/Cons/GW	MGD	0	10	
Total Deliveries and Supply for Demand Level (Average Annual)	MGD	258	297	
Features and Facilities[10]				
Regional Reclaimed Water/Conservation/Groundwater - SF			●	●
Regional Reclaimed Water/Conservation/Groundwater - Other				
Calaveras Reservoir - 12.4 BG (Constrained)		●		
Calaveras Reservoir - 31.6 BG (Restored/Unconstrained)			●	●
Calaveras Reseroivr Release for Fish			●	●
Calaveras Reservoir Release for Fish & Flow Recapture			●	●
Alameda Creek Diversion Dam Bypass Flow & Recapture				
Pilarcitos Reservoir Pump for Creek Summer Release				
Crystal Springs Reservoir - 18.52 BG (Constrained)		●		
Crystal Springs Reservoir - 20.28 BG (Restricted)				
Crystal Springs Reservoir - 22.15 BG (Restored/Unconstrained)			●	●
Sunol Valley Water Treatment Plant Expansion			●	●
Sunol Valley Water Treatment Plant Feed from SJPL			●	●
Harry Tracy Water Treatment Plant Expansion			●	●
Bay Division Pipeline Increased Conveyance			●	●
San Joaquin Pipeline Increased Conveyance			●	●
Desalination Project				
Westside Groundwater Project			●	●
Tuolumne River Transfer			**29,350 (From Storage)**	**2,300 (From Storage)**
Water Supply Reliability[11]				
Action	Level	Rationing %	Rationing %	Rationing %
Implement Drought Water Supply Action (Westside GW or Desal)	1	NA	GW	GW
Rationing (Level 1)	2	10	10	10
Rationing (Level 2)	3	20	20	20
Rationing (Level 3)	4	25	25	25
	Years	Action Level	Action Level	Action Level
	1921			
	1924	2	1	1
	1925		1	
	1926		1	
	1929		1	
	1930		1	
	1931	3	2	2
	1932			
	1933			
	1934	2	1	1
	1935			
	1939			
	1944			
	1946			
	1947			
	1948		1	1
	1949			
	1950		1	
	1953			
	1954			
	1955		1	
	1957			
	1959			
	1960	2	1	1
	1961	3	2	2
	1962			
	1964		1	
	1966			
	1968			
	1971			
	1972		1	
	1976	2	1	1
	1977	3	2	2
	1979			
	1981			
	1984			
	1985		1	
	1987	2	1	1
	1988	3	2	2
	1989	3	2	2
	1990	3	3	3
	1991	3	2	2
	1992	3	3	3
	1994	2	1	1
	DD1993	4	3	3
	DD1994	4	3	3
Max Drought Rationing - Policy Cap[12]	DD	Incidental 25%	20%	20%
	Historical	Incidental 20%	20%	20%

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 2/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
System Wide Parameters				
Incremental Supply - Average[13]				
System Customer Purchase Request Level	MGD	265	300	275 / 300
Demand Level Supplied from Other Sources	MGD	0	10	10
Demand Level Supplied from Tuolumne + Local Watersheds	MGD	265	290	265 / 290
System Deliveries	MGD	258	287	263
Regional Desalination	MGD	0	0	0
San Joaquin Pipelines (Tuolumne Diversion)	MGD	221	245	223
Inferred Local Watershed Production	MGD	37	41	40
Addt'l Tuolumne Diversion (Compared to Calaveras Constrained)	MGD	*221*	24	2
Incremental Design Drought Supply[14]				
From Other Sources - Regional Recl/Cons/GW (Every Year)	MGD	0	10	10
Restoration of Calaveras Reservoir Capacity (w/ flow recapture)	MGD	0	7	7
Restoration of Crystal Springs Capacity		0	1	1
MID/TID Transfer to SFPUC (Results in additional diversion from TR)	MGD	0	25	2
Westside Basin Conjunctive Use (8,100 acre-feet Storage)	MGD	0	6	6
Regional Desalination (26 mgd)	MGD	0	0	0
Sum of Incremental Supplies	MGD	0	48	26
Yield - Without Other Sources Added (Compared to Calaveras Constrained)	MGD	219	257	235
Yield - With Other Sources Added (Compared to Calaveras Constrained)	MGD	219	267	245
Design Drought Delivery Calculator[15]		2	3	7
	MGD			
Average Annual Delivery During	Year 1	265	290	265
Average Annual Delivery During	Year 2	239	290	265
Average Annual Delivery During	Year 3	212	261	239
Average Annual Delivery During	Year 4	212	261	239
Average Annual Delivery During	Year 5	212	232	212
Average Annual Delivery During	Year 6	212	261	239
Average Annual Delivery During	Year 7	212	232	212
Average Annual Delivery During	Year 8	199	232	212
Average Annual Delivery During	Last 6 Mo	99	116	106
	DD Ave	219	256	234
Firm Yield (Nominal) Not Including Other Sources	MGD	219	256	234
Local System Operational Parmeters				
Crystal Springs Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	5.4 - 18.52 16.6 - 56.8	5.4 - 22.15 16.6 - 68.0	Same as
Fall/Winter Operation Storage		16.52 BG (50.7 TAF)	18.55 BG (56.9 TAF)	WSIP
Stream Release		Up to 250 cfs to not exceed 18.52 BG	Up to 250 cfs to not exceed 21 BG	Same as WSIP
Calaveras Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	8.4 - 12.4 25.7 - 38.0	8.4 - 31.5 25.7 - 96.8	Same as
Fall/Winter Operation Storage		10.3 BG (31.6 TAF)	27.0 BG (82.9 TAF)	WSIP
Alameda Creek Release/Recapture[16]	AFY	0	Up to 6,300	Same as WSIP
San Andreas Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	3.0 - 6.2 9.2 - 19.0	3.0 - 6.2 9.2 - 19.0	Same as
Fall/Winter Operation Storage		5.6 BG (17.2 TAF)	5.6 BG (17.2 TAF)	WSIP
San Antonio Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	1.0 - 16.5 3.1 - 50.5	1.0 - 16.5 3.1 - 50.5	Same as
Fall/Winter Operation Storage		15.9 BG (48.8 TAF)	15.9 BG (48.8 TAF)	WSIP
Pilarcitos Reservoir Operation				
Storage - Minimum/Maximum	BG TAF	0.66 - 0.97 2.0 - 3.0	0.66 - 0.97 2.0 - 3.0	Same as
Fall/Winter Operation Storage		0.72 BG (2.2 TAF)	0.72 BG (2.2 TAF)	WSIP
Water Treatment Plants				
Sunol Valley Water Treatment Plant Maximum	MGD	120	160	Same as WSIP
		90 MGD from Calaveras	90 MGD from Calaveras + Recapture	Same as WSIP
Sunol Valley Water Treatment Plant Minimum	MGD	20	20	Same as WSIP
		From Calavers & San Antonio & SJPL	From Calavers & San Antonio & SJPL	Same as WSIP
Harry Tracy Water Treatment Plant Maximum	MGD	120	140	Same as WSIP
Harry Tracy Water Treatment Plant Minimum	MGD	20	20	Same as WSIP
Conveyance				
Bay Division Pipeline Maximum		340 MGD Jun - Sep 320 MGD Apr, May & Oct 290 MGD Nov - Mar	380 MGD Apr - Oct 320 MGD Nov - Mar	Same as WSIP
Bay Division Pipeline Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 230 MGD	Same as Baselines, except maximum 320 MGD	Same as WSIP

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Table 1-1
Setting Characteristics and Modeling Assumptions (Part 3/3)

Assumptions and Characteristics of Setting and/or Program	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Tuolumne River System Operational Parameters				
Hetch Hetchy Reservoir Operation				
Storage - Minimum/Maximum	TAF	26.1 - 360.4	26.1 - 360.4	Same as
Fall/Winter Operation Storage		30 TAF winter buffer	30 TAF winter buffer	WSIP
1987 Stipulation Minimum Release Flows		Yes	Yes	Same as WSIP
1987 Stipulation Supplemental Release Flows		No	No	Same as WSIP
Cherry Reservoir Operation				
Storage - Minimum/Maximum	TAF	1.0 - 273.3	1.0 - 273.3	Same as
Fall/Winter Operation Storage		25.3 TAF winter buffer	25.3 TAF winter buffer	WSIP
Eleanor Reservoir Operation				
Storage - Minimum/Maximum	TAF	0.0 - 27.1	0.0 - 27.1	Same as
Fall/Winter Operation Storage		Required Minimum Storage	Reqrd Minimum Stor	WSIP
New Don Pedro Water Bank Account				
Storage - Minimum/Maximum	TAF	0.0 - 570.0 Temporary storage up to 740 TAF during Apr - Sep	0.0 - 570.0 Temp stor up to 740 TAF during Apr - Sep	Same as WSIP
Conveyance				
San Joaquin Pipelines Maximum	MGD	290	313	Same as WSIP
San Joaquin Pipelines Minimum	MGD	70	70	Same as WSIP
San Joaquin Pipelines Flow Rate Changes		11 Stepwise	17 Stepwise	Same as WSIP
		Surrogate minimum changes by allowing only 7 changes in a year	Allow up to 7 changes in a year (surrogate)	Same as WSIP
San Joaquin Pipelines Maintenance		Cycle one pipeline out Nov - Mar each year (average remaining capacity rotation) maximum 210 MGD	Cyclic 5-year mantenance (see note)	Same as WSIP
TID/MID Operational Parameters			Note: Cyclic 5-year maintenance, maximum capacity available Apr - Oct all years 271 MGD available all other months except 0 MGD available Year 5 Nov - Dec and 135.5 MGD available Year 1 and Year 3 Dec	
Districts' Tuolumne Diversion[17]		Varies annually based on land use and water availability Annual average 875 TAF	Set equal to baseline conditions. SFPUC effects measured by the result of reducing inflow to DP and its effect upon La Grange releases to the TR	Same as WSIP
Tuolumne River La Grange Flow Releases				
Don Pedro, 1996 FERC		X	X	X
VAMP - considered but not modeled[18]		X	X	X

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Table 1-2
Summary of Modeling Results (Part 1/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Design Drought Production & Disposition[19]				
San Joaquin Pipeline Diversion	MGD	208.7	235.0	212.2
Bay-Area Deliveries	MGD	218.3	248.9	226.8
Added Groveland & Coastside Delivery	MGD	2.6	3.6	2.6
Local Reservoir Evaporation	MGD	10.7	12.5	12.7
Inflow from ACDD	MGD	1.3	1.6	1.6
Flow Recapture	MGD	0	5.3	5.2
Local Reservoir Stream Release	MGD	0.6	5.4	5.5
Desalination	MGD	0	0	0
Westside Basin	MGD	0	5.6	6.4
District Transfer to NDP Water Bank	MGD	0	24.7	1.9
Local Storage - Begin	MG	53,854	77,310	77,310
Local Storage - End	MG	18,403	18,495	18,797
Study Average Production & Disposition (1921-02)[20]				
Tuolumne River System				
Reservoirs				
Hetch Hetchy				
Inflow	AF	749,605	749,605	749,605
River	AF	275,255	267,021	276,837
Stream Minimum Release	AF	65,728	65,593	65,828
Tunnel	AF	470,709	478,932	469,171
Evaporation	AF	3,893	3,869	3,875
Reservoir	AF	281,938	275,235	285,919
Cherry				
Inflow	AF	279,293	279,293	279,293
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,337
River	AF	41,636	41,439	41,360
Stream Minimum Release	AF			
Tunnel	AF	352,692	352,915	353,059
Evaporation	AF	3,505	3,501	3,500
Reservoir	AF	239,971	239,309	239,015
Eleanor				
Inflow	AF	169,617	169,617	169,617
Eleanor Gravity	AF	289	289	289
Eleanor Pump	AF	118,251	118,274	118,337
River	AF	49,171	49,148	49,085
Stream Minimum Release	AF			
Evaporation	AF	1,906	1,906	1,906
Reservoir	AF	22,191	22,191	22,191
Don Pedro Reservoir				
Inflow	AF	1,587,517	1,560,828	1,585,611
MID Diversion	AF	302,054	302,055	302,055
TID Diversion	AF	573,164	573,168	573,168
LaGrange Total Stream	AF	668,876	644,009	667,363
LaGrange Minimum Stream Release	AF	221,477	221,477	221,477
Total Evaporation	AF	43,493	42,604	43,366
Reservoir	AF	1,472,337	1,434,872	1,466,669
Water Bank Account				
Balance	AF	514,299	516,733	513,882
Transfer	AF	0	29,350	2,300
San Joaquin Pipelines				
Volume (AF)	AF	247,763	274,450	249,723
Volume (MG)	MG	80,734	89,429	81,372
Rate (MGD)	MGD	221	245	223
Max Rate (MGD)	MGD	290	313	313
Min Rate (MGD)	MGD	70	0	0
East Bay System				
Reservoirs				
Calaveras				
Inflow	MG	12,368	12,368	12,368
From ACDD	MG	1,316	1,730	1,715
Stream	MG	3,660	4,167	4,224
Stream Flow Recapture	MG	0	1,538	1,539
To SVWTP	MG	9,013	8,244	8,163
To San Antonio	MG	0	0	0
Evaporation	MG	1,023	1,704	1,712
Resevoir	MG	10,969	28,170	28,372
San Antonio				
Inflow	MG	2,468	2,468	2,468
From Calaveras/SJPL	MG	1,173	1,734	1,326
Stream	MG	991	613	962
To SVWTP	MG	1,693	2,628	1,813
Evaporation	MG	1,012	973	1,026
Resevoir	MG	15,323	14,490	15,569
Alameda Creek Diversion Dam				
Inflow	MG	4,197	4,197	4,197
To Calaveras Reservoir	MG	1,316	1,730	1,715
Spill	MG	2,881	2,467	2,482
Alameda Creek Confluence				
Accretion	MG	625	625	625
From ACDD	MG	2,881	2,467	2,482
From Calaveras Dam	MG	3,660	4,167	4,224
At Confluence	MG	7,167	7,259	7,331
Treatment Plants				
SVWTP Total	MG	13,662	15,738	15,720
From Calaveras	MG	9,013	8,244	8,163
From San Antonio	MG	1,693	2,628	1,813
From SJPL	MG	2,956	3,329	4,205
From Recapture	MG	0	1,538	1,539
SVWTP Total MGD	MGD	37	43	43
SVWTP Max MGD	MGD	120	158	158
SVWTP Min MGD	MGD	20	20	20

Table 1-2
Summary of Modeling Results (Part 2/2)

HH/LSM Simulation Results	Units	Baseline: Baseline Conditions[1] - Calaveras Constrained	Proposed WSIP	WSIP Variants[3]: 2018 WSIP
Peninsula System				
Reservoirs				
Crystal Springs				
Inflow	MG	3,722	3,722	3,722
From San Andreas	MG	0	0	0
From Pilarcitos and SJPL	MG	8,045	7,643	8,093
Stream	MG	773	325	569
Pump to San Andreas	MG	9,438	9,005	9,426
Pump to Coastside	MG	247	591	255
Evaporation	MG	1,323	1,490	1,565
Reservoir	MG	16,360	18,621	19,663
San Andreas				
Inflow	MG	1,428	1,428	1,428
From other Streams	MG	9,954	9,590	9,990
Stream	MG	0	0	0
To HTWTP	MG	10,851	10,487	10,887
Evaporation	MG	530	531	531
Reservoir	MG	5,892	5,882	5,893
Pilarcitos				
Inflow		1,297	1,297	1,297
To San Andreas	MG	516	584	564
For Stone Diversion	MG	262	280	262
Stream other than Diversion	MG	417	332	369
Evaporation	MG	103	102	103
Reservoir	MG	776	767	775
Stone Dam				
Accretion blw Pilarcitos	MG	167	211	168
Pilarcitos non-diversion Release	MG	417	332	369
Pilarcitos Release for Diversions	MG	584	543	537
Diversion to Coastside	MG	167	211	168
Diversion to Crystal Springs	MG	142	180	156
Spill past Stone	MG	860	695	751
Treatment Plants				
HTWTP Total	MG	10,851	10,487	10,887
HTWTP Total MGD	MGD	30	29	30
HTWTP Max MGD	MGD	149	106	107
HTWTP Min MGD	MGD	20	20	20
Other Facilites				
Westside Basin Net	MG	0	11	11
Desalination Input	MG	0	0	0
Additional Information				
Total Local Reservoir Stream Release	MG	5,842	5,437	6,124
Total Local Reservoir Stream Evaporation	MG	3,991	4,800	4,936
Deliveries				
In-City	MG	29,589	26,686	27,487
South Bay	MG	43,106	52,906	45,267
Crystal Springs	MG	15,120	16,931	15,895
San Andreas	MG	5,400	6,604	5,861
Coastside	MG	675	1,082	1,082
Groveland	MG	365	365	365
Total Deliveries	MG	94,255	104,574	95,957
Total Deliveries	MGD	258	287	263
Storage				
Total Local Storage Begin	MG	49,849	71,363	71,873
Total Local Storage End	MG	43,129	65,197	69,957
Residual Difference during 82-year Simulation	MGD	0.22	0.21	0.06
Westside Storage Begin	MG	0	23,474	23,474
Westside Storage End	MG	0	24,363	24,363
Residual Difference during 82-year Simulation	MGD	0.00	-0.03	-0.03

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Notes for Table 1-1 and Table 1-2

1. Baseline condition represents the existing conditions at the time of NOP publication in September 2005. This is the baseline used to assess WSIP program impacts and impact significance. This setting is indicative of DSOD restrictions on Calaveras and Crystal Springs Reservoirs.

2. N/A

3. These scenarios represent CEQA alternatives that vary from the WSIP on key components in a manner expected to avoid or reduce potentially significant effects of the proposed program.

4. The time horizon for the setting of the scenario. The baseline condition scenario is depicted for recent conditions, while the proposed WSIP, variants, and alternatives are depicted for the future at full buildout and implementation (i.e., conditions in the year 2030). The 2018 WSIP variant assesses conditions at the time that full current contract buildout occurs.

5. HH/LSM simulation study name.

6. The customer purchase request (demand) information is based on the demand and request studies prepared by the SFPUC in coordination with the wholesale customers. This demand on the regional water system includes both the SFPUC retail customers and wholesale customers. The current (2005) average annual demand is 265 mgd and the projected 2030 average annual demand is 300 mgd, assuming the SFPUC adopts the updated wholesale customer purchase requests as part of renewing the Master Sales Agreement with these customers (due in 2009).

7. Certain scenarios include development of additional water supply from a combination of recycled water projects, groundwater projects, and conservation, utilized every year and not subject to reduction during drought.

8. The average annual demand for supplies from the combination of SFPUC local watershed, Tuolumne River, and programs not included in the regional water conservation, recycling, and groundwater programs shown.

9. Modeled results for SFPUC deliveries, with supplies added for regional water conservation, recycling, and groundwater programs. Total deliveries and supply will be less than full customer purchase requests due to rationing in some years.

10. Shows only the features that affect hydrologic results of the system operation simulations. Additional projects are included in the WSIP, variants and alternatives.

11. Illustrates the frequency and severity of water supply action or the severity of systemwide rationing. Only years when variable water supply component is implemented or rationing occurs are shown. "DD" illustrates the shortage results for years included in the prospective drought period of the SFPUC design drought. These years contribute to establishing system operation protocols but are not included in the hydrologic assessment analyses.

12. Rationing policy cap: The SFPUC WSIP level of service goal is to maintain rationing on the regional system at no more than 20% during any one year of the drought. Some alternatives do not achieve this level of service goal. Performance is indicated for the Design Drought ("DD") sequence and for the "Historical" hydrologic sequence.

13. Water supply elements develop water in different amounts from year-to-year, and in some instances only develop water during dry years. This information is provided to illustrate a comparison between local watershed supplies, Tuolumne River supplies and other identifiable water supplies used to meet system purchase requests. Values are stated in units of average annual quantities during the simulated historical sequence.

14. Results from HH/LSM analysis of each scenario. Values represent the average annual production of each element of supply during the design drought period.

15. Simplified calculation of system deliveries during the SFPUC design drought. The value represents the application of system-wide shortages to the demand level being met with SFPUC local watershed, Tuolumne River, and other developed supplies and does not include supplies from regional water conservation, recycled water or groundwater projects. Average value may be slightly misstated (up to 3 mgd) due to metric of analysis that does not account for differences in residual storage between studies. "Nominal" Firm Yield represents the yield of each scenario after adjustment for minor residual storage differences.

16. Supplemental releases from Calaveras Reservoir for fisheries (1997 CDFG MOU) of up to 6,300 acre-feet per year and the Alameda Creek recapture facility project are tied to implementation of the Calaveras Dam Replacement project (SV-2). When the dam is replaced and capacity restored, the flow release and recapture will both occur. The release requirement is based on supplementing other occurring flows below Calaveras Reservoir, sometimes not requiring the full 6,300 acre-feet.

17. SFPUC actions are assumed to not change TID/MID diversions so as to isolate and possibly overstate the WSIP's effects on the Tuolumne River below La Grange Dam. The Districts' diversions are assumed to be constant among the scenarios to provide comparable results of the WSIP-alone effects. The exception is for the Modified WSIP Alternative, in which the TID/MID diversion is reduced by the amount of SFPUC transfer.

18. Participation in the San Joaquin River Agreement is assumed. Although the agreement expires after 2010, it is assumed that a subsequent similar agreement or requirement of the Districts will occur. The HH/LSM does not explicitly model the Districts' participation in the agreement; however, their participation if modeled would result in only minor differences in results and would not change impact conclusions.

19. From HH/LSM results for modeling the SFPUC design drought period.

20. From HH/LSM results for modeling the system operations for the historical hydrologic period 1921-2002. Values indicate average annual quantities during simulated historical period.

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2. WSIP Variant – 2018 WSIP

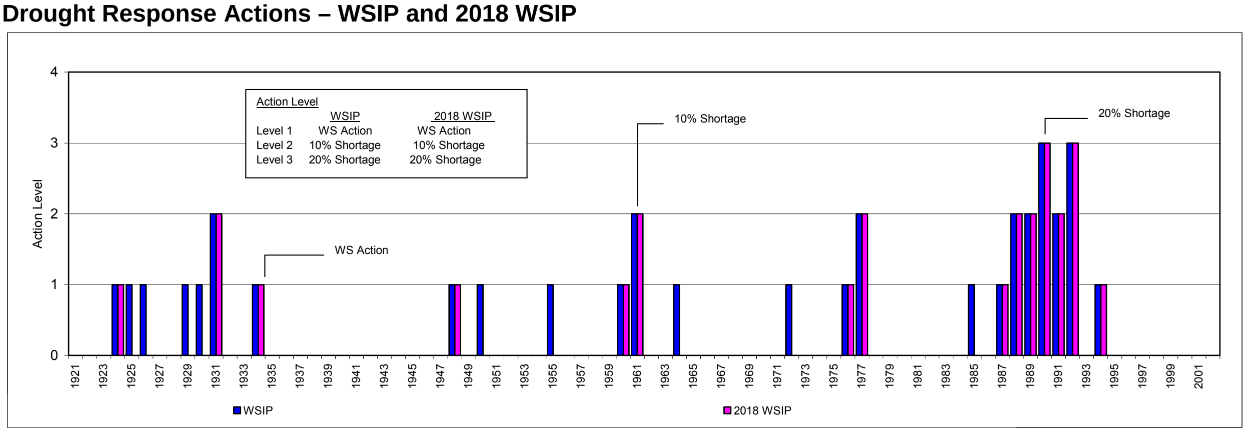
The 2018 WSIP variant would in effect be a combination of the proposed WSIP and the water purchase request of the CEQA No Purchase Request Increase Alternative applicable for the period through the year 2018. This variant would limit the SFPUC wholesale customers' interim future purchases to the terms of the existing Master Water Sales Agreement through 2018. Under that agreement, the wholesale customers may purchase up to 184 mgd on an average annual basis, subject to reductions in the event of a drought, water shortage, earthquake, other natural disaster, or rehabilitation and maintenance of the system. Under the variant, the customer purchase requests through 2018 would not exceed 184 mgd for the wholesale customers. It is assumed that the total customer purchase requests to be served by the regional system through 2018 would be 275 mgd, consisting of 184 mgd for the wholesale customers and 91 mgd for the retail customers. The increased water demand would be offset with 10 mgd from recycled water, groundwater, and conservation projects in San Francisco. Although the net demand through 2018 on the regional water system would be the same as the current demand (265 mgd), the improvement in delivery reliability requires development of additional system yield. The additional deliveries would be served through additional Tuolumne River diversions and increased use of local watershed supplies from restoration of Calaveras Reservoir and Crystal Springs Reservoir. Supplemental supplies would include implementation of the Westside Basin Groundwater Program and a water transfer with TID/MID.

In the context of the WSIP planning horizon for the year 2030, this analysis provides insight into the hydrologic effects of the program at an interim point in time (2018), or it provides a depiction of the WSIP if a delivery limitation is continued through 2030. Should the deliveries of the regional system be allowed to increase after 2018, the analysis described for the WSIP depicts the hydrologic effects associated with increased deliveries. The following description focuses on the time at which the variant's net demand of 265 mgd would occur.

2.1 Water Deliveries and Drought Response Actions

Compared to the WSIP setting for 2030, the regional system's resources are required to serve a net 265 mgd demand (275 mgd purchase request less 10 mgd of recycled water, groundwater, and conservation projects) instead of a net 290 mgd demand. As part of the formulation of this variant, the water transfer from TID/MID was sized to provide the same frequency and severity of water shortages (percentage-wise) for the variant as that occurring in the WSIP setting during the design drought, although systemwide water deliveries would be a net 265 mgd in the variant setting as compared to the WSIP setting delivery of a net 290 mgd. This objective required the water transfer to be sized at 2,300 acre-feet per year. With a water supply formulated about comparable to that provided for the WSIP setting (only proportionately smaller for a lesser demand), the implementation of rationing and the severity of rationing from the SFPUC system during drought periods would be the same. Table 1-1 compares the drought response actions for the proposed program and the variant. Figure 2.1-1 illustrates the occurrence of drought response actions for the simulated 82-year historical period (1921-2002).

Figure 2.1-1
Drought Response Actions – WSIP and 2018 WSIP



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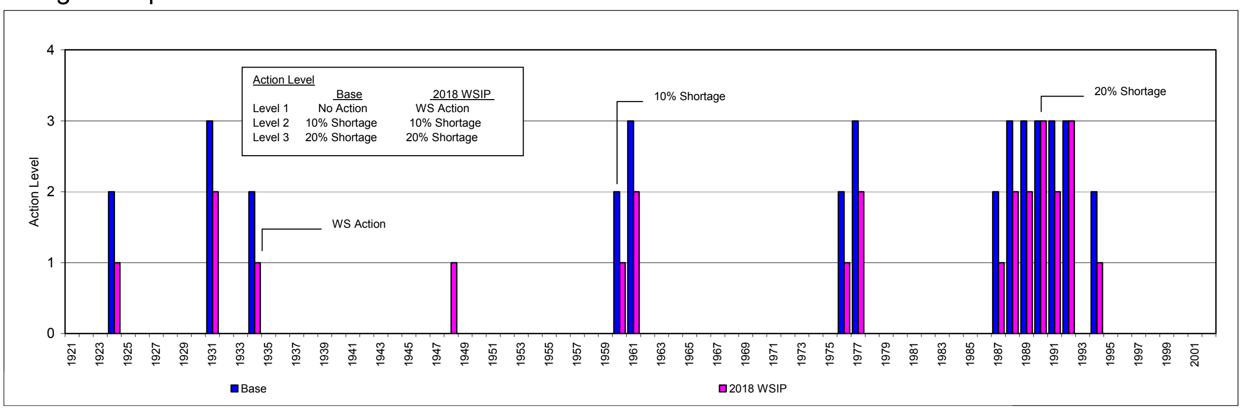
In Figure 2.1-1, years with bars showing a “1” or greater level of action indicate periods when a supplemental water supply action is initiated. In both settings, the water supply action is the use of the Westside Groundwater Basin Program to supplement SFPUC water deliveries. Also occurring in both settings is the water transfer supplemental supply from TID/MID every year. Action levels greater than “1” indicate the imposition of delivery shortages (rationing) to SFPUC customers. SFPUC customers would experience the same frequency and severity of shortages (percentage-wise). The triggering of the Westside Basin Groundwater Program supplemental supply would occur more frequently in the WSIP setting, typically as a precautionary response to potential prolonged drought or to retain local area storage. With the lesser demand of the variant, a less frequent precautionary response would be needed.

The same form of information is shown in Figure 2.1-2 for the comparison between the variant and the base (existing) settings. There is not a level 1 action in the base setting. Without supplemental resources, the existing system only has delivery shortage measures available to cope with drought. In the base setting, the shortage measure is imposed during level 2 (10 percent) and level 3 (20 percent). These percentages of shortage are applied to both the variant and the base settings for these action levels, and they are applied to the same level of net water demand (265 mgd). During this simulation period, rationing would not need to exceed 20 percent in either setting; however, in the variant setting the occurrence of additional water supplies lessens the frequency and severity of water delivery shortages.

Figure 2.1-2
Drought Response Actions – Base and 2018 WSIP



Not illustrated in Figure 2.1-2 but shown in Table 1-1 are the delivery shortages anticipated during the entire SFPUC design drought. During the design drought, the base setting does not have a viable operation without exceeding a 20 percent shortage level. The base setting exceeds the 20 percent shortage level (requires 25 percent rationing) during the last 18 months of the design drought. The variant would viably provide deliveries without exceeding a 20 percent shortage level.

The difference in water deliveries between the proposed program and the variant is shown chronologically for the 82-year simulation in Table 2.1-1. There would be less water delivered to the region by the SFPUC in all years, a result of serving a lesser purchase request (275 mgd instead of 300 mgd, and a lesser net demand of 265 mgd instead of 290 mgd).

Comparing the variant setting to the base setting, Table 2.1-2 illustrates the difference in water deliveries between the two settings. The increases in deliveries under the variant setting occur due to an improvement in water delivery reliability, which reduces the severity of water shortages. The shifting in the pattern of deliveries (most evident during years when there is no increase in total annual delivery) is indicative of the anticipated seasonal effect of recycled water, groundwater, and conservation projects within the pattern of the projected future, albeit limited, purchase request. The 82-year average increase in deliveries amounts to approximately 3.5 mgd.

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Table 2.1-1

Difference in Total System-wide Delivery (MG)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1922	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1923	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1924	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1925	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1926	-801	-620	-508	-433	-479	-637	-745	-901	-985	-1,074	-1,036	-907	-9,124	-9,124
1927	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1928	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1929	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1930	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1931	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1932	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1933	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1934	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1935	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1936	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1937	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1938	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1939	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1940	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1941	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1942	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1943	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1944	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1945	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1946	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1947	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1948	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1949	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1950	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1951	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1952	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1953	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1954	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1955	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1956	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1957	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1958	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1959	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1960	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1961	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1962	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1963	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1964	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1965	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1966	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1967	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1968	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1969	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1970	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1971	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1972	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1973	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1974	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1975	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1976	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1977	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1978	-720	-577	-485	-426	-448	-589	-667	-796	-861	-1,074	-1,036	-907	-8,586	-8,220
1979	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1980	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1981	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1982	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1983	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1984	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1985	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1986	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1987	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
1988	-801	-620	-508	-433	-479	-637	-745	-901	-984	-940	-906	-806	-8,759	-9,124
1989	-720	-577	-485	-426	-448	-589	-667	-796	-861	-940	-906	-806	-8,220	-8,220
1990	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1991	-643	-512	-430	-381	-406	-522	-598	-705	-760	-940	-906	-806	-7,608	-7,306
1992	-720	-577	-485	-426	-448	-589	-667	-796	-861	-832	-808	-708	-7,918	-8,220
1993	-643	-512	-430	-381	-406	-522	-598	-705	-760	-1,074	-1,036	-907	-7,973	-7,306
1994	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1995	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1996	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1997	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1998	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
1999	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2000	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2001	-801	-620	-508	-433	-479	-637	-745	-901	-984	-1,074	-1,036	-907	-9,124	-9,124
2002	-801	-620	-508	-433	-479	-637	-745	-900	-984	-1,074	-1,036	-907	-9,124	-9,124
Avg (21-02)	-791	-614	-504	-431	-475	-631	-736	-888	-970	-1,058	-1,021	-895	-9,013	-9,013

APPENDIX O3

Table 2.1-2

Difference in Total System-wide Delivery (MG)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1922	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1923	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1924	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1925	827	578	386	262	390	641	839	1,035	24	71	59	33	5,145	8,483
1926	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1927	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1928	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1929	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1930	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1931	9	-9	-47	-59	-42	-28	-18	6	24	1,069	1,040	905	2,851	0
1932	827	682	590	521	558	720	812	925	986	71	59	33	6,785	9,636
1933	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1934	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1935	827	578	386	262	390	641	839	1,035	24	71	59	33	5,145	8,483
1936	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1937	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1938	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1939	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1940	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1941	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1942	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1943	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1944	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1945	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1946	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1947	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1948	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	1	0
1949	9	-9	-46	-59	-42	-28	-18	6	24	71	59	33	0	1
1950	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1951	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1952	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1953	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1954	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1955	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1956	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1957	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1958	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1959	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1960	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1961	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1962	827	682	590	521	558	720	812	925	986	71	59	33	6,785	9,636
1963	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1964	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1965	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1966	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1967	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1968	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1969	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1970	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1971	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1972	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1973	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1974	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1975	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1976	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1977	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1978	827	682	590	521	558	720	812	925	-1,124	71	59	33	4,675	7,525
1979	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1980	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1981	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1982	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1983	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1984	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1985	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1986	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1987	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,339	0
1988	827	578	386	262	390	641	839	1,035	1,166	1,069	1,040	905	9,137	9,625
1989	827	682	590	521	558	720	812	925	986	1,069	1,040	905	9,636	9,636
1990	827	682	590	521	558	720	812	925	986	53	37	24	6,736	9,636
1991	3	-3	-28	-43	-25	-19	-12	3	15	1,069	1,040	905	2,905	5
1992	827	682	590	521	558	720	812	925	986	53	37	24	6,736	9,636
1993	3	-3	-28	-43	-25	-19	-12	3	-2,095	71	59	33	-2,056	-2,105
1994	9	-9	-47	-59	-42	-28	-18	6	24	1,273	1,226	1,002	3,338	0
1995	827	578	386	262	390	641	-18	6	24	71	59	33	3,259	6,597
1996	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1997	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1998	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
1999	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2000	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2001	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
2002	9	-9	-47	-59	-42	-28	-18	6	24	71	59	33	0	0
Avg (21-02)	129	85	32	7	34	76	95	136	84	232	216	167	1,293	1,293

2.2 Diversions from the Tuolumne River

The metric for illustrating the SFPUC diversions from the Tuolumne River Basin (Tuolumne) is the flow through the San Joaquin Pipeline (SJPL). Inherent in the variant is a net water demand that is essentially equal to that under the base setting, which is less than the demand served by the proposed program. Table 2.2-1 illustrates the difference in diversions to the SJPL between the proposed program and the variant settings. In both settings, the conveyance capacity of the SJPL is increased compared to the base setting. During the summer, the SJPL would essentially operate at the same maximum rate in both the variant and WSIP settings to minimize drawdown of Bay Area reservoir storage. A few exceptions occur during the summer of drought periods when the variant would serve a lesser demand than the WSIP. Overall, compared to the WSIP setting, the variant setting would divert less water from the Tuolumne.

Table 2.2-2 illustrates the difference in diversions to the SJPL between the variant and base settings. Evident in the operation is the increase in summer diversions associated with an increase in the conveyance capacity of the SJPL. As described above, with the increase in SJPL conveyance capacity, summer diversions would increase to retain storage in the Bay Area reservoirs. With the demand of the variant being approximately the same as the base setting, the increase in summer diversions to the SJPL would result in reduced diversions during the late summer and fall. The differences in December diversions are largely the result of maintenance in the variant setting (lessening available conveyance capacity) that would not occur in the base setting. The increased diversions during the winter and spring result from the need to replenish Bay Area reservoir storage after the maintenance, and then the operation of topping off Bay Area reservoir storage prior to summer. There would be an overall increase in average annual diversions to the SJPL in the variant setting associated with the improvement in water delivery reliability. The 82-year average annual increase in diversions from the Tuolumne amounts to approximately 1,900 acre-feet per year (1.7 mgd).

Table 2.2-3 illustrates the average monthly diversions through the SJPL by year type for the 82-year simulation for the proposed program and the variant settings and the difference between the two settings. Table 2.3-4 shows the same information for the variant and base settings.

APPENDIX O3

Table 2.2-1

Difference in Total San Joaquin Pipeline (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-3,806	-1,841	0	0	0	-3,806	0	0	0	0	0	-4,880	-14,333	-17,095
1922	-9,514	-6,444	-3,045	-952	0	0	-2,762	-2,189	-2,118	0	0	-4,880	-31,904	-31,904
1923	-7,611	-1,841	0	0	0	-3,901	-1,197	-1,237	-1,197	0	0	-6,721	-23,705	-21,864
1924	-7,611	-2,762	-2,854	-1,903	-1,719	0	0	0	0	0	0	-2,118	-18,967	-23,570
1925	-6,945	0	0	0	-2,664	0	0	0	0	0	0	0	-9,609	-11,727
1926	-5,043	-2,854	0	-5,803	-9,452	0	-2,118	0	0	0	0	-6,721	-31,991	-25,270
1927	-7,611	-3,683	-952	-952	0	-1,902	-921	-1,237	-1,197	0	0	-6,721	-25,176	-25,176
1928	-6,755	-4,603	-523	-1,903	-1,719	-3,045	-2,762	-1,237	-1,197	0	0	-6,721	-30,465	-30,465
1929	-8,562	-4,603	-2,854	-1,902	-1,718	0	0	0	0	0	0	-2,118	-21,757	-26,360
1930	-6,945	0	0	0	0	0	0	0	0	0	0	-1,197	-8,142	-9,063
1931	-5,043	-6,537	0	-6,755	-6,101	0	0	0	0	0	-2,664	-9,483	-36,583	-25,633
1932	-8,562	-3,683	-4,757	-1,903	0	-2,854	0	-3,996	-3,867	0	0	-4,880	-34,502	-41,769
1933	-3,805	-2,762	-523	-2,854	-2,578	0	0	0	0	0	0	0	-12,522	-17,402
1934	-5,043	-3,775	-8,658	-7,611	-6,875	0	0	0	0	0	0	-3,867	-35,829	-31,962
1935	-7,897	0	0	-1,047	-2,664	0	-3,038	-3,996	-3,867	0	0	-3,038	-25,547	-26,376
1936	-10,751	-7,365	0	-3,806	0	-5,803	0	-1,237	-1,197	0	0	-4,880	-35,039	-33,197
1937	-11,417	-4,603	-2,854	-3,805	0	-951	-3,683	-2,664	-2,578	0	0	-4,880	-37,435	-37,435
1938	-7,611	-4,603	-2,854	-3,045	0	0	-2,762	-3,140	-3,038	0	0	-4,880	-31,933	-31,933
1939	-5,709	-1,841	-1,902	-1,902	-1,718	0	0	0	0	0	0	-1,197	-14,269	-17,952
1940	-6,945	0	0	0	-7,734	-7,611	-2,762	-2,664	-2,578	0	0	-4,880	-35,174	-31,491
1941	-5,709	-1,841	-1,142	0	0	0	0	-2,854	-2,762	0	0	-2,118	-16,426	-19,188
1942	-7,135	-2,762	-2,663	0	0	-2,663	-921	-2,854	-2,762	0	0	-3,038	-24,798	-23,878
1943	-6,659	-3,682	-523	0	0	-3,805	-1,197	-2,664	-2,578	0	0	-4,880	-25,988	-24,146
1944	-7,611	-1,841	-2,855	0	-1,718	-2,949	0	0	0	0	0	-6,721	-23,695	-21,854
1945	-8,087	0	0	0	-8,593	0	0	0	0	0	0	-4,880	-21,560	-23,401
1946	-10,751	-6,444	0	0	0	-2,949	0	0	0	0	0	-4,880	-25,024	-25,024
1947	-9,514	-7,365	-2,855	-3,805	-3,437	0	0	0	0	0	0	-2,118	-29,094	-31,856
1948	-5,043	-5,616	-523	-5,708	-3,437	0	0	0	0	0	0	-4,880	-25,207	-22,445
1949	-7,897	-5,616	-3,806	-3,805	-3,437	-4,756	0	-1,237	-1,197	0	0	-4,880	-36,631	-36,631
1950	-7,611	0	0	0	-945	0	0	0	0	0	0	0	-8,556	-13,436
1951	-3,996	-11,969	0	0	0	-8,562	0	-1,237	-1,197	0	0	-6,721	-33,682	-26,961
1952	-6,755	-4,603	-2,663	0	0	0	-2,762	-3,140	-3,038	0	0	-4,880	-27,841	-29,682
1953	-7,611	-1,841	0	0	0	-5,803	0	0	0	0	0	-7,642	-22,897	-20,135
1954	-6,755	-4,603	-952	-2,854	-860	-2,949	0	0	0	0	0	-7,642	-26,615	-26,615
1955	-7,611	0	0	0	-2,664	0	0	0	0	0	0	0	-10,275	-17,917
1956	-5,043	-3,775	0	0	0	-1,712	0	-1,237	-1,197	0	0	-7,642	-20,606	-12,964
1957	-6,755	-4,603	-2,854	-3,805	-1,718	0	0	0	0	0	0	-3,867	-23,602	-27,377
1958	-9,514	-5,524	-523	-4,757	0	0	0	-2,949	-2,854	0	0	-3,867	-29,988	-29,988
1959	-5,708	-2,762	-952	-1,902	0	-1,047	0	0	0	0	0	-3,867	-16,238	-16,238
1960	-7,897	0	0	0	-945	0	0	0	0	0	0	0	-8,842	-12,709
1961	-5,043	-5,616	0	-6,755	-6,101	0	0	0	0	0	-5,043	-9,483	-38,041	-23,515
1962	-10,751	-6,537	-2,855	-4,757	-2,578	-1,902	0	-5,043	-4,880	0	0	-4,880	-44,183	-53,829
1963	-3,901	-4,603	-523	0	0	-3,805	-2,762	-2,854	-2,762	0	0	0	-21,210	-26,090
1964	-7,897	-4,603	-952	-2,854	-2,578	0	0	0	0	0	0	0	-18,884	-18,884
1965	-3,996	0	0	-5,708	-5,156	0	-8,286	-952	-921	0	0	-6,721	-31,740	-25,019
1966	-6,755	-2,762	-523	-4,757	-4,297	0	0	0	0	0	0	-2,578	-21,672	-25,815
1967	-6,945	-8,378	-6,659	0	0	0	-2,762	-2,855	-2,762	0	0	-1,197	-31,558	-32,939
1968	-7,897	-2,762	0	-2,854	-2,578	0	0	0	0	0	0	-2,578	-18,669	-17,288
1969	-9,799	-7,365	-3,805	0	0	-951	-2,118	-2,189	-2,118	0	0	-6,721	-35,066	-30,923
1970	-3,806	0	0	-4,757	-4,297	-2,949	0	0	0	0	0	-4,880	-20,689	-22,530
1971	-8,087	-6,444	0	0	0	0	0	0	0	0	0	-2,118	-16,649	-19,411
1972	-7,897	-8,378	-5,709	-3,805	-3,437	0	0	0	0	0	0	-1,197	-30,423	-31,344
1973	-5,043	-6,537	-523	0	0	0	-2,118	-1,237	-1,197	0	0	-6,721	-23,376	-17,852
1974	-7,611	-2,762	0	0	0	-6,659	-1,841	-3,140	-3,038	0	0	-6,721	-31,772	-31,772
1975	-3,806	0	0	0	-4,297	-1,142	-921	-3,140	-3,038	0	0	-6,721	-23,065	-23,065
1976	-3,806	-3,682	-523	-952	-859	0	0	0	0	0	0	-1,197	-11,019	-16,543
1977	-6,945	-3,775	-7,611	-2,855	-2,578	0	0	0	0	6,945	2,949	-2,762	-16,632	-24,961
1978	-3,806	0	523	-5,708	-5,156	-10,464	-6,444	-1,047	-1,013	0	0	-4,880	-37,995	-25,983
1979	-5,708	-2,762	-2,854	-1,902	0	-2,854	0	0	0	0	0	-3,038	-19,118	-20,960
1980	-10,751	0	0	-7,611	0	-6,659	0	-1,237	-1,197	0	0	-6,721	-34,176	-30,493
1981	-5,708	-4,603	-523	-1,902	-1,718	0	0	0	0	0	0	-6,721	-21,175	-21,175
1982	-10,751	-4,603	-3,805	0	0	0	0	-2,854	-2,762	0	0	-3,038	-27,813	-31,496
1983	-5,803	-2,762	-951	0	0	0	-1,841	-3,805	-3,682	0	0	-1,197	-20,041	-21,882
1984	-6,660	-2,762	0	0	0	0	0	0	0	0	0	-2,578	-12,000	-10,619
1985	-6,945	0	0	0	-945	0	0	0	0	0	0	0	-7,890	-10,468
1986	-5,043	-3,775	0	-6,755	-3,437	-7,610	-5,524	-2,189	-2,118	0	0	-6,721	-43,172	-36,451
1987	-5,708	-2,762	-2,854	-3,805	-3,437	0	0	0	0	0	0	-2,118	-20,684	-25,287
1988	-6,945	-3,775	0	-7,611	-5,156	0	0	0	0	0	-3,140	-9,483	-36,110	-25,605
1989	-4,756	-2,762	-1,903	-2,854	-2,578	0	0	0	-2,118	-3,996	-3,806	-5,524	-30,297	-29,594
1990	-4,757	0	0	0	-945	0	0	0	0	-5,043	-7,610	-4,603	-22,958	-19,028
1991	-1,903	-3,682	-523	-952	-860	-2,854	-1,197	-2,854	-2,762	-2,664	-1,903	-4,603	-26,757	-34,843
1992	-2,855	-921	-1,903	0	-1,547	0	0	-5,043	-4,880	-1,047	-2,854	-1,841	-22,891	-26,319
1993	-1,902	-1,841	0	0	0	0	-2,762	-2,854	-2,762	0	0	-3,867	-15,988	-17,863
1994	-5,708	-2,762	-952	-1,903	-1,719	0	0	0	0	0	0	-3,867	-16,911	-16,911
1995	-6,945	0	0	-7,610	-6,874	0	-4,603	-1,903	-1,842	0	0	-4,880	-34,657	-33,644
1996	-5,708	-2,762	-523	0	0	0	0	-2,189	-2,118	0	0	-3,867	-17,167	-18,180
1997	-7,611	-4,604	0	0	0	-2,854	0	0	0	0	0	-2,118	-17,187	-18,936
1998	-9,799	-5,524	-523	0	0	-951	-6,444	-2,949	-2,854	0	0	-4,880	-33,924	-31,162
1999	-5,708	-1,841	-2,855	-1,902	0	-3,805	-2,762	-3,140	-3,038	0	0	-3,867	-28,918	-29,931
2000	-5,708	0	0	0	-5,328	-2,854	0	0	0	0	0	-3,867	-17,757	-17,757
2001	-9,514	-5,524	-523	-3,806	-1,718	-3,901	0	0	0	0	0	-4,880	-29,866	-28,853
2002	-9,514	-2,762	-4,757	-2,854	-2,578	0	0	0	0	0	0	-2,578	-25,043	-27,345
Avg (21-02)	-6,745	-3,361	-1,326	-2,073	-1,896	-1,577	-967	-1,162	-1,150	-71	-294	-4,107	-24,727	-24,788

APPENDIX O3

Table 2.2-2

Difference in Total San Joaquin Pipeline (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
1921	-3,806	-2,762	0	0	0	8,562	2,118	2,189	2,118	2,189	2,189	-2,762	10,035	10,035
1922	-8,562	-4,603	-4,947	0	0	0	4,603	2,854	2,762	2,189	2,189	-2,762	-6,277	-6,277
1923	-7,611	-4,603	0	0	0	11,416	921	952	921	2,189	2,189	-4,603	1,771	3,612
1924	-8,562	-2,762	-952	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	2,189	0	-1,103	-5,706
1925	-4,756	-19,334	-19,979	5,803	14,608	11,512	2,118	2,189	2,118	2,189	2,189	2,118	775	-1,343
1926	0	2,762	-7,088	0	0	15,317	2,762	2,189	2,118	2,189	2,189	-4,603	17,835	24,556
1927	-5,708	-4,604	-952	3,805	0	4,757	1,841	952	921	2,189	2,189	-4,603	787	787
1928	-3,806	-4,603	-2,854	1,902	2,578	2,663	1,841	952	921	2,189	2,189	-4,603	-631	-631
1929	-3,806	-2,762	-952	0	0	5,803	2,118	2,189	2,118	2,189	2,189	0	9,086	4,483
1930	-4,756	-19,334	-19,979	5,803	9,538	11,512	2,118	2,189	2,118	2,189	2,189	921	-5,492	-6,413
1931	-2,854	-921	-7,088	-952	-859	5,803	2,118	2,189	2,118	2,189	-475	-2,762	-1,494	4,853
1932	0	-921	951	3,805	0	12,558	4,880	2,949	2,854	2,189	2,189	-2,762	28,692	26,028
1933	-4,756	-2,762	-7,611	4,757	4,297	5,803	2,118	2,189	2,118	2,189	2,189	2,118	12,649	7,769
1934	-2,854	1,841	-2,855	-952	-860	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	9,177	13,044
1935	-2,854	-19,334	-19,979	18,075	14,608	10,560	6,445	3,901	3,775	2,189	2,189	-920	18,655	17,826
1936	-8,562	-2,762	-7,088	3,805	0	9,514	2,118	952	921	2,189	2,189	-2,762	514	2,356
1937	-7,611	-2,762	-952	0	0	0	2,762	2,379	2,302	2,189	2,189	-2,762	-2,266	-2,266
1938	-5,708	-4,603	-2,854	2,663	0	0	2,762	1,903	1,842	2,189	2,189	-2,762	-2,379	-2,379
1939	-7,611	-2,762	-4,757	952	860	5,803	2,118	2,189	2,118	2,189	2,189	921	4,209	526
1940	-4,756	-19,334	-19,979	15,317	0	5,708	5,524	2,379	2,302	2,189	2,189	-2,762	-11,223	-7,540
1941	-7,611	-2,762	-1,142	0	0	0	0	-1,902	-1,841	2,189	2,189	0	-10,880	-13,642
1942	-4,756	-2,762	-3,805	0	0	0	4,603	0	0	2,189	2,189	-920	-3,262	-2,342
1943	-4,756	-4,603	-7,611	0	0	0	5,524	-475	-460	2,189	2,189	-2,762	-10,765	-8,923
1944	-5,709	-2,762	-2,855	1,902	5,328	12,368	2,118	2,189	2,118	2,189	2,189	-4,603	14,472	16,313
1945	-8,562	-19,334	-19,979	5,803	5,156	15,317	2,118	2,189	2,118	2,189	2,189	-2,762	-13,558	-15,399
1946	-5,708	-4,603	0	0	0	7,611	2,118	2,189	2,118	2,189	2,189	-2,762	5,341	5,341
1947	-8,562	-5,524	-2,855	-4,757	0	10,560	2,118	2,189	2,118	2,189	2,189	0	-335	-3,097
1948	-2,854	0	-7,611	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	-2,762	1,568	4,330
1949	-5,708	0	-952	-4,757	-4,296	-2,854	2,118	952	921	2,189	2,189	-2,762	-12,960	-12,960
1950	-3,806	-19,334	-19,979	16,459	15,468	5,803	2,118	2,189	2,118	2,189	2,189	2,118	7,532	2,652
1951	-1,807	-4,604	0	0	0	0	2,118	952	921	2,189	2,189	-4,603	-2,645	4,076
1952	-3,806	-4,603	-951	0	0	0	6,444	-951	-920	2,189	2,189	-2,762	-3,171	-5,012
1953	-5,709	-2,762	0	0	0	9,514	2,118	2,189	2,118	2,189	2,189	-5,524	6,322	9,084
1954	-8,562	-4,603	-952	0	4,468	7,611	2,118	2,189	2,118	2,189	2,189	-5,524	3,241	3,241
1955	-8,562	-19,334	-15,222	16,459	12,202	5,803	2,118	2,189	2,118	2,189	2,189	2,118	4,267	-3,375
1956	-2,854	1,841	0	0	0	951	2,118	952	921	2,189	2,189	-5,524	2,783	10,425
1957	-3,806	-4,603	-952	0	5,328	10,560	2,118	2,189	2,118	2,189	2,189	-1,749	15,581	11,806
1958	-8,562	-2,762	-7,611	4,757	0	0	0	-1,902	-1,841	2,189	2,189	-1,749	-15,292	-15,292
1959	-5,708	-2,762	-952	952	0	14,270	2,118	2,189	2,118	2,189	2,189	-1,749	14,854	14,854
1960	-5,708	-19,334	-19,979	5,803	9,453	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-11,041	-14,908
1961	-2,854	0	-7,088	-952	3,437	5,803	2,118	2,189	2,118	2,189	0	0	6,960	11,267
1962	-952	3,682	1,902	-952	859	16,173	7,642	2,854	2,762	2,189	2,189	-2,762	35,586	36,159
1963	-952	-2,762	-7,611	0	0	3,805	2,762	-952	-921	2,189	2,189	2,118	-135	-5,015
1964	-5,708	-4,603	-952	4,757	4,297	5,803	2,118	2,189	2,118	2,189	2,189	2,118	16,515	16,515
1965	-1,807	-19,334	-14,270	0	0	11,512	4,603	0	0	2,189	2,189	-4,603	-19,521	-12,800
1966	-3,806	-5,524	-1,902	4,947	4,468	5,803	2,118	2,189	2,118	2,189	2,189	-460	14,329	10,186
1967	-4,756	-2,762	-9,514	0	0	0	3,683	-2,855	-2,762	2,189	2,189	921	-13,667	-15,048
1968	-5,708	-2,762	-7,088	5,708	5,156	5,803	2,118	2,189	2,118	2,189	2,189	-460	11,452	12,833
1969	-7,610	-2,762	-4,757	0	0	0	5,524	0	0	2,189	2,189	-4,603	-9,830	-5,687
1970	-3,806	-19,334	-19,979	7,610	6,874	16,173	2,118	2,189	2,118	2,189	2,189	-2,762	-4,421	-6,262
1971	-5,708	-7,365	0	0	0	10,560	2,118	2,189	2,118	2,189	2,189	0	8,290	5,528
1972	-5,708	-2,762	-5,709	-4,757	0	5,803	2,118	2,189	2,118	2,189	2,189	921	-1,409	-2,330
1973	-2,854	-921	-7,611	0	0	0	4,603	952	921	2,189	2,189	-4,603	-5,135	389
1974	-5,709	-2,762	0	0	0	3,805	2,762	1,903	1,842	2,189	2,189	-4,603	1,616	1,616
1975	-5,708	-19,334	-19,979	11,512	859	2,663	7,365	1,903	1,842	2,189	2,189	-4,603	-19,102	-19,102
1976	-5,708	-4,603	-7,611	-952	-859	5,803	2,118	2,189	2,118	2,189	2,189	921	-2,206	-7,730
1977	-1,902	1,841	-2,855	-2,855	-2,578	5,803	2,118	2,189	2,118	2,189	1,047	4,603	11,718	9,178
1978	3,805	-921	-2,331	0	0	0	5,708	4,756	4,603	2,189	2,189	-2,762	17,236	23,459
1979	-8,562	-2,762	-952	952	0	8,562	2,118	2,189	2,118	2,189	2,189	-920	7,121	5,279
1980	-5,708	-19,334	-15,222	5,708	0	951	4,880	952	921	2,189	2,189	-4,603	-27,077	-23,394
1981	-3,806	-4,603	-7,611	5,708	5,156	11,512	2,118	2,189	2,118	2,189	2,189	-4,603	12,556	12,556
1982	-8,562	-5,524	-3,805	0	0	0	0	-952	-921	2,189	2,189	-920	-16,306	-19,989
1983	-4,756	-5,524	0	0	0	0	2,946	952	921	2,189	2,189	921	-162	-2,003
1984	-5,708	-7,365	0	0	0	5,803	2,118	2,189	2,118	2,189	2,189	-460	3,073	4,454
1985	-4,756	-19,334	-19,979	10,560	8,593	5,803	2,118	2,189	2,118	2,189	2,189	2,118	-6,192	-8,770
1986	-2,854	1,841	-7,088	-952	0	0	1,841	2,854	2,762	2,189	2,189	-4,603	-1,821	4,900
1987	-5,708	-2,762	-952	-4,757	-4,296	5,803	2,118	2,189	2,118	2,189	2,189	0	-1,869	-6,472
1988	-1,902	1,841	-7,088	2,854	2,578	5,803	2,118	2,189	2,118	2,189	-951	0	11,749	14,889
1989	0	-921	2,854	0	0	5,803	2,118	5,043	2,762	1,047	0	1,841	20,547	18,897
1990	1,902	-19,334	-15,222	10,560	8,593	5,803	2,118	2,189	2,118	0	-2,854	1,841	-2,286	1,615
1991	1,902	-4,603	-2,854	-952	-860	7,611	3,683	0	0	-475	1,902	-2,762	2,592	2,914
1992	-2,855	3,682	1,902	952	859	18,075	6,721	1,902	1,841	0	-4,756	0	28,323	31,744
1993	0	-2,762	-1,379	0	0	0	1,841	0	0	2,189	2,189	-1,749	329	-7,056
1994	-8,562	-2,762	-952	-2,855	8,593	5,803	2,118	2,189	2,118	2,189	2,189	-1,749	8,319	8,319
1995	-1,902	-19,334	-19,979	0	0	0	4,603	0	0	2,189	2,189	-2,762	-34,996	-33,983
1996	-3,806	-2,762	-2,854	0	0	0	4,880	2,854	2,762	2,189	2,189	-1,749	3,703	2,690
1997	-5,708	-4,604	0	0	0	7,611	2,118	2,189	2,118	2,189	2,189	0	8,102	6,353
1998	-7,610	-2,762	-7,611	0	0	0	4,604	952	921	2,189	2,189	0	-7,128	-7,128
1999	-3,806	-2,762	-2,855	4,757	0	4,757	6,444	-951	-920	2,189	2,189	-1,749	7,293	9,042
2000	-3,806	-19,334	-19,979	15,317	2,406	13,319	2,118	2,189	2,118	2,189	2,189	-1,749	-3,023	-3,023
2001	-5,708	-2,762	-7,611	3,805	6,875	11,416	2,118	2,189	2,118	2,189	2,189	-2,762	14,056	15,069
2002	-8,562	-2,762	-6,659	3,805	3,437	10,560	2,118	2,189	2,118	2,189	2,189	-460	10,162	7,860
Avg (21-02)	-4,638	-5,883	-6,178	2,233	1,938	5,955	2,897	1,635	1,556	2,089	1,901	-1,546	1,960	1,932

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Table 2.2-3

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	20,579	13,177	8,363	8,491	6,015	8,925	18,753	24,515	23,724	29,778	29,778	24,179	216,278	215,562
Above Normal	20,096	11,265	7,899	13,280	7,228	13,493	23,006	26,291	25,443	29,778	29,778	24,425	231,981	231,792
Normal	19,265	11,911	8,741	13,872	10,032	19,812	27,712	29,064	28,126	29,778	29,778	24,352	252,444	251,317
Below Normal	20,874	12,781	11,615	18,434	15,371	24,361	28,622	29,241	28,172	29,386	29,185	25,080	273,122	272,085
Dry	20,395	16,572	14,580	16,655	14,071	25,651	28,817	29,463	28,512	29,148	27,625	22,948	274,435	277,265
All Years	20,248	13,114	10,228	14,188	10,562	18,460	25,393	27,716	26,796	29,574	29,235	24,210	249,723	249,661

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	27,584	16,762	9,692	11,066	7,304	10,875	21,647	26,722	25,859	29,778	29,778	28,817	245,884	243,146
Above Normal	26,935	14,568	8,898	13,901	8,598	16,352	24,176	28,608	27,685	29,778	29,778	28,817	258,095	258,095
Normal	26,632	15,087	9,698	15,299	11,343	21,935	28,322	29,778	28,817	29,778	29,778	28,817	275,285	275,285
Below Normal	27,567	16,214	13,000	21,070	18,065	25,211	28,817	29,481	28,530	29,778	29,521	27,972	295,227	295,751
Dry	26,210	19,881	16,554	19,818	16,869	25,717	28,817	29,778	28,817	29,094	28,773	27,154	297,481	299,662
All Years	26,992	16,475	11,553	16,261	12,458	20,037	26,359	28,878	27,946	29,645	29,529	28,317	274,450	274,450

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-7,005	-3,585	-1,329	-2,575	-1,289	-1,950	-2,894	-2,206	-2,135	0	0	-4,638	-29,605	-27,585
Above Normal	-6,839	-3,303	-999	-621	-1,370	-2,859	-1,170	-2,317	-2,242	0	0	-4,392	-26,113	-26,303
Normal	-7,367	-3,176	-957	-1,427	-1,311	-2,123	-610	-714	-691	0	0	-4,466	-22,841	-23,968
Below Normal	-6,693	-3,433	-1,385	-2,636	-2,694	-851	-195	-241	-357	-392	-336	-2,892	-22,105	-23,666
Dry	-5,816	-3,309	-1,974	-3,163	-2,798	-65	0	-315	-305	53	-1,148	-4,206	-23,046	-22,397
All Years	-6,745	-3,361	-1,326	-2,073	-1,896	-1,577	-967	-1,162	-1,150	-71	-294	-4,107	-24,727	-24,788

Table 2.3-4

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	20,579	13,177	8,363	8,491	6,015	8,925	18,753	24,515	23,724	29,778	29,778	24,179	216,278	215,562
Above Normal	20,096	11,265	7,899	13,280	7,228	13,493	23,006	26,291	25,443	29,778	29,778	24,425	231,981	231,792
Normal	19,265	11,911	8,741	13,872	10,032	19,812	27,712	29,064	28,126	29,778	29,778	24,352	252,444	251,317
Below Normal	20,874	12,781	11,615	18,434	15,371	24,361	28,622	29,241	28,172	29,386	29,185	25,080	273,122	272,085
Dry	20,395	16,572	14,580	16,655	14,071	25,651	28,817	29,463	28,512	29,148	27,625	22,948	274,435	277,265
All Years	20,248	13,114	10,228	14,188	10,562	18,460	25,393	27,716	26,796	29,574	29,235	24,210	249,723	249,661

Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	24,854	19,046	14,449	7,730	6,015	7,611	15,398	23,962	23,189	27,589	27,589	26,526	223,960	222,101
Above Normal	25,015	18,522	14,830	9,346	6,015	8,831	19,117	25,015	24,208	27,589	27,589	26,699	232,776	232,343
Normal	24,616	19,046	14,865	10,691	6,864	11,060	25,145	27,054	26,181	27,589	27,589	26,699	247,400	246,589
Below Normal	25,239	19,334	18,748	15,927	11,585	16,789	26,374	27,085	26,212	27,421	27,141	25,562	267,417	267,585
Dry	24,676	19,046	19,087	15,995	12,621	18,195	26,411	27,292	26,411	27,232	26,757	23,247	266,970	269,749
All Years	24,886	18,997	16,405	11,955	8,624	12,505	22,496	26,081	25,239	27,485	27,334	25,756	247,763	247,729

Difference in Total San Joaquin Pipeline (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total	FY Total
Wet	-4,275	-5,869	-6,086	761	0	1,314	3,355	553	535	2,189	2,189	-2,348	-7,681	-6,540
Above Normal	-4,919	-7,257	-6,931	3,934	1,213	4,662	3,889	1,276	1,235	2,189	2,189	-2,274	-795	-551
Normal	-5,352	-7,135	-6,125	3,181	3,169	8,752	2,567	2,011	1,945	2,189	2,189	-2,348	5,044	4,728
Below Normal	-4,365	-6,553	-7,133	2,507	3,786	7,572	2,248	2,155	1,961	1,965	2,043	-482	5,705	4,500
Dry	-4,281	-2,474	-4,508	660	1,450	7,456	2,406	2,171	2,101	1,915	869	-299	7,465	7,516
All Years	-4,638	-5,883	-6,178	2,233	1,938	5,955	2,897	1,635	1,556	2,089	1,901	-1,546	1,960	1,932

2.3 Hetch Hetchy Reservoir and Releases

Compared to the WSIP setting, the variant setting would draw less water from the Tuolumne due to the lesser demand. This circumstance would lead to less draw from Hetch Hetchy Reservoir in the variant setting in most years. Figure 2.3-1 illustrates a chronological trace of the simulation of Hetch Hetchy Reservoir storage and stream releases. Shown in Figure 2.3-1 are the results for the WSIP, variant (2018 WSIP), and base settings. Supplementing the Figure 2.3-1 representation of Hetch Hetchy Reservoir storage are Table 2.3-1, Hetch Hetchy Reservoir Storage (2018 WSIP); Table 2.3-2, Hetch Hetchy Reservoir Storage (WSIP); and Table 2.3-3, Difference in Hetch Hetchy Reservoir Storage (2018 WSIP minus WSIP). Table 2.3-4 is provided to illustrate the difference in Hetch Hetchy Reservoir storage between the base and variant settings.

Table 2.3-3 shows that, by the end of summer, storage in Hetch Hetchy Reservoir associated with the variant setting would be greater than the storage in the WSIP setting in about 20 percent of the years, ranging from a minor increase to over 31,000 acre-feet in a year. The relatively minor increases in storage are attributable to years when summer diversions would be the same in both settings (SJPL operating at maximum capacity) but less water would be diverted in the fall due to the lesser water demand. The larger increases in storage are associated with drought periods, during which the differences in underlying demand and water delivery shortages between the WSIP and variant settings are greater.

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Figure 2.3-1
Hetch Hetchy Reservoir Storage and Stream Release

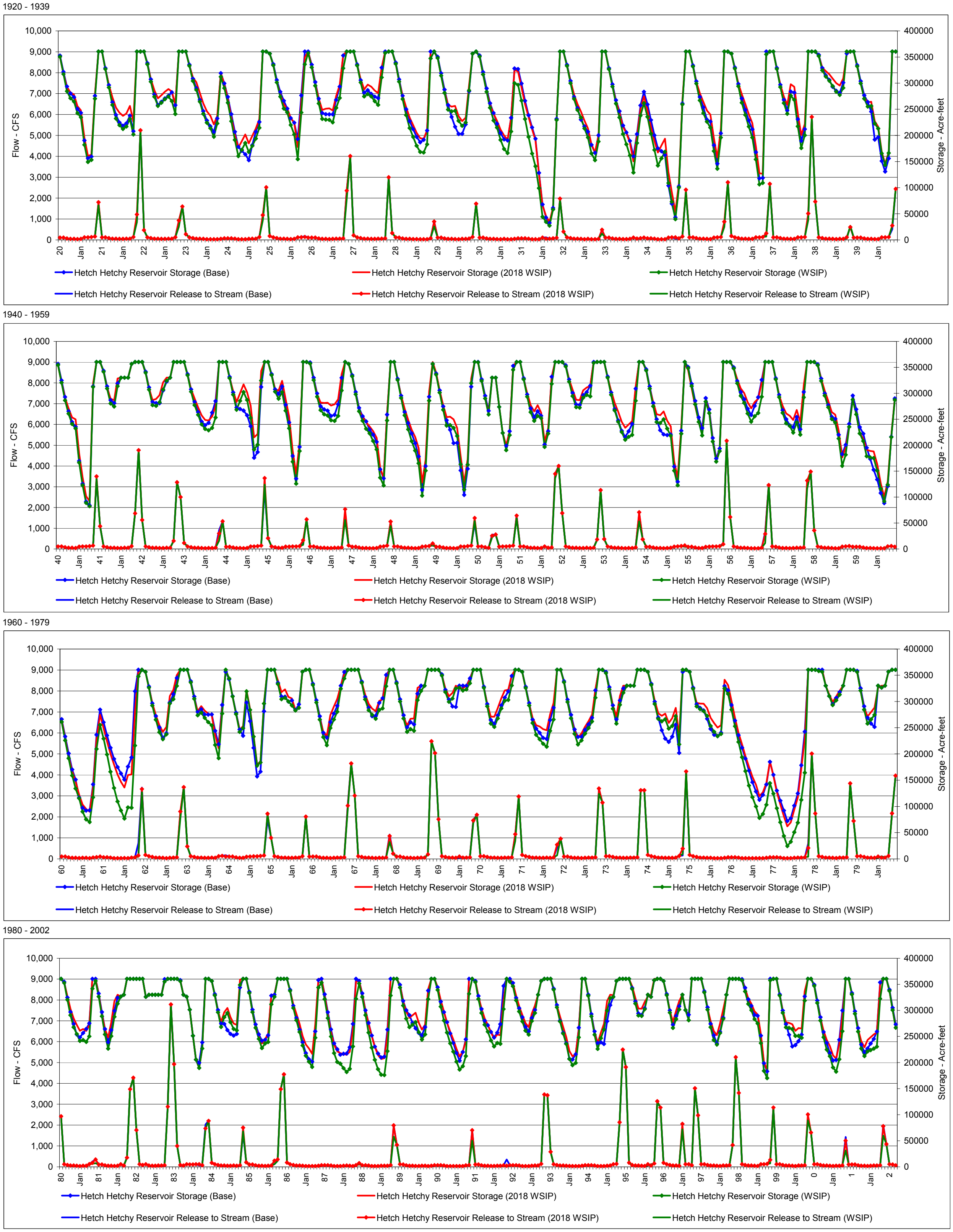

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Table 2.3-1

Hetch Hetchy Reservoir Storage (Acre-feet) 2018 WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	282,609	278,092	255,917	247,975	195,384	160,826	163,128	278,579	360,400	360,400	326,811	296,708
1922	272,692	253,215	243,432	237,356	241,830	256,406	226,719	360,400	360,400	360,400	336,082	307,732
1923	286,405	270,794	276,871	283,590	288,738	283,923	259,278	360,400	360,400	360,400	333,186	310,962
1924	301,568	281,696	261,164	246,096	237,579	221,011	237,619	319,528	297,781	269,833	234,563	200,811
1925	176,725	188,760	201,798	184,735	199,033	213,024	231,155	360,400	360,400	356,465	334,210	301,427
1926	279,127	259,324	251,245	233,085	224,213	177,698	263,211	349,832	360,400	333,232	297,804	270,576
1927	248,777	251,050	251,687	247,855	275,438	296,429	354,032	360,400	360,400	360,400	333,718	307,952
1928	287,960	297,217	293,099	286,032	280,760	330,000	360,400	360,400	360,400	337,096	302,689	276,165
1929	254,035	233,992	219,838	204,878	194,666	193,633	209,190	360,400	360,400	348,102	314,426	283,355
1930	258,555	254,985	256,315	236,814	227,387	233,865	295,228	356,465	360,400	350,768	316,726	284,621
1931	259,237	241,452	227,760	210,946	199,767	191,885	233,170	325,434	322,155	292,228	259,610	234,867
1932	211,484	190,881	126,425	66,408	45,476	34,111	62,131	232,474	360,400	360,400	333,089	304,798
1933	278,840	260,094	245,851	228,098	213,520	182,969	167,504	200,819	360,400	360,400	326,593	293,382
1934	266,003	243,161	216,797	204,346	186,085	150,440	198,562	251,067	274,860	248,611	216,584	189,190
1935	167,090	180,813	193,600	130,416	91,354	53,449	109,363	266,254	360,400	360,400	331,788	302,361
1936	280,873	263,851	247,502	239,843	194,673	157,609	213,898	360,400	360,400	356,465	327,853	298,989
1937	278,787	260,055	240,667	223,486	179,093	127,495	126,725	360,400	360,400	360,400	327,212	297,350
1938	274,407	258,610	297,772	293,013	242,112	200,609	221,893	360,400	360,400	360,400	352,029	329,594
1939	323,052	317,095	308,612	299,875	295,466	308,950	356,592	360,400	360,400	332,157	299,492	271,524
1940	263,350	264,386	227,268	216,494	168,677	145,755	168,357	360,400	360,400	354,451	320,313	291,190
1941	271,263	253,545	249,892	184,092	138,160	101,885	92,264	319,429	360,400	360,400	341,291	311,165
1942	289,497	286,480	328,368	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	310,000
1943	286,861	289,159	296,594	321,028	330,000	330,000	360,400	360,400	360,400	360,400	334,820	307,969
1944	289,730	272,775	257,390	248,581	247,526	255,151	275,226	360,400	360,400	360,400	329,290	304,166
1945	283,254	300,146	317,051	301,901	275,964	215,180	221,432	342,932	360,400	360,400	334,928	308,047
1946	305,207	324,081	288,649	254,722	190,265	144,978	204,939	360,400	360,400	357,267	325,581	298,114
1947	281,975	281,245	281,849	276,388	278,587	288,395	337,342	360,400	356,592	332,847	297,991	267,446
1948	254,417	244,294	235,928	226,952	214,085	155,433	137,737	260,228	360,400	360,400	325,774	295,942
1949	270,211	248,715	229,974	215,741	194,598	128,217	171,843	303,299	360,400	339,844	305,128	276,849
1950	254,009	254,979	249,960	232,946	178,360	126,993	173,245	328,608	360,400	359,600	323,849	289,929
1951	263,034	330,000	330,000	273,739	223,537	199,065	226,940	352,902	360,400	360,400	326,780	299,924
1952	277,192	265,107	276,984	262,472	207,037	232,744	331,312	360,400	360,400	360,400	351,651	327,090
1953	306,915	287,555	286,634	305,694	311,161	314,290	360,400	360,400	360,400	360,400	330,136	304,813
1954	281,411	264,084	245,293	233,461	239,810	246,445	312,245	360,400	360,400	343,956	308,827	282,584
1955	259,833	257,884	265,101	247,276	236,225	168,911	137,956	234,795	356,592	344,694	309,939	275,067
1956	246,064	223,824	286,092	264,022	209,194	170,223	190,121	360,400	360,400	360,400	347,791	326,931
1957	309,473	300,247	282,855	271,022	283,025	289,326	320,587	360,400	360,400	360,400	326,823	296,564
1958	275,676	261,117	256,620	248,538	268,060	244,553	316,356	360,400	360,400	360,400	353,900	327,777
1959	305,000	285,354	263,804	258,795	228,073	176,551	195,296	236,053	288,523	260,077	223,494	212,535
1960	191,220	189,064	187,908	163,510	126,394	100,465	130,282	218,504	290,266	264,021	228,814	194,592
1961	166,799	147,604	122,185	103,560	94,937	89,820	136,861	229,076	274,760	248,652	223,685	200,188
1962	179,904	160,807	146,608	135,879	159,757	160,943	279,470	356,465	360,400	356,465	326,379	297,010
1963	273,823	254,662	242,067	251,423	310,058	322,016	350,074	360,400	360,400	360,400	336,396	305,026
1964	281,564	290,995	282,306	277,015	273,190	235,968	210,684	286,406	360,400	343,750	309,409	275,896
1965	245,809	253,115	321,455	286,120	235,159	179,819	185,636	297,805	360,400	360,400	360,400	339,909
1966	317,826	322,951	308,583	305,796	283,349	288,162	356,592	360,400	360,400	331,450	297,972	267,899
1967	241,427	234,658	273,811	290,049	304,992	330,000	352,295	360,400	360,400	360,400	360,400	336,965
1968	313,146	295,351	286,381	281,571	301,117	304,173	346,380	360,400	360,400	334,325	299,837	270,029
1969	254,522	266,986	267,609	326,006	330,000	330,000	360,400	360,400	360,400	360,400	349,426	324,498
1970	309,819	316,182	330,000	326,065	325,142	330,000	341,873	360,400	360,400	360,400	326,016	295,639
1971	270,928	270,971	287,195	306,077	320,804	322,357	349,749	360,400	360,400	356,465	325,764	294,564
1972	268,852	254,761	252,261	247,271	245,191	275,403	296,867	360,400	360,400	336,426	299,001	269,162
1973	244,428	230,983	238,924	251,779	262,465	275,113	322,681	360,400	360,400	353,990	322,828	292,848
1974	272,123	310,590	330,000	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	301,908
1975	277,436	272,650	276,651	258,972	268,065	287,929	234,337	360,400	360,400	356,465	324,162	297,200
1976	295,909	295,723	287,208	268,903	258,610	250,311	254,661	341,485	330,919	300,830	269,106	240,387
1977	218,384	195,661	175,732	156,532	141,297	119,701	126,961	144,655	185,682	158,583	127,611	103,776
1978	81,190	62,065	69,663	93,807	117,052	170,753	229,138	360,400	360,400	360,400	357,869	360,400
1979	330,000	313,085	298,796	309,602	320,487	330,000	360,400	360,400	360,400	356,097	320,734	287,352
1980	271,512	279,664	288,323	326,065	330,000	330,000	356,592	360,400	360,400	360,400	352,729	327,134
1981	303,223	284,771	272,418	260,876	264,288	260,790	271,414	360,400	360,400	330,185	292,628	264,472
1982	248,006	276,645	317,405	330,000	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	356,951	360,400	360,400	360,400	360,400	357,167
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	299,035
1985	277,894	296,425	304,499	286,883	274,950	272,162	359,303	360,400	360,400	333,535	296,865	266,723
1986	250,445	236,469	245,291	254,917	330,000	330,000	360,400	360,400	360,400	360,400	337,490	311,318
1987	293,620	273,938	250,752	234,807	227,102	216,794	272,945	360,400	360,400	328,763	292,248	259,162
1988	234,316	221,153	217,898	216,791	214,588	220,681	263,542	355,022	356,592	330,735	299,096	274,941
1989	250,690	230,116	214,166	206,589	208,221	254,241	360,400	360,400	360,400	347,970	317,138	297,556
1990	286,000	290,721	295,500	276,136	263,108	272,917	340,617	360,400	360,400	344,204	319,777	297,881
1991	276,582	259,570	244,114	225,926	211,787	220,991	241,549	360,400	360,400	357,093	326,278	304,043
1992	284,649	272,088	257,248	245,762	253,949	252,395	318,919	360,400	359,902	352,164	328,215	308,305
1993	291,250	275,503	268,001	293,942	309,264	330,000	356,592	360,400	360,400	360,400	339,684	309,861
1994	288,288	268,035	248,867	222,053	211,917	216,211	265,068	360,400	360,400	328,106	288,504	257,165
1995	236,917	257,505	274,105	318,014	330,000	329,098	356,592	360,400	360,400	360,400	360,400	346,115
1996	323,688	303,528	303,270	316,260	326,446	330,000	360,400	360,400	360,400	356,465	329,269	299,674
1997	277,861	299,279	317,856	330,000	300,695	283,968	360,400	360,400	360,400	360,400	334,509	303,667
1998	279,663	260,551	252,471	274,673	301,923	330,000	360,400	360,400	360,400	360,400	357,575	341,243
1999	322,965	312,973	298,470	292,088	254,288	201,103	185,376	360,400	360,400	360,400	328,523	299,272
2000	277,088	276,001	273,476	260,779	266,000	265,151	336,457	360,400	360,400	347,257	314,429	284,299
2001	261,745	243,718	231,697	213,737	207,523	235,058	289,029	360,400	360,186	330,828	293,698	264,148
2002	241,297	229,484	243,063	248,705	254,002	257,704	349,922	360,400	360,400	337,536	300,566	269,362
Avg (21-02)	268,676	262,479	259,859	252,012	243,600	235,735	269,224	338,182	352,712	343,017	316,086	289,447

APPENDIX O3

Table 2.3-2

Hetch Hetchy Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	271,165	264,808	242,632	234,683	182,084	149,183	153,305	270,347	360,400	360,400	326,811	291,828
1922	258,301	232,379	219,552	212,511	216,970	231,546	201,859	360,400	360,400	360,400	336,082	302,853
1923	273,916	256,464	262,541	269,252	274,392	265,677	241,032	360,400	360,400	360,400	333,186	304,241
1924	287,239	264,605	241,219	224,237	213,989	197,420	222,900	312,177	290,436	262,497	227,241	191,379
1925	160,353	172,388	185,426	168,354	179,977	193,968	214,415	360,400	360,400	356,465	334,210	301,427
1926	274,085	251,427	243,883	219,916	201,778	154,687	243,705	336,096	357,554	330,389	294,965	261,018
1927	231,614	230,204	229,890	225,094	252,663	271,751	328,434	360,400	360,400	360,400	333,718	301,231
1928	274,488	279,141	274,500	265,521	258,520	310,981	357,818	360,400	360,400	337,096	302,689	269,444
1929	238,756	214,109	197,101	180,226	168,280	167,248	182,805	347,340	360,400	348,102	314,426	281,237
1930	249,493	245,923	247,253	227,747	218,315	224,793	286,156	356,465	360,400	350,768	316,726	283,424
1931	252,998	228,677	214,984	191,409	174,118	166,236	207,521	299,800	296,541	266,646	231,402	197,210
1932	165,286	141,000	99,154	44,357	34,477	27,305	58,254	229,673	360,400	360,400	333,089	299,918
1933	270,157	248,649	233,883	213,269	196,104	165,553	152,529	188,275	360,400	360,400	326,593	293,382
1934	260,961	234,344	202,598	182,895	161,604	129,002	185,456	237,968	261,776	235,550	203,546	172,300
1935	142,314	156,037	168,825	108,936	73,089	39,750	100,334	259,346	360,400	360,400	331,788	299,322
1936	267,086	242,699	226,345	214,884	170,029	136,212	195,836	360,400	360,400	356,465	327,853	294,110
1937	262,493	239,158	216,925	195,925	154,023	106,324	109,133	355,146	360,400	360,400	327,212	292,471
1938	261,919	241,518	276,115	268,301	217,388	175,924	200,166	360,400	360,400	360,400	352,029	324,714
1939	312,466	304,668	294,282	283,636	277,502	290,985	360,400	360,400	360,400	332,157	299,492	270,327
1940	255,209	256,245	222,760	213,012	165,616	143,200	166,203	360,400	360,400	354,451	320,313	286,310
1941	260,678	241,118	232,444	166,634	122,924	89,103	82,492	312,086	360,400	360,400	341,291	309,048
1942	280,245	274,466	313,690	330,000	330,000	330,000	356,592	360,400	360,400	360,400	339,529	306,962
1943	277,164	275,780	282,691	307,119	324,209	330,000	360,400	360,400	360,400	360,400	334,820	303,090
1944	277,241	258,445	240,206	231,387	228,604	233,279	253,354	360,400	360,400	360,400	329,290	297,445
1945	268,450	285,342	302,246	287,091	252,554	191,770	200,884	324,552	360,400	360,400	334,928	303,168
1946	289,579	302,009	266,576	232,638	168,168	125,876	188,823	360,400	360,400	357,267	325,581	293,235
1947	267,584	259,488	257,238	247,959	246,704	256,512	305,459	360,400	356,592	332,847	297,991	265,329
1948	247,258	231,519	222,630	208,209	191,894	137,570	122,657	247,597	360,400	360,400	325,774	291,062
1949	257,437	230,325	207,779	189,698	165,102	102,768	150,930	285,781	356,592	336,040	301,328	268,173
1950	237,728	238,697	233,120	217,888	163,294	114,244	162,551	319,659	360,400	359,600	323,849	289,929
1951	259,038	330,000	330,000	273,739	223,537	190,502	219,413	345,379	360,400	360,400	326,780	293,203
1952	263,719	247,031	256,244	252,090	196,649	222,356	318,163	360,400	360,400	360,400	351,651	322,211
1953	294,426	273,225	272,304	291,357	296,819	294,144	358,469	360,400	360,400	360,400	330,136	297,172
1954	267,018	245,088	225,346	210,648	216,124	219,810	285,610	360,400	360,400	343,956	308,827	274,943
1955	244,584	242,635	249,852	232,018	218,294	150,980	122,826	222,121	360,400	348,498	313,738	278,863
1956	244,816	218,801	283,964	261,892	207,063	168,360	188,550	360,400	360,400	360,400	347,791	319,290
1957	295,080	281,251	261,004	245,354	255,623	261,924	293,186	360,400	360,400	360,400	326,823	292,697
1958	262,298	242,214	237,194	224,344	243,852	220,345	292,148	360,400	360,400	360,400	353,900	323,910
1959	295,427	273,019	250,518	243,597	212,867	160,299	181,528	235,211	287,682	259,237	222,655	207,831
1960	178,623	176,466	175,310	150,905	115,966	92,114	123,900	215,531	287,296	261,055	225,853	191,635
1961	158,801	133,990	115,379	89,989	75,248	70,132	117,173	209,414	255,120	229,047	199,072	166,120
1962	135,106	109,472	92,419	76,863	98,093	97,377	215,903	347,784	360,400	356,465	326,379	292,131
1963	265,044	241,281	228,162	237,510	296,137	304,290	329,586	360,400	360,400	360,400	336,396	305,026
1964	273,668	278,495	268,855	260,703	254,291	217,069	191,863	276,888	360,400	343,750	309,409	275,896
1965	241,813	249,120	319,261	283,925	232,964	177,623	183,699	296,108	360,400	360,400	360,400	333,188
1966	304,353	306,716	299,942	292,395	282,814	287,628	356,592	360,400	360,400	331,450	297,972	265,321
1967	231,906	216,758	249,252	265,475	280,406	324,014	343,546	360,400	360,400	360,400	360,400	335,768
1968	304,053	283,496	274,527	266,857	283,817	286,873	329,080	360,400	360,400	334,325	299,837	267,451
1969	242,147	247,245	244,063	302,446	320,114	330,000	360,400	360,400	360,400	360,400	349,426	317,777
1970	299,296	305,659	324,435	326,065	320,846	322,797	334,670	360,400	360,400	360,400	326,016	290,760
1971	257,964	251,563	267,786	286,658	301,378	302,930	330,322	360,400	360,400	356,465	325,764	292,446
1972	258,839	236,370	228,162	219,353	213,819	244,031	265,495	360,400	360,400	336,426	299,001	267,965
1973	238,190	218,208	225,626	238,473	249,151	261,799	307,249	360,400	360,400	353,990	322,828	286,127
1974	257,794	293,500	316,503	330,000	330,000	330,000	360,400	360,400	360,400	356,465	331,550	295,187
1975	266,912	262,126	266,128	248,443	253,233	271,955	218,363	360,400	360,400	356,465	324,162	290,479
1976	285,385	281,517	272,478	253,215	242,054	233,754	238,104	324,938	314,385	284,316	252,614	222,717
1977	193,779	167,282	139,742	117,657	99,799	78,202	85,462	103,210	144,346	124,287	96,380	69,868
1978	43,507	24,382	32,503	50,915	68,975	112,212	164,152	360,400	360,400	360,400	357,869	356,406
1979	329,957	310,280	293,137	302,038	312,919	330,000	360,400	360,400	360,400	356,097	320,734	284,314
1980	257,725	265,877	274,536	330,000	326,446	330,000	356,592	360,400	360,400	360,400	352,729	320,413
1981	290,796	267,741	254,865	241,410	243,092	239,594	250,218	341,900	356,592	326,381	288,829	253,955
1982	226,746	250,781	287,735	312,861	326,446	330,000	360,400	360,400	360,400	360,400	360,400	360,400
1983	326,065	330,000	330,000	330,000	330,000	330,000	355,110	360,400	360,400	360,400	360,400	355,970
1984	330,000	326,192	301,515	251,330	205,725	189,676	227,004	360,400	360,400	356,465	328,962	296,457
1985	268,372	286,904	294,977	277,357	264,474	261,687	348,828	360,400	360,400	333,535	296,865	266,723
1986	245,402	227,652	236,474	239,341	311,791	326,065	360,400	360,400	360,400	360,400	337,490	304,597
1987	281,194	258,749	232,710	212,948	201,794	191,486	247,637	343,806	353,248	321,619	285,112	249,916
1988	218,130	201,193	197,937	189,208	181,835	187,927	230,788	322,288	351,731	325,880	291,107	257,476
1989	228,478	205,142	187,290	176,843	175,880	221,901	328,424	360,400	360,400	343,974	309,341	284,242
1990	267,935	272,656	277,435	258,063	244,079	253,888	321,588	360,400	360,400	339,162	307,130	280,640
1991	257,447	236,752	220,773	201,620	186,608	192,958	212,319	331,748	360,400	354,429	321,715	294,880
1992	272,636	259,154	242,411	230,916	237,549	235,995	302,519	360,400	355,022	346,244	319,447	297,703
1993	278,750	261,161	253,660	279,592	294,907	330,000	356,592	360,400	360,400	360,400	339,684	305,994
1994	278,714	255,699	235,580	206,856	194,993	199,287	248,143	360,400	360,400	328,106	288,504	253,299
1995	226,108	246,696	263,295	299,588	323,326	326,065	356,592	360,400	360,400	360,400	360,400	341,235
1996	313,102	290,180	289,399	302,383	330,000	326,065	357,776	360,400	360,400	356,465	329,269	295,808
1997	266,385	283,200	301,776	330,000	300,695	281,114	360,400	360,400	360,400	360,400	334,509	301,549
1998	267,747	243,111	234,508	256,700	283,939	330,000	360,400	360,400	360,400	360,400	357,575	336,363
1999	312,379	300,546	283,189	274,898	237,089	183,904	170,253	357,615	360,400	360,400	328,523	295,405
2000	267,514	266,427	263,903	251,200	251,088	247,384	318,690	360,400	360,400	347,257	314,429	280,432
2001	248,366	224,815	212,272	190,495	182,549	206,184	260,155	360,400	360,186	330,828	293,698	259,268
2002	226,907	212,332	221,154	223,929	226,634	230,337	322,554	360,400	360,400	337,536	300,566	266,784
Avg (21-02)	255,904	246,607	243,366	234,942	226,197	219,194	254,171	333,374	350,872	341,109	313,888	283,193

APPENDIX O3

Table 2.3-3

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) — 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	11,444	13,284	13,285	13,292	13,300	11,643	9,823	8,232	0	0	0	4,880
1922	14,391	20,836	23,880	24,845	24,860	24,860	24,860	0	0	0	0	4,879
1923	12,489	14,330	14,330	14,338	14,346	18,246	18,246	0	0	0	0	6,721
1924	14,329	17,091	19,945	21,859	23,590	23,591	14,719	7,351	7,345	7,336	7,322	9,432
1925	16,372	16,372	16,372	16,381	19,056	19,056	16,740	0	0	0	0	0
1926	5,042	7,897	7,362	13,169	22,435	23,011	19,506	13,736	2,846	2,843	2,839	9,558
1927	17,163	20,846	21,797	22,761	22,775	24,678	25,598	0	0	0	0	6,721
1928	13,472	18,076	18,599	20,511	22,240	19,019	2,582	0	0	0	0	6,721
1929	15,279	19,883	22,737	24,652	26,386	26,385	26,385	13,060	0	0	0	2,118
1930	9,062	9,062	9,062	9,067	9,072	9,072	9,072	0	0	0	0	1,197
1931	6,239	12,775	12,776	19,537	25,649	25,649	25,649	25,634	25,614	25,582	28,208	37,657
1932	46,198	49,881	27,271	22,051	10,999	6,806	3,877	2,801	0	0	0	4,880
1933	8,683	11,445	11,968	14,829	17,416	17,416	14,975	12,544	0	0	0	0
1934	5,042	8,817	14,199	21,451	24,481	21,438	13,106	13,099	13,084	13,061	13,038	16,890
1935	24,776	24,776	24,775	21,480	18,265	13,699	9,029	6,908	0	0	0	3,039
1936	13,787	21,152	21,157	24,959	24,644	21,397	18,062	0	0	0	0	4,879
1937	16,294	20,897	23,742	27,561	25,070	21,171	17,592	5,254	0	0	0	4,879
1938	12,488	17,092	21,657	24,712	24,724	24,685	21,727	0	0	0	0	4,880
1939	10,586	12,427	14,330	16,239	17,964	17,965	-3,808	0	0	0	0	1,197
1940	8,141	8,141	4,508	3,482	3,061	2,555	2,154	0	0	0	0	4,880
1941	10,585	12,427	17,448	17,458	15,236	12,782	9,772	7,343	0	0	0	2,117
1942	9,252	12,014	14,678	0	0	0	0	0	0	0	0	3,038
1943	9,697	13,379	13,903	13,909	5,791	0	0	0	0	0	0	4,879
1944	12,489	14,330	17,184	17,194	18,922	21,872	21,872	0	0	0	0	6,721
1945	14,804	14,804	14,805	14,810	23,410	23,410	20,548	18,380	0	0	0	4,879
1946	15,628	22,072	22,073	22,084	22,097	19,102	16,116	0	0	0	0	4,879
1947	14,391	21,757	24,611	28,429	31,883	31,883	31,883	0	0	0	0	2,117
1948	7,159	12,775	13,298	18,743	22,191	17,863	15,080	12,631	0	0	0	4,880
1949	12,774	18,390	22,195	26,043	29,496	25,449	20,913	17,518	3,808	3,804	3,800	8,676
1950	16,281	16,282	16,840	15,058	15,066	12,749	10,694	8,949	0	0	0	0
1951	3,996	0	0	0	0	8,563	7,527	7,523	0	0	0	6,721
1952	13,473	18,076	20,740	10,382	10,388	10,388	13,149	0	0	0	0	4,879
1953	12,489	14,330	14,330	14,337	14,342	20,146	1,931	0	0	0	0	7,641
1954	14,393	18,996	19,947	22,813	23,686	26,635	26,635	0	0	0	0	7,641
1955	15,249	15,249	15,249	15,258	17,931	17,931	15,130	12,674	-3,808	-3,804	-3,799	-3,796
1956	1,248	5,023	2,128	2,130	2,131	1,863	1,571	0	0	0	0	7,641
1957	14,393	18,996	21,851	25,668	27,402	27,402	27,401	0	0	0	0	3,867
1958	13,378	18,903	19,426	24,194	24,208	24,208	24,208	0	0	0	0	3,867
1959	9,573	12,335	13,286	15,198	15,206	16,252	13,768	842	841	840	839	4,704
1960	12,597	12,598	12,598	12,605	10,428	8,351	6,382	2,973	2,970	2,966	2,961	2,957
1961	7,998	13,614	6,806	13,571	19,689	19,688	19,688	19,662	19,640	19,605	24,613	34,068
1962	44,798	51,335	54,189	59,016	61,664	63,566	63,567	8,681	0	0	0	4,879
1963	8,779	13,381	13,905	13,913	13,921	17,726	20,488	0	0	0	0	0
1964	7,896	12,500	13,451	16,312	18,899	18,899	18,821	9,518	0	0	0	0
1965	3,996	3,995	2,194	2,195	2,195	2,196	1,937	1,697	0	0	0	6,721
1966	13,473	16,235	8,641	13,401	535	534	0	0	0	0	0	2,578
1967	9,521	17,900	24,559	24,574	24,586	5,986	8,749	0	0	0	0	1,197
1968	9,093	11,855	11,854	14,714	17,300	17,300	17,300	0	0	0	0	2,578
1969	12,375	19,741	23,546	23,560	9,886	0	0	0	0	0	0	6,721
1970	10,523	10,523	5,565	0	4,296	7,203	7,203	0	0	0	0	4,879
1971	12,964	19,408	19,409	19,419	19,426	19,427	19,427	0	0	0	0	2,118
1972	10,013	18,391	24,099	27,918	31,372	31,372	31,372	0	0	0	0	1,197
1973	6,238	12,775	13,298	13,306	13,314	13,314	15,432	0	0	0	0	6,721
1974	14,329	17,090	13,497	0	0	0	0	0	0	0	0	6,721
1975	10,524	10,524	10,523	10,529	14,832	15,974	15,974	0	0	0	0	6,721
1976	10,524	14,206	14,730	15,688	16,556	16,557	16,557	16,547	16,534	16,514	16,492	17,670
1977	24,605	28,379	35,990	38,875	41,498	41,499	41,499	41,445	41,336	34,296	31,231	33,908
1978	37,683	37,683	37,160	42,892	48,077	58,541	64,986	0	0	0	0	3,994
1979	43	2,805	5,659	7,564	7,568	0	0	0	0	0	0	3,038
1980	13,787	13,787	13,787	-3,935	3,554	0	0	0	0	0	0	6,721
1981	12,427	17,030	17,553	19,466	21,196	21,196	21,196	18,500	3,808	3,804	3,799	10,517
1982	21,260	25,864	29,670	17,139	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	1,841	0	0	0	0	1,197
1984	0	0	0	0	0	0	0	0	0	0	0	2,578
1985	9,522	9,521	9,522	9,526	10,476	10,475	10,475	0	0	0	0	0
1986	5,043	8,817	8,817	15,576	18,209	3,935	0	0	0	0	0	6,721
1987	12,426	15,189	18,042	21,859	25,308	25,308	25,308	16,594	7,152	7,144	7,136	9,246
1988	16,186	19,960	19,961	27,583	32,753	32,754	32,754	32,734	4,861	4,855	7,989	17,465
1989	22,212	24,974	26,876	29,746	32,341	32,340	31,976	0	0	3,996	7,797	13,314
1990	18,065	18,065	18,065	18,073	19,029	19,029	19,029	0	0	5,042	12,647	17,241
1991	19,135	22,818	23,341	24,306	25,179	28,033	29,230	28,652	0	2,664	4,563	9,163
1992	12,013	12,934	14,837	14,846	16,400	16,400	16,400	0	4,880	5,920	8,768	10,602
1993	12,500	14,342	14,341	14,350	14,357	0	0	0	0	0	0	3,867
1994	9,574	12,336	13,287	15,197	16,924	16,924	16,925	0	0	0	0	3,866
1995	10,809	10,809	10,810	18,426	6,674	3,033	0	0	0	0	0	4,880
1996	10,586	13,348	13,871	13,877	-3,554	3,935	2,624	0	0	0	0	3,866
1997	11,476	16,079	16,080	0	0	2,854	0	0	0	0	0	2,118
1998	11,916	17,440	17,963	17,973	17,984	0	0	0	0	0	0	4,880
1999	10,586	12,427	15,281	17,190	17,199	17,199	15,123	2,785	0	0	0	3,867
2000	9,574	9,574	9,573	9,579	14,912	17,767	17,767	0	0	0	0	3,867
2001	13,379	18,903	19,425	23,242	24,974	28,874	28,874	0	0	0	0	4,880
2002	14,390	17,152	21,909	24,776	27,368	27,367	27,368	0	0	0	0	2,578
Avg (21-02)	12,773	15,872	16,493	17,070	17,403	16,541	15,053	4,808	1,840	1,908	2,198	6,254

APPENDIX O3

Table 2.3-4

Difference in Hetch Hetchy Reservoir Storage (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	2,198	4,959	4,960	4,963	4,966	4,342	3,658	3,076	0	0	-2,188	576
1922	9,138	13,741	18,688	18,699	18,710	18,710	18,710	0	0	0	-2,188	575
1923	8,186	12,790	12,790	12,797	12,804	1,387	1,387	0	0	0	-2,188	2,417
1924	10,978	13,740	14,691	17,554	20,142	14,339	5,052	335	-1,783	-3,969	-6,150	-6,143
1925	-1,383	17,951	37,930	32,150	17,566	6,055	5,313	0	0	0	-2,188	-4,304
1926	-4,302	-7,064	-16	-16	-13	-15,330	-13,488	-10,568	0	-2,188	-4,374	233
1927	5,941	10,544	11,496	7,697	7,702	2,945	1,104	0	0	0	-2,188	2,417
1928	6,221	10,824	13,679	11,783	9,210	281	0	0	0	-2,188	-4,373	234
1929	4,038	6,800	7,752	7,756	7,761	1,957	-160	0	0	-2,188	-4,374	-4,370
1930	389	19,723	39,701	33,921	24,402	12,891	10,773	0	0	-2,188	-4,373	-5,291
1931	-2,434	-1,514	5,574	6,528	7,391	1,588	-529	-2,717	-4,832	-7,015	-6,530	-3,761
1932	-3,759	-2,838	-1,897	-1,591	2,645	1,691	1,046	754	0	0	-2,188	576
1933	5,332	8,094	15,705	10,957	6,667	864	761	638	0	0	-2,188	-4,304
1934	-1,448	-3,290	-2,195	-1,415	-3,522	-9,788	-4,179	-6,364	-8,474	-10,650	-12,820	-11,056
1935	-8,196	11,138	31,116	26,406	22,153	10,358	6,874	5,270	0	0	-2,188	-1,265
1936	7,297	10,059	17,258	13,364	13,372	11,707	9,889	0	0	0	-2,188	575
1937	8,186	10,948	11,900	11,907	11,185	9,529	8,018	0	0	0	-2,188	575
1938	6,283	10,887	13,741	11,084	11,089	11,088	9,748	0	0	0	-2,188	576
1939	8,187	10,948	15,705	14,761	13,907	8,104	0	0	0	-2,188	-4,373	-5,291
1940	-531	18,803	35,223	19,926	17,643	14,796	12,490	0	0	-2,188	-4,374	-1,608
1941	6,003	8,766	14,397	14,405	12,626	10,593	8,102	6,094	0	0	-2,188	-2,187
1942	2,571	5,333	9,139	0	0	0	0	0	0	0	-2,188	-1,266
1943	3,492	8,095	15,706	15,713	7,596	0	0	0	0	0	-2,188	575
1944	6,284	9,046	11,900	10,004	4,682	-7,685	-9,803	0	0	0	-2,188	2,417
1945	10,978	30,312	50,291	44,510	39,377	39,377	34,600	30,669	0	0	-2,188	575
1946	6,284	10,887	10,887	10,892	10,898	9,551	8,059	0	0	-2,188	-4,374	-1,608
1947	6,955	12,479	15,333	20,097	20,109	9,549	7,432	0	0	-2,188	-4,374	-4,370
1948	-1,513	-1,513	6,097	6,782	7,645	1,841	1,554	1,305	0	0	-2,188	576
1949	6,283	6,284	7,235	12,020	16,324	14,297	11,995	10,054	3,808	1,616	-574	2,188
1950	5,992	25,326	45,993	28,530	27,001	22,763	18,761	15,708	0	-800	-2,988	-5,103
1951	-3,293	0	0	0	0	0	0	0	0	0	-2,188	2,417
1952	6,221	10,825	11,776	5,895	5,898	5,898	-547	0	0	0	-2,188	575
1953	6,284	9,046	9,046	9,050	9,053	-460	0	0	0	0	-2,188	3,337
1954	11,898	16,502	17,453	17,463	13,005	5,394	3,276	0	0	-2,188	-4,373	1,154
1955	9,716	29,050	44,271	27,839	15,653	9,850	8,315	6,974	-3,808	-5,992	-8,173	-10,284
1956	-7,425	-9,266	-4,758	-4,760	-4,763	-4,139	-3,481	0	0	0	-2,188	3,337
1957	7,141	11,745	12,697	12,703	7,383	-3,177	-5,295	0	0	0	-2,188	-437
1958	8,125	10,887	18,498	13,752	13,760	13,760	13,760	0	0	0	-2,188	-437
1959	5,271	8,033	8,984	8,039	8,043	-6,227	-5,492	-4,932	-7,044	-9,222	-11,394	-9,632
1960	-3,918	15,416	35,395	29,617	18,587	12,000	9,167	2,173	54	-2,134	-4,318	-6,432
1961	-3,574	-3,574	5,300	6,260	2,831	-2,973	-5,090	-7,272	-9,381	-11,556	-11,536	-11,523
1962	-10,565	-14,248	-16,150	-15,212	-16,089	-32,262	-39,903	-3,935	0	0	-2,188	575
1963	1,527	4,288	11,900	11,907	11,914	8,108	5,346	0	0	0	-2,188	-4,304
1964	1,406	6,010	6,961	2,207	-2,088	-7,892	-7,892	-6,967	3,808	1,616	-574	-2,692
1965	-882	18,451	23,517	23,527	23,538	22,738	19,359	16,610	0	0	0	4,603
1966	8,407	13,931	8,868	3,925	-542	-6,346	0	0	0	-2,188	-4,373	-3,910
1967	849	3,612	13,125	13,133	13,139	0	-3,683	0	0	0	0	-921
1968	4,788	7,550	14,637	8,936	3,786	-2,018	-4,136	0	0	-2,188	-4,374	-3,910
1969	3,703	6,466	11,222	11,229	0	0	0	0	0	0	-2,188	2,417
1970	6,221	25,555	40,575	-3,935	-4,858	0	-2,117	0	0	0	-2,188	575
1971	6,283	13,649	13,649	13,656	13,661	3,101	983	0	0	0	-2,188	-2,186
1972	3,523	6,285	11,993	16,756	16,766	10,963	8,846	0	0	-2,188	-4,373	-5,290
1973	-2,433	-1,513	6,098	6,101	6,105	6,105	1,502	0	0	-2,188	-4,374	234
1974	5,941	8,703	5,109	0	0	0	0	0	0	0	-2,188	2,417
1975	8,124	27,459	47,437	35,952	35,115	32,451	32,451	3,935	0	0	-2,188	2,417
1976	8,125	12,728	20,339	21,301	22,172	16,369	14,252	12,055	9,928	7,728	5,530	4,603
1977	6,503	4,661	7,516	10,375	12,962	7,159	5,041	2,846	722	-1,468	-2,510	-7,107
1978	-10,902	-9,981	-7,651	-7,655	-7,664	-7,665	-13,372	0	0	0	-2,188	0
1979	0	2,762	3,713	2,764	2,765	0	0	0	0	-2,188	-4,373	-3,450
1980	2,260	21,594	36,816	-3,935	3,554	0	0	0	0	0	-2,188	2,417
1981	6,222	10,825	18,436	12,738	7,590	-3,922	-3,921	0	0	-2,188	-4,374	233
1982	8,795	14,319	18,125	5,589	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	-2,946	0	0	0	0	-921
1984	0	0	0	0	0	-9,738	-11,659	0	0	0	-2,188	-1,726
1985	3,032	22,365	42,344	31,805	23,229	17,426	15,308	0	0	-2,188	-4,374	-6,487
1986	-3,629	-5,471	1,617	2,568	1,757	0	0	0	0	0	-2,188	2,417
1987	8,124	10,886	11,837	16,602	20,907	15,104	12,987	2,092	0	-2,188	-4,373	-4,370
1988	-2,465	-4,306	2,782	-71	-2,649	-8,452	-10,570	-5,378	0	-2,188	-1,234	-1,233
1989	-1,232	-312	-3,166	-3,168	-3,169	-8,973	0	0	0	-1,046	-1,045	-2,886
1990	-4,787	14,547	29,769	19,223	10,642	4,838	2,720	0	0	0	2,854	1,011
1991	-893	3,710	6,565	7,520	8,383	772	-2,910	0	0	476	-1,428	1,335
1992	4,189	507	-1,396	-2,348	-3,210	-21,285	-28,006	0	-498	-498	4,260	4,256
1993	4,254	7,017	8,396	8,401	8,405	0	0	0	0	0	-2,188	-437
1994	8,126	10,888	11,839	14,699	6,115	312	-1,806	0	0	-2,188	-4,374	-2,621
1995	-717	18,618	38,597	38,619	20,001	3,033	0	0	0	0	0	2,762
1996	6,566	9,328	12,183	12,187	-3,554	3,935	2,624	0	0	0	-2,188	-438
1997	5,271	9,875	9,875	0	0	-7,611	0	0	0	0	-2,188	-2,186
1998	5,426	8,188	15,798	15,807	15,817	0	0	0	0	0	-2,188	-2,186
1999	1,620	4,382	7,236	2,482	2,484	2,483	2,183	0	0	0	-2,188	-437
2000	3,369	22,703	42,681	27,389	24,999	11,680	9,563	0	0	-2,188	-4,373	-2,621
2001	3,089	5,851	13,461	9,663	2,795	-8,622	-10,739	0	-214	-2,402	-4,587	-1,821
2002	6,742	9,504	16,163	12,368	8,938	-1,623	-3,741	0	0	-2,188	-4,374	-3,910
Avg (21-02)	3,098	8,809	14,784	11,355	9,088	3,389	1,921	884	-216	-1,113	-2,878	-1,348

Through the fall and winter, storage in Hetch Hetchy Reservoir would be the same or higher under the variant setting. Hetch Hetchy Reservoir would fill by the end of May during approximately 82 percent of the years, which would prevent any difference in storage from affecting the next summer's reservoir storage. Figure 2.3-2 illustrates the difference in reservoir storage, averaged by year type, for the variant and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation.

Table 2.3-4 illustrates the difference in Hetch Hetchy Reservoir storage between the variant and base settings. Immediately after filling Hetch Hetchy Reservoir (May or June, and then continuing through July), there would only be occasional differences in storage at the reservoir, typically a decrease of less than 12,000 acre-feet. This is indicative of the same amount of water being passed through the reservoir regardless of the size of the conveyance capacity of the SJPL. Water not diverted to the SJPL would return to the Tuolumne River and flow to Don Pedro Reservoir. In the late summer and early fall, there would consistently be a slight difference (lower) in storage levels between the two settings, as additional diversions to the SJPL would retain Bay Area reservoir storage. Some of this additional Hetch Hetchy Reservoir storage depletion would be ameliorated later in the fall and into winter as SJPL diversions are reduced due to less Bay Area reservoir replenishment needs and conveyance system maintenance. Storage becomes greater in November and December of the variant setting due to the assumed systemwide maintenance that would occur in the variant setting but not in the base setting. After December, the storage gain occurring in the variant setting would again be affected as replenishment of Bay Area reservoir storage resumes. In non-wet years, there is a difference in storage between the variant and base settings; the variant setting sometimes results in a lower storage in the reservoir by the end of April. Figure 2.3-3 illustrates the difference in reservoir storage, averaged by year type, between the variant and base settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.3-4 illustrates the average monthly storage in Hetch Hetchy Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Hetch Hetchy Reservoir attributed to the diversion effects of the variant would manifest in differences in releases from O'Shaughnessy Dam to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. Figure 2.3-1 illustrates the stream release from O'Shaughnessy Dam for the WSIP, variant, and base settings. Table 2.3-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant exhibits an incrementally greater stream release, predominately during May or June, which is reflective of the months when releases to the stream are made in excess of minimum release requirements in anticipation of filling the reservoir. The exceptions to this circumstance, during which incrementally larger reductions in releases to the stream occur, are considered anomalous within the modeling and simply the result of shifting releases from one month to the next. The increase in releases is the result of a less-depleted reservoir, which is the result of lesser SFPUC demands between the settings.

Table 2.3-6 illustrates the difference in stream releases between the variant and base settings. In this comparison, releases could be either greater or less than depicted for the base setting, and these differences would occur predominately during May or June. Generally, Hetch Hetchy Reservoir storage would be slightly lower during non-wet years, leading to a reduction in stream releases during non-wetter years if a release occurs. During wetter years, the releases are projected to increase. The differences, either increases or decreases, are a result of the coincidence of several operational parameters affecting the release of water from the reservoir, including systemwide water demands, conveyance capacity and maintenance assumptions, and the watershed's hydrology.

Table 2.3-5 illustrates the difference in stream releases between the variant and WSIP settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.3-7 illustrates the same information and the average monthly stream release for the variant and WSIP setting, expressed in average monthly flow (cfs). Table 2.3-5 shows an increase in monthly flow below O'Shaughnessy Dam of up to approximately 32,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly

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Figure 2.3-2

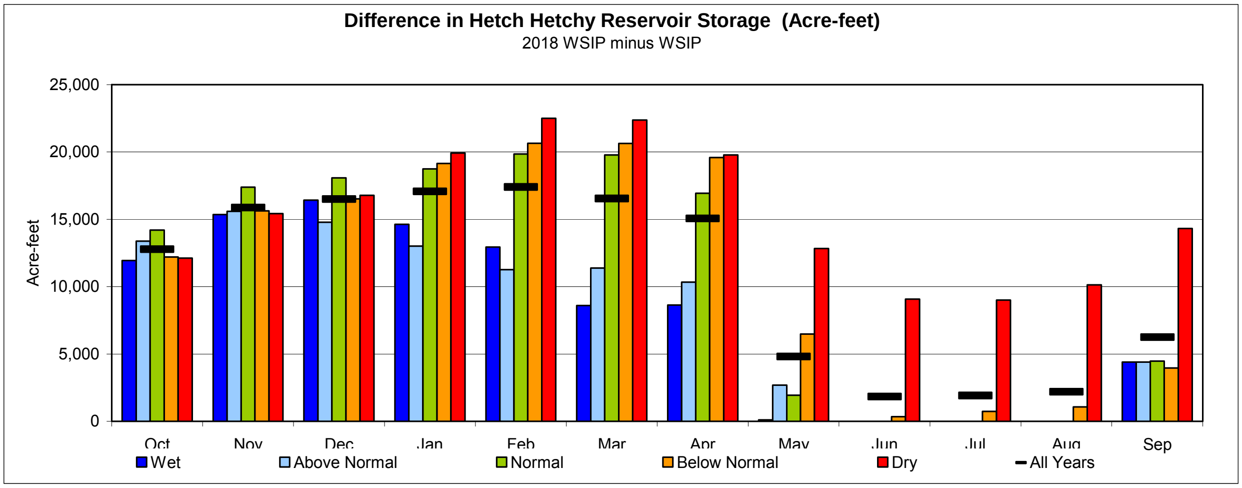

Figure 2.3-3

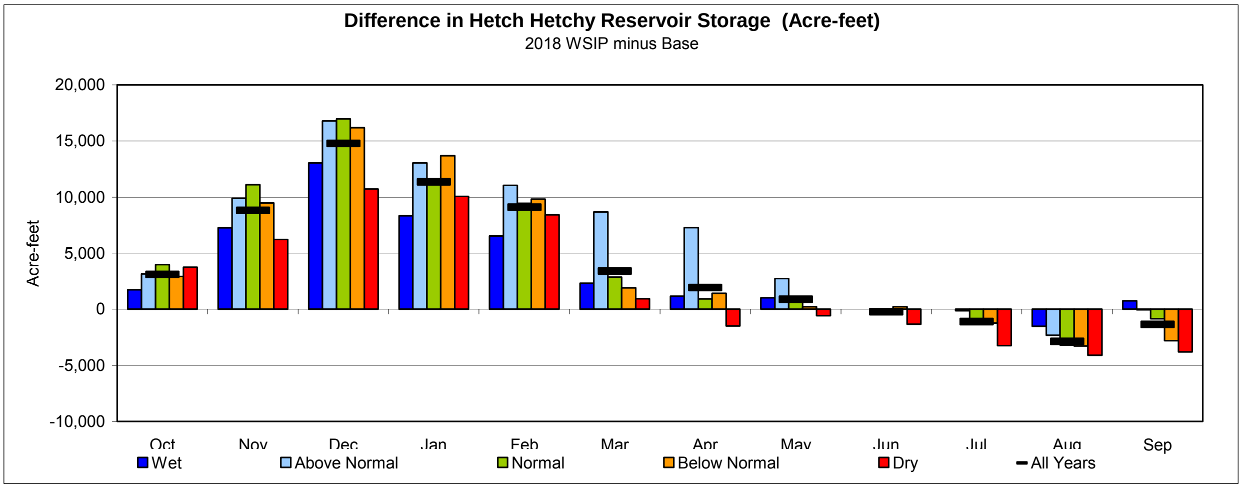

Figure 2.3-4

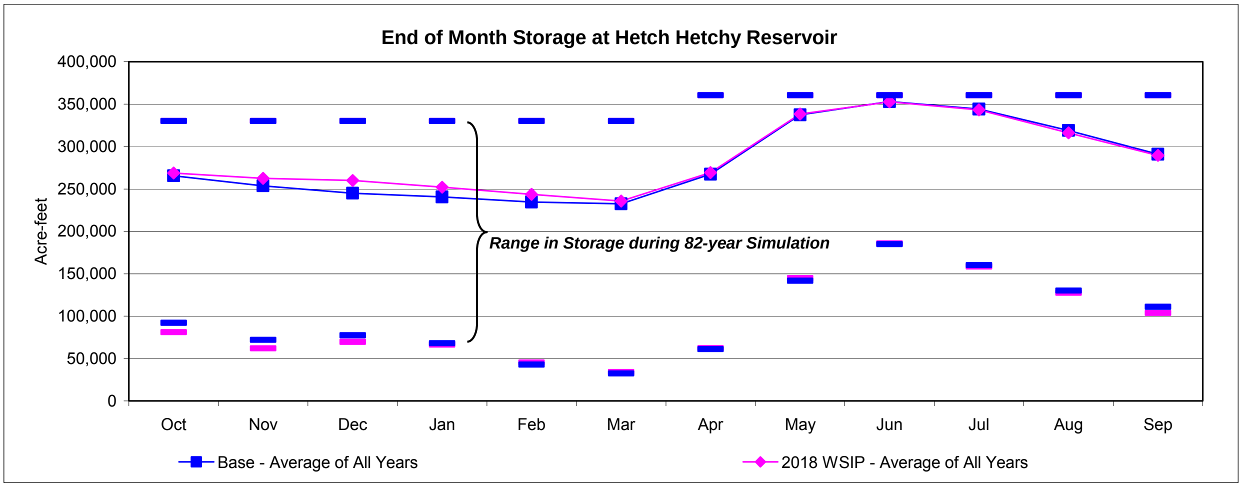

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Table 2.3-5

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	8,224	0	0	0	8,224
1922	0	0	0	0	0	0	0	22,812	0	0	0	0	22,812
1923	0	0	0	0	0	0	0	18,235	0	0	0	0	18,235
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	16,306	0	0	0	0	16,306
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	26,265	0	0	0	0	26,265
1928	0	0	0	0	0	0	0	2,741	0	0	0	0	2,741
1929	0	0	0	0	0	0	0	0	13,872	0	0	0	13,872
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	2,798	0	0	0	2,798
1933	0	0	0	0	0	0	0	0	11,014	0	0	0	11,014
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	6,899	0	0	0	6,899
1936	0	0	0	0	0	0	0	15,759	0	0	0	0	15,759
1937	0	0	0	0	0	0	0	9,359	5,570	0	0	0	14,929
1938	0	0	0	0	0	0	0	19,469	0	0	0	0	19,469
1939	0	0	0	0	0	0	3,808	-4,045	0	0	0	0	-237
1940	0	0	0	0	0	0	0	1,791	0	0	0	0	1,791
1941	0	0	0	0	0	0	0	0	7,337	0	0	0	7,337
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	21,859	0	0	0	0	21,859
1945	0	0	0	0	0	0	0	0	18,365	0	0	0	18,365
1946	0	0	0	0	0	0	0	14,088	0	0	0	0	14,088
1947	0	0	0	0	0	0	0	31,870	0	0	0	0	31,870
1948	0	0	0	0	0	0	0	0	12,616	0	0	0	12,616
1949	0	0	0	0	0	0	0	0	5,408	0	0	0	5,408
1950	0	0	0	0	0	0	0	0	8,943	0	0	0	8,943
1951	0	3,996	0	0	0	0	0	0	8,010	0	0	0	12,006
1952	0	0	0	0	0	0	0	13,144	0	0	0	0	13,144
1953	0	0	0	0	0	0	0	2,049	0	0	0	0	2,049
1954	0	0	0	0	0	0	0	26,624	0	0	0	0	26,624
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	1,373	0	0	0	0	1,373
1957	0	0	0	0	0	0	0	27,391	0	0	0	0	27,391
1958	0	0	0	0	0	0	0	24,198	0	0	0	0	24,198
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	3,935	9,227	0	0	0	13,162
1963	0	0	0	0	0	0	0	20,897	0	0	0	0	20,897
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	1,695	0	0	0	1,695
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	9,309	0	0	0	0	9,309
1968	0	0	0	0	0	0	0	17,457	0	0	0	0	17,457
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	43	0	7,200	0	0	0	0	7,243
1971	0	0	0	0	0	0	0	19,814	0	0	0	0	19,814
1972	0	0	0	0	0	0	0	31,356	0	0	0	0	31,356
1973	0	0	0	0	0	0	0	15,425	0	0	0	0	15,425
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	15,964	0	0	0	0	15,964
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	25,740	0	0	0	0	25,740
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	2,684	10,310	0	0	0	12,994
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	1,959	0	0	0	0	1,959
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	11,152	0	0	0	0	11,152
1986	0	0	0	0	0	10,235	3,935	0	0	0	0	0	14,170
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1989	0	0	0	0	0	0	364	33,044	0	0	0	0	33,408
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	29,675	0	0	0	29,675
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	16,086	0	0	0	0	0	0	0	0	16,086
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	10,281	2,950	0	0	0	13,231
2000	0	0	0	0	0	0	0	17,759	0	0	0	0	17,759
2001	0	0	0	0	0	0	0	28,859	0	0	0	0	28,859
2002	0	0	0	0	0	0	0	27,763	0	0	0	0	27,763
Avg (21-02)	0	49	0	244	0	77	115	7,252	2,080	0	0	0	9,817

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Table 2.3-6

Difference in Hetch Hetchy Reservoir Release to Stream (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	3,073	0	0	0	3,073
1922	0	0	0	0	0	0	0	17,442	0	0	0	0	17,442
1923	0	0	0	0	0	0	0	1,386	0	0	0	0	1,386
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	5,311	0	0	0	0	5,311
1926	0	0	0	0	0	0	0	-2,913	0	0	0	0	-2,913
1927	0	0	0	0	0	0	0	1,175	0	0	0	0	1,175
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-3,554	0	0	0	753	0	0	0	-2,801
1933	0	0	0	0	0	0	0	0	561	0	0	0	561
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	3,935	0	0	5,263	0	0	0	9,198
1936	0	0	0	0	0	0	0	8,614	0	0	0	0	8,614
1937	0	0	0	0	0	0	0	6,700	0	0	0	0	6,700
1938	0	0	0	0	0	0	0	9,009	0	0	0	0	9,009
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	10,463	0	0	0	0	10,463
1941	0	0	0	0	0	0	0	0	6,089	0	0	0	6,089
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	-9,799	0	0	0	0	-9,799
1945	0	0	0	0	0	0	0	0	30,644	0	0	0	30,644
1946	0	0	0	0	0	0	0	7,043	0	0	0	0	7,043
1947	0	0	0	0	0	0	0	7,429	0	0	0	0	7,429
1948	0	0	0	0	0	0	0	0	1,304	0	0	0	1,304
1949	0	0	0	0	0	0	0	0	5,408	0	0	0	5,408
1950	0	0	0	0	0	0	0	0	15,695	0	0	0	15,695
1951	0	-3,293	0	0	0	0	0	0	0	0	0	0	-3,293
1952	0	0	0	0	0	0	0	-547	0	0	0	0	-547
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	3,276	0	0	0	0	3,276
1955	0	0	0	0	0	0	0	0	3,808	0	0	0	3,808
1956	0	0	0	0	0	0	0	-3,039	0	0	0	0	-3,039
1957	0	0	0	0	0	0	0	-5,292	0	0	0	0	-5,292
1958	0	0	0	0	0	0	0	13,755	0	0	0	0	13,755
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	-35,603	-4,171	0	0	0	-39,774
1963	0	0	0	0	0	0	0	5,712	0	0	0	0	5,712
1964	0	0	0	0	0	0	0	0	-3,808	0	0	0	-3,808
1965	0	0	0	0	0	0	0	0	16,595	0	0	0	16,595
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	-3,920	0	0	0	0	-3,920
1968	0	0	0	0	0	0	0	-4,416	0	0	0	0	-4,416
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	3,935	0	43	0	-2,117	0	0	0	0	1,861
1971	0	0	0	0	0	0	0	1,049	0	0	0	0	1,049
1972	0	0	0	0	0	0	0	8,841	0	0	0	0	8,841
1973	0	0	0	0	0	0	0	1,501	0	0	0	0	1,501
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	19,987	4,171	0	0	0	24,158
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-13,365	0	0	0	-310	-13,675
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	3,935	-3,554	0	0	0	0	0	0	0	381
1981	0	0	0	0	0	0	0	-3,919	0	0	0	0	-3,919
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	-3,131	0	0	0	0	-3,131
1984	0	0	0	0	0	3,935	0	-11,653	0	0	0	0	-7,718
1985	0	0	0	0	0	0	0	16,315	0	0	0	0	16,315
1986	0	0	0	0	0	1,757	0	0	0	0	0	0	1,757
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	364	0	0	0	0	0	364
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	-18,433	0	0	0	0	-18,433
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	3,554	-3,935	1,311	2,785	0	0	0	0	3,715
1997	0	0	0	9,878	0	0	0	0	0	0	0	0	9,878
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	1,912	0	0	0	0	1,912
2000	0	0	0	0	0	0	0	9,558	0	0	0	0	9,558
2001	0	0	0	0	0	0	0	-10,735	0	0	0	0	-10,735
2002	0	0	0	0	0	0	0	-3,985	0	0	0	0	-3,985
Avg (21-02)	0	-40	0	216	-43	70	20	322	1,041	0	0	-4	1,583

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Table 2.3-7

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	187	85	94	148	2,509	4,551	2,034	184	89
Above Normal	55	93	88	66	93	90	133	1,303	3,139	379	125	89
Normal	54	54	50	55	74	74	98	1,437	1,924	167	122	86
Below Normal	55	55	46	43	51	63	92	727	770	113	111	73
Dry	53	53	44	40	44	50	60	172	168	86	86	65
All Years	54	62	56	77	70	75	106	1,224	2,107	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	167	89	84	144	2,412	4,550	2,034	184	89
Above Normal	55	89	88	66	89	94	131	1,192	3,093	379	125	89
Normal	54	54	50	55	74	74	98	1,253	1,890	167	122	86
Below Normal	55	55	46	43	51	63	91	550	709	113	111	73
Dry	53	53	44	40	44	50	56	156	139	86	86	65
All Years	54	61	56	73	70	73	104	1,107	2,072	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	20	-4	10	4	97	2	0	0	0
Above Normal	0	4	0	0	4	-4	1	112	46	0	0	0
Normal	0	0	0	0	0	0	0	184	34	0	0	0
Below Normal	0	0	0	0	0	0	0	177	62	0	0	0
Dry	0	0	0	0	0	0	4	16	29	0	0	0
All Years	0	1	0	4	0	1	2	118	35	0	0	0

flow (cfs).[1] When comparing the variant to the WSIP setting, a change in the volume of release from O'Shaughnessy Dam to the stream would likely result in the release being delayed or initiated earlier by a matter of days. Typical springtime releases, when initiated, amount to a release of up to 3,000 cfs (approximately 6,000 acre-feet over the span of a day). Using the assumption that a change in release volume equates to a delay or an earlier initiation of releasing 6,000 acre-feet per day means that the difference in stream release between the variant and WSIP would be up to an added five days of release. Normally, this change in release would not affect the peak stream release rate during a year. Table 2.3-8 illustrates the average monthly stream release for the variant and base settings, and the differences, expressed in average monthly flow (cfs). Table 2.3-6 illustrates that the difference in monthly flow below O'Shaughnessy Dam between the variant and base settings could range from an increase of approximately 30,000 acre-feet to a decrease of approximately 36,000 acre-feet. Using the same metric as described above to estimate the delay or addition in the number days of release to the stream, the variant could lead to an effect ranging from an increase of five days of release to a decrease of up to 6 days compared to the base setting.

Table 2.3-8

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	187	85	94	148	2,509	4,551	2,034	184	89
Above Normal	55	93	88	66	93	90	133	1,303	3,139	379	125	89
Normal	54	54	50	55	74	74	98	1,437	1,924	167	122	86
Below Normal	55	55	46	43	51	63	92	727	770	113	111	73
Dry	53	53	44	40	44	50	60	172	168	86	86	65
All Years	54	62	56	77	70	75	106	1,224	2,107	548	125	81

Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	55	51	51	173	89	93	148	2,510	4,534	2,034	184	90
Above Normal	55	96	88	66	93	86	131	1,249	3,092	379	125	89
Normal	54	54	50	51	74	74	98	1,443	1,909	167	122	86
Below Normal	55	55	46	43	51	63	91	723	763	113	111	73
Dry	53	53	44	40	44	50	60	199	168	86	86	65
All Years	54	62	56	74	70	73	106	1,219	2,089	548	125	81

Difference in Hetch Hetchy Reservoir Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	14	-4	2	0	-1	17	0	0	0
Above Normal	0	-3	0	0	0	4	1	54	46	0	0	0
Normal	0	0	0	4	0	0	0	-6	15	0	0	0
Below Normal	0	0	0	0	0	0	0	4	7	0	0	0
Dry	0	0	0	0	0	0	0	-27	0	0	0	0
All Years	0	-1	0	4	-1	1	0	5	17	0	0	0

[1] See *Estimated Affect of WSIP on Daily Releases below Hetch Hetchy Reservoir*, Memorandum by Daniel B. Steiner, December 31, 2006.

2.4 Lake Lloyd and Lake Eleanor

Compared to the operation of the WSIP, the operation of Lake Lloyd and Lake Eleanor are simulated to be only slightly different for the variant. Figure 2.4-1 illustrates a chronological trace of the simulation of Lake Lloyd storage and stream releases. Shown in Figure 2.4-1 are the results for the WSIP, variant, and base settings. The operation resulting from the variant is essentially the same as the WSIP setting, including during drought. Although the level of delivery between the variant and base settings is essentially the same (net 265 mgd demand) during the 1987-1992 drought, water delivery reliability has been improved in the variant setting; as a result, the drawdown of Lake Lloyd during this period looks closer to that in the WSIP setting. Although there is less water delivered during this period in the variant setting compared to the WSIP setting, more water is delivered in the variant setting than in the base setting. The additional draw of water reduced the amount of water released from Hetch Hetchy Reservoir to Don Pedro Reservoir in the variant setting, which, in order to satisfy TID/MID entitlements to inflow, was met with additional releases from Lake Lloyd, similar to the WSIP setting. The additional release from Lake Lloyd associated with the variant appears to be approximately the same as in the WSIP setting in this instance, which is partially a factor of modeling discretion in that the HH/LSM makes release decisions in the form of block amounts of releases. Additional refinement of modeling assumptions would likely produce a result that places Lake Lloyd storage during this drought period more between the base setting and WSIP setting results. Otherwise, the results for Lake Lloyd storage are essentially the same between the WSIP and variant settings.

Figure 2.4-2 illustrates the almost identical operation of Lake Eleanor for the variant and WSIP settings. Also shown in Figure 2.4-2 is the operation for the base setting. Any difference in the Lake Eleanor operation would be caused by a small change in operation at Lake Lloyd that would affect the operation of the Cherry-Eleanor Tunnel between the two watersheds. Any difference that occurs in the simulations is more likely the result of modeling discretion as opposed to any substantive difference in operation.

Supplementing the Figure 2.4-1 representation of Lake Lloyd stream releases is Table 2.4-1, which illustrates releases for the variant and WSIP settings, and the difference in releases between the two settings. Table 2.4-2 provides the same form of information for the variant and base settings. With essentially no change in reservoir operations, stream releases will not be different.

2.5 Don Pedro Reservoir and La Grange Releases

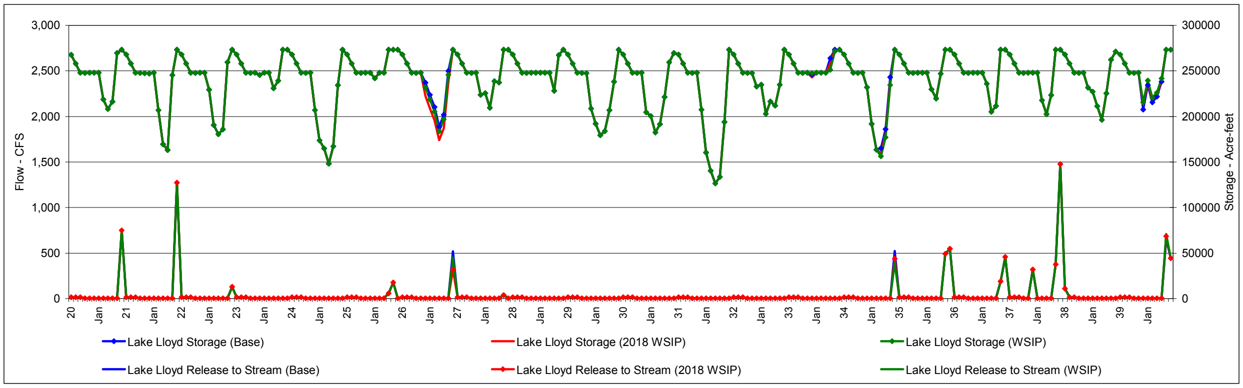
A change in Don Pedro Reservoir operation is caused by changes in inflow to the reservoir. The changes in inflow to the reservoir are the result of net changes within the operation of the upstream SFPUC facilities described previously, and other changes in SFPUC operations associated with diversions to the Holm, Kirkwood, and Moccasin Powerhouses. Figure 2.5-1 illustrates a chronological trace of the simulation of Don Pedro Reservoir storage and Tuolumne River stream releases from La Grange Dam. Shown in Figure 2.5-1 are the results for the WSIP, variant, and base settings. Supplementing the Figure 2.5-1 representation of Don Pedro Reservoir storage are Table 2.5-1, Don Pedro Reservoir Storage (2018 WSIP); Table 2.5-2, Don Pedro Reservoir Storage (WSIP); and Table 2.5-3, Difference in Don Pedro Reservoir Storage (2018 WSIP minus WSIP). Table 2.5-4 is provided to illustrate the difference in Don Pedro Reservoir storage between the base and variant settings.

Table 2.5-3 shows that, throughout many years, the storage in Don Pedro Reservoir associated with the variant setting would differ from the storage in the WSIP setting, and this difference would always be more storage. Table 2.5-4 illustrates that the variant setting results for Don Pedro Reservoir storage are close to the storage results depicted for the base setting, although typically lower than the base setting. Compared to the WSIP setting, the differences in storage are indicative of the increases to the inflow of Don Pedro Reservoir that are due to lesser demands and SJPL diversions in the variant setting. The increases in inflow typically occur during the winter through early summer period. Comparing to the base setting, the variant would result in typically less inflow to Don Pedro Reservoir during non-wet years and particularly during drought periods when more water is diverted to the SJPL in the variant setting. Less inflow leads to less reservoir storage.

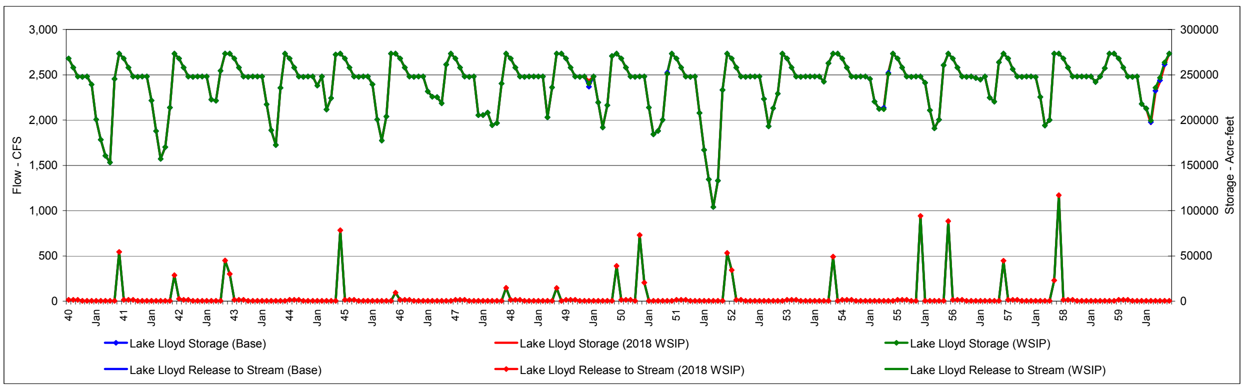
APPENDIX O3

Figure 2.4-1
Lake Lloyd Storage and Stream Release

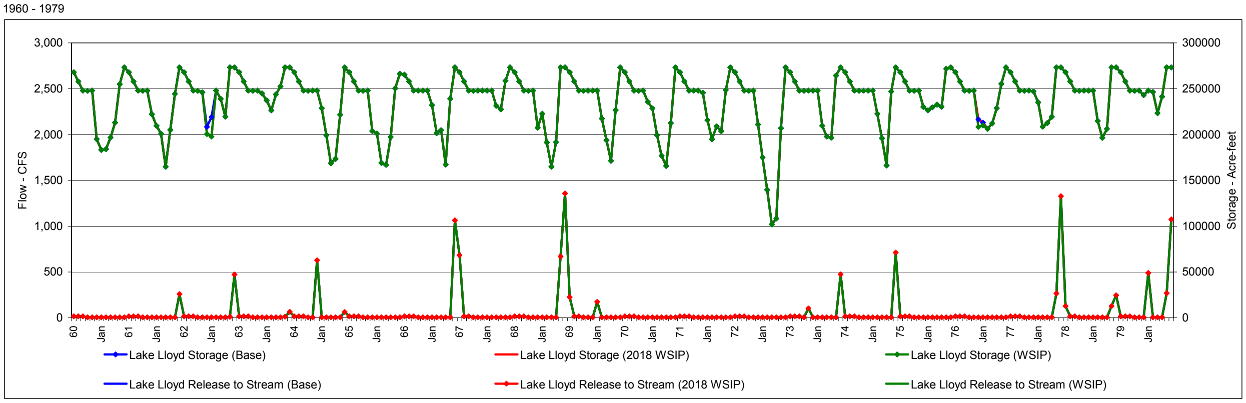
1920 - 1939



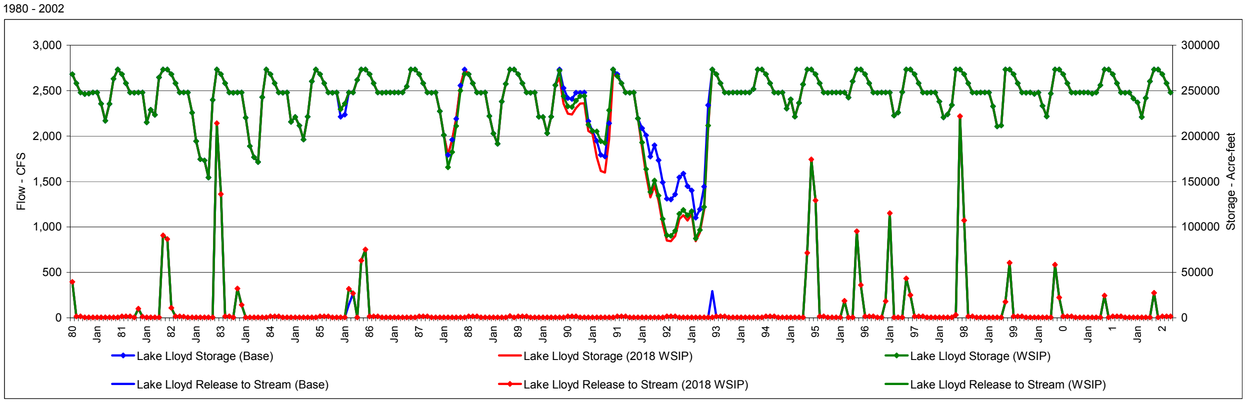
1940 - 1959



1960 - 1979



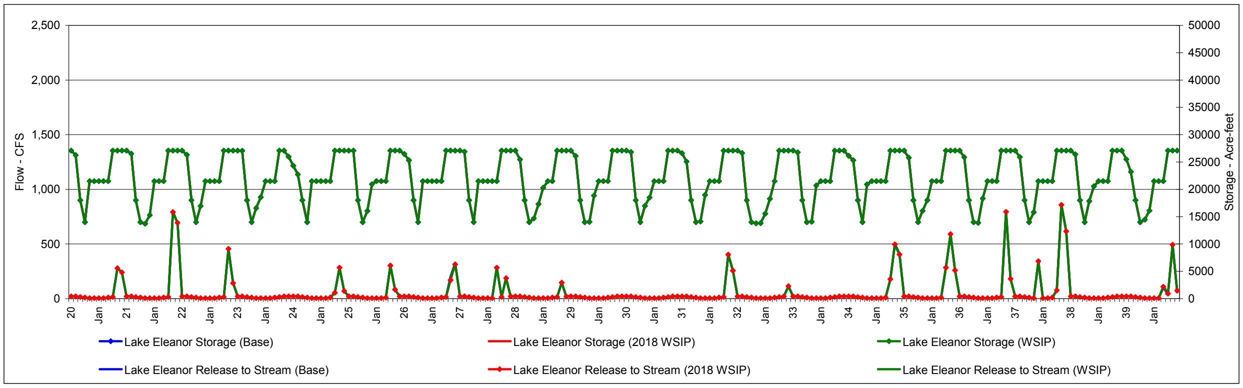
1980 - 2002



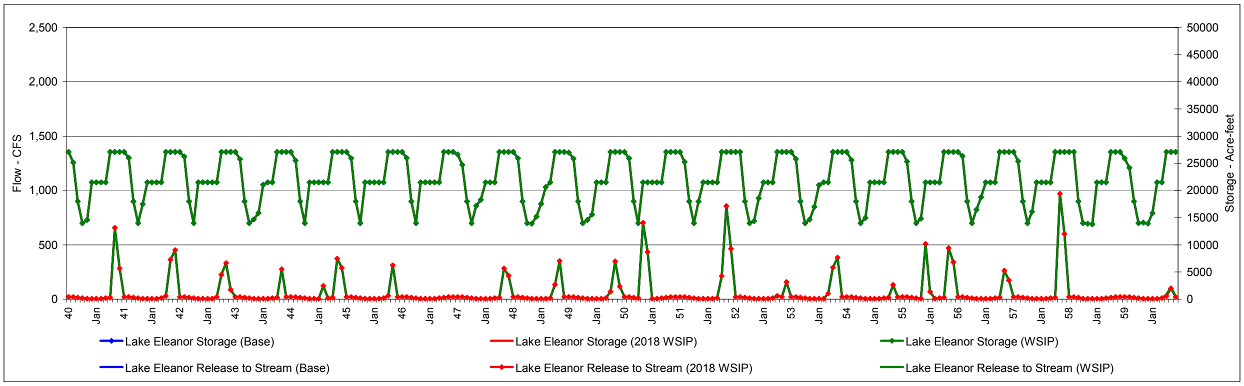
APPENDIX O3

Figure 2.4-2
Lake Eleanor Storage and Stream Release

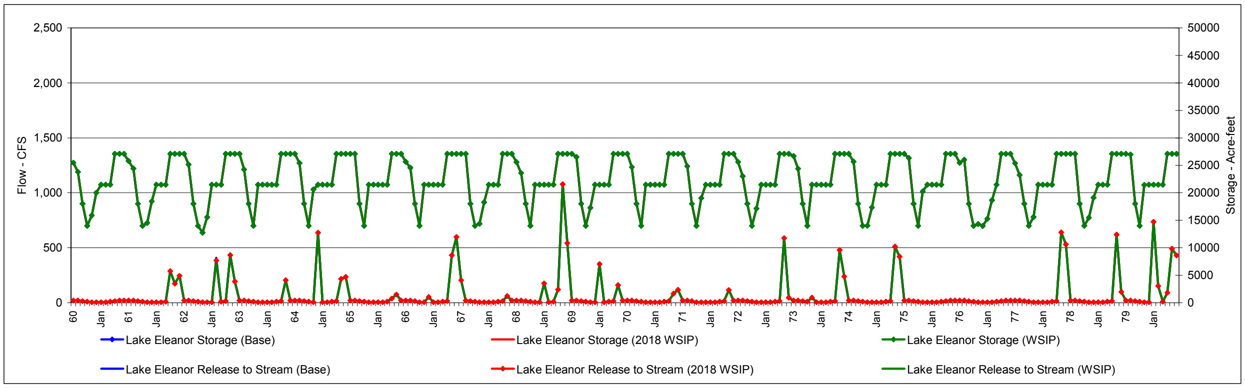
1920 - 1939



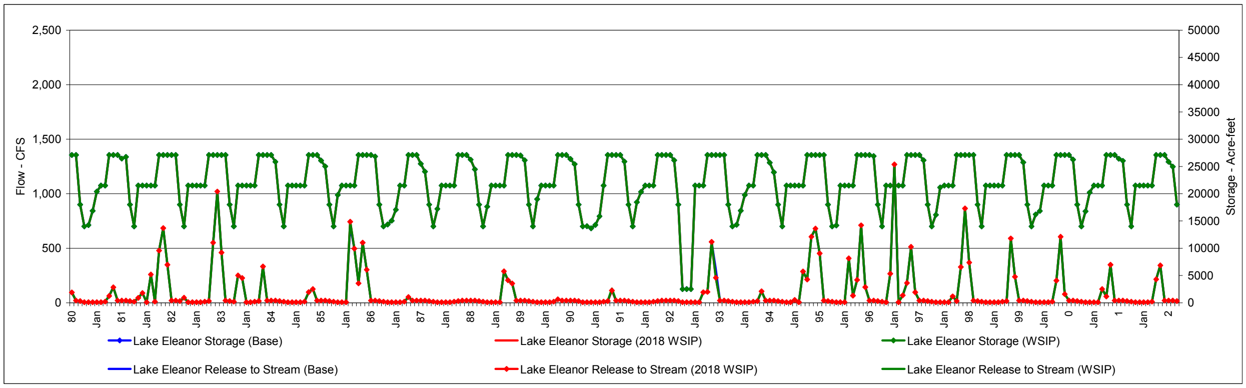
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.4-1

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	167	451	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	121	341	83	15	15

Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	0	0	0	0	0	0	0	0
Above Normal	0	0	0	0	0	0	0	-1	-5	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	0	0	0	0	-1	0	0	0

Table 2.4-2

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	25	21	5	284	1,058	363	15	15
Above Normal	5	72	25	5	16	5	5	166	446	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	16	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	11	8	6	120	340	83	15	15

Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	5	11	134	107	14	21	5	284	1,076	363	15	15
Above Normal	5	72	25	5	16	5	5	164	462	16	15	15
Normal	5	5	5	16	5	5	5	110	162	15	15	15
Below Normal	5	5	5	5	5	5	8	39	43	15	15	15
Dry	5	5	5	5	5	5	5	5	5	16	15	15
All Years	5	20	34	27	9	8	6	120	347	83	15	15

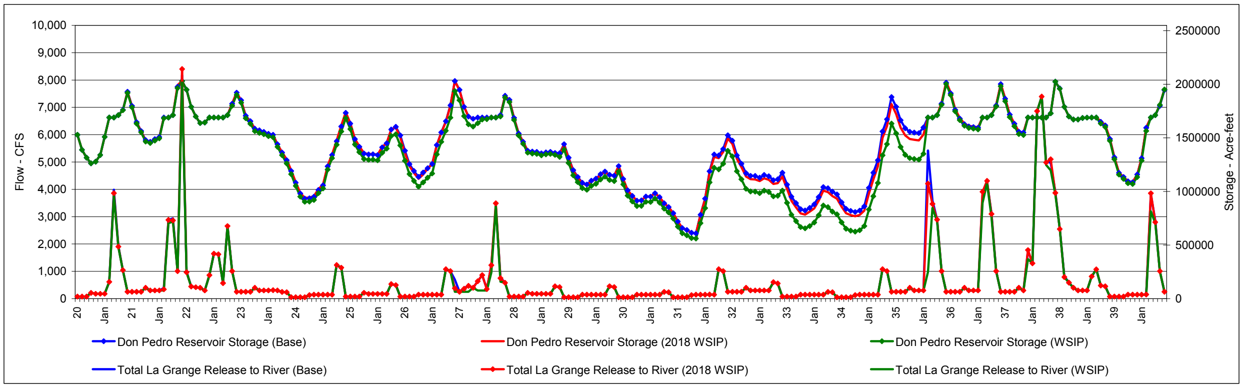
Difference in Lake Lloyd Release to Stream (CFS)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Wet	0	0	0	0	11	0	0	0	-18	0	0	0
Above Normal	0	0	0	0	0	0	0	2	-17	0	0	0
Normal	0	0	0	0	0	0	0	0	0	0	0	0
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	0	2	0	0	0	-7	0	0	0

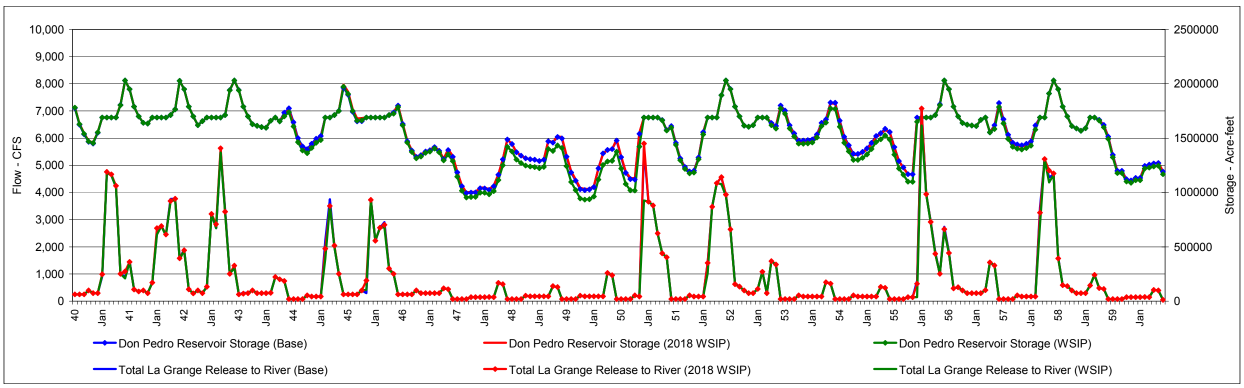
APPENDIX O3

Figure 2.5-1
Don Pedro Reservoir Storage and Release below La Grange Dam

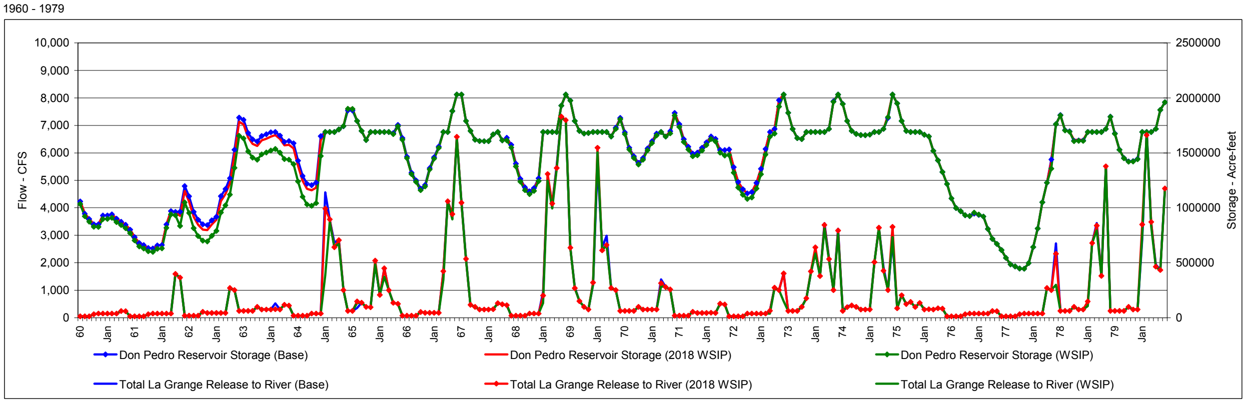
1920 - 1939



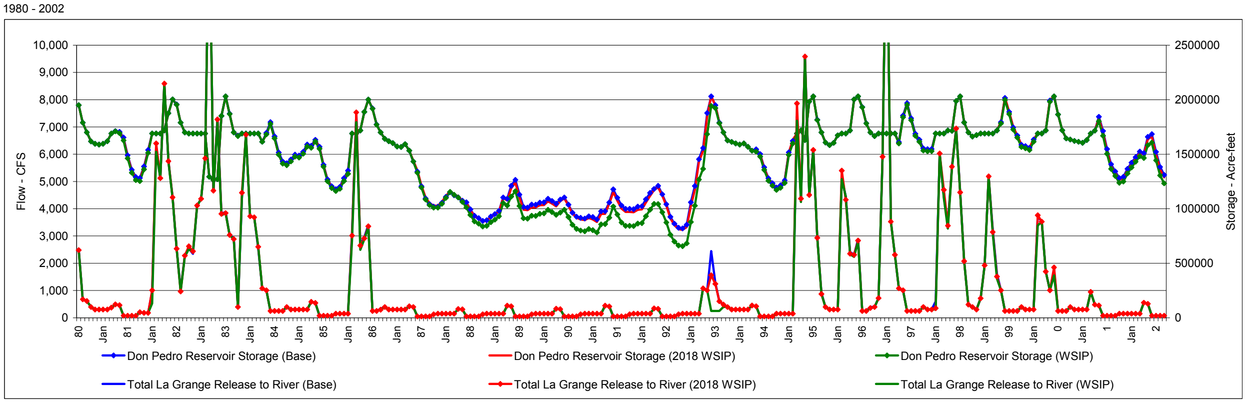
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.5-1

Don Pedro Reservoir Storage (Acre-feet) 2018 WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,759,836	1,929,872	1,795,122	1,642,903	1,561,467
1922	1,476,098	1,461,286	1,485,580	1,505,746	1,690,000	1,690,000	1,713,000	1,992,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,818,811	1,921,545	1,849,358	1,703,848	1,652,705
1924	1,583,462	1,568,125	1,554,108	1,535,704	1,526,296	1,437,843	1,367,530	1,299,008	1,198,414	1,088,618	987,802	939,989
1925	942,530	956,806	1,020,799	1,064,510	1,240,998	1,347,397	1,474,470	1,615,182	1,739,010	1,636,396	1,492,869	1,421,142
1926	1,357,759	1,349,705	1,350,678	1,344,610	1,415,467	1,453,841	1,577,587	1,597,384	1,505,811	1,362,452	1,237,529	1,173,931
1927	1,119,098	1,158,716	1,213,376	1,252,953	1,430,873	1,547,483	1,651,730	1,798,260	2,030,000	1,945,826	1,790,015	1,700,021
1928	1,678,968	1,690,000	1,689,999	1,690,000	1,689,998	1,690,000	1,713,000	1,892,918	1,852,213	1,684,386	1,539,110	1,461,648
1929	1,378,684	1,370,354	1,367,461	1,354,252	1,363,106	1,367,611	1,358,042	1,353,385	1,435,177	1,308,957	1,193,211	1,129,770
1930	1,074,149	1,058,505	1,094,019	1,114,013	1,154,900	1,180,553	1,149,383	1,149,171	1,237,597	1,117,703	1,010,832	958,391
1931	914,265	916,605	954,041	952,219	983,746	946,664	889,656	854,795	796,687	720,808	659,664	640,497
1932	614,702	609,573	780,705	928,191	1,178,848	1,323,183	1,310,061	1,368,137	1,494,132	1,442,497	1,303,910	1,227,394
1933	1,138,926	1,114,464	1,112,164	1,097,635	1,122,288	1,109,608	1,071,071	1,077,986	1,137,667	1,024,295	911,286	852,616
1934	795,676	784,435	812,878	843,182	913,663	1,007,422	994,677	957,730	932,400	858,181	796,665	778,406
1935	768,307	781,950	821,496	980,113	1,110,056	1,235,130	1,500,457	1,610,736	1,815,196	1,722,464	1,596,472	1,522,899
1936	1,490,506	1,482,448	1,476,914	1,530,941	1,689,992	1,690,000	1,713,000	1,828,205	2,023,492	1,920,902	1,768,102	1,685,847
1937	1,633,138	1,612,431	1,605,906	1,599,838	1,689,993	1,690,000	1,713,000	1,807,790	2,004,824	1,865,944	1,716,966	1,632,686
1938	1,559,162	1,550,594	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,656,392	1,619,603	1,491,554	1,319,580	1,175,055	1,136,817
1940	1,095,214	1,088,278	1,158,283	1,313,203	1,598,290	1,690,000	1,713,000	1,811,156	1,956,231	1,786,375	1,633,362	1,545,380
1941	1,475,404	1,460,051	1,555,484	1,689,994	1,689,991	1,690,000	1,690,000	1,809,501	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,980	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,942,900	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,722,440	1,760,597	1,629,785	1,485,295	1,408,489
1945	1,383,848	1,431,872	1,478,308	1,504,602	1,689,996	1,690,000	1,713,000	1,752,531	1,994,151	1,926,860	1,769,823	1,682,382
1946	1,684,536	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,742,418	1,802,336	1,633,975	1,475,548	1,389,609
1947	1,330,399	1,346,833	1,380,160	1,392,380	1,420,980	1,386,364	1,311,268	1,398,938	1,336,215	1,192,020	1,064,241	1,001,385
1948	1,005,411	1,006,673	1,045,296	1,044,695	1,030,810	1,064,961	1,168,301	1,307,352	1,488,934	1,446,256	1,371,345	1,339,394
1949	1,315,662	1,306,917	1,302,086	1,290,976	1,302,671	1,476,867	1,464,005	1,518,090	1,509,235	1,342,135	1,195,742	1,120,908
1950	1,043,199	1,033,376	1,032,790	1,062,133	1,220,402	1,356,178	1,390,070	1,398,269	1,490,152	1,336,013	1,192,427	1,134,118
1951	1,131,198	1,551,572	1,689,993	1,689,971	1,689,993	1,690,000	1,665,120	1,572,653	1,607,282	1,449,711	1,307,131	1,228,274
1952	1,187,272	1,194,984	1,316,576	1,555,164	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,637,424	1,608,420	1,793,686	1,744,750	1,609,064	1,534,706
1954	1,469,539	1,468,740	1,472,382	1,479,183	1,525,624	1,631,571	1,663,552	1,819,798	1,815,534	1,651,299	1,502,531	1,424,559
1955	1,345,778	1,345,529	1,363,813	1,396,390	1,446,662	1,510,333	1,535,054	1,574,478	1,553,856	1,414,751	1,287,229	1,228,969
1956	1,166,559	1,165,186	1,689,999	1,689,941	1,689,992	1,690,000	1,713,000	1,807,502	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,611,430	1,813,966	1,662,502	1,519,752	1,446,510
1958	1,430,457	1,423,228	1,435,937	1,458,900	1,605,471	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,664,890	1,615,856	1,508,807	1,339,502	1,193,352	1,193,577
1960	1,116,301	1,105,497	1,128,724	1,128,413	1,242,827	1,254,357	1,266,792	1,274,965	1,193,674	1,059,552	948,479	899,812
1961	852,490	851,707	929,711	931,404	940,474	902,104	874,430	846,491	801,180	734,666	679,786	660,893
1962	635,317	630,243	657,977	661,913	849,011	970,130	962,682	926,491	1,152,410	1,057,459	917,799	845,534
1963	803,072	797,354	847,675	892,734	1,059,917	1,125,577	1,221,773	1,488,662	1,782,245	1,759,044	1,640,421	1,582,051
1964	1,563,592	1,613,138	1,628,805	1,646,921	1,661,438	1,628,214	1,569,664	1,573,364	1,540,885	1,381,791	1,243,865	1,173,355
1965	1,160,424	1,183,720	1,615,220	1,689,968	1,689,993	1,690,000	1,713,000	1,745,042	1,904,664	1,902,728	1,790,047	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,997	1,690,000	1,671,267	1,742,980	1,621,208	1,453,063	1,306,695	1,236,619
1967	1,161,360	1,194,898	1,348,589	1,447,600	1,545,433	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,631,582	1,564,347	1,393,113	1,255,040	1,177,814
1969	1,141,689	1,171,002	1,260,484	1,689,994	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,951	1,689,996	1,690,000	1,649,691	1,725,267	1,812,130	1,677,976	1,538,175	1,460,554
1971	1,401,168	1,444,087	1,531,135	1,597,040	1,666,233	1,690,000	1,647,943	1,696,251	1,859,604	1,755,286	1,618,891	1,549,928
1972	1,488,330	1,496,877	1,540,474	1,590,945	1,644,402	1,622,344	1,520,665	1,526,251	1,530,960	1,368,983	1,234,744	1,168,506
1973	1,130,407	1,143,406	1,225,477	1,354,278	1,533,895	1,690,000	1,717,600	1,980,428	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,981	1,689,998	1,690,000	1,717,600	1,967,320	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,843,935	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	947,434	935,499	920,302	807,861	717,614	671,985	616,188	544,088	486,063	467,590
1978	447,587	445,349	497,632	642,722	811,608	1,050,474	1,227,234	1,422,184	1,761,000	1,841,159	1,704,419	1,693,810
1979	1,616,809	1,619,882	1,618,938	1,689,998	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,973	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,696,762	1,643,753	1,478,587	1,347,280	1,279,582
1982	1,270,713	1,377,626	1,528,369	1,689,993	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,718	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,674,768	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,627,178	1,560,993	1,396,489	1,262,208	1,199,021
1986	1,172,425	1,193,632	1,265,216	1,330,216	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,441,899	1,348,658	1,213,978	1,103,276	1,050,438
1988	1,028,266	1,027,370	1,063,553	1,117,369	1,159,268	1,132,506	1,113,585	1,075,240	1,052,478	988,685	929,322	907,745
1989	881,458	888,956	921,637	945,294	974,852	1,096,511	1,074,781	1,187,792	1,239,357	1,103,491	991,217	986,561
1990	1,013,158	1,011,804	1,031,860	1,034,571	1,067,161	1,046,506	1,022,267	1,069,558	1,094,928	1,028,132	955,187	917,736
1991	901,946	896,655	915,575	900,825	878,053	952,682	954,166	1,046,829	1,153,735	1,074,822	1,001,810	970,239
1992	970,401	967,882	990,041	994,631	1,057,963	1,117,256	1,170,798	1,196,794	1,119,765	1,026,824	912,751	848,997
1993	812,849	806,440	832,269	1,025,300	1,175,081	1,428,792	1,529,484	1,851,088	2,030,000	1,950,131	1,790,048	1,700,022
1994	1,627,183	1,612,977	1,599,160	1,589,203	1,599,265	1,567,690	1,531,912	1,540,588	1,495,756	1,373,248	1,273,406	1,227,849
1995	1,188,744	1,208,544	1,253,327	1,510,846	1,634,353	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,873	1,689,994	1,690,000	1,601,041	1,842,832	1,954,413	1,813,753	1,671,658	1,617,925
1998	1,536,645	1,530,258	1,531,663	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,796,699	2,019,661	1,889,630	1,747,778	1,673,732
2000	1,587,403	1,575,740	1,560,094	1,636,019	1,689,993	1,690,000	1,717,600	1,999,588	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,830,206	1,697,383	1,532,770	1,393,883	1,328,387
2002	1,266,574	1,278,191	1,351,666	1,407,098	1,459,264	1,509,787	1,494,576	1,639,080	1,661,806	1,498,519	1,360,085	1,287,271
Avg (21-02)	1,323,652	1,333,411	1,376,601	1,422,420	1,482,772	1,507,579	1,511,798	1,590,588	1,673,668	1,573,106	1,436,385	1,368,045

APPENDIX O3

Table 2.5-2

Don Pedro Reservoir Storage (Acre-feet) WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	1,262,860	1,277,365	1,340,344	1,508,876	1,689,999	1,690,000	1,713,000	1,758,255	1,920,087	1,785,379	1,633,202	1,551,799
1922	1,466,449	1,451,643	1,475,936	1,496,100	1,682,686	1,690,000	1,713,000	1,965,236	2,030,000	1,950,094	1,790,026	1,700,016
1923	1,638,028	1,643,364	1,689,999	1,689,989	1,689,997	1,690,000	1,713,000	1,799,363	1,900,966	1,828,869	1,683,448	1,632,370
1924	1,563,169	1,547,842	1,533,824	1,515,415	1,506,005	1,417,560	1,338,399	1,262,605	1,162,134	1,052,503	951,855	904,167
1925	906,788	921,085	985,076	1,028,777	1,205,262	1,311,674	1,436,468	1,560,568	1,684,578	1,582,202	1,438,920	1,367,376
1926	1,304,106	1,296,082	1,296,519	1,290,435	1,361,093	1,400,064	1,518,241	1,532,438	1,430,226	1,287,212	1,162,635	1,099,288
1927	1,044,610	1,084,270	1,129,224	1,168,777	1,346,690	1,463,332	1,567,658	1,688,723	1,936,134	1,852,362	1,703,718	1,627,130
1928	1,606,224	1,637,560	1,672,026	1,675,150	1,689,999	1,690,000	1,701,151	1,877,285	1,835,437	1,667,682	1,522,481	1,445,074
1929	1,362,145	1,353,824	1,350,930	1,337,716	1,346,569	1,351,080	1,341,527	1,323,621	1,392,489	1,266,466	1,150,912	1,087,613
1930	1,032,080	1,016,460	1,051,972	1,071,954	1,112,838	1,138,506	1,107,377	1,098,218	1,186,818	1,067,154	960,515	908,251
1931	864,235	866,605	904,039	902,201	933,725	896,662	839,706	804,980	747,051	671,410	610,497	591,503
1932	565,821	560,723	704,485	844,787	1,084,372	1,221,695	1,205,745	1,259,030	1,378,752	1,327,642	1,189,590	1,113,456
1933	1,025,224	1,000,826	998,521	983,959	1,008,603	995,965	955,100	959,906	1,007,489	894,719	782,336	724,120
1934	667,461	656,295	676,788	711,356	777,968	868,739	854,724	813,053	786,448	712,923	652,109	634,358
1935	624,570	638,297	677,837	832,051	956,075	1,079,921	1,337,695	1,442,297	1,633,298	1,541,356	1,416,179	1,343,212
1936	1,311,194	1,303,236	1,297,699	1,351,659	1,689,999	1,690,000	1,713,000	1,808,939	2,003,094	1,900,592	1,747,881	1,665,690
1937	1,613,022	1,592,326	1,585,791	1,579,717	1,689,994	1,690,000	1,713,000	1,792,830	1,982,099	1,843,316	1,694,437	1,610,230
1938	1,536,751	1,528,196	1,689,998	1,689,992	1,689,987	1,690,000	1,690,000	1,730,000	2,025,000	1,959,369	1,790,073	1,700,032
1939	1,672,242	1,671,809	1,685,673	1,689,024	1,689,999	1,690,000	1,634,629	1,601,698	1,473,709	1,301,817	1,157,373	1,119,194
1940	1,077,628	1,070,702	1,134,704	1,288,559	1,565,488	1,690,000	1,713,000	1,808,008	1,950,520	1,780,688	1,627,700	1,539,737
1941	1,469,773	1,454,423	1,553,735	1,689,994	1,689,991	1,690,000	1,690,000	1,804,234	2,030,000	1,950,157	1,790,024	1,700,010
1942	1,641,462	1,634,171	1,689,999	1,689,982	1,689,995	1,690,000	1,713,000	1,765,000	2,027,000	1,950,170	1,790,025	1,700,004
1943	1,619,298	1,656,980	1,690,000	1,689,976	1,689,995	1,690,000	1,713,000	1,940,240	2,030,000	1,940,444	1,790,004	1,700,004
1944	1,627,652	1,614,506	1,602,762	1,595,713	1,659,696	1,690,000	1,654,802	1,700,608	1,738,836	1,608,117	1,463,726	1,386,992
1945	1,362,396	1,410,433	1,456,868	1,483,156	1,689,997	1,690,000	1,713,000	1,750,377	1,973,670	1,906,466	1,749,519	1,662,142
1946	1,664,336	1,690,000	1,689,996	1,689,984	1,689,995	1,690,000	1,713,000	1,726,331	1,786,301	1,618,009	1,459,654	1,373,770
1947	1,314,592	1,331,036	1,364,362	1,376,577	1,405,177	1,370,566	1,295,486	1,351,369	1,288,812	1,144,830	1,017,268	954,574
1948	958,700	959,989	998,610	997,725	983,836	1,013,678	1,114,286	1,251,048	1,420,232	1,377,867	1,303,272	1,271,554
1949	1,247,966	1,239,259	1,234,425	1,223,326	1,235,015	1,400,436	1,383,115	1,432,798	1,409,371	1,242,728	1,096,786	1,022,286
1950	944,784	935,019	938,337	962,506	1,119,822	1,253,320	1,285,258	1,291,998	1,375,323	1,221,712	1,078,645	1,020,719
1951	1,018,036	1,422,514	1,689,995	1,689,971	1,689,993	1,690,000	1,664,085	1,570,386	1,596,323	1,438,802	1,296,271	1,217,452
1952	1,176,472	1,184,189	1,305,781	1,533,995	1,689,998	1,690,000	1,690,000	1,895,000	2,030,000	1,951,049	1,790,051	1,700,027
1953	1,614,775	1,604,850	1,619,190	1,689,999	1,689,998	1,688,681	1,619,217	1,588,332	1,773,663	1,724,813	1,589,215	1,514,922
1954	1,449,795	1,449,008	1,452,649	1,459,444	1,505,884	1,611,838	1,643,837	1,773,541	1,769,428	1,605,391	1,456,830	1,379,013
1955	1,300,328	1,300,104	1,318,386	1,350,951	1,401,218	1,464,906	1,489,052	1,525,796	1,487,090	1,348,288	1,221,076	1,163,037
1956	1,100,763	1,099,427	1,651,474	1,689,947	1,689,993	1,690,000	1,713,000	1,804,698	2,030,000	1,950,170	1,790,030	1,700,025
1957	1,639,825	1,624,492	1,616,539	1,610,979	1,668,413	1,690,000	1,553,124	1,584,074	1,786,699	1,635,352	1,492,723	1,419,571
1958	1,403,575	1,396,361	1,409,069	1,432,024	1,578,593	1,690,000	1,690,000	1,910,000	2,030,000	1,950,170	1,790,046	1,700,029
1959	1,611,062	1,589,728	1,567,833	1,592,273	1,689,999	1,690,000	1,662,406	1,600,478	1,493,480	1,324,246	1,178,165	1,178,441
1960	1,101,196	1,090,401	1,113,627	1,113,311	1,220,539	1,228,588	1,240,002	1,245,830	1,168,185	1,034,178	923,226	874,650
1961	827,383	826,615	897,810	899,493	908,561	870,204	842,562	814,709	769,512	703,148	648,423	629,635
1962	604,125	599,069	626,802	630,729	817,825	938,956	931,539	835,624	1,048,335	953,860	814,699	742,797
1963	700,558	694,902	745,217	790,246	957,421	1,023,119	1,119,414	1,363,268	1,654,516	1,631,866	1,513,806	1,455,856
1964	1,437,657	1,487,272	1,502,934	1,521,014	1,535,522	1,502,343	1,443,836	1,438,577	1,397,068	1,238,632	1,101,362	1,031,330
1965	1,018,694	1,042,070	1,471,762	1,689,988	1,689,993	1,690,000	1,713,000	1,743,852	1,900,867	1,898,947	1,790,038	1,700,028
1966	1,615,736	1,690,000	1,689,998	1,689,996	1,689,998	1,690,000	1,670,732	1,742,447	1,620,676	1,452,534	1,306,169	1,236,095
1967	1,160,837	1,194,375	1,348,066	1,447,078	1,544,910	1,690,000	1,690,000	1,880,000	2,030,000	2,030,000	1,790,252	1,700,021
1968	1,619,820	1,607,624	1,605,760	1,605,959	1,668,870	1,690,000	1,614,396	1,614,311	1,547,133	1,375,977	1,237,984	1,160,815
1969	1,124,725	1,154,047	1,243,529	1,689,996	1,689,990	1,690,000	1,690,000	1,930,000	2,030,000	1,975,279	1,790,111	1,700,033
1970	1,676,114	1,681,553	1,689,999	1,689,952	1,689,996	1,690,000	1,649,691	1,718,076	1,804,962	1,670,839	1,531,070	1,453,473
1971	1,394,102	1,437,025	1,524,073	1,589,976	1,659,167	1,690,000	1,647,943	1,676,856	1,840,272	1,736,038	1,599,726	1,530,826
1972	1,469,268	1,477,826	1,521,421	1,571,887	1,625,342	1,603,292	1,501,630	1,475,950	1,480,830	1,319,081	1,185,074	1,119,002
1973	1,081,006	1,094,033	1,176,102	1,304,888	1,484,502	1,646,959	1,675,219	1,921,511	2,030,000	1,863,873	1,716,891	1,634,144
1974	1,625,114	1,690,000	1,689,998	1,689,983	1,689,998	1,690,000	1,717,600	1,964,185	2,030,000	1,943,894	1,790,018	1,700,018
1975	1,671,620	1,661,732	1,660,185	1,665,519	1,689,996	1,690,000	1,717,600	1,824,854	2,030,000	1,950,013	1,790,077	1,700,024
1976	1,690,000	1,690,000	1,690,000	1,664,706	1,649,459	1,519,032	1,432,156	1,326,070	1,216,796	1,085,092	998,502	968,734
1977	932,654	925,543	955,652	938,503	920,299	807,858	717,610	671,981	616,184	544,084	486,059	467,586
1978	447,583	445,345	497,628	642,718	811,604	1,050,470	1,227,230	1,356,274	1,761,000	1,841,159	1,704,419	1,692,926
1979	1,606,278	1,609,357	1,608,413	1,689,999	1,689,995	1,690,000	1,690,000	1,717,600	1,827,795	1,673,824	1,527,042	1,450,952
1980	1,419,903	1,422,622	1,442,656	1,689,977	1,689,987	1,690,000	1,717,600	1,890,400	1,960,200	1,950,171	1,790,057	1,700,035
1981	1,617,942	1,596,204	1,588,406	1,595,955	1,619,607	1,690,000	1,710,315	1,694,081	1,626,429	1,461,340	1,330,112	1,262,473
1982	1,253,640	1,360,563	1,511,306	1,689,997	1,689,988	1,690,000	1,717,600	1,876,400	2,002,900	1,954,717	1,790,097	1,700,116
1983	1,690,000	1,690,000	1,689,995	1,689,966	1,689,989	1,294,700	1,264,000	1,270,800	1,851,400	2,030,000	1,869,137	1,700,118
1984	1,666,919	1,690,000	1,689,992	1,689,972	1,689,993	1,690,000	1,614,072	1,682,328	1,778,205	1,646,266	1,496,949	1,414,071
1985	1,399,091	1,434,211	1,478,590	1,469,173	1,504,226	1,570,360	1,558,812	1,616,719	1,550,570	1,386,112	1,251,881	1,188,728
1986	1,162,153	1,183,366	1,254,950	1,319,946	1,689,994	1,690,000	1,717,600	1,888,300	2,001,400	1,917,776	1,770,749	1,700,004
1987	1,641,221	1,619,848	1,601,298	1,570,175	1,566,241	1,592,870	1,533,147	1,433,211	1,330,588	1,195,991	1,085,371	1,032,594
1988	1,010,460	1,009,573	1,045,756	1,099,567	1,155,125	1,128,364	1,103,870	1,063,204	1,011,973	943,381	884,236	862,821
1989	836,632	844,157	876,836	900,479	930,034	1,051,709	1,029,659	1,110,864	1,160,578	1,025,069	913,162	908,781
1990	935,547	934,238	954,290	956,979	989,562	968,936	944,775	965,169	990,902	924,588	852,141	815,058
1991	799,492	794,262	814,409	803,540	782,227	856,893	858,476	917,797	1,020,071	946,830	874,711	843,590
1992	844,030	841,586	863,738	868,291	931,612	990,953	1,044,352	1,043,659	967,160	874,930	761,589	698,367
1993	662,549	656,233	682,056	877,956	1,027,740	1,267,172	1,365,280	1,684,448	1,941,790	1,923,275	1,785,144	1,700,014
1994	1,627,176	1,612,969	1,599,152	1,589,196	1,599,258	1,567,682	1,531,904	1,523,687	1,478,913	1,356,482	1,256,718	1,211,217
1995	1,172,146	1,191,956	1,236,737	1,494,252	1,599,122	1,690,000	1,717,600	1,629,700	1,982,800	2,030,000	1,814,001	1,700,059
1996	1,608,079	1,583,093	1,604,410	1,672,573	1,689,990	1,690,000	1,717,600	2,002,400	2,030,000	1,930,383	1,782,384	1,700,010
1997	1,667,198	1,690,000	1,689,993	1,689,875	1,689,994	1,690,000	1,598,189	1,839,987	1,951,576	1,810,929	1,668,846	1,615,122
1998	1,533,848	1,527,463	1,528,868	1,690,000	1,689,989	1,690,000	1,717,600	1,714,000	1,987,500	2,030,000	1,790,242	1,700,022
1999	1,662,014	1,675,303	1,690,000	1,689,986	1,689,990	1,690,000	1,717,600	1,781,250	1,998,452	1,868,511	1,726,752	1,652,772
2000	1,566,486	1,554,834	1,539,188	1,615,107	1,689,994	1,690,000	1,717,600	1,981,851	2,030,000	1,864,407	1,719,364	1,644,682
2001	1,634,728	1,622,232	1,613,706	1,605,692	1,629,054	1,690,000	1,716,911	1,801,382	1,668,653	1,504,167	1,365,411	1,300,012
2002	1,238,260	1,249,893	1,323,366	1,378,790	1,430,954	1,481,487	1,466,303	1,583,557	1,606,470	1,443,430	1,305,249	1,232,624
Avg (21-02)	1,289,807	1,299,980	1,345,245	1,393,639	1,456,995	1,482,690	1,485,599	1,553,787	1,637,503	1,537,849	1,401,689	1,333,676

APPENDIX O3

Table 2.5-3

Difference in Don Pedro Reservoir Storage (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	1,581	9,785	9,743	9,701	9,668
1922	9,649	9,643	9,644	9,646	7,314	0	0	27,000	0	0	0	0
1923	0	0	0	0	0	0	0	19,448	20,579	20,489	20,400	20,335
1924	20,293	20,283	20,284	20,289	20,291	20,283	29,131	36,403	36,280	36,115	35,947	35,822
1925	35,742	35,721	35,723	35,733	35,736	35,723	38,002	54,614	54,432	54,194	53,949	53,766
1926	53,653	53,623	54,159	54,175	54,374	53,777	59,346	64,946	75,585	75,240	74,894	74,643
1927	74,488	74,446	84,152	84,176	84,183	84,151	84,072	109,537	93,866	93,464	86,297	72,891
1928	72,744	52,440	17,973	14,850	-1	0	11,849	15,633	16,776	16,704	16,629	16,574
1929	16,539	16,530	16,531	16,536	16,537	16,531	16,515	29,764	42,688	42,491	42,299	42,157
1930	42,069	42,045	42,047	42,059	42,062	42,047	42,006	50,953	50,779	50,549	50,317	50,140
1931	50,030	50,000	50,002	50,018	50,021	50,002	49,950	49,815	49,636	49,398	49,167	48,994
1932	48,881	48,850	76,220	83,404	94,476	101,488	104,316	109,107	115,380	114,855	114,320	113,938
1933	113,702	113,638	113,643	113,676	113,685	113,643	115,971	118,080	130,178	129,576	128,950	128,496
1934	128,215	128,140	136,090	131,826	135,695	138,683	139,953	144,677	145,952	145,258	144,556	144,048
1935	143,737	143,653	143,659	148,062	153,981	155,209	162,762	168,439	181,898	181,108	180,293	179,687
1936	179,312	179,212	179,215	179,282	-7	0	0	19,266	20,398	20,310	20,221	20,157
1937	20,116	20,105	20,115	20,121	-1	0	0	14,960	22,725	22,628	22,529	22,456
1938	22,411	22,398	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	21,763	17,905	17,845	17,763	17,682	17,623
1940	17,586	17,576	23,579	24,644	32,802	0	0	3,148	5,711	5,687	5,662	5,643
1941	5,631	5,628	1,749	0	0	0	0	5,267	0	0	0	0
1942	0	0	0	-2	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	2,660	0	0	0	0
1944	0	0	0	0	0	0	0	21,832	21,761	21,668	21,569	21,497
1945	21,452	21,439	21,440	21,446	-1	0	0	2,154	20,481	20,394	20,304	20,240
1946	20,200	0	0	0	0	0	0	16,087	16,035	15,966	15,894	15,839
1947	15,807	15,797	15,798	15,803	15,803	15,798	15,782	47,569	47,403	47,190	46,973	46,811
1948	46,711	46,684	46,686	46,970	46,974	51,283	54,015	56,304	68,702	68,389	68,073	67,840
1949	67,696	67,658	67,661	67,650	67,656	76,431	80,890	85,292	99,864	99,407	98,956	98,622
1950	98,415	98,357	94,453	99,627	100,580	102,858	104,812	106,271	114,829	114,301	113,782	113,399
1951	113,162	129,058	-2	0	0	0	1,035	2,267	10,959	10,909	10,860	10,822
1952	10,800	10,795	10,795	21,169	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	18,207	20,088	20,023	19,937	19,849	19,784
1954	19,744	19,732	19,733	19,739	19,740	19,733	19,715	46,257	46,106	45,908	45,701	45,546
1955	45,450	45,425	45,427	45,439	45,444	45,427	46,002	48,682	66,766	66,463	66,153	65,932
1956	65,796	65,759	38,525	-6	-1	0	0	2,804	0	0	0	0
1957	0	0	0	0	0	0	0	27,356	27,267	27,150	27,029	26,939
1958	26,882	26,867	26,868	26,876	26,878	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	2,484	15,378	15,327	15,256	15,187	15,136
1960	15,105	15,096	15,097	15,102	22,288	25,769	26,790	29,135	25,489	25,374	25,253	25,162
1961	25,107	25,092	31,901	31,911	31,913	31,900	31,868	31,782	31,668	31,518	31,363	31,258
1962	31,192	31,174	31,175	31,184	31,186	31,174	31,143	90,867	104,075	103,599	103,100	102,737
1963	102,514	102,452	102,458	102,488	102,496	102,458	102,359	125,394	127,729	127,178	126,615	126,195
1964	125,935	125,866	125,871	125,907	125,916	125,871	125,828	134,787	143,817	143,159	142,503	142,025
1965	141,730	141,650	143,458	-20	0	0	0	1,190	3,797	3,781	9	0
1966	0	0	0	0	-1	0	535	533	532	529	526	524
1967	523	523	523	522	523	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	17,271	17,214	17,136	17,056	16,999
1969	16,964	16,955	16,955	-2	0	0	0	0	0	0	0	0
1970	0	0	0	-1	0	0	0	7,191	7,168	7,137	7,105	7,081
1971	7,066	7,062	7,062	7,064	7,066	0	0	19,395	19,332	19,248	19,165	19,102
1972	19,062	19,051	19,053	19,058	19,060	19,052	19,035	50,301	50,130	49,902	49,670	49,504
1973	49,401	49,373	49,375	49,390	49,393	43,041	42,381	58,917	0	0	0	0
1974	0	0	0	-2	0	0	0	3,135	0	0	0	0
1975	0	0	0	0	0	0	0	19,081	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	-8,218	-3,004	3	3	4	4	4	4	4	4
1978	4	4	4	4	4	4	4	65,910	0	0	0	884
1979	10,531	10,525	10,525	-1	0	0	0	0	0	0	0	0
1980	0	0	0	-4	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	2,681	17,324	17,247	17,168	17,109
1982	17,073	17,063	17,063	-4	0	0	0	0	0	1	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0
1984	7,849	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	10,459	10,423	10,377	10,327	10,293
1986	10,272	10,266	10,266	10,270	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	8,688	18,070	17,987	17,905	17,844
1988	17,806	17,797	17,797	17,802	4,143	4,142	9,715	12,036	40,505	45,304	45,086	44,924
1989	44,826	44,799	44,801	44,815	44,818	44,802	45,122	76,928	78,779	78,422	78,055	77,780
1990	77,611	77,566	77,570	77,592	77,599	77,570	77,492	104,389	104,026	103,544	103,046	102,678
1991	102,454	102,393	101,166	97,285	95,826	95,789	95,690	129,032	133,664	127,992	127,099	126,649
1992	126,371	126,296	126,303	126,340	126,351	126,303	126,446	153,135	152,605	151,894	151,162	150,630
1993	150,300	150,207	150,213	147,344	147,341	161,620	164,204	166,640	88,210	26,856	4,904	8
1994	7	8	8	7	7	8	8	16,901	16,843	16,766	16,688	16,632
1995	16,598	16,588	16,590	16,594	35,231	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	-2	0	0	2,852	2,845	2,837	2,824	2,812	2,803
1998	2,797	2,795	2,795	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	15,449	21,209	21,119	21,026	20,960
2000	20,917	20,906	20,906	20,912	-1	0	0	17,737	0	0	0	0
2001	0	0	0	0	0	0	0	28,824	28,730	28,603	28,472	28,375
2002	28,314	28,298	28,300	28,308	28,310	28,300	28,273	55,523	55,336	55,089	54,836	54,647
Avg (21-02)	33,844	33,431	31,356	28,781	25,777	24,889	26,199	36,801	36,165	35,257	34,696	34,369

APPENDIX O3

Table 2.5-4

Difference in Don Pedro Reservoir Storage (Acre-feet)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1921	0	0	0	0	0	0	0	-1,607	-648	-2,828	-2,815	-2,807
1922	-2,800	-2,800	-2,799	-2,800	0	0	0	15,826	0	-5	0	0
1923	0	0	0	0	0	0	0	434	-486	-2,668	-2,656	-2,647
1924	-2,642	-2,641	-2,640	-2,642	-2,642	-2,641	4,447	6,884	6,791	6,676	6,577	6,513
1925	6,495	6,490	6,489	6,484	6,483	6,472	5,090	8,195	6,054	3,844	3,827	3,815
1926	3,807	3,805	3,844	3,845	3,843	3,841	-764	-5,857	-18,492	-18,408	-18,322	-18,261
1927	-18,223	-18,213	-3,466	-3,467	-3,467	-3,466	-3,462	-5,260	0	-2,184	-5	0
1928	0	0	0	0	0	0	0	-950	-1,866	-1,858	-1,850	-1,844
1929	-1,841	-1,839	-1,839	-1,840	-1,840	-1,839	-1,837	-4,177	-6,277	-6,249	-6,220	-6,199
1930	-6,186	-6,183	-6,183	-6,185	-6,186	-6,183	-6,177	2,407	286	285	284	282
1931	282	281	281	282	282	282	281	281	279	278	276	275
1932	275	275	-1,617	-5,732	-9,971	-21,567	-25,781	-28,366	-30,365	-32,412	-32,263	-32,152
1933	-32,085	-32,067	-32,068	-32,079	-32,081	-32,068	-34,052	-36,027	-37,380	-39,394	-39,207	-39,066
1934	-38,982	-38,959	-34,222	-37,043	-34,080	-33,605	-35,480	-41,192	-41,045	-40,846	-40,651	-40,508
1935	-40,421	-40,397	-40,399	-53,757	-64,082	-57,213	-60,115	-62,533	-66,173	-68,068	-67,773	-67,550
1936	-67,412	-67,374	-67,488	-67,410	2	0	0	8,922	7,973	5,756	5,730	5,712
1937	5,701	5,698	5,698	5,699	0	0	0	5,622	3,306	1,108	1,104	1,100
1938	1,098	1,098	0	0	0	0	0	0	0	-2,183	-5	0
1939	0	0	0	0	0	0	5,984	3,783	1,657	1,649	1,641	1,635
1940	1,632	1,631	-368	2,411	4,704	0	0	12,026	9,689	9,647	9,605	9,574
1941	9,554	9,548	5,059	-1	0	0	0	3,897	0	-4	0	0
1942	0	0	0	-1	0	0	0	0	0	0	0	0
1943	0	0	0	0	0	0	0	475	0	-2,183	-4	0
1944	0	0	0	0	0	0	0	-11,972	-14,047	-16,170	-16,098	-16,044
1945	-16,010	-16,002	-16,002	-16,007	0	0	0	1,721	30,195	27,882	27,759	27,672
1946	27,617	106	0	0	0	0	0	5,859	3,726	3,710	3,693	3,680
1947	3,673	3,671	3,671	3,672	3,672	3,671	3,668	8,891	6,747	6,717	6,686	6,663
1948	6,648	6,645	6,645	6,917	6,919	6,916	5,118	3,209	2,456	343	409	448
1949	464	468	470	447	449	5,347	5,526	6,492	11,777	11,724	11,670	11,631
1950	11,607	11,599	4,140	11,949	-1,973	-3,538	-1,650	-796	12,760	11,317	11,266	11,228
1951	11,205	12,508	0	0	0	0	-2,116	-1,801	-3,973	-6,138	-6,109	-6,089
1952	-6,076	-6,073	-6,073	-186	0	0	0	0	0	-2,184	-5	0
1953	0	0	0	0	0	0	-2,576	-4,755	-6,854	-9,008	-8,970	-8,940
1954	-8,921	-8,916	-8,917	-8,919	-8,920	-8,917	-8,908	-7,801	-9,889	-9,847	-9,803	-9,770
1955	-9,750	-9,744	-9,745	-9,748	-9,748	-9,744	-10,970	-11,689	-2,467	-2,456	-2,444	-2,437
1956	-2,431	-2,430	0	0	0	0	0	-4,425	0	0	0	0
1957	0	0	0	0	0	0	0	-7,471	-9,561	-11,703	-11,651	-11,612
1958	-11,589	-11,582	-11,582	-11,586	-11,587	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	-2,851	-5,587	-5,568	-5,543	-5,517	-5,499
1960	-5,487	-5,484	-5,485	-5,485	-1,747	-962	-590	3,800	2,402	2,391	2,380	2,371
1961	2,365	2,364	577	578	577	577	577	575	573	571	568	566
1962	565	564	565	564	565	564	564	-38,191	-44,742	-46,722	-46,503	-46,336
1963	-46,236	-46,209	-38,284	-24,977	-46,239	-46,222	-46,178	-39,770	-38,718	-40,734	-40,557	-40,424
1964	-40,342	-40,320	-40,322	-40,333	-28,562	-28,551	-30,641	-33,668	-46,421	-46,212	-45,996	-45,842
1965	-45,748	-45,722	-36,519	5	0	0	0	2,733	19,292	17,025	33	0
1966	0	0	0	0	0	0	-8,459	-10,623	-12,703	-12,646	-12,588	-12,545
1967	-12,519	-12,512	-12,513	-12,517	-12,517	0	0	0	0	0	-5	0
1968	0	0	0	0	0	0	0	-6,315	-8,407	-8,369	-8,330	-8,303
1969	-8,285	-8,280	-8,281	1	0	0	0	0	0	-2,184	-5	0
1970	0	0	0	-5	0	0	0	-4,300	-6,400	-8,556	-8,518	-8,489
1971	-8,471	-8,467	-8,467	-8,470	-8,469	0	0	-1,204	-3,314	-5,482	-5,459	-5,440
1972	-5,430	-5,427	-5,427	-5,429	-5,429	-5,427	-5,422	1,237	-882	-877	-873	-870
1973	-869	-868	-868	-868	-868	0	0	549	0	0	0	0
1974	0	0	0	-1	0	0	0	-1,901	0	-2,184	-5	0
1975	0	0	0	0	0	0	0	26,562	0	-4	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	-18,098	0	-2,183	-2,174	-1,593
1979	6,965	6,961	6,960	-1	0	0	0	0	-2,114	-2,105	-2,096	-2,088
1980	-2,085	-2,083	-2,083	-5	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	-2,116	-8,211	-10,299	-10,253	-10,206	-10,170
1982	-10,149	-10,143	-10,144	0	0	0	0	0	0	-2,183	-9	0
1983	0	0	0	0	0	0	0	0	0	0	-2,183	0
1984	4,784	0	0	0	0	0	-196	-14,019	-16,087	-18,202	-18,121	-18,061
1985	-18,022	-18,013	-18,013	-18,018	-18,020	-18,013	-17,996	-4,852	-6,951	-6,919	-6,887	-6,864
1986	-6,850	-6,846	-15,243	-18,908	0	0	0	0	0	-2,184	-2,174	-4
1987	-3	-3	-3	-4	-3	-3	-3	8,685	8,627	8,587	8,548	8,518
1988	8,501	8,497	8,496	8,499	8,499	8,496	8,488	1,102	-6,380	-6,351	-6,321	-6,298
1989	-6,284	-6,281	-6,281	-6,283	-6,284	-6,281	-17,360	-22,351	-25,032	-24,919	-24,805	-24,718
1990	-24,666	-24,652	-24,653	-24,661	-24,662	-24,653	-24,629	-14,718	-8,948	-8,908	-8,865	-8,834
1991	-14,011	-14,003	-15,236	-22,968	-24,438	-24,428	-24,420	-11,105	-23,342	-26,274	-28,497	-28,408
1992	-28,351	-28,336	-28,336	-28,346	-28,348	-28,338	-11,124	-13,430	-13,423	-13,406	-13,380	-13,354
1993	-13,339	-13,332	-21,270	-33,454	-33,472	-25,229	-27,190	-27,124	0	-5	0	0
1994	0	0	0	0	0	0	0	-3,987	-6,088	-6,060	-6,032	-6,012
1995	-6,000	-5,996	-5,996	-5,998	12,637	0	0	0	0	0	-2,184	-3
1996	-3	-3	-3	-3	0	0	0	0	0	-2,183	-2,174	-4
1997	-3	0	0	-1	0	0	-9,724	-11,886	-13,961	-16,084	-16,014	-15,961
1998	-15,929	-15,920	-15,921	3	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	3,128	4,038	1,838	1,828	1,824
2000	1,819	1,819	1,818	1,819	0	0	0	7,361	0	0	0	0
2001	0	0	0	1	0	0	0	-12,907	-14,766	-14,700	-14,634	-14,584
2002	-14,553	-14,545	-14,545	-14,549	-14,550	-14,545	-14,531	-20,414	-22,460	-22,361	-22,257	-22,181
Avg (21-02)	-5,902	-6,276	-6,397	-5,823	-4,775	-4,479	-4,848	-5,008	-5,462	-6,344	-6,419	-6,284

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Figure 2.5-1 and Table 2.5-4 illustrate that during drought sequences, a reduction to inflow to Don Pedro Reservoir can accumulate from year to year. Compared to the base setting, the variant would result in lower Don Pedro Reservoir storage during drought periods. Figure 2.5-2 illustrates the difference in reservoir storage averaged by year type for the variant and WSIP settings. Also shown is the average difference in storage for the two settings during the 82-year simulation. Figure 2.5-3 shows the same information for the variant and the base settings.

Figure 2.5-2

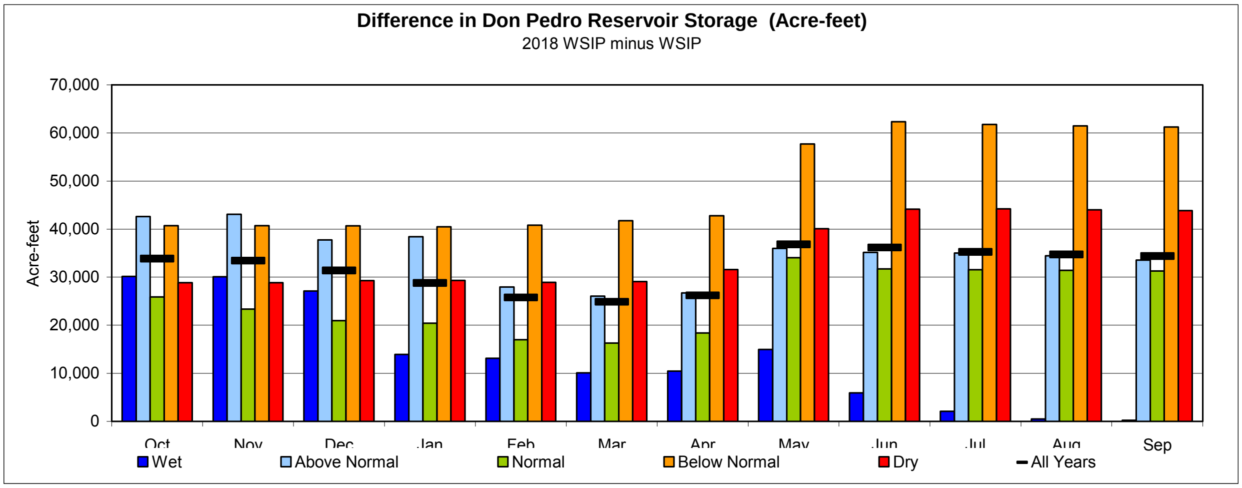

Figure 2.5-3

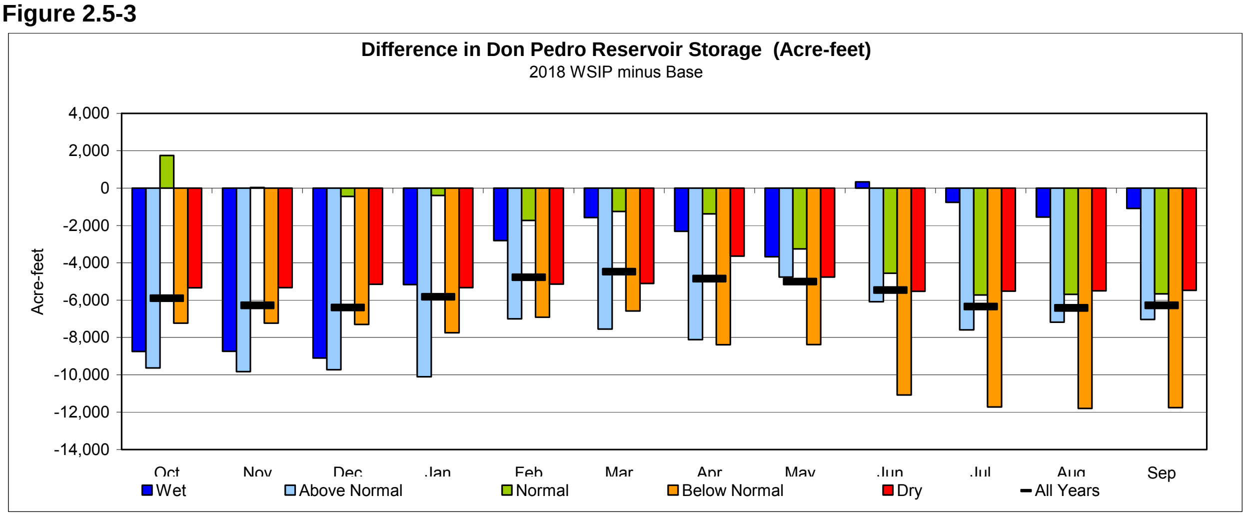

Figure 2.5-4 illustrates the average monthly storage in Don Pedro Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

The difference in storage in Don Pedro Reservoir attributed to the upstream effects of the variant would manifest in differences in releases from La Grange Dam to the stream. A different amount of available reservoir space in the winter and spring due to the variant would lead to a different ability to regulate inflow, thus potentially changing the amount of water released to the stream that is in excess of minimum release requirements. During periods when inflow differs and Don Pedro Reservoir is at maximum storage capacity within the flood control storage limitation, a change in inflow directly manifests as a change in releases from La Grange Dam (a change of either more or less flow). Figure 2.5-1 illustrates the stream releases from La Grange Dam for the WSIP, variant, and base settings.

Figure 2.5-4

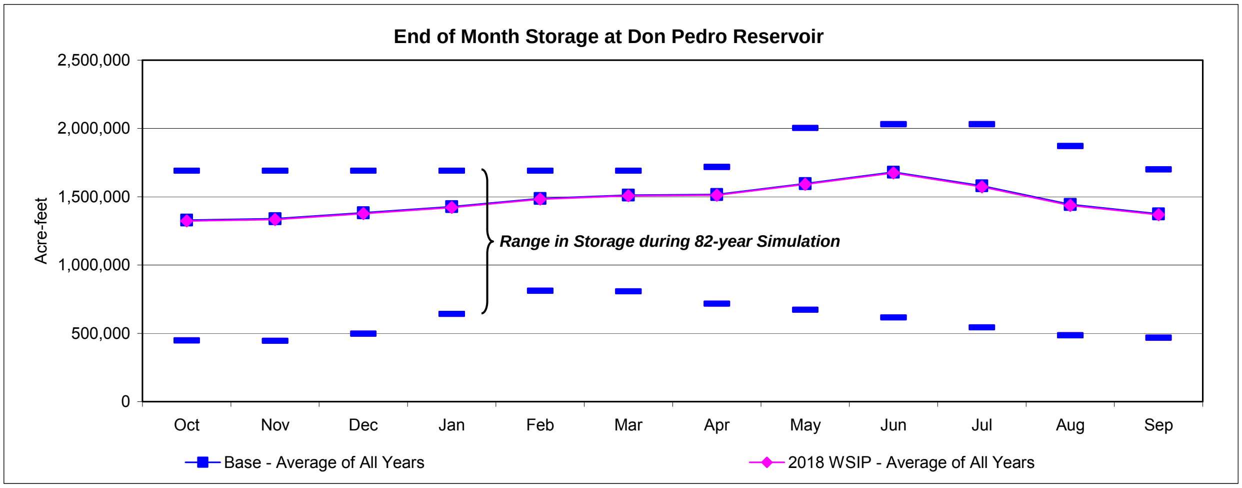

Table 2.5-5 illustrates the difference in stream releases between the variant and WSIP settings. Compared to the WSIP setting, the variant exhibits an incrementally larger stream release, predominately during some months of the early winter through June period, which is reflective of the months when releases to the stream are made in excess of minimum release requirements due to flood control or in anticipation of filling the reservoir. Table 2.5-6 shows the same information for the variant and WSIP settings, arranged by ranking the years in descending order of the San Joaquin River Index (an index of the wetness of the Tuolumne and San Joaquin River Basins). The table illustrates the finding that differences in releases to the Tuolumne River from La Grange Dam occur only when there are releases in excess of minimum FERC flow requirements. This circumstance typically occurs only in above-normal and wet years, and predominately during early winter through June. During other year types and during the summer and fall, releases would be maintained at minimum FERC flow requirements regardless of the setting. Compared to the WSIP setting, the large reduction in flow following an extended drought period is reduced with the variant, since the amount of water delivered by the SFPUC during these periods is less than that delivered in the WSIP setting, but is still more than delivered in the base setting.

As described above concerning Don Pedro inflow and storage, compared to the base setting the variant setting would lead to an additional draw of storage due to SFPUC diversions that are greater than in the base setting in drought periods. Although the reduction in storage would not greatly accumulate, greater replenishment of Don Pedro Reservoir storage would be needed in about 25 percent of the years in the 82-year simulation. There are occasions when an increase in releases would occur. This circumstance would result from the shift in timing of SJPL diversions due to the increased conveyance capacity. The effect would be an occasional additional release of water from Hetch Hetchy Reservoir in the winter that then manifests as an additional release from Don Pedro Reservoir. Table 2.5-7 illustrates the difference in stream releases between the variant and base settings, depicting the predominance of mostly slight reductions in flow. Table 2.5-8 illustrates the same information ranked in descending order of the San Joaquin River Index.

Table 2.5-5 and Table 2.5-7 illustrate the difference in stream releases among the variant, WSIP, and base settings, expressed in terms of a monthly volume (acre-feet) of flow. Table 2.5-9 presents the same information and the average monthly stream releases for the variant and WSIP settings, expressed in average monthly flow (cfs), and Table 2.5-10 shows the same information for the variant and base settings. For the comparison of the variant to the WSIP setting, the difference in monthly flow below La Grange Dam could range from an increase of approximately 179,000 acre-feet to a decrease of approximately 7,000 acre-feet. Considering the manner in which releases are determined and made to the stream, it is not always meaningful to quantify the effect of these changes in terms of average monthly flow (cfs). Similar to the operation of releases below O'Shaughnessy Dam, a change in the volume of release from La Grange Dam to the stream would likely delay or accelerate the initiation of the release by a matter of days. Using the assumption that a change in release volume equates to a delay or acceleration of releasing 6,000 acre-feet per day means that the difference in stream release from La Grange Dam between the variant and WSIP would be an additional day of delay in releases

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Table 2.5-5

Difference in Total La Grange Release to River (Acre-feet) 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	5,463	1,820	0	0	0	0	0	7,283
1922	0	0	0	0	2,334	7,312	2,762	0	29,074	0	0	0	41,482
1923	0	0	0	0	0	0	1,197	0	0	0	0	0	1,197
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	7,952	0	6,771	13,152	27,875
1928	0	20,270	34,469	3,128	14,851	6,265	7,344	0	0	0	0	0	86,327
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	179,625	9,045	3,334	0	0	0	0	0	192,004
1937	0	0	0	0	22,628	4,850	7,262	0	0	0	0	0	34,740
1938	0	0	20,688	0	0	39	5,721	24,854	3,038	0	0	0	54,340
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	40,502	2,839	0	0	0	0	0	43,341
1941	0	0	0	1,749	2,234	2,454	3,011	0	15,359	0	0	0	24,807
1942	0	0	0	14,686	-2	2,664	920	2,854	2,762	0	0	0	23,884
1943	0	0	0	0	8,123	9,596	1,197	0	5,234	0	0	0	24,150
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	21,448	-1	2,862	0	0	0	0	0	24,309
1946	0	20,195	0	0	0	5,945	2,986	0	0	0	0	0	29,126
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	129,063	-3	0	0	0	0	0	0	0	0	129,060
1952	0	0	0	0	21,172	0	0	16,285	3,038	0	0	0	40,495
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	30,130	38,536	-5	1,979	293	0	3,995	0	0	0	74,928
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	26,874	0	27,147	2,854	0	0	0	56,875
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	149,207	5,136	0	8,544	0	0	0	3,764	8	166,659
1966	0	0	8,118	0	17,169	0	0	0	0	0	0	0	25,287
1967	0	0	0	0	0	19,122	0	11,600	2,762	0	0	0	33,484
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	16,960	13,682	10,836	2,117	2,188	2,117	0	0	0	47,900
1970	0	0	4,959	10,325	-2	43	0	0	0	0	0	0	15,325
1971	0	0	0	0	0	7,064	0	0	0	0	0	0	7,064
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	6,336	620	0	60,018	0	0	0	66,974
1974	0	0	3,594	13,504	-2	6,659	1,841	0	6,169	0	0	0	31,765
1975	0	0	0	0	0	0	920	0	22,088	0	0	0	23,008
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	66,812	0	0	0	66,812
1979	0	0	0	10,528	-1	10,422	0	0	0	0	0	0	20,949
1980	0	0	0	25,343	-7,495	10,214	0	1,236	1,197	0	0	0	30,495
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	29,613	17,142	-1	0	2,854	2,762	0	1	3,038	55,409
1983	5,803	2,762	952	1	0	0	0	5,646	3,683	0	0	0	18,847
1984	0	10,608	0	0	0	0	0	0	0	0	0	0	10,608
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	11,085	21,884	9,459	2,188	2,118	0	0	0	46,734
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	77,912	61,107	21,881	4,889	165,789
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	38,866	7,636	1,903	1,842	0	0	0	50,247
1996	0	0	0	0	17,438	-7,490	1,311	4,811	2,118	0	0	0	18,188
1997	0	0	0	16,088	-2	0	0	0	0	0	0	0	16,086
1998	0	0	0	2,797	-1	18,936	6,445	2,949	2,854	0	0	0	33,980
1999	0	0	0	0	0	3,805	4,838	0	0	0	0	0	8,643
2000	0	0	0	0	20,913	-1	0	0	17,708	0	0	0	38,620
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	71	657	2,829	4,054	4,481	3,289	1,064	1,299	4,213	745	395	257	23,355

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Table 2.5-6

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange 2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	5,803	2,762	952	1	0	0	0	5,646	3,683	0	0	0	18,847
1995	0	0	0	0	0	38,866	7,636	1,903	1,842	0	0	0	50,247
1969	0	0	0	16,960	13,682	10,836	2,117	2,188	2,117	0	0	0	47,900
1982	0	0	0	29,613	17,142	-1	0	2,854	2,762	0	1	3,038	55,409
1938	0	0	20,688	0	0	39	5,721	24,854	3,038	0	0	0	54,340
1998	0	0	0	2,797	-1	18,936	6,445	2,949	2,854	0	0	0	33,980
1997	0	0	0	16,088	-2	0	0	0	0	0	0	0	16,086
1956	0	0	30,130	38,536	-5	1,979	293	0	3,995	0	0	0	74,928
1967	0	0	0	0	0	19,122	0	11,600	2,762	0	0	0	33,484
1980	0	0	0	25,343	-7,495	10,214	0	1,236	1,197	0	0	0	30,495
1986	0	0	0	0	11,085	21,884	9,459	2,188	2,118	0	0	0	46,734
1952	0	0	0	0	21,172	0	0	16,285	3,038	0	0	0	40,495
1978	0	0	0	0	0	0	0	0	66,812	0	0	0	66,812
1965	0	0	0	149,207	5,136	0	8,544	0	0	0	3,764	8	166,659
1958	0	0	0	0	0	26,874	0	27,147	2,854	0	0	0	56,875
1993	0	0	0	0	0	0	0	0	77,912	61,107	21,881	4,889	165,789
1941	0	0	0	1,749	2,234	2,454	3,011	0	15,359	0	0	0	24,807
1951	0	0	129,063	-3	0	0	0	0	0	0	0	0	129,060
1922	0	0	0	0	2,334	7,312	2,762	0	29,074	0	0	0	41,482
1984	0	10,608	0	0	0	0	0	0	0	0	0	0	10,608
1943	0	0	0	0	8,123	9,596	1,197	0	5,234	0	0	0	24,150
1942	0	0	0	14,686	-2	2,664	920	2,854	2,762	0	0	0	23,884
1996	0	0	0	0	17,438	-7,490	1,311	4,811	2,118	0	0	0	18,188
1974	0	0	3,594	13,504	-2	6,659	1,841	0	6,169	0	0	0	31,765
1940	0	0	0	0	0	40,502	2,839	0	0	0	0	0	43,341
1936	0	0	0	0	179,625	9,045	3,334	0	0	0	0	0	192,004
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	3,805	4,838	0	0	0	0	0	8,643
1945	0	0	0	0	21,448	-1	2,862	0	0	0	0	0	24,309
1927	0	0	0	0	0	0	0	0	7,952	0	6,771	13,152	27,875
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	920	0	22,088	0	0	0	23,008
1973	0	0	0	0	0	6,336	620	0	60,018	0	0	0	66,974
1921	0	0	0	0	0	5,463	1,820	0	0	0	0	0	7,283
1937	0	0	0	0	22,628	4,850	7,262	0	0	0	0	0	34,740
1970	0	0	4,959	10,325	-2	43	0	0	0	0	0	0	15,325
2000	0	0	0	0	20,913	-1	0	0	17,708	0	0	0	38,620
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	10,528	-1	10,422	0	0	0	0	0	0	20,949
1946	0	20,195	0	0	0	5,945	2,986	0	0	0	0	0	29,126
1923	0	0	0	0	0	0	1,197	0	0	0	0	0	1,197
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	7,064	0	0	0	0	0	0	7,064
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	20,270	34,469	3,128	14,851	6,265	7,344	0	0	0	0	0	86,327
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	8,118	0	17,169	0	0	0	0	0	0	0	25,287
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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Table 2.5-7

Difference in Total La Grange Release to River (Acre-feet)

2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-7,939	-1,434	0	0	0	0	0	-9,373
1922	0	0	0	0	-2,800	0	-4,603	0	13,038	-2,183	-5	0	3,447
1923	0	0	0	0	0	0	-921	0	0	0	0	0	-921
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-18,955	0	-2,174	-4	-21,133
1928	0	0	0	0	0	6,266	-1,561	0	0	0	0	0	4,705
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-67,414	-7,845	-301	0	0	0	0	0	-75,560
1937	0	0	0	0	6,428	1,655	-1,251	0	0	0	0	0	6,832
1938	0	0	1,098	0	0	0	-1,422	7,840	-1,842	0	-2,173	-5	3,496
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	2,307	-2,839	0	0	0	0	0	-532
1941	0	0	0	5,060	1,788	2,032	2,492	0	11,823	-2,184	-5	0	21,006
1942	0	0	0	9,144	-1	0	-4,604	0	0	-2,188	0	0	2,351
1943	0	0	0	0	8,123	7,595	-5,524	0	935	0	-2,174	-5	8,950
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-16,008	-15,316	2,660	0	0	0	0	0	-28,664
1946	0	27,503	106	0	0	-6,263	-626	0	0	0	0	0	20,720
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	12,509	0	0	0	0	0	0	0	0	0	12,509
1952	0	0	0	0	-185	0	0	406	921	0	-2,174	-4	-1,036
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-6,938	0	0	-1,576	-2,775	0	-5,339	-2,188	0	0	-18,816
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-11,584	0	15,657	1,841	-2,188	0	0	3,726
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-36,529	4	-10,710	-1,225	0	0	0	14,767	32	-33,661
1966	0	1	6,966	0	0	0	0	0	0	0	0	0	6,967
1967	0	0	0	0	0	624	0	-827	2,762	-2,188	-2,184	-5	-1,818
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-8,284	11,234	-1	-5,524	0	0	0	-2,174	-4	-4,753
1970	0	0	4,959	36,921	-5,959	-21,031	0	0	0	0	0	0	14,890
1971	0	0	0	0	0	-8,468	0	0	0	0	0	0	-8,468
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-868	0	0	-372	0	0	0	-1,240
1974	0	0	3,594	5,112	-1	-3,806	-2,762	0	-3,738	0	-2,174	-5	-3,780
1975	0	0	0	0	0	0	-7,366	0	28,609	-2,183	-4	0	19,056
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-22,671	0	0	0	-22,671
1979	0	0	0	6,963	-1	-5,797	-2,118	-2,188	0	0	0	0	-3,141
1980	0	0	0	32,984	-7,496	2,603	-4,879	-952	-921	-2,188	0	0	19,151
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	2,398	5,591	-1	0	951	921	0	-4,357	911	6,414
1983	4,757	5,524	0	0	0	0	0	-3,896	-920	-2,188	0	-2,180	1,097
1984	0	12,147	0	0	0	3,936	0	0	0	0	0	0	16,083
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-6,028	1,757	-1,841	-2,854	-2,762	0	0	-2,167	-13,895
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-52,475	-2,184	-5	0	-54,664
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	29,603	-1,570	0	0	-2,188	0	-2,177	23,668
1996	0	0	0	0	15,744	-7,490	-3,569	-231	-2,762	0	0	-2,167	-475
1997	0	-3	0	9,880	-1	0	0	0	0	0	0	0	9,876
1998	0	0	0	-15,925	2	15,817	-4,603	-951	-920	-2,188	0	0	-8,768
1999	0	0	0	0	0	-4,757	-6,144	0	0	0	0	0	-10,901
2000	0	0	0	0	1,819	-1	0	0	5,232	0	0	0	7,050
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	58	551	272	582	-816	-479	-784	158	-580	-320	-59	-95	-1,513

APPENDIX O3

Table 2.5-8

Difference in Total La Grange Release to River (Acre-feet)

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending Unimpaired Runoff at LaGrange — 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	4,757	5,524	0	0	0	0	0	-3,896	-920	-2,188	0	-2,180	1,097
1995	0	0	0	0	0	29,603	-1,570	0	0	-2,188	0	-2,177	23,668
1969	0	0	0	-8,284	11,234	-1	-5,524	0	0	0	-2,174	-4	-4,753
1982	0	0	0	2,398	5,591	-1	0	951	921	0	-4,357	911	6,414
1938	0	0	1,098	0	0	0	-1,422	7,840	-1,842	0	-2,173	-5	3,496
1998	0	0	0	-15,925	2	15,817	-4,603	-951	-920	-2,188	0	0	-8,768
1997	0	-3	0	9,880	-1	0	0	0	0	0	0	0	9,876
1956	0	0	-6,938	0	0	-1,576	-2,775	0	-5,339	-2,188	0	0	-18,816
1967	0	0	0	0	0	624	0	-827	2,762	-2,188	-2,184	-5	-1,818
1980	0	0	0	32,984	-7,496	2,603	-4,879	-952	-921	-2,188	0	0	19,151
1986	0	0	0	0	-6,028	1,757	-1,841	-2,854	-2,762	0	0	-2,167	-13,895
1952	0	0	0	0	-185	0	0	406	921	0	-2,174	-4	-1,036
1978	0	0	0	0	0	0	0	0	-22,671	0	0	0	-22,671
1965	0	0	0	-36,529	4	-10,710	-1,225	0	0	0	14,767	32	-33,661
1958	0	0	0	0	0	-11,584	0	15,657	1,841	-2,188	0	0	3,726
1993	0	0	0	0	0	0	0	0	-52,475	-2,184	-5	0	-54,664
1941	0	0	0	5,060	1,788	2,032	2,492	0	11,823	-2,184	-5	0	21,006
1951	0	0	12,509	0	0	0	0	0	0	0	0	0	12,509
1922	0	0	0	0	-2,800	0	-4,603	0	13,038	-2,183	-5	0	3,447
1984	0	12,147	0	0	0	3,936	0	0	0	0	0	0	16,083
1943	0	0	0	0	8,123	7,595	-5,524	0	935	0	-2,174	-5	8,950
1942	0	0	0	9,144	-1	0	-4,604	0	0	-2,188	0	0	2,351
1996	0	0	0	0	15,744	-7,490	-3,569	-231	-2,762	0	0	-2,167	-475
1974	0	0	3,594	5,112	-1	-3,806	-2,762	0	-3,738	0	-2,174	-5	-3,780
1940	0	0	0	0	0	2,307	-2,839	0	0	0	0	0	-532
1936	0	0	0	0	-67,414	-7,845	-301	0	0	0	0	0	-75,560
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	-4,757	-6,144	0	0	0	0	0	-10,901
1945	0	0	0	0	-16,008	-15,316	2,660	0	0	0	0	0	-28,664
1927	0	0	0	0	0	0	0	0	-18,955	0	-2,174	-4	-21,133
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	-7,366	0	28,609	-2,183	-4	0	19,056
1973	0	0	0	0	0	-868	0	0	-372	0	0	0	-1,240
1921	0	0	0	0	0	-7,939	-1,434	0	0	0	0	0	-9,373
1937	0	0	0	0	6,428	1,655	-1,251	0	0	0	0	0	6,832
1970	0	0	4,959	36,921	-5,959	-21,031	0	0	0	0	0	0	14,890
2000	0	0	0	0	1,819	-1	0	0	5,232	0	0	0	7,050
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	6,963	-1	-5,797	-2,118	-2,188	0	0	0	0	-3,141
1946	0	27,503	106	0	0	-6,263	-626	0	0	0	0	0	20,720
1923	0	0	0	0	0	0	-921	0	0	0	0	0	-921
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-8,468	0	0	0	0	0	0	-8,468
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	6,266	-1,561	0	0	0	0	0	4,705
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	6,966	0	0	0	0	0	0	0	0	0	6,967
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 2.5-9

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,264	21,635	56,327	150,325	184,968	276,250	214,153	243,710	227,036	142,651	66,645	45,515	1,652,480
Above Normal	18,683	30,882	67,212	75,648	127,296	167,481	128,473	78,842	84,574	27,869	19,798	18,215	844,972
Normal	18,264	17,249	35,981	51,832	74,090	104,453	84,424	77,929	20,660	9,992	9,992	9,670	514,534
Below Normal	17,105	13,768	20,372	15,874	17,613	21,364	34,828	33,554	4,025	4,160	4,160	4,025	190,847
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,886	19,545	39,070	61,141	83,616	117,468	96,354	90,205	67,352	37,099	20,595	16,032	667,363

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,901	21,463	53,092	132,916	181,173	266,954	211,640	237,532	215,975	138,831	65,042	45,019	1,592,538
Above Normal	18,683	30,258	59,409	73,887	113,696	163,096	126,954	78,391	79,235	27,869	19,400	17,441	808,318
Normal	18,264	14,720	33,517	50,334	70,441	101,554	83,097	77,929	15,802	9,992	9,992	9,670	495,309
Below Normal	17,105	13,768	19,894	15,874	16,603	21,364	34,828	33,554	4,025	4,160	4,160	4,025	189,359
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	363	173	3,236	17,409	3,795	9,297	2,513	6,178	11,062	3,819	1,603	496	59,943
Above Normal	0	624	7,803	1,761	13,600	4,385	1,520	451	5,339	0	398	774	36,654
Normal	0	2,529	2,464	1,499	3,649	2,899	1,327	0	4,858	0	0	0	19,225
Below Normal	0	0	478	0	1,010	0	0	0	0	0	0	0	1,487
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	71	657	2,829	4,054	4,481	3,289	1,064	1,299	4,213	745	395	257	23,355

Table 2.5-10

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	23,264	21,635	56,327	150,325	184,968	276,250	214,153	243,710	227,036	142,651	66,645	45,515	1,652,480
Above Normal	18,683	30,882	67,212	75,648	127,296	167,481	128,473	78,842	84,574	27,869	19,798	18,215	844,972
Normal	18,264	17,249	35,981	51,832	74,090	104,453	84,424	77,929	20,660	9,992	9,992	9,670	514,534
Below Normal	17,105	13,768	20,372	15,874	17,613	21,364	34,828	33,554	4,025	4,160	4,160	4,025	190,847
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,886	19,545	39,070	61,141	83,616	117,468	96,354	90,205	67,352	37,099	20,595	16,032	667,363

Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	22,967	21,290	56,692	151,293	184,772	274,592	215,643	242,749	232,124	143,744	66,539	45,865	1,658,271
Above Normal	18,683	30,167	66,265	74,511	130,859	168,855	130,389	78,856	82,871	28,383	20,182	18,343	848,363
Normal	18,264	15,530	35,664	49,090	73,947	107,106	84,918	78,066	20,356	9,992	9,992	9,670	512,593
Below Normal	17,105	13,768	19,962	15,874	18,305	21,364	34,828	33,554	4,025	4,160	4,160	4,025	191,130
Dry	17,240	13,842	14,866	13,950	15,511	20,672	21,732	21,240	3,347	3,459	3,459	3,347	152,665
All Years	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876

Difference in Total La Grange Release to River (Acre-feet)
(Average within Year Type - Grouped by Unimpaired Runoff at LaGrange) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	297	345	-365	-967	195	1,658	-1,490	961	-5,088	-1,094	106	-350	-5,791
Above Normal	0	715	947	1,136	-3,563	-1,373	-1,915	-14	1,703	-514	-384	-128	-3,391
Normal	0	1,719	317	2,743	143	-2,653	-494	-137	304	0	0	0	1,941
Below Normal	0	0	410	0	-693	0	0	0	0	0	0	0	-283
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	58	551	272	582	-816	-479	-784	158	-580	-320	-59	-95	-1,513

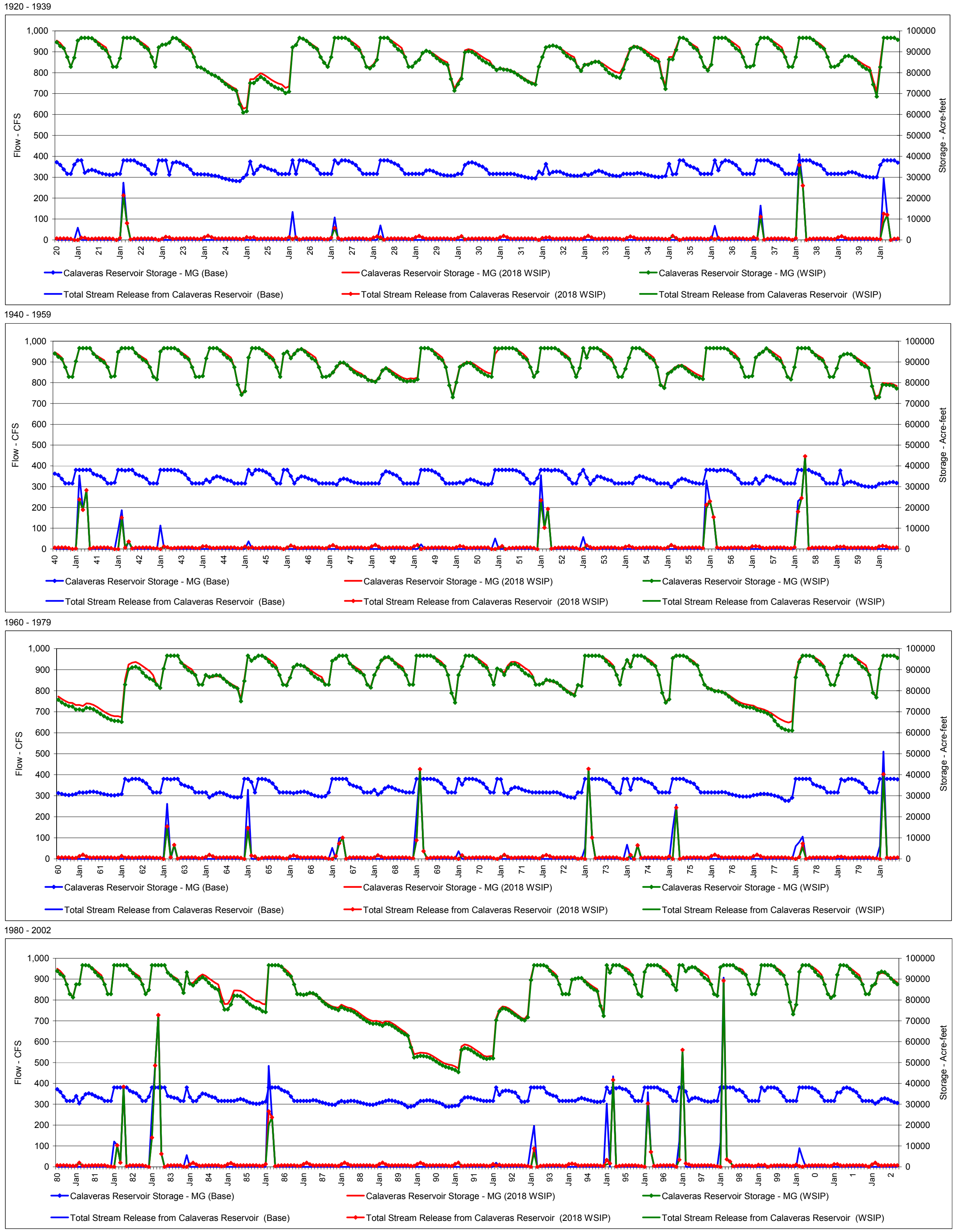
or up to almost an added month of release. Normally, a change in release would not affect the peak stream release rate during a year. However, infrequently (a rare event following a prolonged drought), the variant's effect on stream releases could manifest as an elimination of all flow during a year or as the only provision of flow that occurs in excess of minimum FERC flow requirements. Compared to the base setting, the variant's effect on stream flow ranges from a reduction in releases (a potential delay in release of 11 days) to an increase in releases (a potential additional 5 days of release).

2.6 Calaveras and San Antonio Reservoirs, Alameda Creek, and Downstream

Compared to the WSIP setting, the operation of Calaveras Reservoir in the variant setting is almost identical. Figure 2.6-1 illustrates a chronological trace of the simulation of Calaveras Reservoir storage and stream releases from Calaveras Dam. Shown in Figure 2.6-1 are the results for the WSIP, variant, and base settings. In recognition of the different levels of systemwide deliveries served in each setting, the near identical operation of Calaveras Reservoir resulting from the two settings is an indication that Calaveras Reservoir operations are mostly influenced by the principles that manage local watershed production. The differences in reservoir operation during droughts are the result of modeling assumptions that balance reservoir storage among SFPUC reservoirs and the selection of the monthly SJPL conveyance rate. It is anticipated that the difference in Calaveras Reservoir operation during actual operations would be minimal, if any difference occurred at all.

APPENDIX O3

Figure 2.6-1
Calaveras Reservoir Storage and Stream Release



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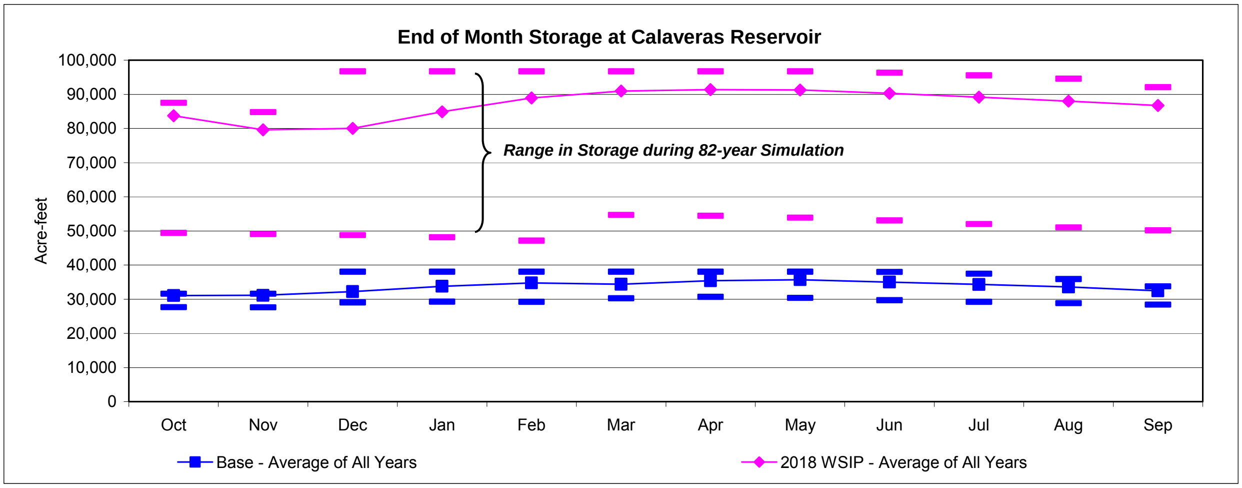
The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. Under both the variant and WSIP settings the full capacity of Calaveras Reservoir would be available, and a greater range in storage operation would occur. Figure 2.6-2 illustrates the average monthly storage in Calaveras Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.6-2



Compared to the WSIP setting, there would be the potential for either less or more release to Calaveras Creek below Calaveras Dam in the variant setting. Both settings require fishery releases below Calaveras Reservoir that are not included in the base setting. Calaveras Reservoir storage in the variant setting is sometimes more or sometimes less than in the WSIP setting; however, in either direction the difference is minor. Table 2.6-1 illustrates the difference in releases to Calaveras Creek between the variant and WSIP settings (considered insubstantial). Supplementing the Figure 2.6-1 representation of Calaveras Dam stream releases and Table 2.6-1 is Table 2.6-2, which illustrates the releases for the variant and WSIP settings, and the difference in releases between the two. Table 2.6-3 provides the same form of information for the variant and base settings. The notable difference in releases between the variant and base settings is the addition of the required flows to satisfy the 1997 CDFG MOU and the reduction of stream releases during wetter-year, wetter-season flows due to the restoration of Calaveras Reservoir operational capacity.

There would be very little, if any, difference in Alameda Creek diversions to Calaveras Reservoir in the variant setting compared to the WSIP setting. With essentially the same storage conditions between the two settings, there would be no difference in diversions from the Alameda Creek watershed. With no difference in diversions at Alameda Creek Diversion Dam (ACDD), flow spilling past the diversion dam would be the same in the variant setting. Table 2.6-4 illustrates the difference in flow below the ACDD between the variant and WSIP settings (considered insubstantial).

Table 2.6-5 illustrates the difference in flow below the ACDD between the variant and base settings. In this comparison, the reduction in flow below the diversion dam is due to the additional diversions to Calaveras Reservoir resulting from the restoration of reservoir operating capacity. Table 2.6-6 and Table 2.6-7 illustrate the flow past the ACDD, comparing the variant, WSIP, and base settings by year type and the average of all years.

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Table 2.6-1

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	11	0	0	0	0	0	0	0	11
1928	0	0	0	0	0	583	0	0	0	0	0	0	583
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	-1	0	0	0	0	0	0	0	-1
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	2,379	0	0	0	0	0	0	0	2,379
1941	0	0	0	0	18	0	0	0	0	0	0	0	18
1942	0	0	0	0	0	0	-52	0	0	0	0	0	-52
1943	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	384	0	0	0	0	0	0	0	0	384
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	1,044	0	0	0	0	0	0	0	0	0	1,044
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	291	0	0	0	0	0	0	0	291
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	954	0	0	0	0	0	0	0	0	954
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	-6	0	0	0	0	0	0	-6
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	26	0	0	0	0	0	0	0	26
1974	0	0	0	0	0	-132	0	0	0	0	0	0	-132
1975	0	0	0	0	0	447	0	0	0	0	0	0	447
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	1,136	0	0	0	0	0	0	1,136
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	447	0	0	0	0	0	0	0	447
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	3,629	0	0	0	0	0	0	0	3,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	1,110	0	0	0	0	0	0	0	1,110
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	1,311	0	0	0	0	0	0	0	0	1,311
1996	0	0	0	0	354	0	0	0	0	0	0	0	354
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	291	0	0	0	0	0	0	0	291
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	13	32	104	25	-1	0	0	0	0	0	173

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Table 2.6-2

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,063	5,067	14,701	9,862	5,082	255	386	417	425	415	38,348
Above Normal	425	258	172	825	3,440	2,773	606	327	396	424	428	417	10,490
Normal	429	275	194	548	725	543	265	370	408	428	430	417	5,031
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	387	1,558	4,108	2,874	1,314	350	403	426	428	417	12,962

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	998	4,985	14,425	9,862	5,085	255	386	417	425	415	37,928
Above Normal	425	258	172	746	3,196	2,688	606	327	396	424	428	417	10,082
Normal	429	275	194	548	725	506	265	370	408	428	430	417	4,995
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	374	1,526	4,004	2,850	1,314	350	403	426	428	417	12,788

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	82	276	0	-3	0	0	0	0	0	419
Above Normal	0	0	0	79	244	85	0	0	0	0	0	0	408
Normal	0	0	0	0	0	36	0	0	0	0	0	0	36
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	13	32	104	25	-1	0	0	0	0	0	173

Table 2.6-3

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	1,063	5,067	14,701	9,862	5,082	255	386	417	425	415	38,348
Above Normal	425	258	172	825	3,440	2,773	606	327	396	424	428	417	10,490
Normal	429	275	194	548	725	543	265	370	408	428	430	417	5,031
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	387	1,558	4,108	2,874	1,314	350	403	426	428	417	12,962

Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	1,741	9,267	16,622	9,968	5,024	0	0	0	0	0	42,623
Above Normal	0	0	184	2,685	5,918	3,096	459	0	0	0	0	0	12,342
Normal	0	0	216	364	898	353	0	0	0	0	0	0	1,831
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	420	2,436	4,645	2,656	1,076	0	0	0	0	0	11,233

Difference in Total Stream Release from Calaveras Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-678	-4,200	-1,921	-106	57	255	386	417	425	415	-4,275
Above Normal	425	258	-12	-1,860	-2,477	-323	147	327	396	424	428	417	-1,852
Normal	429	275	-22	184	-173	190	265	370	408	428	430	417	3,200
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-33	-878	-537	219	238	350	403	426	428	417	1,729

Table 2.6-4

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)

2018 WSIP minus WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	447	0	0	0	0	0	0	0	447
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	0	0	0	0	0	0	0
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	291	0	0	0	0	0	0	0	291
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	4,282	-3,001	-212	0	0	0	0	0	0	0	1,068
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	204	0	0	0	0	0	0	0	0	204
1974	0	0	0	0	0	1,842	0	0	0	0	0	0	1,842
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	52	-34	6	22	0	0	0	0	0	0	47

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Table 2.6-5

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	-2,559	-1,946	0	0	0	0	0	0	0	-4,505
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	-2,856	-1,688	-1,004	0	0	0	0	0	0	0	-5,547
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	-3,210	0	0	0	0	0	0	0	-3,210
1927	0	0	0	0	0	0	235	0	0	0	0	0	235
1928	0	0	0	0	0	0	-214	0	0	0	0	0	-214
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2,422	0	0	0	0	0	0	0	-2,422
1937	0	0	0	0	-3,964	0	0	0	0	0	0	0	-3,964
1938	0	0	0	0	0	0	-187	0	0	0	0	0	-187
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	0	-156	0	0	0	0	0	-156
1941	0	0	0	-1,197	0	0	0	0	0	0	0	0	-1,197
1942	0	0	0	0	0	0	0	0	0	0	0	0	0
1943	0	0	0	0	-1,822	0	0	0	0	0	0	0	-1,822
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-4,471	0	0	0	0	0	0	0	-4,471
1946	0	0	-4,651	-1,522	0	0	0	0	0	0	0	0	-6,173
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	-5,524	0	0	0	0	0	0	-5,524
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	-2,793	-1,287	301	0	0	0	0	0	0	-3,779
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	-3,956	0	0	0	0	0	0	0	0	-3,956
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	-3,275	0	0	0	0	0	0	0	-3,275
1963	0	0	0	-2,219	0	0	0	0	0	0	0	0	-2,219
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	-1,163	0	0	0	3,250	0	0	0	0	0	2,087
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	-1,676	-1,872	0	0	0	0	0	0	0	-3,548
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	-4,247	0	-1,623	0	0	0	0	0	0	-5,870
1971	0	0	-1,260	0	0	0	0	0	0	0	0	0	-1,260
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	-4,722	0	0	0	0	0	0	0	0	-4,722
1974	0	0	-791	0	0	1,444	0	0	0	0	0	0	653
1975	0	0	0	0	-5,196	0	-180	0	0	0	0	0	-5,376
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	-4,152	-3,403	0	0	0	0	0	0	0	-7,556
1979	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	-3,360	0	-482	0	0	0	0	0	0	-3,842
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0
1983	0	0	0	0	0	0	0	687	0	0	0	0	687
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	-3,354	0	0	0	0	0	0	0	-3,354
1993	0	0	0	-4,999	0	651	0	0	0	0	0	0	-4,349
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	0	0	0	0	0	0	0	0
1996	0	0	0	-5,239	0	0	0	0	0	0	0	0	-5,239
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	-3,223	0	1,392	0	0	0	0	0	-1,831
2000	0	0	0	0	-4,567	0	0	0	0	0	0	0	-4,567
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	-131	-541	-549	-64	50	8	0	0	0	0	-1,225

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Table 2.6-6

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,282	7,982	5,727	2,960	173	0	0	0	0	24,531
Above Normal	7	23	843	2,281	3,740	3,237	959	0	0	0	0	0	11,091
Normal	0	6	585	260	824	459	113	0	0	0	0	0	2,247
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	562	1,759	2,526	1,926	798	34	0	0	0	0	7,617

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,269	7,982	5,727	2,960	173	0	0	0	0	24,518
Above Normal	7	23	591	2,457	3,735	3,129	959	0	0	0	0	0	10,903
Normal	0	6	585	260	796	459	113	0	0	0	0	0	2,219
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	509	1,793	2,520	1,903	798	34	0	0	0	0	7,570

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	13	0	0	0	0	0	0	0	0	13
Above Normal	0	0	252	-177	5	108	0	0	0	0	0	0	188
Normal	0	0	0	0	28	0	0	0	0	0	0	0	28
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	52	-34	6	22	0	0	0	0	0	0	47

Table 2.6-7

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,282	7,982	5,727	2,960	173	0	0	0	0	24,531
Above Normal	7	23	843	2,281	3,740	3,237	959	0	0	0	0	0	11,091
Normal	0	6	585	260	824	459	113	0	0	0	0	0	2,247
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	562	1,759	2,526	1,926	798	34	0	0	0	0	7,617

Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	28	1,379	6,967	8,099	5,757	2,972	130	0	0	0	0	25,331
Above Normal	7	23	1,126	3,672	5,294	3,096	692	0	0	0	0	0	13,911
Normal	0	6	954	868	1,870	906	126	0	0	0	0	0	4,731
Below Normal	0	0	18	45	102	229	0	0	0	0	0	0	394
Dry	0	0	0	0	57	0	0	0	0	0	0	0	58
All Years	1	12	692	2,299	3,075	1,989	748	26	0	0	0	0	8,843

Difference in Flow Passing Alameda Creek Diversion Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	-685	-117	-30	-12	43	0	0	0	0	-801
Above Normal	0	0	-283	-1,391	-1,554	141	267	0	0	0	0	0	-2,820
Normal	0	0	-369	-608	-1,046	-447	-13	0	0	0	0	0	-2,483
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-131	-541	-549	-64	50	8	0	0	0	0	-1,225

Comparing the variant and WSIP settings, differences in releases from Calaveras Dam to the stream and differences to spills at the ACDD result in differences in flow below the Alameda Creek and Calaveras Creek confluence between the settings. Table 2.6-8 illustrates the flow below the confluence for the variant and WSIP settings. The modeled differences in these parameters were described above as insubstantial, and thus the combined effect of the differences at the confluence would also be insubstantial. Fishery releases for the 1997 MOU are assumed in both of the settings. Table 2.6-9 provides the same form of information for the variant and base settings. The notable differences between the variant and base settings (comparable to the differences between the WSIP and base settings) are the addition of required stream flows for the 1997 MOU and the reduction of wetter-year, wet-season flows due to the restoration of Calaveras Reservoir storage.

Table 2.6-8

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,786	12,358	23,871	16,574	8,643	605	417	429	429	417	67,286
Above Normal	437	326	1,259	3,703	7,956	6,572	1,876	430	418	430	429	417	24,255
Normal	429	304	1,006	1,077	1,935	1,329	536	430	417	429	430	417	8,739
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,128	3,726	7,164	5,232	2,348	464	417	430	429	417	22,497

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,721	12,263	23,595	16,575	8,647	605	417	429	429	417	66,854
Above Normal	437	326	1,007	3,801	7,708	6,379	1,876	430	418	430	429	417	23,658
Normal	429	304	1,006	1,077	1,907	1,293	536	430	417	429	430	417	8,675
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,063	3,728	7,053	5,185	2,349	464	417	430	429	417	22,276

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	95	276	0	-3	0	0	0	0	0	432
Above Normal	0	0	252	-98	248	194	0	0	0	0	0	0	596
Normal	0	0	0	0	28	36	0	0	0	0	0	0	64
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	65	-2	111	47	-1	0	0	0	0	0	220

Table 2.6-9

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	430	326	2,786	12,358	23,871	16,574	8,643	605	417	429	429	417	67,286
Above Normal	437	326	1,259	3,703	7,956	6,572	1,876	430	418	430	429	417	24,255
Normal	429	304	1,006	1,077	1,935	1,329	536	430	417	429	430	417	8,739
Below Normal	429	297	324	859	1,214	1,046	417	430	417	430	430	417	6,709
Dry	429	298	307	813	1,168	816	418	430	417	430	430	417	6,373
All Years	431	310	1,128	3,726	7,164	5,232	2,348	464	417	430	429	417	22,497

Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	1	80	3,465	17,243	25,909	16,711	8,598	307	30	12	4	2	72,361
Above Normal	12	68	1,554	6,954	11,987	6,754	1,462	103	22	6	2	1	28,926
Normal	1	29	1,397	1,501	3,154	1,586	284	60	9	2	0	0	8,022
Below Normal	1	22	78	186	338	450	72	41	7	0	0	0	1,195
Dry	1	6	26	35	124	69	43	23	1	0	0	0	328
All Years	3	41	1,292	5,145	8,250	5,077	2,060	106	14	4	1	1	21,993

Difference in Flow below Alameda/Calaveras Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	429	246	-678	-4,885	-2,038	-136	46	298	386	417	425	415	-5,075
Above Normal	425	258	-295	-3,251	-4,031	-182	414	327	396	424	428	417	-4,671
Normal	429	275	-391	-424	-1,219	-257	251	370	408	428	430	417	717
Below Normal	428	275	246	672	876	596	345	389	411	430	430	417	5,515
Dry	429	292	281	778	1,044	747	375	407	416	430	430	417	6,044
All Years	428	269	-164	-1,419	-1,086	155	288	358	403	426	428	417	504

A flow recapture facility in Alameda Creek below Calaveras Reservoir is incorporated in the variant and WSIP settings. This facility is assumed to recapture flows explicitly released from Calaveras Dam for the 1997 MOU. The effect of the recapture would be a reduction in the flow below the confluence of Alameda and Calaveras Creeks, but only to the extent that releases were explicitly made from Calaveras Reservoir for the 1997 MOU. Flows below this diversion have been estimated and noted as the flow above the Alameda Creek and San Antonio Creek confluence. Table 2.6-10 illustrates the flow at this location for the variant and WSIP settings. The flow changes at this location are consistent with the changes noted for below the confluence of Alameda and Calaveras Creeks. These flow changes are considered insubstantial. Table 2.6-11 provides the same form of information for the variant and base settings. The flows identified at this location are indicative of flow occurring below the confluence of Alameda and Calaveras Creeks (described above) with the addition of estimated stream accretions between the Alameda and Calaveras Creek confluence and the Alameda and San Antonio Creek confluence, less the water assumed to be recaptured (diverted) by the SFPUC from the creek.

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Table 2.6-10

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,178	13,705	25,474	17,719	9,294	556	76	33	15	9	70,220
Above Normal	19	150	1,455	4,230	8,670	7,073	2,127	217	54	20	9	6	24,031
Normal	7	64	1,131	909	1,768	1,255	466	128	28	9	4	3	5,770
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,194	3,831	7,299	5,346	2,395	207	38	14	7	4	20,432

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,113	13,610	25,199	17,720	9,297	556	76	33	15	9	69,788
Above Normal	19	150	1,203	4,350	8,422	6,871	2,127	217	54	20	9	6	23,450
Normal	7	64	1,131	909	1,740	1,219	466	128	28	9	4	3	5,706
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,129	3,838	7,188	5,297	2,396	207	38	14	7	4	20,215

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	65	95	276	0	-3	0	0	0	0	0	432
Above Normal	0	0	252	-120	248	201	0	0	0	0	0	0	581
Normal	0	0	0	0	28	36	0	0	0	0	0	0	64
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	65	-7	111	49	-1	0	0	0	0	0	217

Table 2.6-11

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,178	13,705	25,474	17,719	9,294	556	76	33	15	9	70,220
Above Normal	19	150	1,455	4,230	8,670	7,073	2,127	217	54	20	9	6	24,031
Normal	7	64	1,131	909	1,768	1,255	466	128	28	9	4	3	5,770
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,194	3,831	7,299	5,346	2,395	207	38	14	7	4	20,432

Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,973	18,714	27,673	17,977	9,358	513	76	33	15	9	78,502
Above Normal	19	150	1,922	7,772	13,068	7,467	1,861	217	54	20	9	6	32,566
Normal	7	64	1,716	1,881	3,712	2,007	479	128	28	9	4	3	10,037
Below Normal	7	56	183	404	678	717	154	91	20	5	3	2	2,321
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,560	5,733	9,019	5,624	2,355	198	38	14	7	4	24,650

Difference in Alameda Creek Flow abv San Antonio Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-795	-5,009	-2,198	-258	-64	43	0	0	0	0	-8,282
Above Normal	0	0	-467	-3,542	-4,397	-394	266	0	0	0	0	0	-8,535
Normal	0	0	-585	-972	-1,944	-752	-13	0	0	0	0	0	-4,267
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-366	-1,901	-1,720	-279	40	8	0	0	0	0	-4,218

Compared to the WSIP setting, the variant's San Antonio Reservoir operation would typically draw less from storage on an annual basis, particularly during cyclic maintenance. Figure 2.6-3 illustrates a chronological trace of the simulation of San Antonio Reservoir storage and stream releases from San Antonio Dam. Shown in Figure 2.6-3 are the results for the WSIP, variant, and base settings. The difference in San Antonio Reservoir storage between the variant and WSIP settings is mostly caused by the lesser demand of the variant. Considering that Calaveras Reservoir storage is essentially the same between the settings, the difference in San Antonio Reservoir storage is indicative of the operational strategy to affect storage in San Antonio Reservoir more than storage in the other SFPUC Bay Area reservoirs. San Antonio Reservoir would retain more storage in the variant setting compared to the WSIP setting.

The difference in storage between the variant and WSIP settings and the base setting is due to the restoration of the operational capacity of Calaveras Reservoir. In the base setting, the limited operating storage capacity at Calaveras Reservoir leads to a different operation at San Antonio Reservoir, one that retains relatively more stored water for system demands when the draw from Calaveras Reservoir is constrained due to limited storage. There is also a notable difference in storage operation between the variant and WSIP settings and the base setting due to assumed maintenance. Assumed systematic maintenance of Hetch Hetchy conveyance facilities constrains diversions to the Bay Area from Hetch Hetchy every year, and particularly during every fifth year in the WSIP and variant settings.

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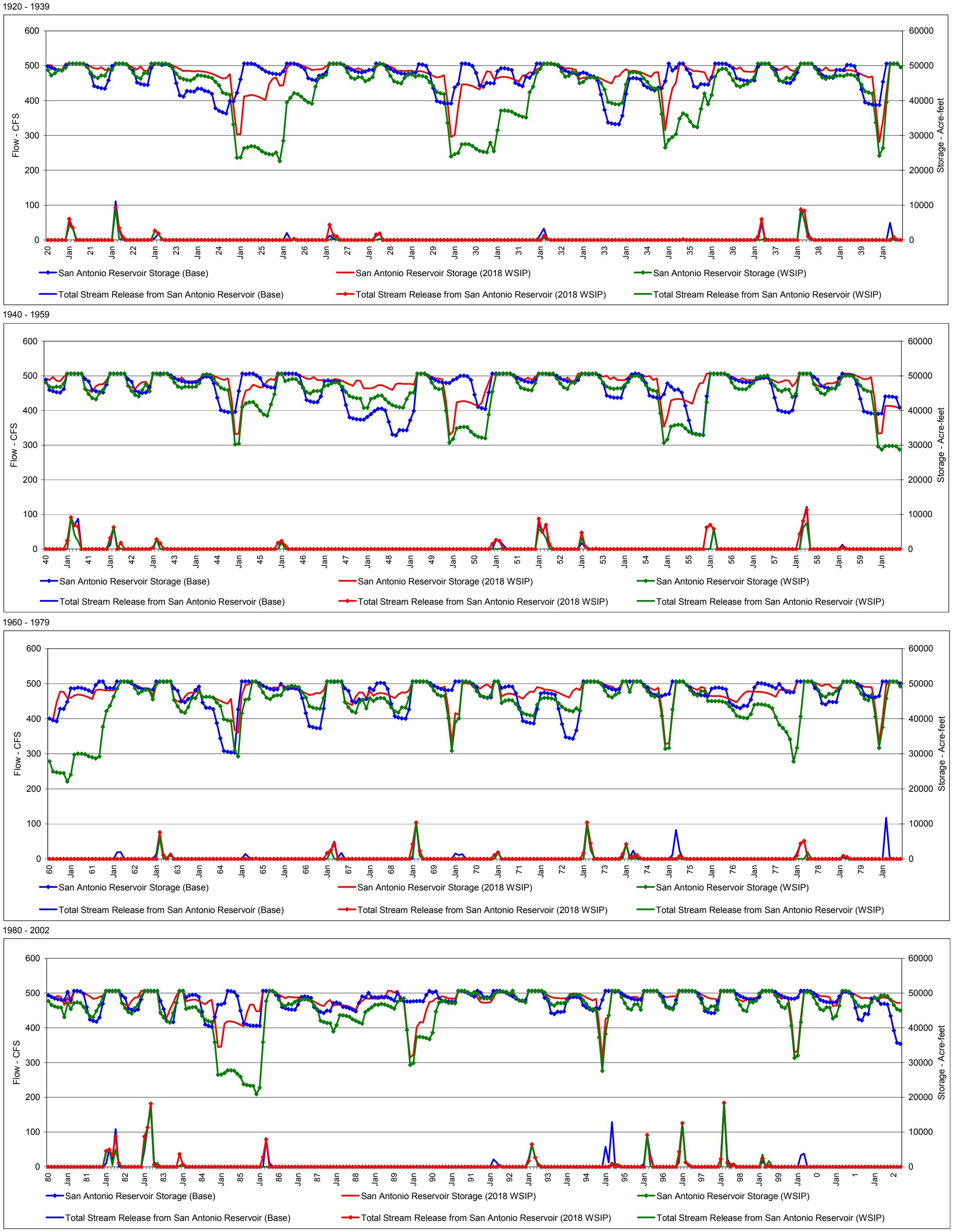
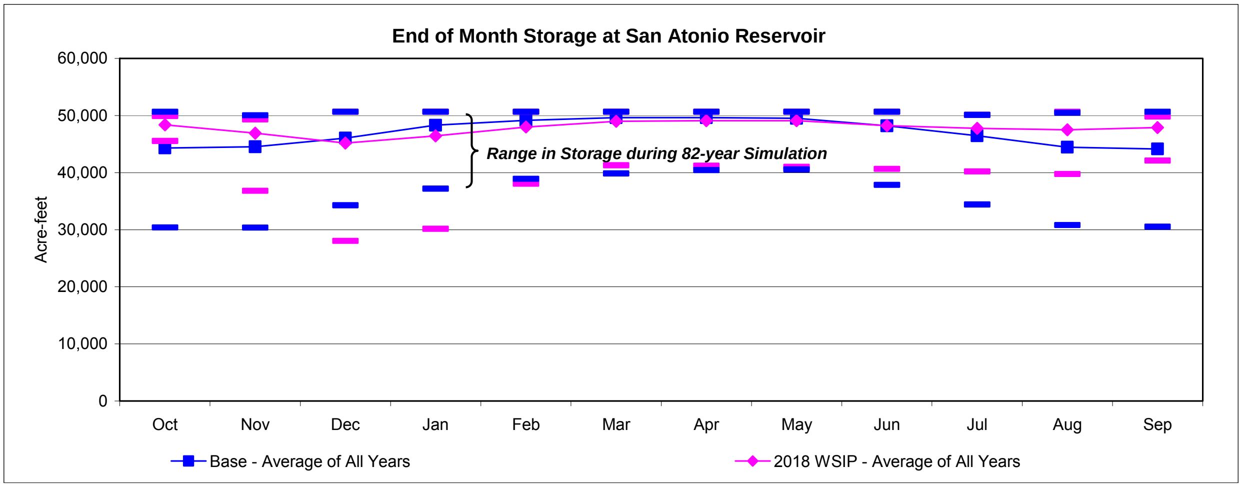
Figure 2.6-3
San Antonio Reservoir Storage and Stream Release



The reduction in diversion from Hetch Hetchy during these periods is accommodated in the system by drawing additional water from the Bay Area reservoirs. The proportionate share of this operation that is directed toward San Antonio Reservoir is evident in the tracing of San Antonio Reservoir storage for the variant and WSIP settings. Figure 2.6-4 illustrates the average monthly storage in San Antonio Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. Compared to the base setting, the variant would draw less storage from San Antonio Reservoir, typically retaining a fuller reservoir except during the cyclic maintenance period November through January.

Figure 2.6-4



There is very little anticipated change in stream releases below San Antonio Reservoir between the variant and WSIP settings. Table 2.6-12 illustrates the modeled releases to San Antonio Creek from San Antonio Reservoir for the two settings and the differences for the average release during a year type. With a different reservoir operation at times during the winter, as seen in Figure 2.6-4, it is expected that there would be a difference in the ability to regulate reservoir inflow and avoid stream releases. Given the sometimes rigid constraints within the modeling assumptions, the model will overestimate the frequency and magnitude of stream releases from San Antonio Reservoir under any of the investigated settings. The flexibility that occurs in actual operations would likely avoid most of the releases represented by the model. The modeled stream releases from San Antonio Reservoir and the difference between releases for the variant and base setting are shown in Table 2.6-13. The differences between the two settings reflect a slight decrease in modeled releases. This modeled circumstance reflects the different resulting storage operation between the two settings, as seen in Figure 2.6-3. In most instances, the variant setting storage at San Antonio Reservoir during a period would be lower than that projected for the base setting during the same period. This circumstance could lead to an occasionally lesser modeled release for the variant setting, which is reflected in the results. As described above, the model will overestimate the frequency and magnitude of releases from San Antonio Reservoir, and the actual releases from the reservoir in any setting and the difference between settings are expected to be minor.

Flow below the confluence of Alameda and San Antonio Creeks is influenced by releases from San Antonio Creek and flow arriving at the location from Alameda Creek, which includes upstream impairment by SFPUC operations and facilities. Table 2.6-14 illustrates the flow below the confluence for the variant and WSIP settings, and the differences in flow between the two. The differences in flow between the variant and WSIP settings at this location are the net sum of the differences identified for flow reaching the location from Alameda Creek and from San Antonio Creek. The difference in flow from upstream in Alameda Creek was previously identified as insubstantial. Along with the conclusion that flow differences in San Antonio Creek would not be substantial, modeled differences below the confluence are also considered insubstantial.

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Table 2.6-12

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	404	2,195	3,512	2,817	1,171	88	0	0	0	0	10,187
Above Normal	0	0	107	673	1,818	888	197	62	0	0	0	0	3,745
Normal	0	0	251	368	133	90	90	11	0	0	0	0	943
Below Normal	0	0	0	0	16	4	0	0	0	0	0	0	19
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	150	640	1,091	752	287	32	0	0	0	0	2,952

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	44	1,208	3,251	1,558	658	151	0	0	0	0	6,870
Above Normal	0	0	0	442	1,381	158	192	62	0	0	0	0	2,235
Normal	0	0	11	287	78	6	13	0	0	0	0	0	395
Below Normal	0	0	0	0	0	0	4	0	0	0	0	0	4
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	11	383	936	338	172	42	0	0	0	0	1,882

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	360	987	261	1,259	513	-63	0	0	0	0	3,317
Above Normal	0	0	107	231	437	731	4	0	0	0	0	0	1,510
Normal	0	0	240	81	55	84	78	11	0	0	0	0	548
Below Normal	0	0	0	0	16	4	-4	0	0	0	0	0	15
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	139	256	155	414	115	-10	0	0	0	0	1,070

Table 2.6-13

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	404	2,195	3,512	2,817	1,171	88	0	0	0	0	10,187
Above Normal	0	0	107	673	1,818	888	197	62	0	0	0	0	3,745
Normal	0	0	251	368	133	90	90	11	0	0	0	0	943
Below Normal	0	0	0	0	16	4	0	0	0	0	0	0	19
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	150	640	1,091	752	287	32	0	0	0	0	2,952

Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	101	1,322	3,669	3,288	1,398	94	0	0	0	0	9,872
Above Normal	0	0	26	687	1,909	1,487	116	58	0	0	0	0	4,283
Normal	0	0	7	370	441	237	65	0	0	0	0	0	1,120
Below Normal	0	0	0	0	41	0	0	0	0	0	0	0	41
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	26	472	1,206	996	309	30	0	0	0	0	3,041

Difference in Total Stream Release from San Antonio Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	303	873	-157	-471	-227	-6	0	0	0	0	315
Above Normal	0	0	81	-14	-91	-599	81	4	0	0	0	0	-538
Normal	0	0	244	-1	-309	-147	26	11	0	0	0	0	-177
Below Normal	0	0	0	0	-26	4	0	0	0	0	0	0	-22
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	124	167	-115	-244	-23	2	0	0	0	0	-89

Table 2.6-14

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,582	15,900	28,986	20,536	10,465	644	76	33	15	9	80,407
Above Normal	19	150	1,562	4,903	10,488	7,961	2,324	280	54	20	9	6	27,776
Normal	7	64	1,382	1,278	1,901	1,345	556	139	28	9	4	3	6,713
Below Normal	7	56	183	404	694	720	154	91	20	5	3	2	2,340
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,344	4,471	8,390	6,098	2,682	239	38	14	7	4	23,384

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,157	14,818	28,449	19,278	9,955	707	76	33	15	9	76,658
Above Normal	19	150	1,203	4,792	9,803	7,029	2,320	279	54	20	9	6	25,685
Normal	7	64	1,142	1,197	1,818	1,224	478	128	28	9	4	3	6,101
Below Normal	7	56	183	404	678	717	159	91	20	5	3	2	2,326
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,140	4,221	8,124	5,635	2,567	249	38	14	7	4	22,097

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	425	1,081	537	1,259	510	-63	0	0	0	0	3,749
Above Normal	0	0	359	111	685	932	4	0	0	0	0	0	2,091
Normal	0	0	240	81	83	121	78	11	0	0	0	0	612
Below Normal	0	0	0	0	16	4	-4	0	0	0	0	0	15
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	204	250	266	463	115	-10	0	0	0	0	1,288

Table 2.6-15 illustrates the same information for the variant and base settings. Table 2.6-15 shows the larger differences in flow that would occur between the variant and base settings. Those differences are particularly due to the effects of the restoration of Calaveras Reservoir operating capacity and the difference in San Antonio Reservoir storage operations.

Table 2.6-15

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	3,582	15,900	28,986	20,536	10,465	644	76	33	15	9	80,407
Above Normal	19	150	1,562	4,903	10,488	7,961	2,324	280	54	20	9	6	27,776
Normal	7	64	1,382	1,278	1,901	1,345	556	139	28	9	4	3	6,713
Below Normal	7	56	183	404	694	720	154	91	20	5	3	2	2,340
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,344	4,471	8,390	6,098	2,682	239	38	14	7	4	23,384

Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	6	154	4,075	20,036	31,342	21,266	10,756	607	76	33	15	9	88,374
Above Normal	19	150	1,948	8,459	14,977	8,954	1,977	276	54	20	9	6	36,849
Normal	7	64	1,723	2,251	4,153	2,244	544	128	28	9	4	3	11,157
Below Normal	7	56	183	404	720	717	154	91	20	5	3	2	2,363
Dry	6	19	70	98	231	145	91	48	9	3	2	2	724
All Years	9	89	1,587	6,205	10,225	6,620	2,664	229	38	14	7	4	27,691

Difference in Flow blw San Antonio and Alameda Creek Confluence (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	-492	-4,136	-2,355	-730	-291	37	0	0	0	0	-7,967
Above Normal	0	0	-386	-3,557	-4,489	-993	347	4	0	0	0	0	-9,073
Normal	0	0	-341	-973	-2,252	-899	12	11	0	0	0	0	-4,443
Below Normal	0	0	0	0	-26	4	0	0	0	0	0	0	-22
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	-243	-1,734	-1,835	-523	17	10	0	0	0	0	-4,307

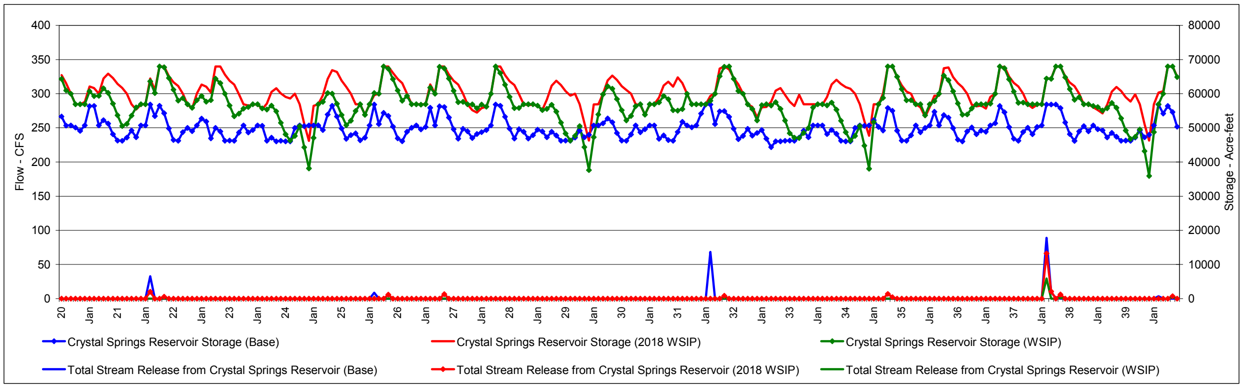
2.7 Crystal Springs and San Andreas Reservoirs

There are differences in Crystal Springs Reservoir operations among the WSIP, variant, and base settings. Figure 2.7-1 illustrates a chronological trace of the simulation of Crystal Springs Reservoir storage and stream releases from Crystal Springs Dam. Shown in Figure 2.7-1 are the results for the WSIP, variant, and base settings. Fundamental to the difference in storage operations between the WSIP and variant settings and the base setting is the restoration of reservoir operation capacity in the WSIP and variant setting that does not occur in the base setting. The result is the operation of Crystal Springs Reservoir at a lower maximum storage in the base setting. The difference in Crystal Springs Reservoir storage between the variant and WSIP settings is caused by the interaction of the increased demand served by the system's resources (a net 265 mgd for the variant and a net 290 mgd for the WSIP), which tends to lessen the operational range of the reservoir in the variant setting. Less drawdown and an accelerated replenishment of Crystal Springs Reservoir storage (as well as other Bay Area reservoirs) would occur with less systemwide demand to serve. The magnitude of the draw of storage from Crystal Springs Reservoir is partially dependent on the discretionary assumptions of the model that proportion the use of storage among the Bay Area system reservoirs. In actual operations, some of these differences may not occur, as system operators and prevailing hydraulic and hydrologic conditions may result in a different apportionment of effect among the reservoirs. However, the operational strategy prefers the retention of storage in the Peninsula reservoirs, similar to the strategy used by the model. Figure 2.7-2 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and WSIP settings.

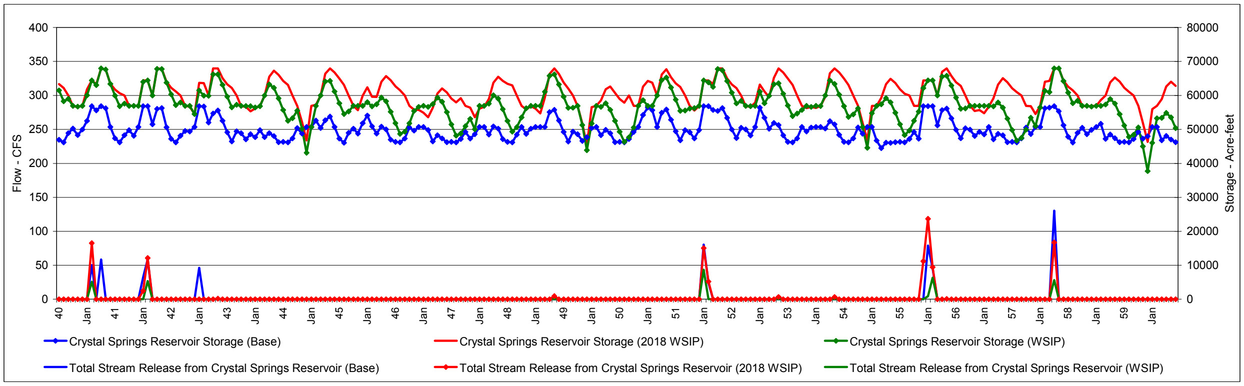
APPENDIX O3

Figure 2.7-1
Crystal Springs Reservoir Storage and Release

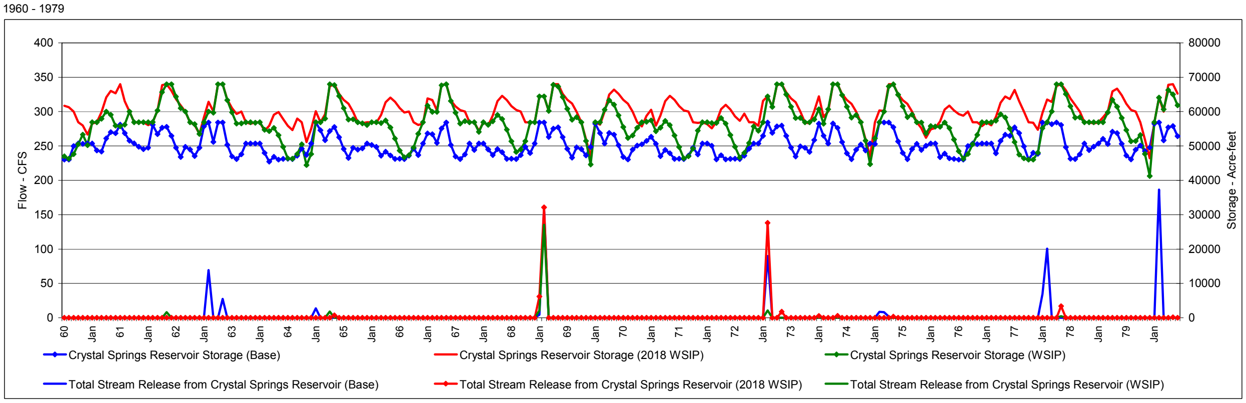
1920 - 1939



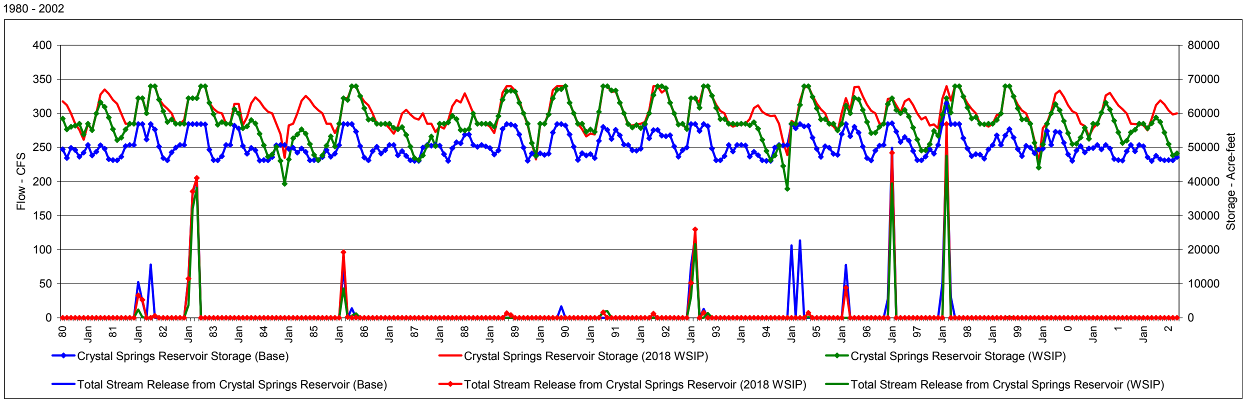
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Figure 2.7-2

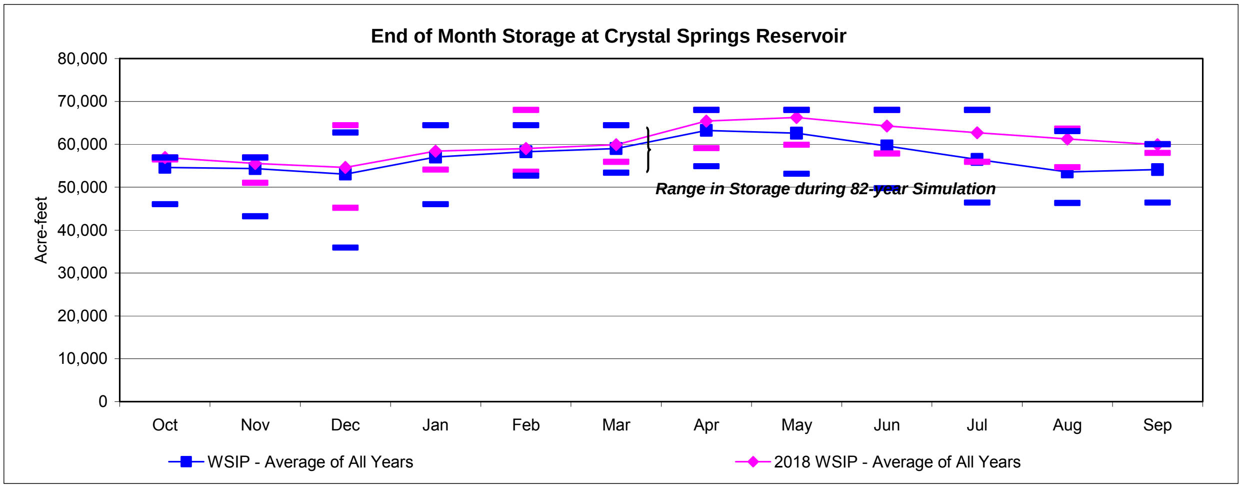


Figure 2.7-3 illustrates the average monthly storage in Crystal Springs Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings. The variant setting would result in reservoir storage operating at a higher average level during all months, and the range of operating storage would be larger in some months.

Figure 2.7-3

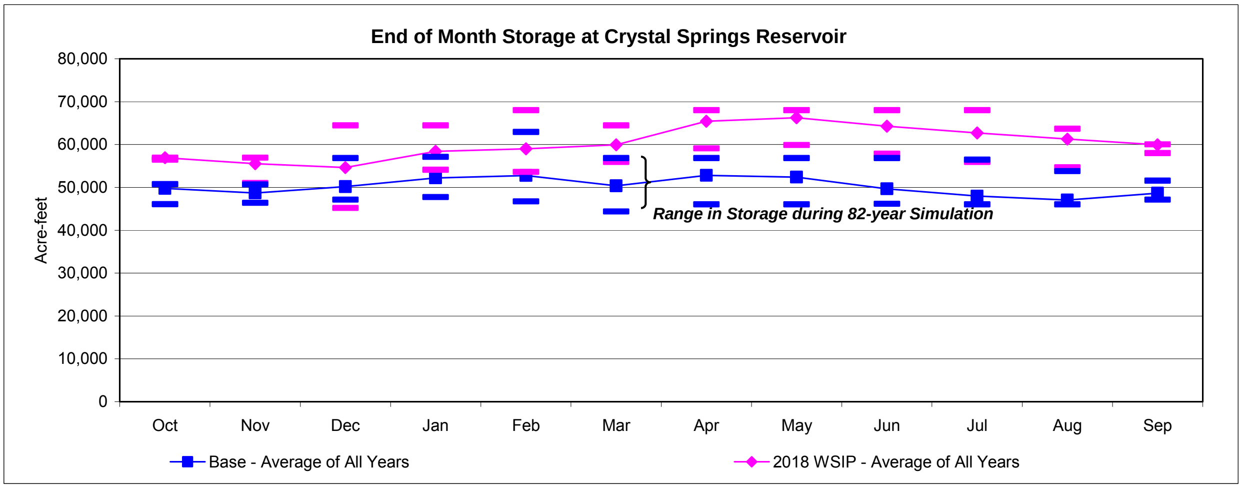


Table 2.7-1 illustrates the modeled variant and WSIP stream releases from Crystal Springs Reservoir and the differences between the two settings. Modeling results indicate that an increase or decrease in the occasional release could occur. The potential difference is attributed to a difference in the operating range of reservoir storage in the variant setting. In actual operations, it is anticipated that system operators would manage the reservoir system whereby stream releases would be minimal under any setting, and the effect would be essentially no difference between the variant and WSIP settings. Similarly, Table 2.7-2 illustrates the stream releases for the variant and base settings, and the difference in modeled flows between the two settings. A difference in Crystal Springs Reservoir storage between the two settings would lead to a different potential to regulate reservoir inflow, which could lead to different stream releases. However, as described above, actual system operations attempt to minimize releases under any setting, and thus the difference in releases between the variant and base setting is minimal, if any.

APPENDIX O3

Table 2.7-1

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	2,186	4,073	833	310	101	0	0	0	0	7,718
Above Normal	0	0	0	195	600	0	26	140	0	0	0	0	960
Normal	0	0	0	0	0	0	48	77	0	0	0	0	125
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	467	919	163	81	71	3	0	0	0	1,745

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	0	1,098	2,435	732	115	48	0	0	0	0	4,428
Above Normal	0	0	0	111	353	0	32	47	0	0	0	0	544
Normal	0	0	0	0	0	0	0	31	0	0	0	0	31
Below Normal	0	0	0	0	0	0	31	35	0	0	0	0	67
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	0	237	548	143	36	33	0	0	0	0	997

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	1,088	1,638	101	195	53	0	0	0	0	3,290
Above Normal	0	0	0	83	247	0	-6	92	0	0	0	0	416
Normal	0	0	0	0	0	0	48	46	0	0	0	0	94
Below Normal	0	0	0	0	0	0	-4	-24	0	0	0	0	-28
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	230	371	20	45	38	3	0	0	0	749

Table 2.7-2

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	215	2,186	4,073	833	310	101	0	0	0	0	7,718
Above Normal	0	0	0	195	600	0	26	140	0	0	0	0	960
Normal	0	0	0	0	0	0	48	77	0	0	0	0	125
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	15	0	0	0	41
All Years	0	0	42	467	919	163	81	71	3	0	0	0	1,745

Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	2,744	4,279	1,376	1,047	2	0	0	0	0	9,556
Above Normal	0	0	0	618	1,343	29	52	100	0	0	0	0	2,142
Normal	0	0	0	0	268	0	0	0	0	0	0	0	268
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	62	0	0	0	62
All Years	0	0	21	664	1,166	274	215	21	12	0	0	0	2,373

Difference in Total Stream Release from Crystal Springs Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) 2018 WSIP minus Base

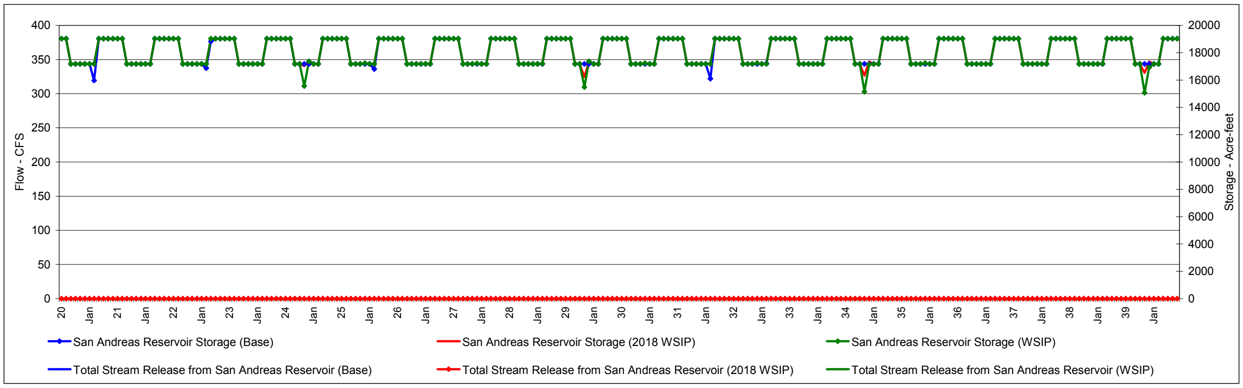
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	107	-558	-207	-542	-737	98	0	0	0	0	-1,838
Above Normal	0	0	0	-424	-743	-29	-26	40	0	0	0	0	-1,182
Normal	0	0	0	0	-268	0	48	77	0	0	0	0	-143
Below Normal	0	0	0	0	0	0	28	12	0	0	0	0	39
Dry	0	0	0	0	0	0	0	26	-48	0	0	0	-22
All Years	0	0	21	-197	-247	-112	-134	50	-9	0	0	0	-628

Reservoir storage at San Andreas Reservoir would follow a systematic filling and lowering each year; however, there would be slight differences in drawdown between the variant and WSIP settings, primarily due to the coincidence of the effects of different systemwide maintenance and water demands within each setting. Figure 2.7-4 illustrates a chronological trace of the simulation of San Andreas Reservoir storage and stream releases from San Andreas Dam. Shown in Figure 2.7-4 are the results for the WSIP, variant, and base settings. There are no projected stream releases from San Andreas Reservoir in any setting. Compared to the base setting, as Figure 2.7-4 illustrates, there would be a difference in storage operation every fifth year for the WSIP and variant settings. These differences would be the result of Hetch Hetchy conveyance maintenance, which is assumed to occur systematically in the variant and WSIP settings. The maintenance constrains the amount of Hetch Hetchy water supplied to serve water demands in the Bay Area. As previously discussed, during these winter periods the Bay Area reservoir system would accommodate the reduction in imported supply by serving the Bay Area water deliveries with the local watersheds' runoff and storage. At San Andreas Reservoir, serving this water demand would affect the reservoir when additional required water production at Harry Tracy WTP associated with WSIP or the variant exceeded the ability to maintain San Andreas Reservoir storage with pumping from Crystal Springs Reservoir. In the modeling, the conveyance capacity from Crystal Springs Reservoir is assumed to be the same among all of the settings. The additional water demand of the WSIP and variant require additional production from Harry Tracy WTP to be drawn from San Andreas Reservoir.

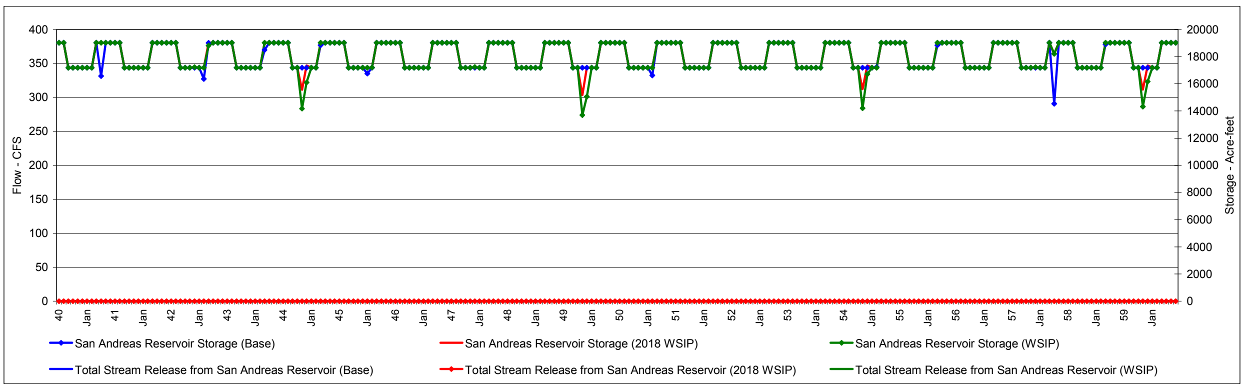
APPENDIX O3

Figure 2.7-4
San Andreas Reservoir Storage and Stream Release

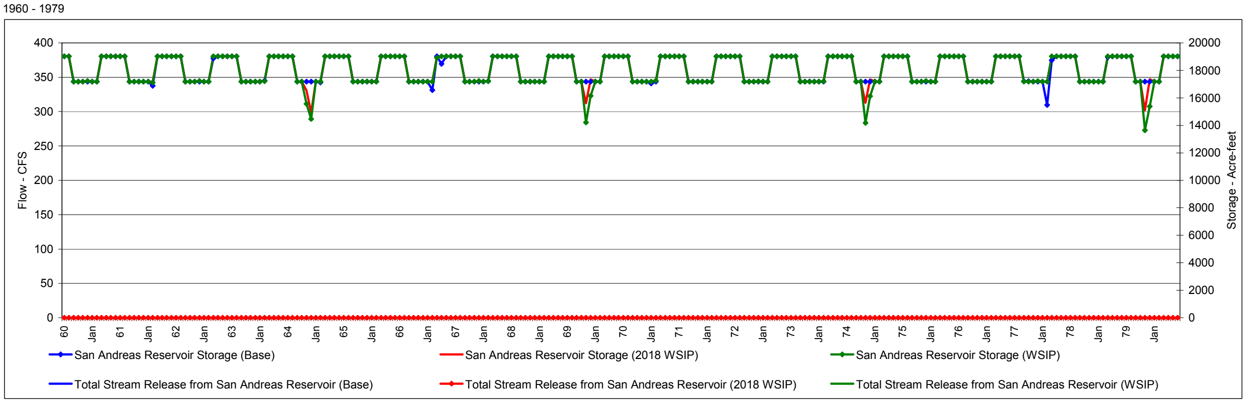
1920 - 1939



1940 - 1959



1960 - 1979



1980 - 2002

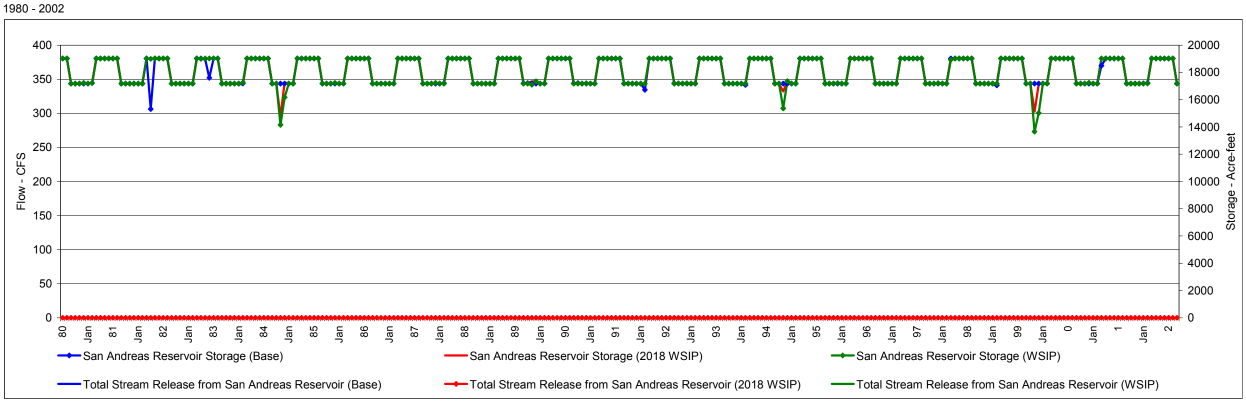
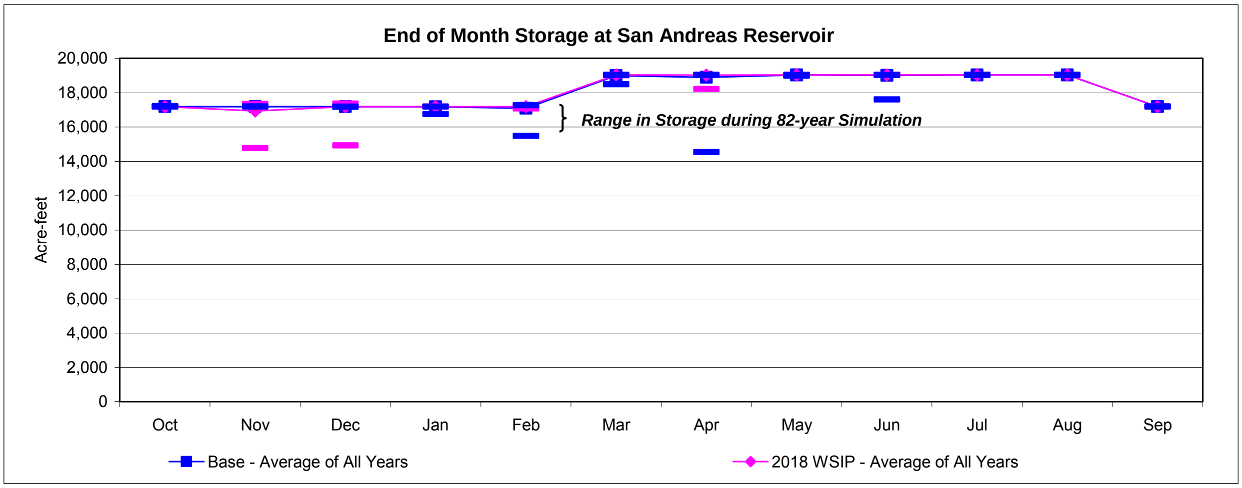


Figure 2.7-5 illustrates the average monthly storage in San Andreas Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

Figure 2.7-5



2.8 Pilarcitos Reservoir

Coastside County Water District's (Coastside CWD) water demand and its SFPUC purchase request are projected to increase within the WSIP planning horizon of year 2030. Within the context of the 2030 purchase request of 300 mgd, Coastside CWD's portion is estimated to amount to about 3 mgd. This projected purchase request is approximately 1 mgd greater that its current purchase request. Considering the current physical constraints on deliveries from the SFPUC to Coastside CWD and the ongoing planning activities in the watershed, the precise means of serving Coastside CWD's additional purchase request, and the resultant potential changes in the operation of SFPUC facilities and their affected environs, are uncertain.[2] For the variant, Coastside CWD's delivery would remain at its current level of approximately 1.8 mgd.

Assuming a range of potential means to serve the additional purchase request from Coastside CWD, the following are potential hydrologic effects on SFPUC facilities and their affected environs:

- Due to limited yield from Pilarcitos Reservoir, additional diversions would be required from Crystal Springs Reservoir.
- If deliveries to Coastside CWD from Pilarcitos Reservoir increase during the winter season, these deliveries could potentially reduce storage in Pilarcitos Reservoir, thereby potentially reducing diversions to the San Mateo Creek watershed. Although the increased delivery would increase releases to Pilarcitos Creek from Pilarcitos Dam for a period of time, the increase would subsequently lead to a reduction in spills past Stone Dam.
- Additional wintertime deliveries could also potentially impair the ability to provide carryover storage into the summer season from Pilarcitos Reservoir, and subsequently lead to an acceleration of the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.
- An increase in summertime deliveries from Pilarcitos Creek could also accelerate the beginning of the season when releases to Pilarcitos Creek from Pilarcitos Reservoir consist only of the passage of reservoir inflow.

Figure 2.8-1 illustrates a chronological trace of the simulation of Pilarcitos Reservoir storage and stream releases from Pilarcitos Dam. Shown in Figure 2.8-1 are the results for the WSIP, variant, and base

[2] See *Analysis of SFPUC Pilarcitos/Coastside County Water District Operations*, Memorandum by Daniel B. Steiner, March 8, 2007.

settings. For the WSIP setting, the operation assumes an increase in purchase request by Coastside CWD, distributed on a proportionate monthly pattern during the year consistent with historical SFPUC deliveries. Also assumed is a conveyance constraint of 2 mgd to Coastside CWD from the Pilarcitos Creek source of water. When the assumed monthly purchase request of Coastside CWD exceeds this conveyance constraint, Coastside CWD's request is met with deliveries from Crystal Springs Reservoir. For the variant setting, Coastside CWD's demand is the same as depicted for the base setting.

Compared to the WSIP setting, the variant would draw less water from Pilarcitos Reservoir, thus avoiding the effects on Pilarcitos Reservoir and its operations associated with the WSIP. A potential increased draw of storage from Pilarcitos Reservoir earlier in the year would not occur under the variant, and thus the earlier summertime reduction in Pilarcitos Reservoir releases to the Pilarcitos Creek would not occur. The variant's operation would be much the same as, if not identical to, that depicted for the base setting. Figure 2.8-2 illustrates the average monthly storage in Pilarcitos Reservoir for the 82-year simulation, and the range in storage for each month for the variant and base settings.

There are occasional differences in the operation of Pilarcitos Reservoir due to slight changes in the overall operation of the SFPUC system. These changes could affect the timing and frequency of the transfer of water from the Pilarcitos Creek watershed to the San Mateo Creek watershed.

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Figure 2.8-1
Pilarcitos Reservoir Storage and Stream Release

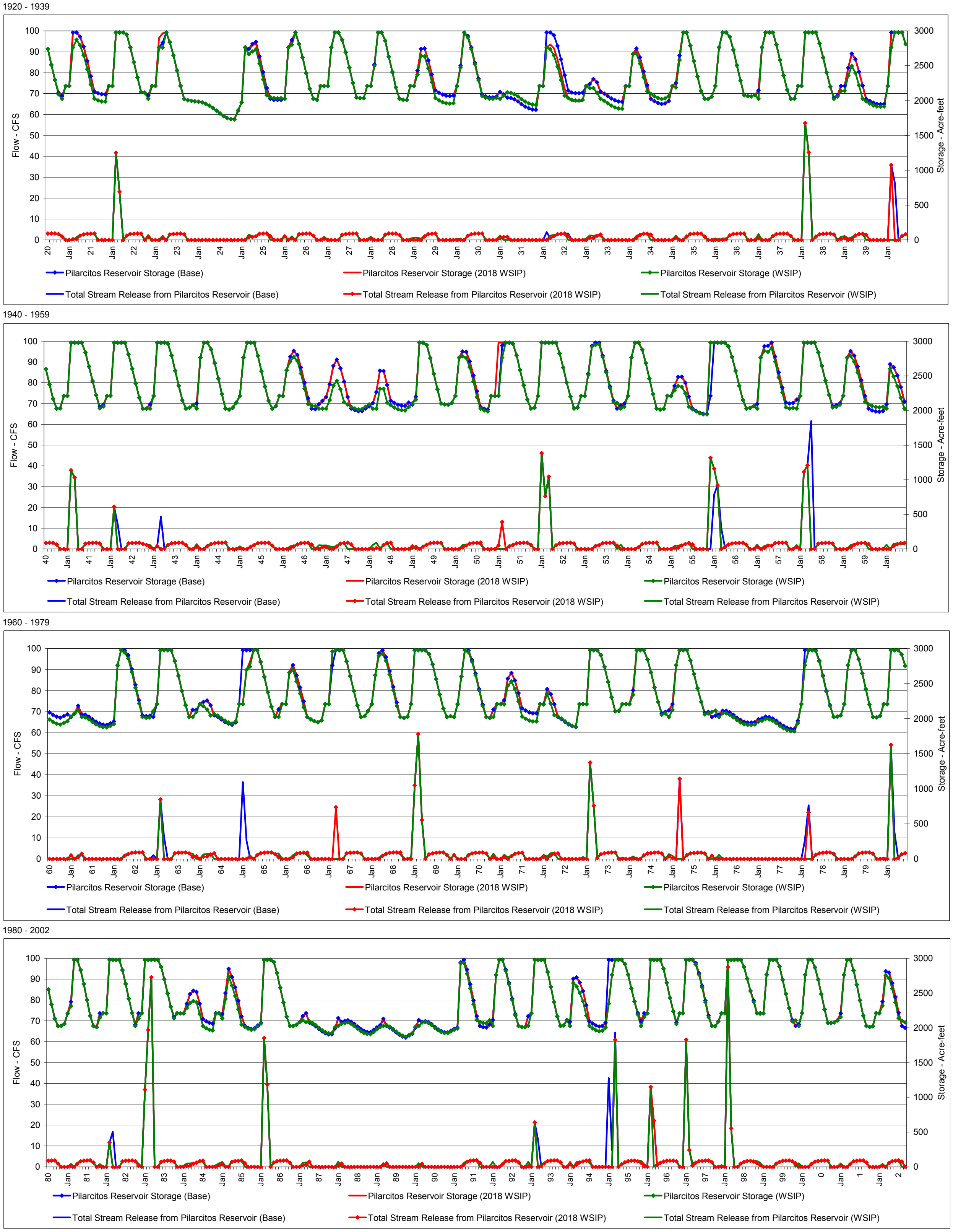
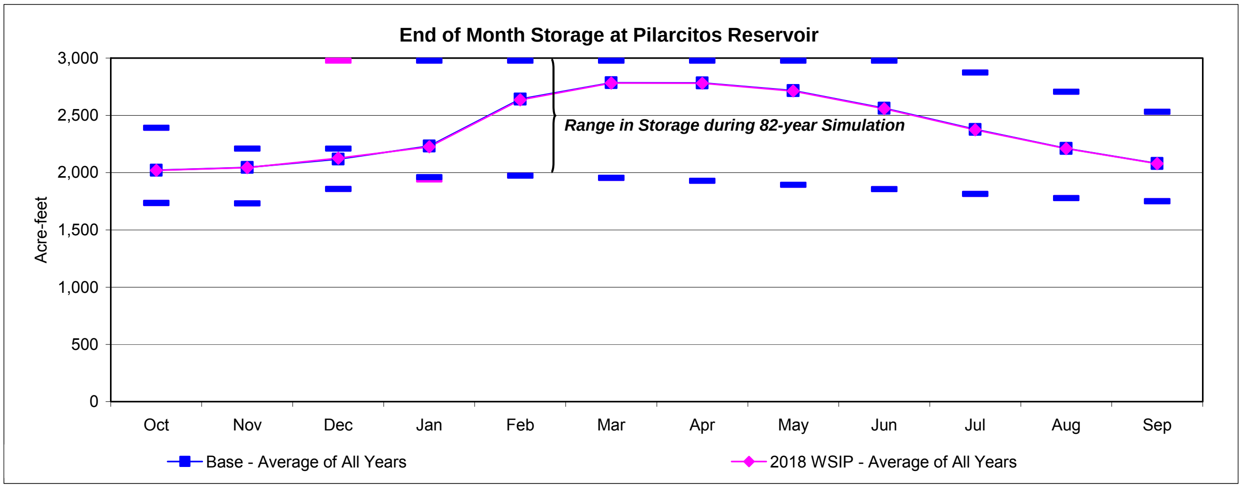


Figure 2.8-2



Stream releases from Pilarcitos Dam are also shown in Figure 2.8-1. Releases can occur for diversions at Stone Dam for Coastside CWD deliveries, conveyance to the San Mateo Creek watershed (e.g., Crystal Springs Reservoir), and reservoir spills. Pilarcitos Creek typically gains flow from unregulated tributary streams and runoff below Pilarcitos Dam. The differences in flow between the variant setting and base setting are shown chronologically in Table 2.8-1 and summarized by monthly averages within year types in Table 2.8-2. The reductions in flows during the winter and spring are indicative of the averaging of the few instances when additional water is transferred to the San Mateo watershed from Pilarcitos Reservoir.

The effect of the variant on Pilarcitos Creek flows below Stone Dam is different than the effect on flows below Pilarcitos Dam. Figure 2.8-3 illustrates the chronological trace of inflow to Stone Dam, which includes releases from Pilarcitos Dam to Pilarcitos Creek and unregulated flow to the stream below Pilarcitos Dam, and releases (spills) from Stone Dam to Pilarcitos Creek. Shown in the figure are the results for the WSIP, variant, and base settings. The flow past Stone Dam in all settings is typically minor (zero in modeling results, but may be measurable in terms of leakage and seepage past the dam), as inflow to the dam is diverted to Coastside CWD or to the San Mateo watershed. Releases past Stone Dam typically occur when unregulated flow below Pilarcitos Dam exceeds the delivery needs of Coastside CWD at a time when the storage level at Crystal Springs Reservoir rejects the water from the Pilarcitos watershed. There are a few instances when flow past Stone Dam in the variant setting would be diminished by the change in releases from Pilarcitos Reservoir. Table 2.8-3 summarizes the results for the variant and base settings in terms of average monthly flows by year type, and the average differences in flow between the two settings.

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Table 2.8-1

Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet) 2018 WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	0	0	0	0	0	0	0	0
1922	0	0	0	0	0	0	0	0	0	0	0	0	0
1923	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	7	15	0	0	0	0	-21	1
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	-211	12	16	17	0	0	-76	0	-241
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	3	0	0	0	0	0	0	0	3
1936	0	0	0	0	0	0	0	0	0	0	0	0	0
1937	0	0	0	0	0	0	0	0	0	0	0	0	0
1938	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-1,677	0	0	0	0	0	0	-1,677
1941	0	0	0	0	0	0	0	0	0	0	0	0	0
1942	0	0	0	0	0	-734	0	0	0	0	0	0	-734
1943	0	0	0	0	0	-958	0	0	0	0	0	0	-958
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	0	0	0	0	0	0	0	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	109	725	0	0	0	0	0	0	0	834
1952	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	2,697	766	0	-624	0	0	0	0	0	0	2,838
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	0	-3,661	0	0	0	0	0	-3,661
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	7	15	0	0	0	0	0	22
1962	0	0	0	0	0	0	16	17	0	0	0	0	34
1963	0	0	-107	0	0	-639	0	0	0	0	0	0	-747
1964	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	0	0	0	-2,248	-485	0	0	0	0	0	0	0	-2,733
1966	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	0	0	0	0	0	1,511	0	0	0	0	0	0	1,511
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	-503	-213	0	17	0	0	0	0	-698
1979	-10	0	0	0	0	0	0	0	0	0	0	0	-10
1980	0	0	0	0	0	-783	0	0	0	0	0	0	-783
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	-1,032	0	0	0	0	0	0	-1,032
1983	0	0	0	0	0	0	0	0	0	0	0	0	0
1984	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	4	3	0	0	0	0	0	0	0	8
1989	0	0	0	0	0	12	-20	0	0	0	0	0	-7
1990	0	0	0	0	0	12	0	0	0	0	0	0	12
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	16	17	0	0	0	-17	17
1993	0	0	0	0	0	-820	0	0	0	0	0	0	-820
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	-2,620	-442	-213	0	0	0	0	0	0	-3,275
1996	0	0	0	0	0	0	0	0	0	0	0	0	0
1997	0	0	0	0	0	0	0	0	0	0	0	0	0
1998	0	0	0	0	0	0	0	0	0	0	0	0	0
1999	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	0	0	32	-49	-11	-75	-44	1	0	0	-1	0	-148

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Table 2.8-2

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	172	837	2,116	1,653	13	70	152	175	183	177	5,606
Above Normal	56	37	14	11	589	388	22	116	161	181	186	169	1,928
Normal	54	3	7	15	11	9	63	143	171	185	159	127	947
Below Normal	57	6	7	15	6	24	103	154	164	171	124	63	894
Dry	36	0	11	27	17	43	70	69	55	44	8	0	381
All Years	51	10	41	177	542	418	54	111	141	152	133	107	1,938

Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	54	3	4	953	2,144	1,770	242	70	152	175	183	177	5,927
Above Normal	56	37	20	137	605	641	22	115	161	181	186	169	2,328
Normal	55	3	7	15	24	9	60	139	171	185	164	128	960
Below Normal	57	6	7	15	6	23	103	154	164	171	124	65	894
Dry	36	0	11	26	17	41	70	69	55	44	8	0	378
All Years	52	10	10	225	553	493	98	110	141	152	134	108	2,085

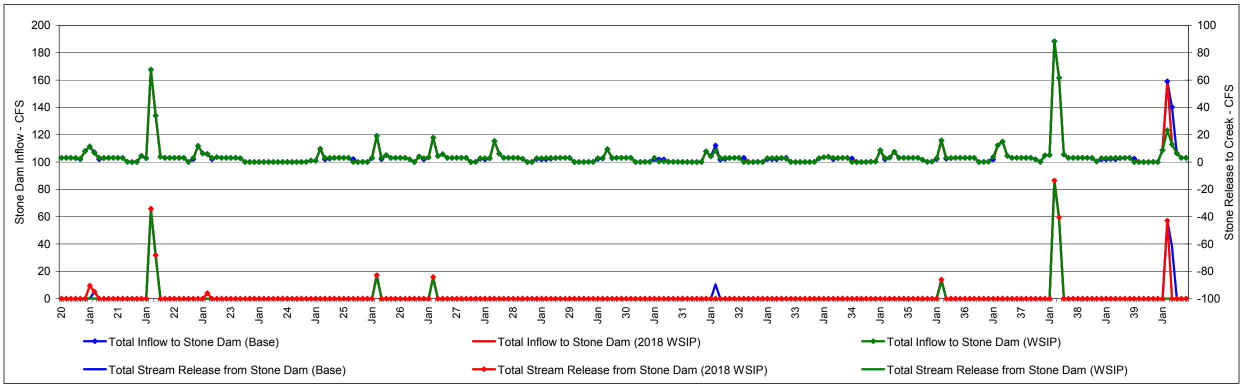
Difference in Total Stream Release from Pilarcitos Reservoir (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff)
2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	169	-116	-28	-117	-229	0	0	0	0	0	-321
Above Normal	0	0	-6	-126	-15	-253	0	1	0	0	0	0	-400
Normal	-1	0	0	0	-13	1	3	3	0	0	-5	-1	-12
Below Normal	0	0	0	0	0	0	1	0	0	0	0	-1	0
Dry	0	0	0	0	0	2	0	0	0	0	0	0	2
All Years	0	0	32	-49	-11	-75	-44	1	0	0	-1	0	-148

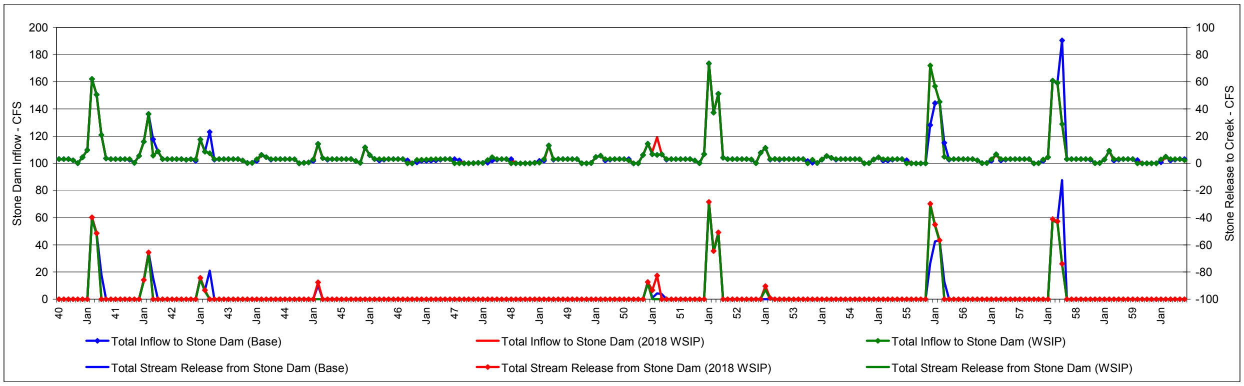
APPENDIX O3

Figure 2.8-3
Stone Dam Stream Release and Inflow

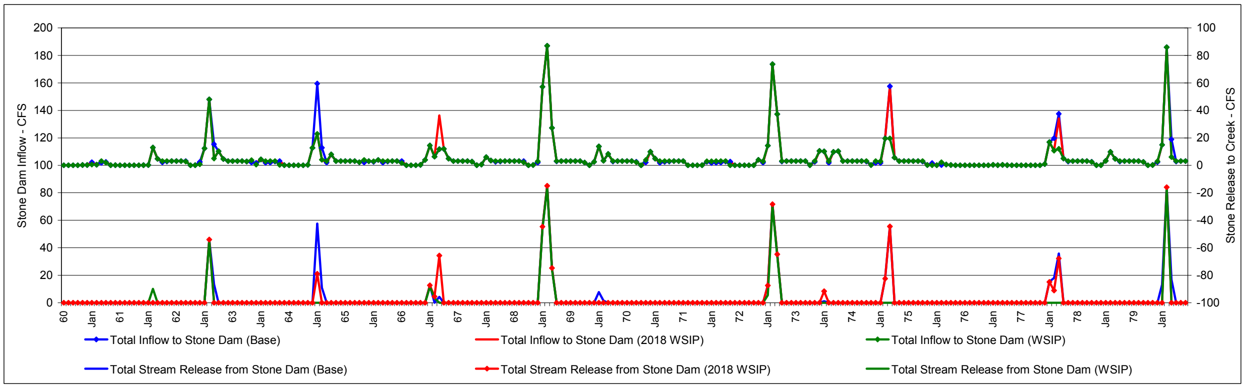
1920 - 1939



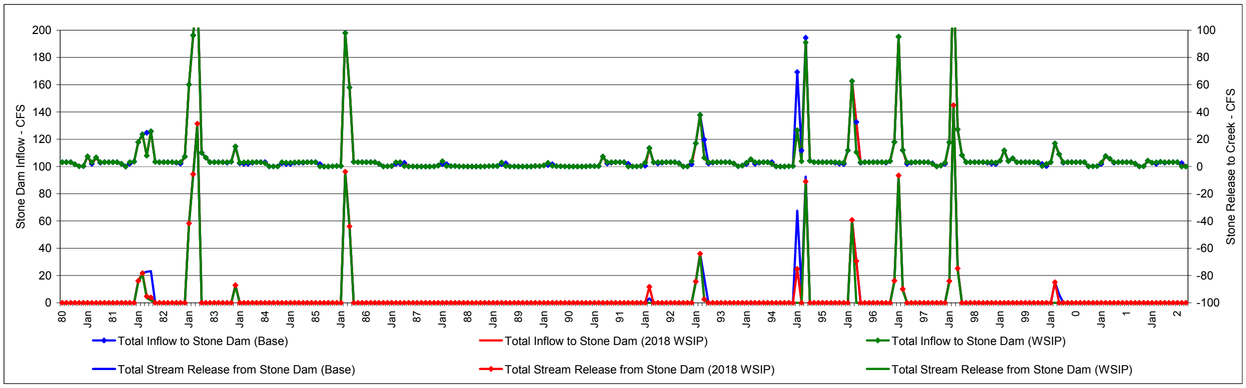
1940 - 1959



1960 - 1979



1980 - 2002



APPENDIX O3

Table 2.8-3

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	332	1,652	3,233	2,366	112	0	0	0	0	0	7,695
Above Normal	0	0	46	332	1,164	553	0	0	0	0	0	0	2,095
Normal	0	0	49	37	195	0	0	0	0	0	0	0	281
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	84	398	910	576	22	0	0	0	0	0	1,991

Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	164	1,819	3,252	2,509	479	0	0	0	0	0	8,223
Above Normal	0	0	46	384	1,174	921	0	0	0	0	0	0	2,525
Normal	0	0	49	30	197	0	0	0	0	0	0	0	276
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	51	440	917	680	94	0	0	0	0	0	2,182

Difference in Total Stream Release from Stone Dam (Acre-feet)
(Average within Year Type - Grouped by 5 Local Reservoir Runoff) — 2018 WSIP minus Base

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
Wet	0	0	169	-167	-19	-143	-368	0	0	0	0	0	-528
Above Normal	0	0	0	-52	-11	-368	0	0	0	0	0	0	-430
Normal	0	0	0	7	-2	0	0	0	0	0	0	0	4
Below Normal	0	0	0	0	0	0	0	0	0	0	0	0	0
Dry	0	0	0	0	0	0	0	0	0	0	0	0	0
All Years	0	0	33	-42	-6	-104	-72	0	0	0	0	0	-191

APPENDIX O4

Memorandum

Subject: **Analysis of WSIP upon the San Joaquin River and the Sacramento-San Joaquin Delta**
From: **Daniel B. Steiner**
Date: **May 22, 2008**

1. Introduction

This memorandum summarizes an evaluation of the potential effects of the WSIP on the hydrology and operations of the San Joaquin River and the Sacramento-San Joaquin Delta (Delta). The evaluation is based on a contrast of HH/LSM results for the simulation of the WSIP against the simulation of San Joaquin River and Delta hydrology and operations. The projected hydrology due to the WSIP is primarily discussed in terms of a comparison to the existing condition.

2. Setting

The Tuolumne River is one of the principal tributaries of the San Joaquin River. Combined with the operations of the Stanislaus River, the Merced River, and intermittent releases from the upper San Joaquin River, Kings River, and other lesser tributary and uncontrolled flow, the contemporary average annual flow in the Tuolumne River at Vernalis is estimated to be approximately 3,050,000 acre-feet per year (afy), with a very large variance between drought and flood conditions. Figure 2-1 illustrates the setting of the Tuolumne River within the San Joaquin River system.

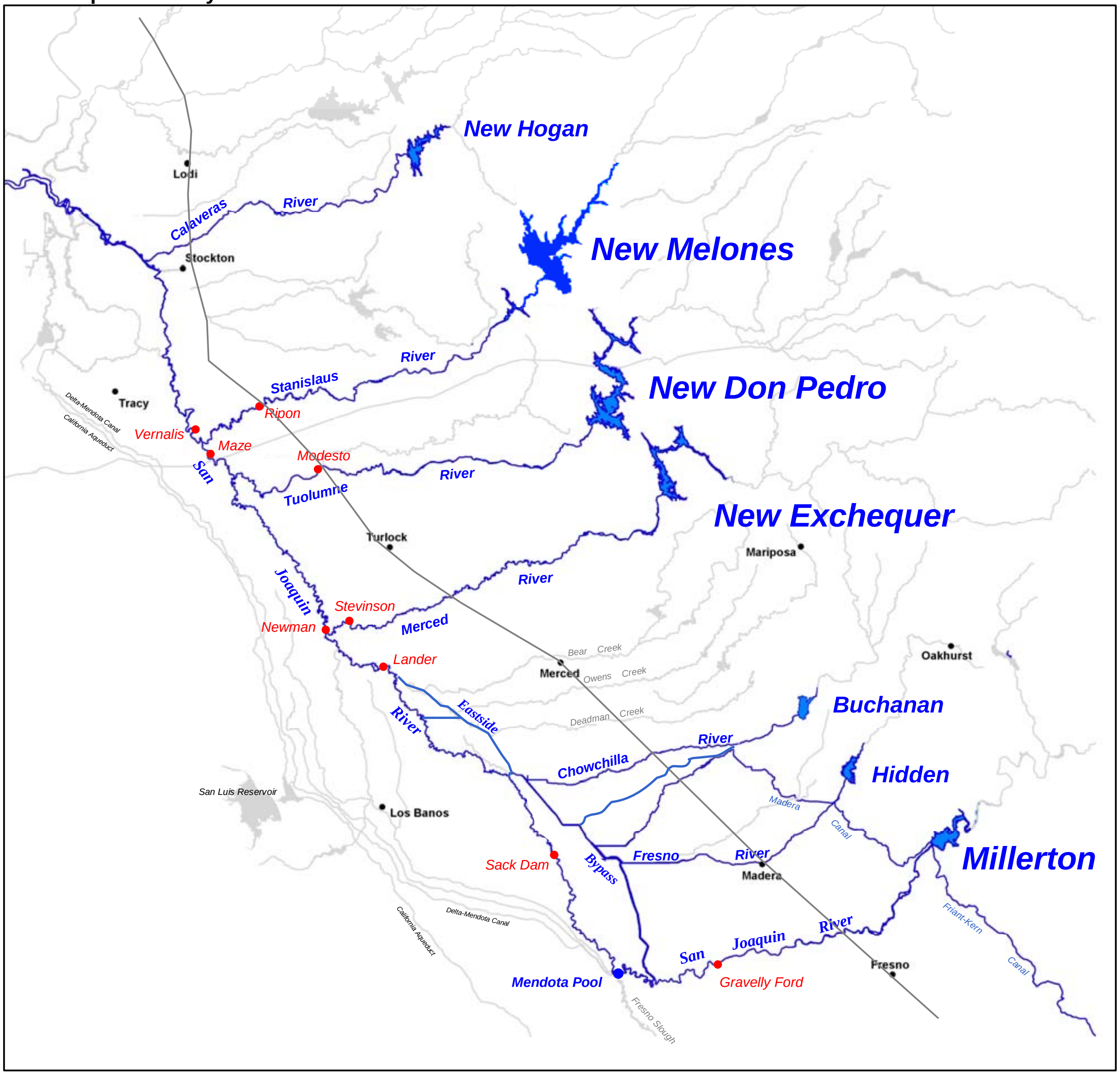
The Tuolumne River experiences an average annual unimpaired runoff of approximately 1,850,000 afy, of which an average of approximately 669,000 afy are released at La Grange Dam to the lower Tuolumne River. Releases below La Grange Dam are guided by FERC flows requirements and range between 94,000 and 301,000 afy. Additional releases occur in excess of FERC requirements during wetter years. The general magnitude and distribution of current releases at La Grange Dam by year type are illustrated in Figure 2-2. The effect of the WSIP on the Don Pedro Project would be to reduce inflow to Don Pedro Reservoir, which, if not affecting TID/MID canal diversions, would lead to a depletion in Don Pedro Reservoir storage. The depletion in reservoir storage would be replenished during wetter years when, absent the WSIP, releases below La Grange Dam would be in excess of required FERC flows. The average annual reduction in flow below La Grange Dam due to the WSIP amounts to approximately 25,000 afy, primarily during wetter years and during the winter or spring period depending on the coincidence of the WSIP's effect on inflow and the sequence of month-to-month and year-to-year hydrology.

The hydrology of the San Joaquin River at Vernalis is illustrated in Figure 2-4. The hydrology at Vernalis is dependent on several factors, including incidental and prescribed operations within the basin for the San Joaquin River. Generally, the flow in the San Joaquin River is a result of the independent operation of the tributaries for purposes specific to their respective watershed basins. An amount of flow interaction with the river also occurs through groundwater accretions, diversions, and return flows from adjacent lands.

The U.S. Bureau of Reclamation's (USBR) Central Valley Project (CVP) New Melones Project regulates the Stanislaus River, which is operated for purposes of water supply, flood control, power generation, fishery enhancement, and water quality improvement in the lower San Joaquin River. The operations of the New Melones Project are partially guided by State Water Resources Control Board (SWRCB) decisions, including Decision 1422 pertaining to releases for existing water rights, fish and wildlife enhancement, and the maintenance of water quality in the Stanislaus River and San Joaquin River. Decision 1641 assigns additional responsibility to the USBR concerning flow requirements at Vernalis.

APPENDIX O4

Figure 2-1
San Joaquin River System



APPENDIX O4

Figure 2-2
Tuolumne River Flow below La Grange Dam

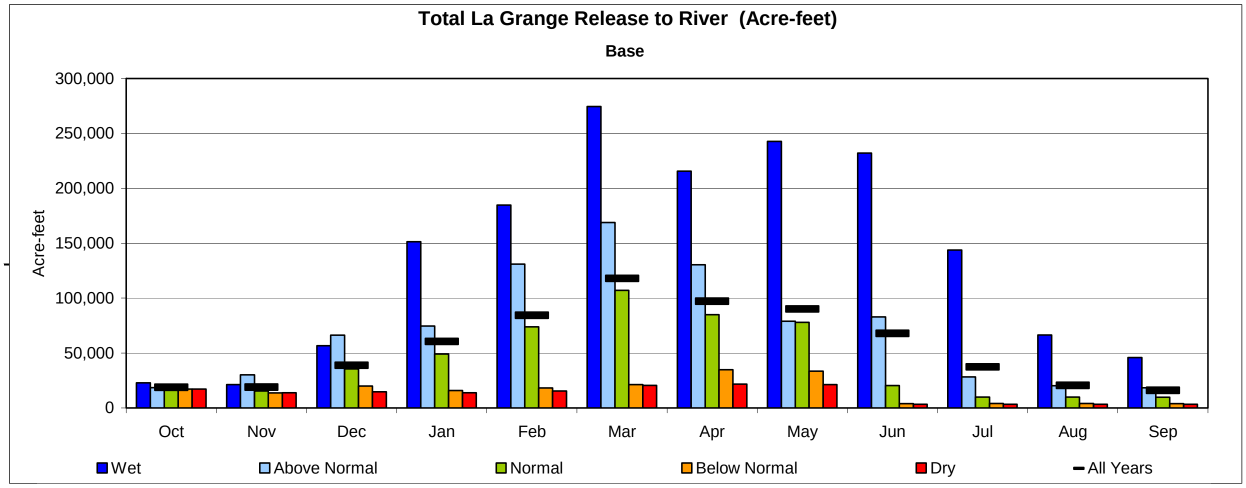


Figure 2-3
Tuolumne River Flow below La Grange Dam – WSIP Effect

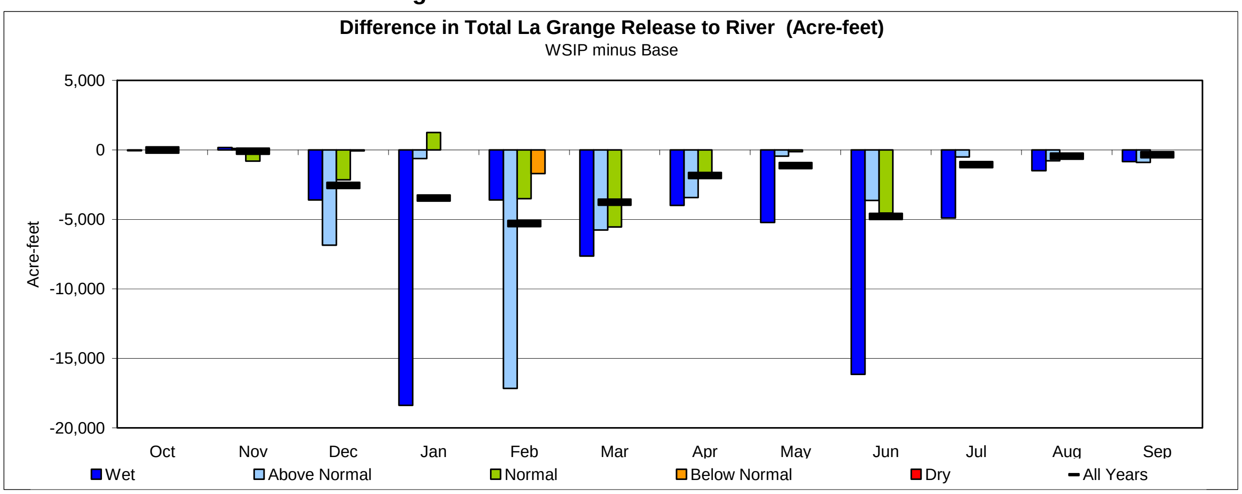
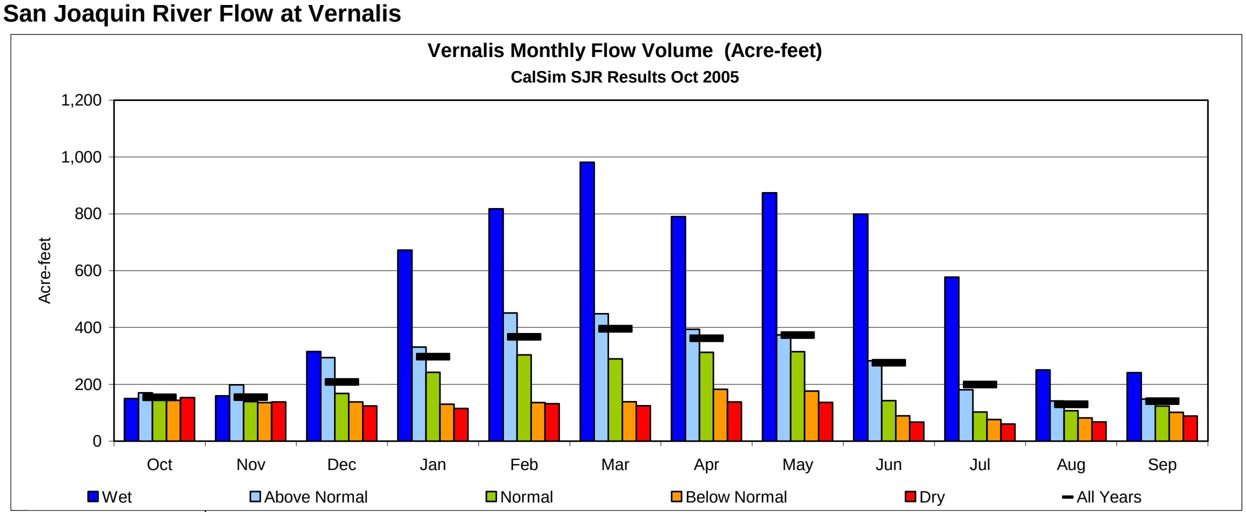


Figure 2-4
San Joaquin River Flow at Vernalis



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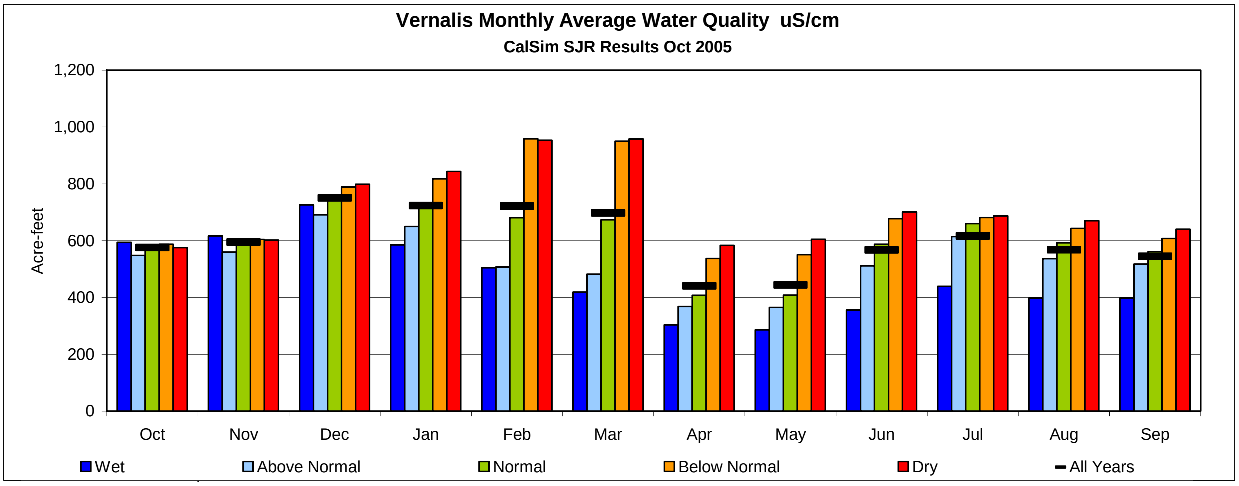
Water quality objectives at Vernalis are established as follows: for the irrigation season (April through August), a running 30-day average conductivity of 0.7 milliSiemens per centimeter (mS/cm); and during the rest of the year, 1.0 mS/cm. Flow requirements at Vernalis are established for the February through June period. Based on the wetness of the San Joaquin River Basin and the required location of a water quality parameter prescribed by Decision 1641 (called “X2”), the “base” required flow at Vernalis ranges between 710 cubic feet per second (cfs) and 3,420 cfs. During a 30-day period in April and May, the Vernalis Adaptive Management Plan (VAMP) flow objective ranges between 3,200 cfs and 7,000 cfs. The SWRCB has assigned the USBR the responsibility for compliance with the Vernalis flow standards, with other entities within the basin contributing towards compliance during the VAMP period through agreement. Water quality (electrical conductivity) at Vernalis is illustrated in Figure 2-5.

Figure 2-5
San Joaquin River Water Quality at Vernalis



The Delta forms the confluence of the Sacramento and San Joaquin Rivers, and is the eastern portion of the San Francisco Bay estuary. The CVP and the State Water Project (SWP) use the Delta channels to convey water to their respective export facilities in the southern Delta. Jones Pumping Plant (CVP) has a pumping capacity of 4,600 cfs; Banks Pumping Plant (SWP) has a pumping capacity of 10,300 cfs, although it is typically constrained to an average pumping capacity of 6,680 cfs. Figure 2-6 illustrates the geographical setting of the Delta.

Through coordinated operation, the CVP and SWP control releases from reservoirs and exports from the Delta to serve water supply contracts totaling several million acre-feet. The Coordinated Operating Agreement (COA) sets guidelines for sharing the supply as well as the responsibility for meeting water quality standards in the Delta. Currently, Delta water quality objectives are prescribed by the 1995 *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* through SWRCB Decision 1641.

In addition to SWRCB requirements, the operations of the CVP and SWP are also affected by the objectives of their various authorizations, requirements under the Endangered Species Act, and legal directives. Most recently, in December 2007 a federal court constrained the export operations of the CVP and SWP while a new federal biological opinion is developed for delta smelt. Additional CVP and SWP operational constraints may be developed for the protection of salmon.

To provide a context for comparing changes in Tuolumne River flow, Table 2-1 illustrates several parameters of historical measured flow within the Delta. For the recent period 1995 through 2006, the average annual total exports from the Delta have amounted to approximately 5,585,000 acre-feet, as computed outflow has been 24,189,000 acre-feet. Measured San Joaquin River flow at Vernalis for the same period, which includes flow from the Tuolumne River, has been an average annual of 4,075,000 acre-feet.

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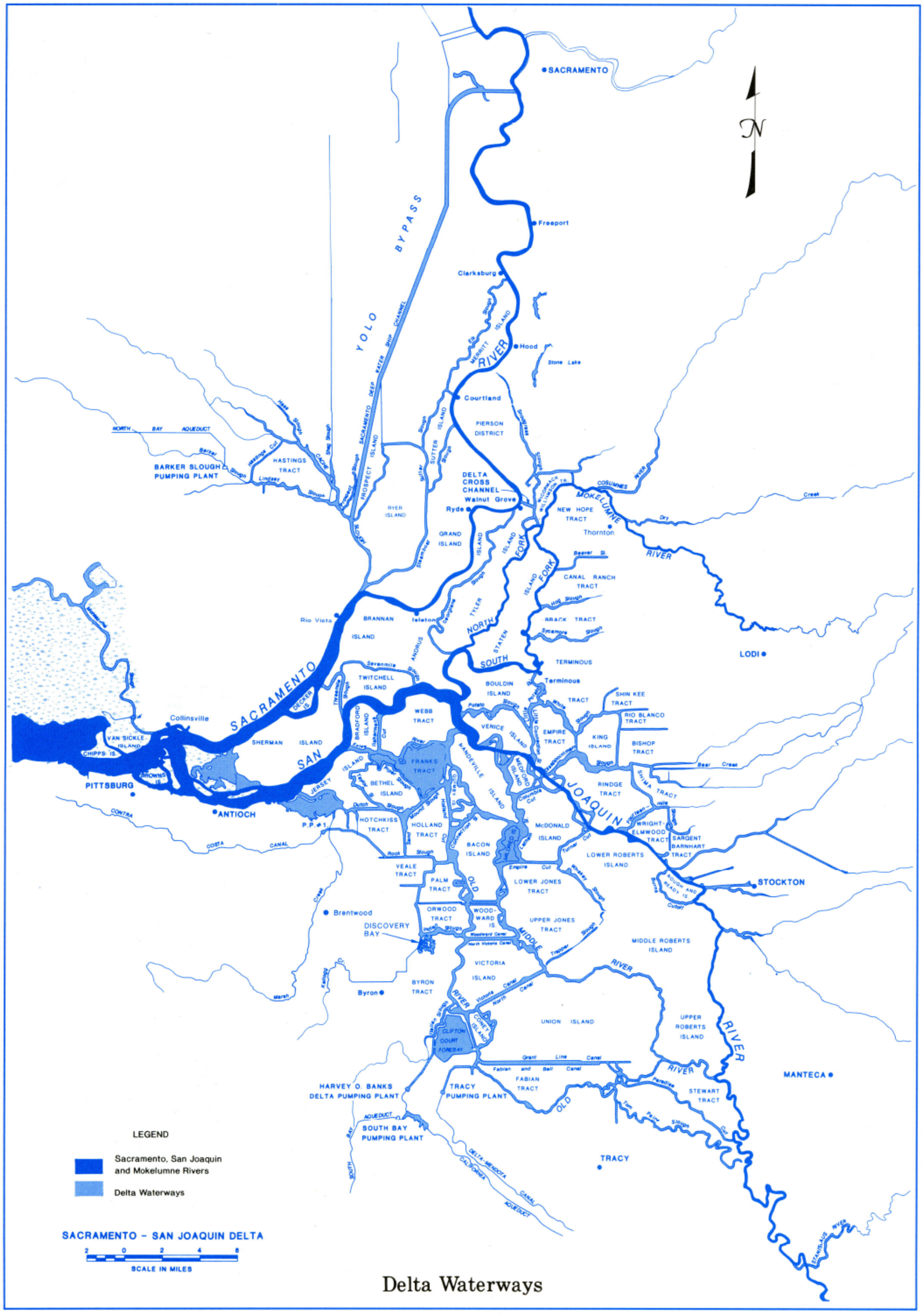
Figure 2-6
Sacramento-San Joaquin Delta



Sacramento–San Joaquin Delta Atlas *Department of Water Resources*

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Table 2-1
Measured Historical Delta Flows

Water Year	Total Exports	Sacramento River Inflow	San Joaquin R Inflow	Delta Ouflow
1971	2,874,333	24,192,000	1,775,014	23,251,928
1972	3,495,757	12,548,000	1,108,825	9,226,357
1973	3,440,149	24,482,000	2,373,013	24,414,917
1974	4,408,835	38,233,000	2,769,796	37,459,002
1975	3,939,862	20,811,000	2,814,656	19,930,841
1976	4,942,896	11,035,000	1,527,879	6,596,232
1977	2,181,995	5,509,000	416,534	2,522,619
1978	4,402,769	20,480,000	4,478,832	21,349,263
1979	4,559,091	13,144,000	2,614,526	11,441,671
1980	4,607,462	25,629,000	5,954,154	28,155,761
1981	4,789,735	11,609,000	1,765,402	7,912,080
1982	4,677,208	37,221,000	5,474,326	40,945,458
1983	4,470,267	48,798,000	15,406,434	64,289,934
1984	3,938,610	27,327,000	6,284,455	30,635,544
1985	5,583,587	12,379,000	2,107,505	8,434,052
1986	5,411,704	28,061,000	5,227,289	29,671,290
1987	5,175,981	10,080,000	1,813,670	6,078,525
1988	5,736,575	9,829,000	1,165,644	4,417,524
1989	6,100,259	12,347,000	1,058,878	6,592,739
1990	5,929,312	9,903,000	915,614	3,933,160
1991	3,294,025	7,652,000	657,097	4,347,499
1992	3,021,048	8,142,000	696,216	5,178,236
1993	4,758,603	21,538,000	1,702,844	19,075,046
1994	4,113,456	11,409,741	1,219,740	6,010,543
1995	5,149,575	27,780,391	6,300,636	41,824,482
1996	5,338,588	25,991,516	3,922,419	25,511,023
1997	5,084,754	30,816,584	6,772,377	34,333,623
1998	4,749,955	38,011,421	8,490,664	43,506,339
1999	4,806,790	23,405,992	3,567,963	22,570,354
2000	6,285,299	21,321,316	2,845,985	18,175,727
2001	5,039,586	10,883,722	1,732,250	6,975,620
2002	5,499,327	13,812,201	1,395,751	9,190,646
2003	6,280,616	19,426,635	1,364,926	14,049,962
2004	6,093,213	20,250,761	1,373,096	14,922,390
2005	6,422,061	17,453,822	3,789,397	15,403,712
2006	6,271,595	41,073,358	7,339,862	43,806,137
2007	5,742,300	11,372,200	1,591,588	
Average	4,827,491	20,377,261	3,292,304	19,781,673

Source: Dayflow record, Interagency Ecological Progarm (http://www.iep.ca.gov/dayflow/)

Total Exports: Banks PP, Jones PP, Contra Costa Pumping

Sacramento River Inflow: Sacramento River and Yolo Byapss

San Joaquin R Inflow: San Joaquin River at Vernalis

Delta Outflow: Net computed outflow at Chipps Island

3. San Joaquin River

The effect of the WSIP on San Joaquin River hydrology is evaluated by a post-process analysis of operation simulations of the Tuolumne River system and the San Joaquin River Basin system. The Tuolumne River system, including the SFPUC regional water system and the Don Pedro Project, is modeled using the HH/LSM, as described in the PEIR. Results are provided from that model for the flow release to the lower Tuolumne River below La Grange Dam. Changes in those projected releases between the PEIR "base" study (current conditions without the WSIP) and a projected future condition (with the WSIP) provide the hydrologic data needed to track the WSIP's effects downstream of La Grange Dam. These projected changes in La Grange Dam releases to the Tuolumne River are combined with a separate San Joaquin River operation simulation to estimate the impacts of the WSIP on San Joaquin River hydrology and operations.

APPENDIX O4

CalSim II, a computer model developed jointly by the Department of Water Resources (DWR) and the USBR, is used to model the San Joaquin River Basin system and much of the Central Valley and Delta region water resources infrastructure system. Focused primarily on the operations of the CVP and SWP, CalSim II necessarily incorporates the simulated operations of non-CVP/SWP projects that exist on tributaries to the San Joaquin and Sacramento Rivers. Explicitly, the operation of the Don Pedro Project is modeled in CalSim II. Although the HH/LSM and CalSim II are different models, the underlying logic of Don Pedro Project operations for each of the models was developed coincidentally and produces very similar results.

A subset of the CalSim II model and its results are used for this analysis of San Joaquin River hydrology. Development of the CalSim II model during 2005 included a refinement of the depiction of San Joaquin River Basin operations and hydrology. For the development process, a stand-alone version of CalSim II focusing on San Joaquin River Basin operations was constructed. This version of the model uses a constant boundary condition for the geographical range of the system outside of the San Joaquin River Basin to speed up the processing of simulations. This approach to CalSim II modeling of the San Joaquin River Basin system is adequate for studies that focus on San Joaquin River operations, which are not greatly dependent on a broader CVP-SWP operation. The model's depiction of the San Joaquin River Basin's current operations and hydrology received a peer review (2005) and was described in a public workshop sponsored by the SWRCB during 2006. The CalSim II results used for that workshop are used for this analysis.[1]

3.1 Releases to the Tuolumne River at La Grange Dam

As described above, the effect of the WSIP on the Don Pedro Project would be to reduce inflow to Don Pedro Reservoir, which would lead to depletions in Don Pedro Reservoir storage. The depletion in reservoir storage would be replenished during wetter years when, absent the WSIP, releases below La Grange Dam would be in excess of FERC-required flows. Table 3.1-1 and Table 3.1-2 illustrate the projected monthly releases at La Grange Dam to the Tuolumne River for the WSIP and base settings for the 82-year simulation period (1921-2002). Table 3.1-3 illustrates the projected difference in releases at La Grange Dam due to the WSIP's effect on Don Pedro Project operations.[2] The average annual reduction in flow below La Grange Dam due to the WSIP would amount to approximately 25,000 afy, primarily during wetter years and during the winter or spring period depending on the coincidence of the WSIP's effect on inflow and the sequence of month-to-month and year-to-year hydrology. The projected difference in releases from La Grange Dam (comparing the WSIP and base settings), ranked in descending order of wetness in the San Joaquin River Basin runoff, is illustrated in Table 3.1-4. These changes in La Grange Dam releases to the lower Tuolumne River would change the flow in the Tuolumne River between La Grange Dam and the confluence with the San Joaquin River. The flow projected in the San Joaquin River between the Tuolumne River confluence and the Stanislaus River confluence would be similarly changed.

3.2 Flow Upstream of the Stanislaus River Confluence

The flow of the San Joaquin River upstream of the Stanislaus River confluence (commonly referred to as the "Maze" Boulevard crossing of the San Joaquin River) is a point of interest in the identification of San Joaquin River hydrology. The tributary operations upstream of the Stanislaus River confluence (e.g., the Tuolumne River and Merced River) are generally not required to be responsive to San Joaquin River conditions. Therefore, the changes in the hydrology of the San Joaquin River upstream of the Stanislaus River due to the WSIP can be described by the change in hydrology that occurs at La Grange Dam. Downstream of the Stanislaus River confluence, the San Joaquin River hydrology may also include the reactions of the USBR's New Melones Project (Stanislaus River) to changes in the river at Maze; that is, reactions to both flow and water quality conditions. Projected changes in San Joaquin River flow upstream of the Stanislaus River confluence at Maze are illustrated in Figure 3.2-1 through Figure 3.2-4.[2] The figures illustrate the wetness rank-ordered flow at Maze with the projected coincidental change in

[1] CalSim II studies supporting a presentation of the San Joaquin River Group Authority to the State Water Resources Control Board regarding CalSim II – San Joaquin River Basin Development, Refinements and Results, April 24, 2006. Notice and materials of workshop can be found at http://www.waterrights.ca.gov/baydelta/Notices.htm.

[2] La Grange Dam release results are from the HH/LSM. Maze and San Joaquin River results are from CalSim II.

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Table 3.1-1
Total La Grange Release to River (Acre-feet) – WSIP

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	231,996	111,640	64,123	14,876	15,372	15,372	14,876	547,810
1922	24,397	17,852	18,447	18,447	16,661	169,885	167,789	61,936	470,876	59,363	27,204	24,862	1,077,719
1923	24,397	17,852	52,816	101,025	90,321	34,926	156,958	61,936	14,876	15,372	15,372	14,876	600,727
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	240,822
1928	24,397	17,852	18,447	18,447	53,135	208,209	37,200	35,902	4,463	4,612	4,612	4,463	431,739
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	54,167	204,086	168,811	61,936	14,876	15,372	15,372	14,876	628,639
1937	24,397	17,852	18,447	18,447	194,659	260,123	177,081	61,936	14,876	15,372	15,372	14,876	833,438
1938	24,397	17,852	88,717	79,596	381,104	454,579	291,007	288,864	227,401	156,701	48,636	34,811	2,093,665
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	196,482	163,672	61,936	14,876	15,372	15,372	14,876	527,809
1941	24,397	17,852	18,447	59,195	262,128	284,760	249,836	61,936	49,928	88,796	26,488	21,347	1,165,110
1942	24,397	17,852	41,845	150,525	153,324	148,197	218,453	228,994	91,485	115,177	26,854	17,017	1,234,120
1943	24,397	17,852	32,826	197,464	149,252	336,578	194,801	61,936	72,671	15,372	17,014	17,597	1,137,760
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	86,052	215,383	119,005	61,936	14,876	15,372	15,372	14,876	588,045
1946	24,397	25,160	229,316	136,983	150,231	166,940	68,500	61,936	14,876	15,372	15,372	14,876	923,959
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	227,649	225,258	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,048,093
1952	13,240	10,413	10,760	10,760	56,975	213,745	258,495	264,611	230,309	162,673	38,667	32,093	1,302,741
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	9,223	397,642	218,902	177,380	103,683	61,936	153,608	108,969	29,023	30,608	1,309,123
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	173,384	311,309	268,728	276,764	96,627	36,329	32,935	1,250,968
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	17,256	18,447	28,168	27,263	4,463	4,612	4,612	4,463	188,427
1965	9,223	8,926	9,223	94,896	193,710	157,615	159,589	61,936	14,876	15,372	32,886	32,779	791,031
1966	24,397	22,517	119,607	51,266	82,677	61,610	32,240	31,252	4,463	4,612	4,612	4,463	443,716
1967	12,744	10,711	11,068	11,068	9,997	84,982	252,040	220,298	388,802	257,232	131,931	28,007	1,418,880
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	32,847	276,920	244,541	322,211	447,942	425,936	156,634	66,306	35,885	2,036,594
1970	24,397	17,852	73,665	370,017	136,129	162,608	64,241	61,936	14,876	15,372	15,372	14,876	971,341
1971	24,397	17,852	18,447	18,447	16,661	70,249	66,522	63,363	4,463	4,612	4,612	4,463	314,088
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	35,698	15,372	15,372	14,876	261,644
1974	24,397	42,215	100,199	144,039	84,226	200,904	125,080	61,936	182,580	15,372	23,592	26,455	1,030,995
1975	24,397	17,852	18,447	18,447	112,415	201,425	100,944	61,936	174,642	21,358	50,309	29,597	831,769
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	71,448	15,372	15,372	14,876	295,907
1979	24,397	17,852	18,447	25,892	150,953	195,605	90,635	338,861	14,876	15,372	15,372	14,876	923,138
1980	24,397	17,852	18,447	183,143	376,597	204,132	110,674	105,463	278,671	152,585	41,442	36,580	1,549,983
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	32,535	338,147	314,765	511,142	350,499	260,216	155,711	59,424	132,689	2,189,651
1983	155,278	142,160	252,175	268,145	324,750	929,999	277,685	441,769	223,430	236,135	186,588	171,850	3,609,964
1984	24,397	262,407	413,016	228,905	204,697	159,934	64,241	61,936	14,876	15,372	15,372	14,876	1,480,029
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	156,378	441,405	148,505	177,029	197,577	15,372	15,372	17,744	1,205,977
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	23,914	248,373
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	444,650	252,480	587,468	266,389	378,373	180,518	51,840	2,206,644
1996	24,397	17,852	18,447	18,447	282,350	273,866	138,689	137,214	166,467	15,372	15,372	21,277	1,129,750
1997	24,397	42,957	363,466	949,830	195,855	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,905,139
1998	24,397	17,852	18,447	18,548	334,719	269,674	194,691	338,154	410,419	282,802	127,440	28,820	2,065,963
1999	24,397	17,852	43,763	118,488	288,111	189,381	85,028	61,936	14,876	15,372	15,372	14,876	889,452
2000	24,397	17,852	18,447	18,447	187,912	217,038	100,903	61,936	92,171	15,372	15,372	14,876	784,723
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,815	18,888	36,241	57,087	79,135	114,179	95,290	88,906	63,139	36,354	20,200	15,774	644,009
Max (21-02)	155,278	262,407	413,016	949,830	381,104	929,999	511,142	587,468	470,876	378,373	186,588	171,850	3,609,964
Min (21-02)	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999

APPENDIX O4

Table 3.1-2
Total La Grange Release to River (Acre-feet) – Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	12,744	10,711	11,068	11,068	33,964	245,398	114,894	64,123	14,876	15,372	15,372	14,876	564,466
1922	24,397	17,852	18,447	18,447	21,795	177,197	175,154	61,936	486,912	61,546	27,209	24,862	1,115,754
1923	24,397	17,852	52,816	101,025	90,321	34,926	159,076	61,936	14,876	15,372	15,372	14,876	602,845
1924	24,397	17,852	18,447	18,447	17,256	18,447	14,650	14,589	2,975	3,074	3,074	2,975	156,183
1925	7,736	8,926	9,223	9,223	8,331	9,223	73,158	69,584	4,463	4,612	4,612	4,463	213,554
1926	13,240	10,413	10,760	10,760	9,719	10,760	31,566	30,449	4,463	4,612	4,612	4,463	145,817
1927	9,223	8,926	9,223	9,223	8,331	9,223	64,241	61,936	41,783	15,372	24,317	28,032	289,830
1928	24,397	38,122	52,916	21,575	67,986	208,208	46,105	35,902	4,463	4,612	4,612	4,463	513,361
1929	12,744	10,711	11,068	11,068	9,997	11,068	26,770	25,952	2,975	3,074	3,074	2,975	131,476
1930	9,223	8,926	9,223	9,223	8,331	9,223	27,049	26,214	2,975	3,074	3,074	2,975	119,510
1931	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1932	7,736	8,926	9,223	9,223	8,628	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,632
1933	24,397	17,852	18,447	18,447	16,661	18,447	35,753	34,374	4,463	4,612	4,612	4,463	202,528
1934	9,223	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	95,486
1935	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	14,876	15,372	15,372	14,876	239,335
1936	24,397	17,852	18,447	18,447	301,206	220,976	172,446	61,936	14,876	15,372	15,372	14,876	896,203
1937	24,397	17,852	18,447	18,447	210,859	263,318	185,594	61,936	14,876	15,372	15,372	14,876	861,346
1938	24,397	17,852	108,307	79,596	381,104	454,618	298,150	305,878	232,281	156,701	50,809	34,816	2,144,509
1939	24,397	17,852	18,447	18,447	45,240	66,009	28,525	27,598	4,463	4,612	4,612	4,463	264,665
1940	9,223	8,926	9,223	9,223	8,628	234,677	169,350	61,936	14,876	15,372	15,372	14,876	571,682
1941	24,397	17,852	18,447	55,884	262,574	285,182	250,355	61,936	53,464	90,980	26,493	21,347	1,168,911
1942	24,397	17,852	41,845	156,067	153,323	150,861	223,977	231,848	94,247	117,365	26,854	17,017	1,255,653
1943	24,397	17,852	32,826	197,464	149,252	338,579	201,522	61,936	76,970	15,372	19,188	17,602	1,152,960
1944	24,397	17,852	18,447	18,447	17,256	55,093	47,894	45,898	4,463	4,612	4,612	4,463	263,434
1945	13,240	10,413	10,760	10,760	123,508	230,698	119,207	61,936	14,876	15,372	15,372	14,876	641,018
1946	24,397	17,852	229,210	136,983	150,231	179,148	72,112	61,936	14,876	15,372	15,372	14,876	932,365
1947	24,397	17,852	18,447	18,447	16,661	18,447	28,054	27,156	4,463	4,612	4,612	4,463	187,611
1948	9,223	8,926	9,223	9,223	8,628	9,223	39,947	38,477	4,463	4,612	4,612	4,463	151,020
1949	12,744	10,711	11,068	11,068	9,997	11,068	33,037	31,999	4,463	4,612	4,612	4,463	149,842
1950	12,744	10,711	11,068	11,068	9,997	11,068	61,680	58,823	4,463	4,612	4,612	4,463	205,309
1951	13,240	10,413	344,203	225,255	195,815	153,328	104,899	99,341	4,463	4,612	4,612	4,463	1,164,644
1952	13,240	10,413	10,760	10,760	78,332	213,745	258,495	280,490	232,426	162,673	40,841	32,097	1,344,272
1953	24,397	17,852	18,447	27,845	60,046	18,447	87,632	83,153	4,463	4,612	4,612	4,463	355,969
1954	13,240	10,413	10,760	10,760	9,719	10,760	41,422	39,831	4,463	4,612	4,612	4,463	165,055
1955	13,240	10,413	10,760	10,760	9,719	10,760	31,555	30,438	4,463	4,612	4,612	4,463	145,795
1956	9,223	8,926	46,291	436,178	218,897	180,935	106,751	61,936	162,942	111,157	29,023	30,608	1,402,867
1957	24,397	17,852	18,447	18,447	16,661	25,078	85,025	80,709	4,463	4,612	4,612	4,463	304,766
1958	13,240	10,413	10,760	10,760	9,719	211,842	311,309	280,218	277,777	98,815	36,329	32,935	1,304,117
1959	24,397	17,852	18,447	18,447	32,284	59,822	28,824	27,878	4,463	4,612	4,612	4,463	246,101
1960	9,223	8,926	9,223	9,223	8,628	9,223	24,895	24,194	2,975	3,074	3,074	2,975	115,633
1961	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1962	7,736	8,926	9,223	9,223	8,331	9,223	94,959	90,022	4,463	4,612	4,612	4,463	255,793
1963	13,240	10,413	10,760	10,760	9,719	10,760	64,241	61,936	14,876	15,372	15,372	14,876	252,325
1964	24,397	17,852	18,447	18,447	29,030	18,447	28,168	27,263	4,463	4,612	4,612	4,463	200,201
1965	9,223	8,926	9,223	280,632	198,842	168,325	169,358	61,936	14,876	15,372	21,883	32,755	991,351
1966	24,397	22,516	120,759	51,266	99,846	61,610	32,240	31,252	4,463	4,612	4,612	4,463	462,036
1967	12,744	10,711	11,068	11,068	9,997	103,480	252,040	232,725	388,802	259,420	134,115	28,012	1,454,182
1968	24,397	17,852	18,447	18,447	17,256	32,584	28,988	28,031	4,463	4,612	4,612	4,463	204,152
1969	9,223	8,926	9,223	58,091	279,368	255,378	329,852	450,130	428,053	156,634	68,480	35,889	2,089,247
1970	24,397	17,852	73,665	343,421	142,086	183,682	64,241	61,936	14,876	15,372	15,372	14,876	971,776
1971	24,397	17,852	18,447	18,447	16,661	85,781	66,522	63,363	4,463	4,612	4,612	4,463	329,620
1972	13,240	10,413	10,760	10,760	10,066	10,760	30,579	29,524	2,975	3,074	3,074	2,975	138,200
1973	9,223	8,926	9,223	9,223	8,331	16,427	64,861	61,936	96,088	15,372	15,372	14,876	329,858
1974	24,397	42,215	100,199	152,431	84,225	211,369	129,683	61,936	192,487	15,372	25,766	26,460	1,066,540
1975	24,397	17,852	18,447	18,447	112,415	201,425	109,230	61,936	168,121	23,541	50,313	29,597	835,721
1976	35,185	23,322	33,098	18,447	17,256	18,447	20,660	20,224	2,975	3,074	3,074	2,975	198,737
1977	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999
1978	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	160,931	15,372	15,372	14,876	385,390
1979	24,397	17,852	18,447	29,457	150,953	211,824	92,753	341,049	14,876	15,372	15,372	14,876	947,228
1980	24,397	17,852	18,447	175,502	376,598	211,743	115,553	107,651	280,789	154,773	41,442	36,580	1,561,327
1981	24,397	17,852	18,447	18,447	16,661	22,926	29,256	28,454	4,463	4,612	4,612	4,463	194,590
1982	12,744	10,711	11,068	59,750	349,698	314,765	511,142	352,402	262,057	155,711	63,782	134,816	2,238,646
1983	156,324	139,398	253,127	268,146	324,750	929,999	277,685	451,311	228,033	238,323	186,588	174,030	3,627,714
1984	24,397	260,868	413,016	228,905	204,697	155,998	64,241	61,936	14,876	15,372	15,372	14,876	1,474,554
1985	24,397	17,852	18,447	18,447	16,661	18,447	34,634	33,325	4,463	4,612	4,612	4,463	200,360
1986	9,223	8,926	9,223	9,223	173,491	461,532	159,805	182,071	202,457	15,372	15,372	19,911	1,266,606
1987	24,397	17,852	18,447	18,447	16,661	18,447	25,003	24,296	2,975	3,074	3,074	2,975	175,648
1988	7,736	8,926	9,223	9,223	8,628	9,223	19,297	18,947	2,975	3,074	3,074	2,975	103,301
1989	7,736	8,926	9,223	9,223	8,331	9,223	26,519	25,717	2,975	3,074	3,074	2,975	116,996
1990	7,736	8,926	9,223	9,223	8,331	9,223	19,866	19,480	2,975	3,074	3,074	2,975	104,106
1991	7,736	8,926	9,223	9,223	8,331	9,223	26,397	25,603	2,975	3,074	3,074	2,975	116,760
1992	7,736	8,926	9,223	9,223	8,628	9,223	20,501	20,075	2,975	3,074	3,074	2,975	105,633
1993	7,736	8,926	9,223	9,223	8,331	9,223	64,241	61,936	145,263	78,663	37,258	28,803	468,826
1994	24,397	17,852	18,447	18,447	16,661	18,447	26,774	25,956	2,975	3,074	3,074	2,975	179,079
1995	9,223	8,926	9,223	9,223	8,331	453,913	261,686	589,371	268,231	380,561	180,518	54,017	2,233,223
1996	24,397	17,852	18,447	18,447	284,044	273,866	143,569	142,256	171,347	15,372	15,372	23,444	1,148,413
1997	24,397	42,960	363,466	956,038	195,854	141,961	64,241	61,936	14,876	15,372	15,372	14,876	1,911,349
1998	24,397	17,852	18,447	37,270	334,716	272,793	205,739	342,054	414,193	284,990	127,440	28,820	2,108,711
1999	24,397	17,852	43,763	118,488	288,111	197,943	96,010	61,936	14,876	15,372	15,372	14,876	908,996
2000	24,397	17,852	18,447	18,447	207,006	217,038	100,903	61,936	104,647	15,372	15,372	14,876	816,293
2001	24,397	17,852	18,447	18,447	16,661	58,155	28,763	27,821	4,463	4,612	4,612	4,463	228,693
2002	9,223	8,926	9,223	9,223	8,331	9,223	32,775	31,582	4,463	4,612	4,612	4,463	136,656
Avg (21-02)	18,828	18,994	38,798	60,559	84,433	117,947	97,139	90,047	67,933	37,419	20,654	16,126	668,876
Max (21-02)	156,324	260,868	413,016	956,038	381,104	929,999	511,142	589,371	486,912	380,561	186,588	174,030	3,627,714
Min (21-02)	7,736	8,926	9,223	9,223	8,331	9,223	14,650	14,589	2,975	3,074	3,074	2,975	93,999

APPENDIX O4

Table 3.1-3
Total La Grange Release to River (Acre-feet) – Difference WSIP minus Base

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
Avg (21-02)	-13	-106	-2,557	-3,472	-5,298	-3,768	-1,849	-1,141	-4,793	-1,065	-454	-352	-24,868
Max (21-02)	0	7,308	106	26,596	5	3,936	0	0	6,521	0	11,003	24	5,475
Min (21-02)	-1,046	-20,270	-116,554	-185,736	-247,039	-38,458	-11,300	-17,014	-130,387	-63,291	-21,886	-13,156	-267,564

APPENDIX O4

Table 3.1-4
Total La Grange Release to River (Acre-feet) – Difference WSIP minus Base

Matrix Data for Water Year 1921-2002 Rank Ordered by Descending SJR Index

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1983	-1,046	2,762	-952	-1	0	0	0	-9,542	-4,603	-2,188	0	-2,180	-17,750
1969	0	0	0	-25,244	-2,448	-10,837	-7,641	-2,188	-2,117	0	-2,174	-4	-52,653
1995	0	0	0	0	0	-9,263	-9,206	-1,903	-1,842	-2,188	0	-2,177	-26,579
1938	0	0	-19,590	0	0	-39	-7,143	-17,014	-4,880	0	-2,173	-5	-50,844
1998	0	0	0	-18,722	3	-3,119	-11,048	-3,900	-3,774	-2,188	0	0	-42,748
1982	0	0	0	-27,215	-11,551	0	0	-1,903	-1,841	0	-4,358	-2,127	-48,995
1967	0	0	0	0	0	-18,498	0	-12,427	0	-2,188	-2,184	-5	-35,302
1952	0	0	0	0	-21,357	0	0	-15,879	-2,117	0	-2,174	-4	-41,531
1958	0	0	0	0	0	-38,458	0	-11,490	-1,013	-2,188	0	0	-53,149
1980	0	0	0	7,641	-1	-7,611	-4,879	-2,188	-2,118	-2,188	0	0	-11,344
1978	0	0	0	0	0	0	0	0	-89,483	0	0	0	-89,483
1922	0	0	0	0	-5,134	-7,312	-7,365	0	-16,036	-2,183	-5	0	-38,035
1956	0	0	-37,068	-38,536	5	-3,555	-3,068	0	-9,334	-2,188	0	0	-93,744
1942	0	0	0	-5,542	1	-2,664	-5,524	-2,854	-2,762	-2,188	0	0	-21,533
1941	0	0	0	3,311	-446	-422	-519	0	-3,536	-2,184	-5	0	-3,801
1986	0	0	0	0	-17,113	-20,127	-11,300	-5,042	-4,880	0	0	-2,167	-60,629
1993	0	0	0	0	0	0	0	0	-130,387	-63,291	-21,886	-4,889	-220,453
1997	0	-3	0	-6,208	1	0	0	0	0	0	0	0	-6,210
1996	0	0	0	0	-1,694	0	-4,880	-5,042	-4,880	0	0	-2,167	-18,663
1943	0	0	0	0	0	-2,001	-6,721	0	-4,299	0	-2,174	-5	-15,200
1937	0	0	0	0	-16,200	-3,195	-8,513	0	0	0	0	0	-27,908
1974	0	0	0	-8,392	1	-10,465	-4,603	0	-9,907	0	-2,174	-5	-35,545
1975	0	0	0	0	0	0	-8,286	0	6,521	-2,183	-4	0	-3,952
1965	0	0	0	-185,736	-5,132	-10,710	-9,769	0	0	0	11,003	24	-200,320
1936	0	0	0	0	-247,039	-16,890	-3,635	0	0	0	0	0	-267,564
1984	0	1,539	0	0	0	3,936	0	0	0	0	0	0	5,475
1979	0	0	0	-3,565	0	-16,219	-2,118	-2,188	0	0	0	0	-24,090
1945	0	0	0	0	-37,456	-15,315	-202	0	0	0	0	0	-52,973
1999	0	0	0	0	0	-8,562	-10,982	0	0	0	0	0	-19,544
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-26,907	0	-8,945	-13,156	-49,008
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1946	0	7,308	106	0	0	-12,208	-3,612	0	0	0	0	0	-8,406
1973	0	0	0	0	0	-7,204	-620	0	-60,390	0	0	0	-68,214
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
2000	0	0	0	0	-19,094	0	0	0	-12,476	0	0	0	-31,570
1940	0	0	0	0	0	-38,195	-5,678	0	0	0	0	0	-43,873
1923	0	0	0	0	0	0	-2,118	0	0	0	0	0	-2,118
1921	0	0	0	0	0	-13,402	-3,254	0	0	0	0	0	-16,656
1970	0	0	0	26,596	-5,957	-21,074	0	0	0	0	0	0	-435
1951	0	0	-116,554	3	0	0	0	0	0	0	0	0	-116,551
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	0	0	-15,532	0	0	0	0	0	0	-15,532
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1928	0	-20,270	-34,469	-3,128	-14,851	1	-8,905	0	0	0	0	0	-81,622
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	0	1	-1,152	0	-17,169	0	0	0	0	0	0	0	-18,320
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-11,774	0	0	0	0	0	0	0	-11,774
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0

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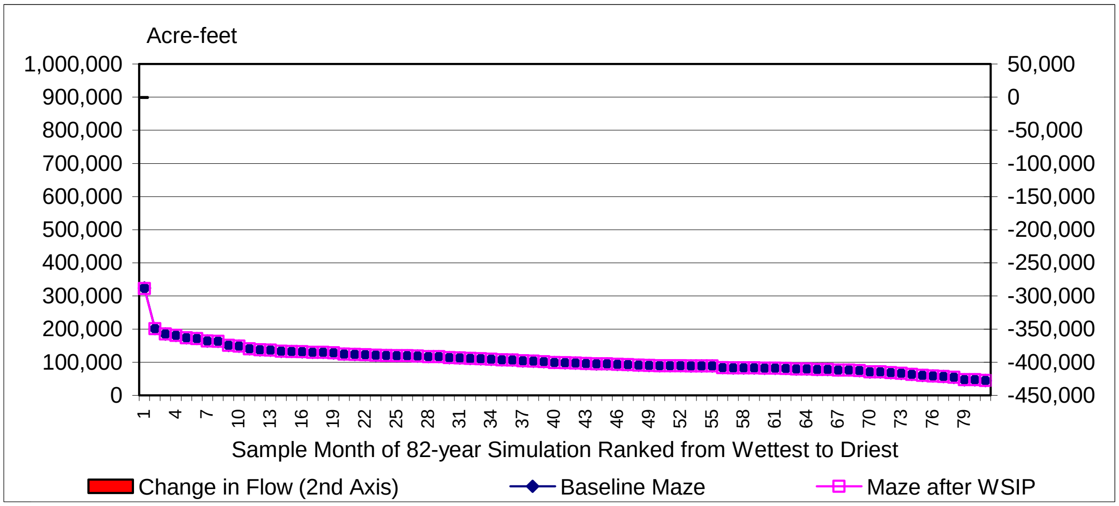
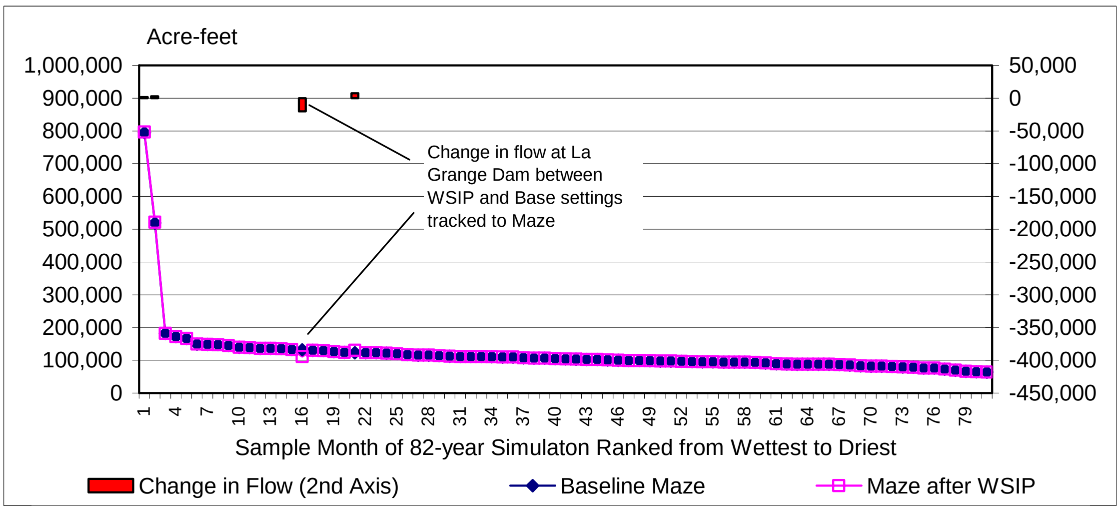
Figure 3.2-1
San Joaquin River Flow Upstream of Stanislaus River Confluence – October through December

October



November



December

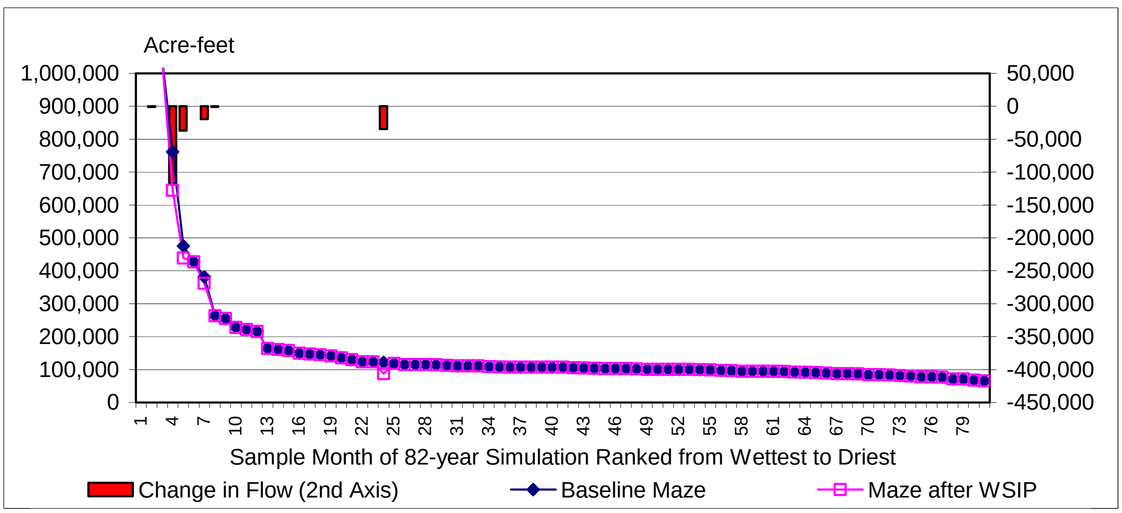
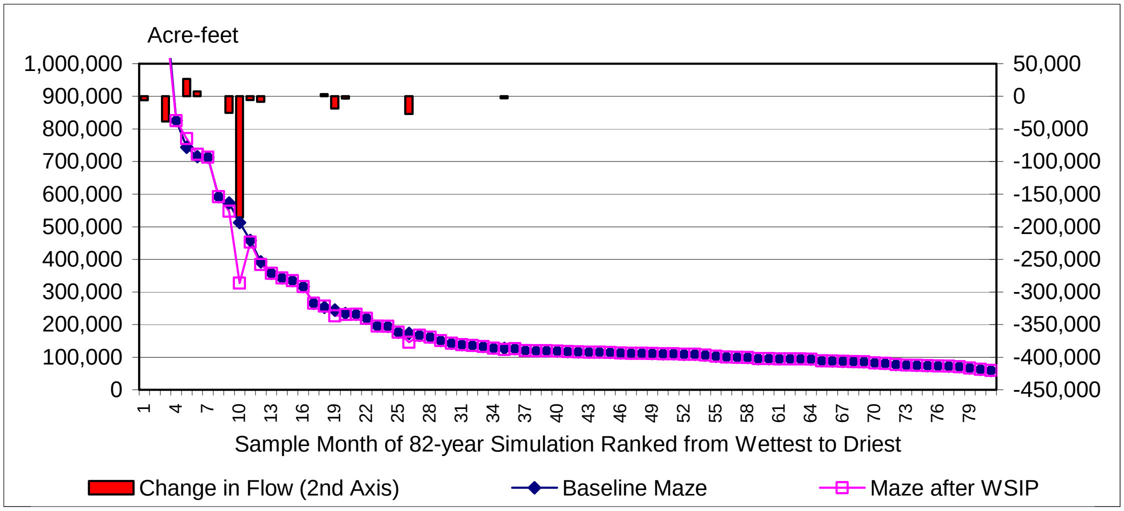
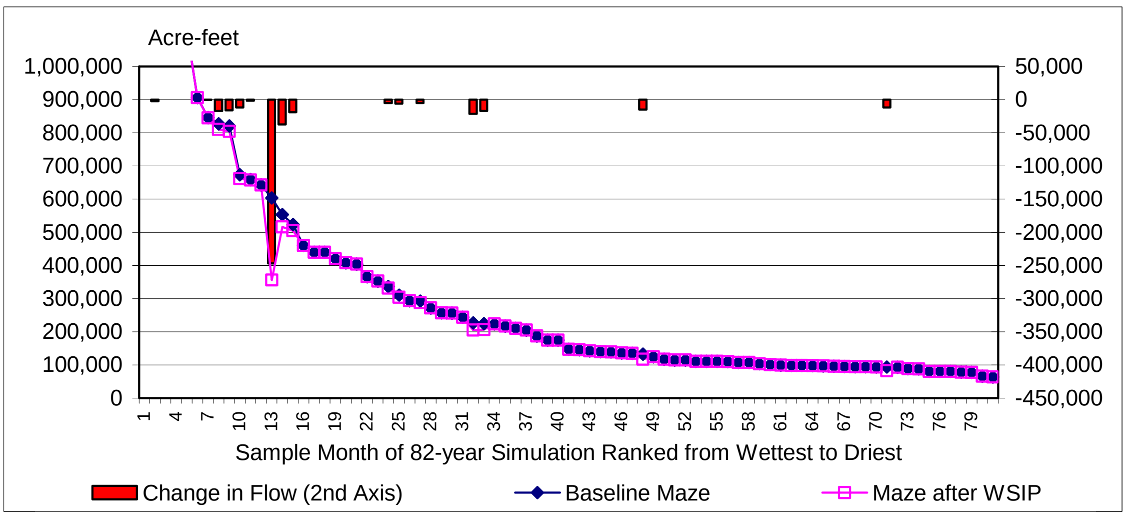


Figure 3.2-2
San Joaquin River Flow Upstream of Stanislaus River Confluence – January through March

January



February



March

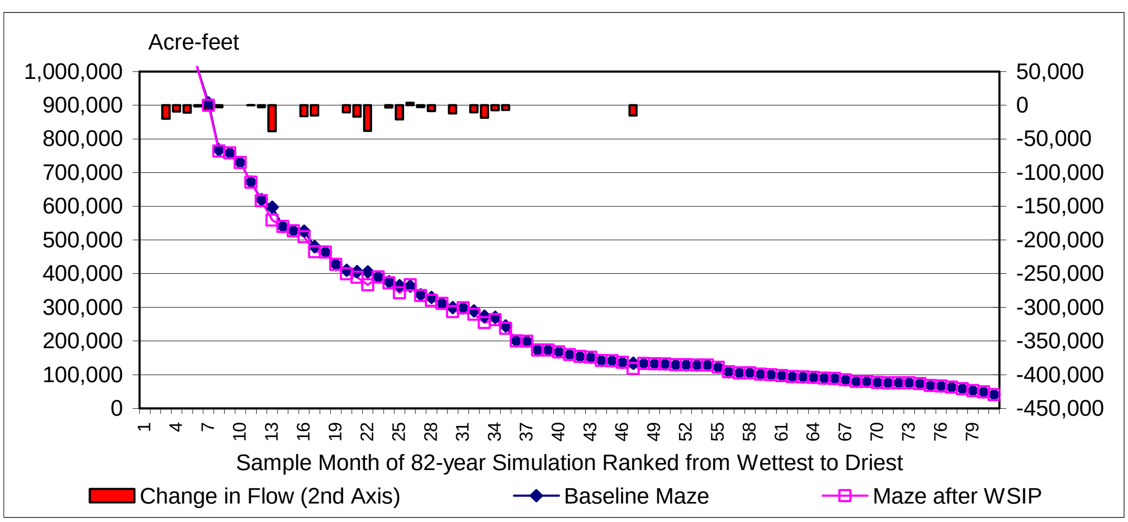
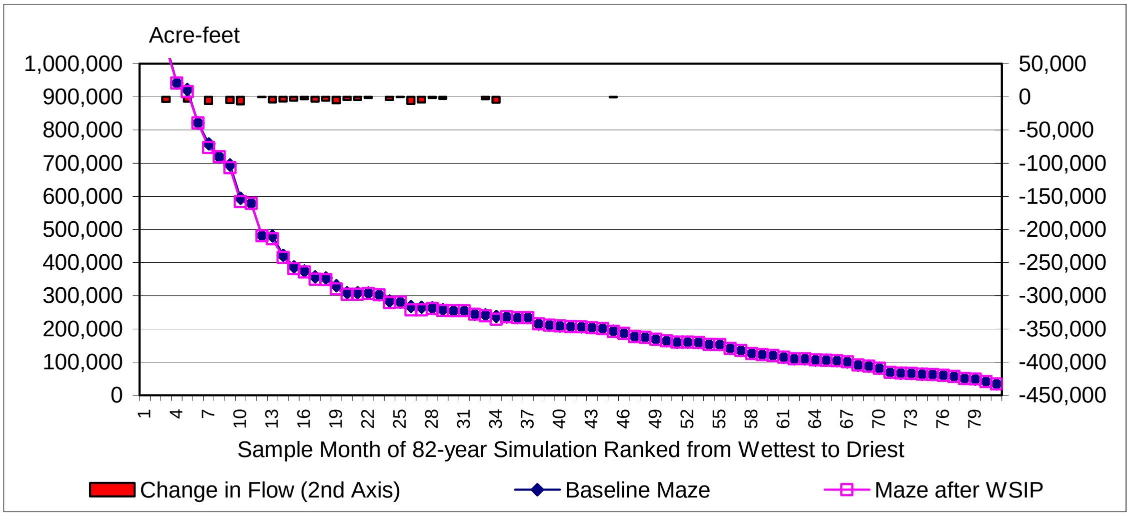
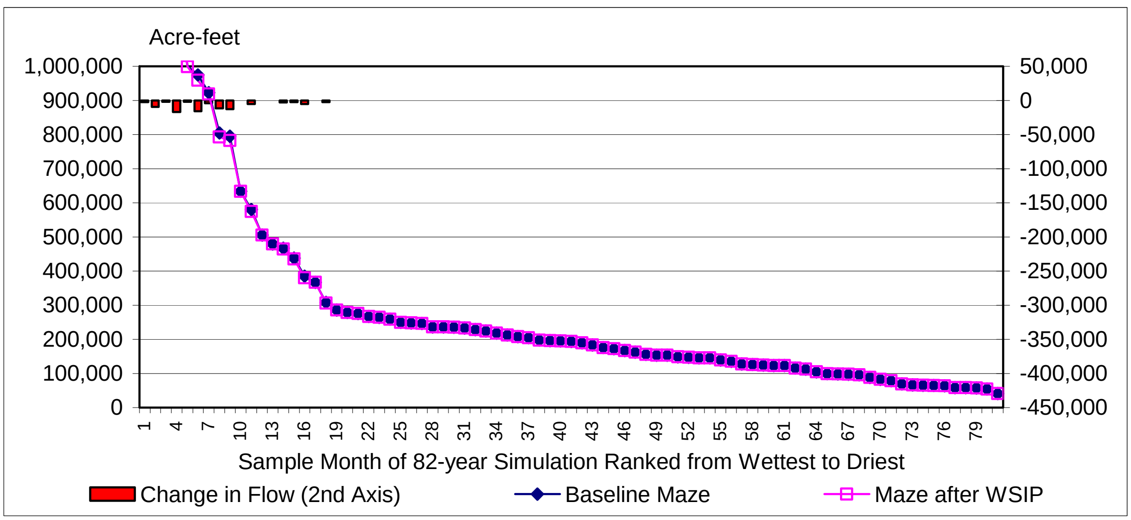


Figure 3.2-3
San Joaquin River Flow Upstream of Stanislaus River Confluence – April through June

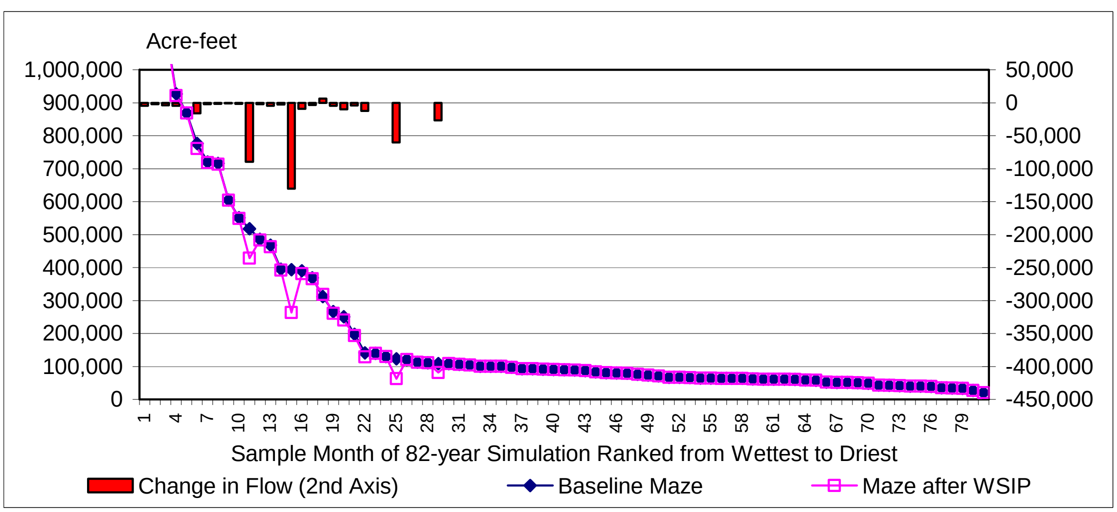
April



May



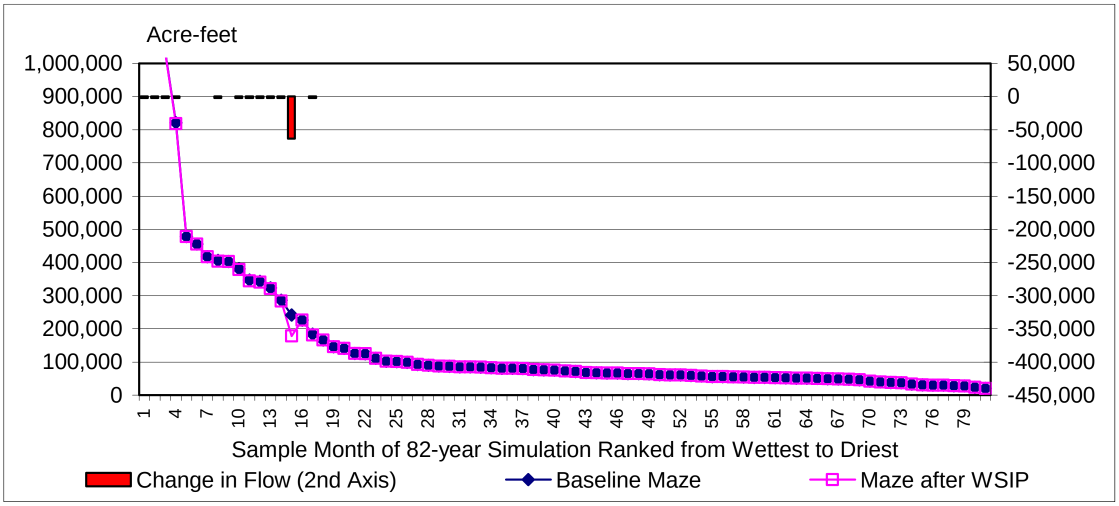
June



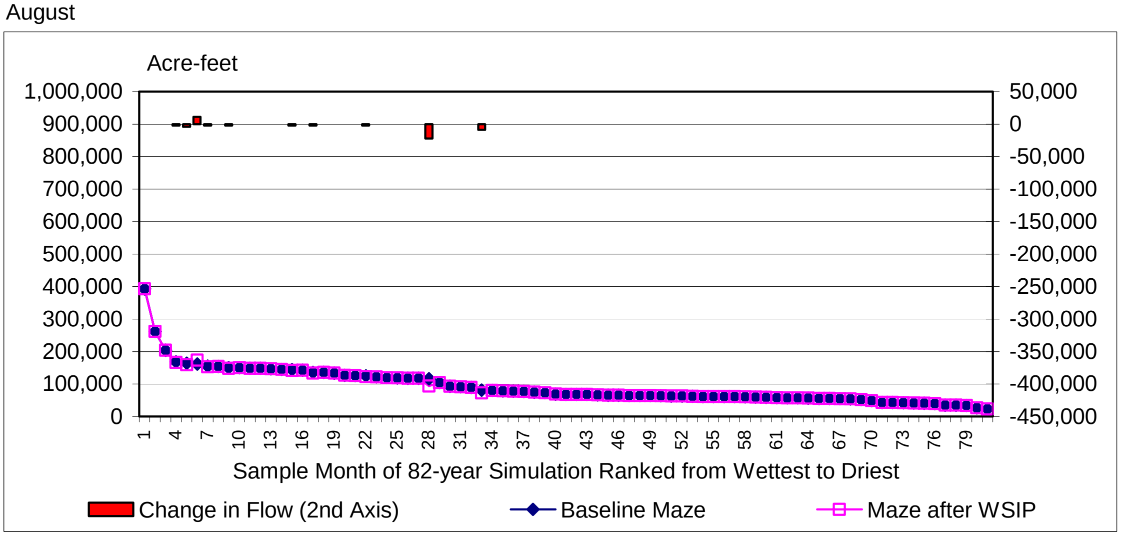
APPENDIX O4

Figure 3.2-4
San Joaquin River Flow Upstream of Stanislaus River Confluence – July through August

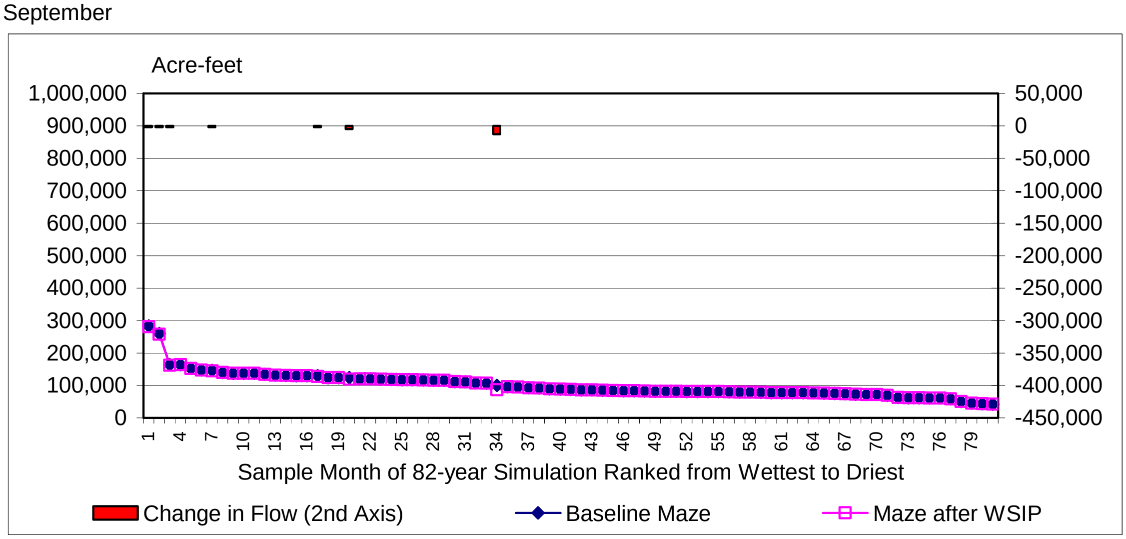
July



August



September



flow at La Grange Dam superimposed on that flow. The illustration depicts the current flow in the San Joaquin River and how the flow is projected to change due to the WSIP. Consistent with the discussion of flow changes at La Grange Dam, the figures for Maze flow illustrate that the projected flow changes at Maze would typically occur during wetter years, and that the more sizeable changes in flow would occur during years when the flows at Maze are relatively large.

3.3 Stanislaus River

The USBR operates the New Melones Project for several purposes, including flow and water quality conditions in the Stanislaus River and the San Joaquin River below the Stanislaus River confluence. Because the USBR has responsibility for San Joaquin River flow and water quality objectives, the agency will at times utilize New Melones Project releases to achieve compliance with those objectives. During these times, the USBR may provide flows from the Stanislaus River to supplement flows in the San Joaquin River. These supplemental flows may either provide for flow compliance at Vernalis or may provide dilution flow to comply with downstream water quality objectives. Changes in flow or water quality conditions upstream of the Stanislaus River such as would occur under the WSIP could at times cause a reaction of New Melones Project operations to maintain compliance with downstream water quality or flow objectives.

An analysis was conducted to identify the frequency at which the WSIP could affect the USBR's operation of the New Melones Project; the analysis consisted of superimposing the occurrence of flow changes at La Grange Dam upon the projected periods when releases from New Melones could be made explicitly for San Joaquin River flow or water quality compliance. Table 3.3-1 illustrates the results of the analysis. The numeric values shown in Table 3.3-1 represent the period and magnitude of the flow changes at La Grange Dam due to the WSIP. For instance, in June of 1922, there is a 16,000-acre-foot reduction in releases projected at La Grange Dam. In this instance, there is no release from the Stanislaus River explicitly for either water quality or flow conditions at Vernalis. Therefore, the change in releases at La Grange Dam would not lead to a change in Stanislaus River operations, and thus the change at La Grange Dam would track directly downstream in the San Joaquin River to Vernalis.

As illustrated in Table 3.3-1, only rarely (3 monthly instances within the 82-year analysis) would there be a potential conflict between WSIP-induced changes in releases and periods of controlled releases from the Stanislaus River for San Joaquin River flow or water quality conditions. The rarity of occurrence is expected, as the WSIP-induced effect would typically occur during wetter years when there are sufficient flows in the San Joaquin River and explicit releases from the Stanislaus River would not be required to achieve compliance with downstream water quality and flow objectives. The rare instances of potential conflict occurred during periods when flow objectives at Vernalis were a controlling condition of operations, and only once during a coincidental time of water quality control. If the flow in the San Joaquin River from the Tuolumne River was reduced during these periods of control, the USBR might increase its release from the Stanislaus River (or from other sources) to counter the reduction.

In those few instances, if the USBR released additional water to the Stanislaus River to offset the reduction in flow from the Tuolumne River, storage in New Melones Reservoir (maximum storage of over 2,400,000 acre-feet) could be reduced by the amount of the additional release. This reduction in storage could have an effect on a year's allocation of water to the several USBR uses of Stanislaus River water. These uses include deliveries to CVP New Melones Project water contractors and the instream fishery releases. The frequency and magnitude of such potential reductions was estimated through additional review of study results. In two of the three instances when a supplemental release by the USBR could occur (27,000 acre-feet in June 1927, and 12,000 acre-feet in February 1964), a reduction in New Melones Reservoir storage could carry into a year's allocation of deliveries to CVP contractors and fishery releases. For the 1927 example, CVP deliveries to the Stanislaus River contractors could be reduced by about 3,000 acre-feet in 1928 (out of a projected 46,000 acre-feet of delivery for that year). The allocated annual fishery releases could be reduced by about 12,000 acre-feet during a year like 1928, but that potential reduction would be incidentally countered with the 27,000 acre-feet increase in release due to the reaction to the decrease in flow from the Tuolumne River; thus, on an annual basis the Stanislaus River could experience greater flow in such a year. CVP Stanislaus River contractors currently receive an allocation of up to 90,000 afy, with sequential periods of no deliveries. The reduction in CVP deliveries during 1928 would represent about a 6 percent reduction in CVP supply during that year, a supply that is zero during a quarter of the time.

In the second instance, February 1964, a reduction in New Melones Reservoir storage could affect the current year's allocations of water supply. The estimated effect in that year to CVP Stanislaus River contractors would be zero, as no water supply was allocated to the contractors. Annual fishery releases would again be reduced for the year (about 6,000 acre-feet), but the river would incidentally have an increase in release of 12,000 acre-feet in February. A reduction to the CVP contractors' supply would not occur until a couple of years later, if at all, and within current allocation procedures would amount to about 1,000 acre-feet.

The third instance of potential effect on New Melones Project operations (June 1973) potentially occurs subsequent to the time that the current year's water supply allocations are made, thereby not affecting 1973 operations except for a reduction in New Melones Reservoir storage carried into 1974. Hydrology during 1974 is sufficiently wet that New Melones Reservoir is projected to spill during filling; thus, the additional release during 1973 would not affect water supply allocations in a subsequent year.

3.4 San Joaquin River at Vernalis

Current flow and water quality conditions at Vernalis are described in Section 2 above, and the potential changes in flow to the San Joaquin River due to WSIP-induced changes from the Tuolumne River are shown in Table 3.1-4. As described in Section 3.3 above, there would only be a rare instance when Stanislaus River operations would react to changes in the San Joaquin River due to the WSIP. Therefore, in almost all circumstances, the change in La Grange flows would track as a change in San Joaquin River flow at Vernalis (inflow to the Delta). While the absolute water quality at Vernalis would be slightly reduced with the reduction of Tuolumne River flow (which is of better quality), water quality objectives at Vernalis would continue to be met. Flow objectives at Vernalis would continue to be met if the USBR meets those objectives.

3.5 Sacramento-San Joaquin Delta

The CVP and SWP have the responsibility of providing compliance with the Delta water quality objectives prescribed by SWRCB Decision 1641. Additional operational constraints on the CVP and SWP are in place as a result of biological opinions and court decisions. The CVP and SWP would react to WSIP-induced changes to inflow to the Delta from the San Joaquin River. These reactions could manifest as changes in upstream releases or changes in exports from the southern Delta. A post-process analysis was used to identify the frequency and magnitude of the potential reaction of the CVP and SWP. Similar to the analysis described for the Stanislaus River and San Joaquin River evaluation, this analysis contrasts changes in La Grange Dam releases against Delta operational conditions.

Two different types of indicator analysis are used. The first is used to identify the coincidence of Tuolumne River flow changes and Delta "balanced conditions." A Delta balanced condition is the period of time when the CVP and SWP are explicitly balancing reservoir releases with export operations to provide a certain Delta outflow to meet either flow or water quality objectives in the Delta. A change in flow (e.g., from the San Joaquin River) would lead to the CVP and SWP modifying their reservoir releases or exports to react to the change in flow to the Delta. During periods when the Delta is in a balanced condition, a change in San Joaquin River flow could cause a change in CVP and SWP operations. During periods when the Delta is in an "excess condition," the change in flow would not necessitate a change in releases, but could cause a change in exports, as described later.

Table 3.5-1 contrasts Tuolumne River flow changes due to the WSIP against those periods when the Delta is projected to be in a balanced condition. The CalSim II study used for this analysis is derived from the report entitled *Draft State Water Project Delivery Reliability Report* (DWR, 2007).[3] The study represents a depiction of current CVP and SWP operations as affected by current regulatory requirements, including the emergency remedy measures specified by Judge Wanger to protect delta

[3] Report and studies accessible at http://www.water.ca.gov.

APPENDIX O4

Table 3.3-1
Coincidence of Periods of New Melones Vernalis Water and Flow Releases and La Grange Flow Changes

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	-5	-7	-7	0	-16	-2	0	0
1923	0	0	0	0	0	0	-2	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-27	0	-9	-13
1928	0	-20	-34	-3	-15	0	-9	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247	-17	-4	0	0	0	0	0
1937	0	0	0	0	-16	-3	-9	0	0	0	0	0
1938	0	0	-20	0	0	0	-7	-17	-5	0	-2	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38	-6	0	0	0	0	0
1941	0	0	0	3	0	0	-1	0	-4	-2	0	0
1942	0	0	0	-6	0	-3	-6	-3	-3	-2	0	0
1943	0	0	0	0	0	-2	-7	0	-4	0	-2	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37	-15	0	0	0	0	0	0
1946	0	7	0	0	0	-12	-4	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-117	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	-21	0	0	-16	-2	0	-2	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37	-39	0	-4	-3	0	-9	-2	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38	0	-11	-1	-2	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-12	0	0	0	0	0	0	0
1965	0	0	0	-186	-5	-11	-10	0	0	0	11	0
1966	0	0	-1	0	-17	0	0	0	0	0	0	0
1967	0	0	0	0	0	-18	0	-12	0	-2	-2	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25	-2	-11	-8	-2	-2	0	-2	0
1970	0	0	0	27	-6	-21	0	0	0	0	0	0
1971	0	0	0	0	0	-16	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7	-1	0	-60	0	0	0
1974	0	0	0	-8	0	-10	-5	0	-10	0	-2	0
1975	0	0	0	0	0	0	-8	0	7	-2	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89	0	0	0
1979	0	0	0	-4	0	-16	-2	-2	0	0	0	0
1980	0	0	0	8	0	-8	-5	-2	-2	-2	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27	-12	0	0	-2	-2	0	-4	-2
1983	-1	3	-1	0	0	0	0	-10	-5	-2	0	-2
1984	0	2	0	0	0	4	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17	-20	-11	-5	-5	0	0	-2
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130	-63	-22	-5
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9	-9	-2	-2	-2	0	-2
1996	0	0	0	0	-2	0	-5	-5	-5	0	0	-2
1997	0	0	0	-6	0	0	0	0	0	0	0	0
1998	0	0	0	-19	0	-3	-11	-4	-4	-2	0	0
1999	0	0	0	0	0	-9	-11	0	0	0	0	0
2000	0	0	0	0	-19	0	0	0	-12	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0

Key	Instances of required New Melones releases for Vernalis water quality		Instances of potential conflict
	Instances of required New Melones releases for Vernalis flow	-5	La Grange flow change (TAF)

smelt. The measures required by the court will be in place for an interim period, and a revised biological opinion and OCAP (Operations Criteria & Plan) could lead to different operational requirements. However, this study provides the best available depiction of current CVP and SWP operations in a format that is usable for this analysis. Also, while measures that are ultimately implemented by the CVP and SWP may differ from those measures assumed in this analysis, the conclusions of this analysis are not expected to significantly change.

Table 3.5-1 illustrates that the vast majority of instances of Tuolumne River flow change occur during Delta excess conditions. During these periods, it is unlikely that the CVP or SWP would modify their upstream reservoir operations in reaction to a change in inflow from the San Joaquin River. There are 26 months (out of the 82-year [984-month] simulation) during which a change in flow occurs during Delta balanced conditions. When there was a change, the change ranged from minimal (17 instances less than 10,000 acre-feet in a month) to three instances of change greater than 60,000 acre-feet in a month (June 1973: 60,000 acre-feet; June 1978: 89,000 acre-feet; and July 1993: 63,000 acre-feet). The average annual reduction in inflow during balanced conditions amounts to 7,000 acre-feet. When these reductions in inflow to the Delta occur, the CVP and SWP may elect to increase reservoir releases, decrease exports, or a combination of both. The larger instances of change occur during months when Don Pedro Reservoir is refilling during wetter years subsequent to prolonged drought.

A second analysis is used to identify the potential effect on CVP and SWP exports due to San Joaquin River flow changes. This second analysis is separate, but at times linked to the analysis previously described. During Delta balanced conditions, the CVP and SWP could choose whether to adjust releases or exports in reaction to a change in San Joaquin River flow into the Delta. However, current operational constraints can separately limit exports based on hydraulic conditions in the south Delta. Table 3.5-2 illustrates a bookend potential effect that WSIP-induced San Joaquin River flow changes could have on CVP and SWP exports. The analysis is focused on the January through June time period, which is the primary focus of the Judge Wanger emergency remedy measures to protect delta smelt. During this period, the allowable reverse flows in Old and Middle River are established. These flows are dependent on the hydraulics of the south Delta, including the amount of water that enters the Delta from the San Joaquin River. A general rule-of-thumb is that about 50 percent of the flow at Vernalis affects the flow in Old and Middle Rivers, and exports have almost a direct (1:1) effect on flow in Old and Middle Rivers. Thus, about one-half of the change in flow in the San Joaquin River will affect the amount of allowed export. Table 3.5-2 reports the amount of change in allowed export (in cfs) that would occur due to WSIP-induced reductions in flow in the San Joaquin River during the January through June period. The potential average annual effect on CVP and SWP exports amounts to approximately 10,000 afy. About half of the years of the analysis resulted in essentially no change in potential exports, and the remainder of the years showed a potential annual change ranging from 5,000 acre-feet to up to about 130,000 acre-feet. This analysis may overstate the reduction of exports due to WSIP-induced reductions in inflow to the Delta. The method of the analysis does not consider the shifting of export operations by the CVP and SWP to reduce the potential loss of exports. Nor does the analysis consider the potential occurrence of extremely high flow conditions in the San Joaquin River that would ameliorate the effect of a WSIP-induced flow reduction in the San Joaquin River.

As described above, the CVP and SWP operate their systems in an integrated and coordinated fashion, and, when a difference in hydrology occurs (such as a WSIP-induced flow change to the Delta), the CVP and SWP generally have two means to react: a change in releases and/or a change in exports. The two separate isolated analyses described above indicate the magnitude and frequency of changes in Delta inflow from the WSIP-induced effect on Don Pedro Project operations. The two separate potential CVP/SWP effects described above are not always additive, as the projects could select one export or release reaction over the other, or a combination of both.

APPENDIX O4

Table 3.5-1

Coincidence of La Grange Flow Changes and Delta Balanced and Excess Conditions

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY Total
1922	0	0	0	0	-5	-7	-7	0	-16	-2	0	0	-38
1923	0	0	0	0	0	0	-2	0	0	0	0	0	-2
1924	0	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-27	0	-9	-13	-49
1928	0	-20	-34	-3	-15	0	-9	0	0	0	0	0	-82
1929	0	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-247	-17	-4	0	0	0	0	0	-268
1937	0	0	0	0	-16	-3	-9	0	0	0	0	0	-28
1938	0	0	-20	0	0	0	-7	-17	-5	0	-2	0	-51
1939	0	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-38	-6	0	0	0	0	0	-44
1941	0	0	0	3	0	0	-1	0	-4	-2	0	0	-4
1942	0	0	0	-6	0	-3	-6	-3	-3	-2	0	0	-22
1943	0	0	0	0	0	-2	-7	0	-4	0	-2	0	-15
1944	0	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-37	-15	0	0	0	0	0	0	-53
1946	0	7	0	0	0	-12	-4	0	0	0	0	0	-8
1947	0	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	-117	0	0	0	0	0	0	0	0	0	-117
1952	0	0	0	0	-21	0	0	-16	-2	0	-2	0	-42
1953	0	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	-37	-39	0	-4	-3	0	-9	-2	0	0	-94
1957	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-38	0	-11	-1	-2	0	0	-53
1959	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-12	0	0	0	0	0	0	0	-12
1965	0	0	0	-186	-5	-11	-10	0	0	0	11	0	-200
1966	0	0	-1	0	-17	0	0	0	0	0	0	0	-18
1967	0	0	0	0	0	-18	0	-12	0	-2	-2	0	-35
1968	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-25	-2	-11	-8	-2	-2	0	-2	0	-53
1970	0	0	0	27	-6	-21	0	0	0	0	0	0	0
1971	0	0	0	0	0	-16	0	0	0	0	0	0	-16
1972	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-7	-1	0	-60	0	0	0	-68
1974	0	0	0	-8	0	-10	-5	0	-10	0	-2	0	-36
1975	0	0	0	0	0	0	-8	0	7	-2	0	0	-4
1976	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-89	0	0	0	-89
1979	0	0	0	-4	0	-16	-2	-2	0	0	0	0	-24
1980	0	0	0	8	0	-8	-5	-2	-2	-2	0	0	-11
1981	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-27	-12	0	0	-2	-2	0	-4	-2	-49
1983	-1	3	-1	0	0	0	0	-10	-5	-2	0	-2	-18
1984	0	2	0	0	0	4	0	0	0	0	0	0	5
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-17	-20	-11	-5	-5	0	0	-2	-61
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-130	-63	-22	-5	-220
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-9	-9	-2	-2	-2	0	-2	-27
1996	0	0	0	0	-2	0	-5	-5	-5	0	0	-2	-19
1997	0	0	0	-6	0	0	0	0	0	0	0	0	-6
1998	0	0	0	-19	0	-3	-11	-4	-4	-2	0	0	-43
1999	0	0	0	0	0	-9	-11	0	0	0	0	0	-20
2000	0	0	0	0	-19	0	0	0	-12	0	0	0	-32
2001	0	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0	0

Key
(shaded) Periods of Delta "excess condition", and no potential flow conflict
-5 La Grange flow change (TAF)

APPENDIX O4

Table 3.5-2
Coincidence of La Grange Flow Changes and CVP/SWP Export Constraints (January through June)

Water Yr	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1922	0	0	0	0	-46	-59	-62	0	-135	0	0	0
1923	0	0	0	0	0	0	-18	0	0	0	0	0
1924	0	0	0	0	0	0	0	0	0	0	0	0
1925	0	0	0	0	0	0	0	0	0	0	0	0
1926	0	0	0	0	0	0	0	0	0	0	0	0
1927	0	0	0	0	0	0	0	0	-226	0	0	0
1928	0	0	0	-25	-134	0	-75	0	0	0	0	0
1929	0	0	0	0	0	0	0	0	0	0	0	0
1930	0	0	0	0	0	0	0	0	0	0	0	0
1931	0	0	0	0	0	0	0	0	0	0	0	0
1932	0	0	0	0	0	0	0	0	0	0	0	0
1933	0	0	0	0	0	0	0	0	0	0	0	0
1934	0	0	0	0	0	0	0	0	0	0	0	0
1935	0	0	0	0	0	0	0	0	0	0	0	0
1936	0	0	0	0	-2226	-137	-31	0	0	0	0	0
1937	0	0	0	0	-146	-26	-72	0	0	0	0	0
1938	0	0	0	0	0	0	-60	-138	-41	0	0	0
1939	0	0	0	0	0	0	0	0	0	0	0	0
1940	0	0	0	0	0	-311	-48	0	0	0	0	0
1941	0	0	0	27	-4	-3	-4	0	-30	0	0	0
1942	0	0	0	-45	0	-22	-46	-23	-23	0	0	0
1943	0	0	0	0	0	-16	-56	0	-36	0	0	0
1944	0	0	0	0	0	0	0	0	0	0	0	0
1945	0	0	0	0	-337	-125	-2	0	0	0	0	0
1946	0	0	0	0	0	-99	-30	0	0	0	0	0
1947	0	0	0	0	0	0	0	0	0	0	0	0
1948	0	0	0	0	0	0	0	0	0	0	0	0
1949	0	0	0	0	0	0	0	0	0	0	0	0
1950	0	0	0	0	0	0	0	0	0	0	0	0
1951	0	0	0	0	0	0	0	0	0	0	0	0
1952	0	0	0	0	-192	0	0	-129	-18	0	0	0
1953	0	0	0	0	0	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0	0	0	0	0	0
1955	0	0	0	0	0	0	0	0	0	0	0	0
1956	0	0	0	-313	0	-29	-26	0	-78	0	0	0
1957	0	0	0	0	0	0	0	0	0	0	0	0
1958	0	0	0	0	0	-313	0	-93	-9	0	0	0
1959	0	0	0	0	0	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0	0	0	0	0	0
1961	0	0	0	0	0	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	0	0	0	0	0	0	0
1964	0	0	0	0	-106	0	0	0	0	0	0	0
1965	0	0	0	-1510	-46	-87	-82	0	0	0	0	0
1966	0	0	0	0	-155	0	0	0	0	0	0	0
1967	0	0	0	0	0	-150	0	-101	0	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	-205	-22	-88	-64	-18	-18	0	0	0
1970	0	0	0	216	-54	-171	0	0	0	0	0	0
1971	0	0	0	0	0	-126	0	0	0	0	0	0
1972	0	0	0	0	0	0	0	0	0	0	0	0
1973	0	0	0	0	0	-59	-5	0	-507	0	0	0
1974	0	0	0	-68	0	-85	-39	0	-83	0	0	0
1975	0	0	0	0	0	0	-70	0	55	0	0	0
1976	0	0	0	0	0	0	0	0	0	0	0	0
1977	0	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	-752	0	0	0
1979	0	0	0	-29	0	-132	-18	-18	0	0	0	0
1980	0	0	0	62	0	-62	-41	-18	-18	0	0	0
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	-221	-104	0	0	-15	-15	0	0	0
1983	0	0	0	0	0	0	0	-78	-39	0	0	0
1984	0	0	0	0	0	32	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	-154	-164	-95	-41	-41	0	0	0
1987	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	0	0	0	0	0	0	0	0	0
1992	0	0	0	0	0	0	0	0	0	0	0	0
1993	0	0	0	0	0	0	0	0	-1096	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	0	0	-75	-77	-15	-15	0	0	0
1996	0	0	0	0	-15	0	-41	-41	-41	0	0	0
1997	0	0	0	-50	0	0	0	0	0	0	0	0
1998	0	0	0	-152	0	-25	-93	-32	-32	0	0	0
1999	0	0	0	0	0	-70	-92	0	0	0	0	0
2000	0	0	0	0	-172	0	0	0	-105	0	0	0
2001	0	0	0	0	0	0	0	0	0	0	0	0
2002	0	0	0	0	0	0	0	0	0	0	0	0

Key
(shaded) Periods when a reduction in La Grange flow occurs during January through June
-15 La Grange flow change (cfs)