SANTA ANA RIVER WATERMASTER

ORANGE COUNTY WATER DISTRICT v. CITY OF CHINO, et al.
CASE NO. 117628--COUNTY OF ORANGE

WATERMASTER
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April 30, 2020

To: Clerk of Superior Court of Orange County and all Parties

Re: Watermaster Report for Water Year October 1, 2018 - September 30, 2019

Ladies and Gentlemen:

We have the honor of submitting herewith the Forty-Ninth Annual Report of the Santa Ana River Watermaster. The supporting Basic Data Appendices are bound separately.

The principal findings of the Watermaster for the Water Year 2018-19 are as follows:

At Prado

1	Measured Outflow at Prado	251,974	acre-feet
2	Base Flow at Prado	97,993	acre-feet
3	Annual Weighted TDS in Base and Storm Flows	395	mg/L
4	Annual Adjusted Base Flow	122,900	acre-feet
5	Cumulative Adjusted Base Flow	5,715,223	acre-feet
6	Other Credits (Debits)	1,150	acre-feet
7	Cumulative Entitlement of OCWD	2,058,000	acre-feet
8	Cumulative Credit	3,698,381	acre-feet
9	One-Third of Cumulative Debit	0	acre-feet
10	Minimum Required Base Flow in 2018-19	34,000	acre-feet

At Riverside Narrows

1	Base Flow at Riverside Narrows	36,604	acre-feet
2	Annual Weighted TDS in Base Flow	652	mg/L
3	Annual Adjusted Base Flow	36,604	acre-feet
4	Cumulative Adjusted Base Flow	2,118,495	acre-feet
5	Cumulative Entitlement of IEUA and WMWD	747,250	acre-feet
6	Cumulative Credit	1,371,245	acre-feet
7	One-Third of Cumulative Debit	0	acre-feet
8	Minimum Required Base Flow in 2018-19	12,420	acre-feet

Based on these findings, the Watermaster concludes that there was full compliance with the provisions of the Stipulated Judgment in 2018-19.

At the end of the 2018-19 Water Year, Inland Empire Utilities Agency (formerly Chino Basin Municipal Water District) and Western Municipal Water District have a cumulative credit of 3,698,381 acre-feet to their Base Flow obligation at Prado Dam. San Bernardino Valley Municipal Water District has a cumulative credit of 1,371,245 acre-feet to its Base Flow obligation at Riverside Narrows.

The Watermaster continued to exercise surveillance over the many active and proposed projects within the watershed for their potential effect on Base Flow.

Sincerely yours,
Santa Ana River Watermaster

By: Shivaji Deshmukh
Shivaji Deshmukh

Michael R. Markus

Roy L. Herndon

Craig D. Miller

Wen B. Huang

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

v. CITY OF CHINO, et al.

CASE NO. 117628 - COUNTY OF ORANGE

FORTY- NINTH

ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2018 - SEPTEMBER 30, 2019

APRIL 30, 2020

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF PLATES

(Located at back of report)

TABLE OF CONTENTS (Continued)

APPENDICES

The following appendices are bound separately and available for review at the office of the Secretary of the Santa Ana River Watermaster.

CHAPTER I

WATERMASTER ACTIVITIES AND WATER CONDITIONS

Introduction

This Forty-Ninth Annual Report of the Santa Ana River Watermaster covers Water Year 2018-19. The annual report is required by the Stipulated Judgment (Judgment) in the case of Orange County Water District v. City of Chino, et al., Case No. 117628-County of Orange, entered by the court on April 17, 1969. The Judgment became effective on October 1, 1970. It contains a declaration of rights of the water users and other entities in the Lower Area of the Santa Ana River Basin downstream of Prado Dam as against those in the Upper Area tributary to Prado Dam, and provides a physical solution to satisfy those rights. Chapter IV presents a history of the litigation and a summary of the Judgment.

The physical solution accomplishes, in general, a regional intrabasin allocation of the surface flow of the Santa Ana River System. The Judgment leaves to each of the major hydrologic units within the basin the determination and regulation of individual rights therein and the development and implementation of its own water management plan subject only to compliance with the physical solution.

The Judgment designates four public agencies to represent the interests of the Upper and Lower Areas and gives them the responsibility to fulfill the obligations set forth in the Judgment, including the implementation of the physical solution. The Lower Area is represented by Orange County Water District (OCWD). The Upper Area is represented by San Bernardino Valley Municipal Water District (SBVMWD), Western Municipal Water District of Riverside County (WMWD), and Inland Empire Utilities Agency (IEUA), formerly the Chino Basin Municipal Water District (CBMWD). The locations of the districts are shown on Plate 1, "Santa Ana River Watershed".

The court appoints a five-member Watermaster Committee (Watermaster) to administer the provisions of the Judgment. The duties of the Watermaster are to maintain a continuous accounting of each of the items listed in the letter of transmittal at the front of this report and to report thereon annually for each water year to the court and the parties. The water year begins October 1 and ends the following September 30. The time for submission of the annual report was amended by the court (dated December 24, 1981) to be seven months after the end of the water year (April 30).

The Watermaster Committee signing the Water Year 2018-19 Annual Report consisted of Shivaji Deshmukh, Wen Huang, Roy L. Herndon, Michael R. Markus, and Craig D. Miller. At the January 31, 2020 meeting, Mr. Herndon was re-elected Chairman and Mr. Huang was elected Secretary/Treasurer. The history of the Watermaster membership is presented in Chapter IV.

Compilation of Basic Data

The Watermaster annually compiles the basic hydrologic and water quality data necessary to determine compliance with the provisions of the Judgment. The data include records of stream discharge (flow) and quality for the Santa Ana River (River) at Prado Dam and at Riverside Narrows as well as discharges for most tributaries; flow and quality of Nontributary water entering the River; rainfall records at locations in or adjacent to the Watershed; and other data that may be used to support the determinations of the Watermaster. For Water Year 2018-19 the United States Geological Survey (USGS) provided discharge and water quality data for the River at two gaging stations, "Santa Ana River Below Prado Dam" (Prado) and "Santa Ana River at Metropolitan Water District (MWD) Crossing" (Riverside Narrows). The discharge data at both stations consist of computed daily mean discharges, expressed in cubic feet per second (cfs), and are based on continuous recordings. At times the USGS must estimate daily mean discharges due to damaged or malfunctioning recording equipment.

The USGS also provided discharge data for other gaging stations for streams tributary to Prado, including, among others, the Santa Ana River at E Street in San Bernardino, Temescal Creek above Main Street in Corona, Cucamonga Creek near Mira Loma, Chino Creek at Schaefer Avenue, Lytle Creek at Colton, Warm Creek near San Bernardino, and San Timoteo Creek near Loma Linda (see Appendix A). Based on a determination by the Watermaster in Water Year 2011-12, the USGS was requested to establish a new gaging station at the spillway at Lee Lake. Expenses associated with the installation and measurements at this gage were added to the Watermaster costs paid by the Parties. Beginning in Water Year 2012-13, the new Temescal Creek at Corona Lake "Lee Lake" (near Corona) gage provided useful data (also included in Appendix A) to assist in the determination of the amount of water discharged from the San Jacinto Watershed that arrived at Prado.

The Water Year 2018-19 daily mean discharge records at Prado are rated "fair" by the USGS. Daily mean discharges at the station are controlled at times by storage operations in the reservoir behind Prado Dam just upstream. The maximum and minimum daily mean discharge values during the water year were, respectively, 5,380 cfs on February 15, 2019 and 71.3 cfs on October 10, 2018. The Water Year 2018-19 daily mean discharge record at Riverside Narrows was rated "fair" by the USGS. The maximum and minimum daily mean discharge values during the year were 7,590 cfs on February 14, 2019 and 25.2 cfs on October 2, 2018.

The water quality data at Prado consist of daily maximum and minimum and mean values for electrical conductivity (EC), measured as specific conductance and expressed in microsiemens per centimeter (μs/cm) based on a continuous recording, and 40 measured values (three to four per month) for EC and/or total dissolved solids (TDS) expressed in milligrams per liter (mg/L). The water quality data at Riverside Narrows consist of 23 values measured by the USGS (generally twice per month) and 103 values measured by the City of Riverside (generally twice per week) for both EC and TDS. The maximum and minimum, daily, flow-weighted mean EC values reported by the USGS for the River at Prado were 1,210 μs/cm on May 11, 2019 and 293 μs/cm on January 18, 2019, respectively. The

corresponding calculated TDS concentrations were 723 and 175 mg/L. At Riverside Narrows, the maximum and minimum EC values were 1,083 μs/cm on September 11, 2019, reported by the City of Riverside and 127 μs/cm on February 2, 2019, reported by the USGS. The corresponding measured TDS concentrations were 671 and 95 mg/L. Specific conductance records are affected by releases from Prado Dam. Interruptions in record occur at times due to malfunction of recording or sensing equipment. A portion of chemical data was collected for the National Water-Quality Assessment (NAWQA) Program. There were interruptions in the Prado EC records on April 24, April 25, June 10, June 11, June 12 and August 5, 2019 due to malfunction of recording or sensing equipment.

To assist in making its determinations each year the Watermaster refers to the records of many precipitation stations located in or near the Santa Ana River Watershed. The record for the former Perris Hill Station 163 in the Bunker Hill-San Timoteo area, operated by the San Bernardino County Flood Control District, was used to define the hydrologic base period for the physical solution in the Judgment. The record for San Bernardino County Department of Public Works (SBCDPW) Station 2146, which was located very near to Station 163 at the San Bernardino County Hospital, was used until Water Year 2000-01 in the Annual Reports of the Watermaster to provide a comparison with historical conditions.

During Water Year 2000-01 Station 2146 was destroyed when the hospital buildings were demolished. For several years, the Watermaster used estimated precipitation data based on the records for three nearby stations. The SBCDPW established a new station, Station 2146-A, near the location of the former Station 2146. During the preparation of the report for Water Year 2004-05, the precipitation total recorded at Station 2146-A was sufficiently close to the estimate prepared from the three nearby stations that the Watermaster used the record for Station 2146-A.

The USGS established a precipitation gage network during the Water Year 2003-04 to assist local flood control agencies with flood prediction in the area of the “Old Fire”, which burned a large portion of the northerly mountains of the Santa Ana River Watershed area during October and November 2003. When the flood control agencies declined to fund the ongoing operation of the precipitation gage network, the Parties to the Judgment agreed to add the precipitation gage program to the ongoing stream gage program. The Parties also added a gage designated as “Gilbert Street Precipitation Gage” (USGS No. 340742117161701) at the same location as SBCDPW Station 2146-A. The Gilbert Street Gage was placed into operation in October 2005.

The Watermaster has compared the record from the USGS Gilbert Street Gage to the record from the Station 2146-A gage and has found them to be virtually identical. The Watermaster has accepted the Gilbert Street Gage in this report as the most accurate and reliable of the two gages. Because of the Watermaster’s finding of suitability of the Gilbert Street Gage, in Water Year 2011-12 the Parties determined that funding of the other precipitation gages was no longer a necessary Watermaster expense.

For Water Year 2018-19, the total precipitation recorded at the Gilbert Street gage was 19.85 inches, or 110% of the average of 17.98 inches that occurred during the 26-year base

period (1934-35 through 1959-60) that was used in the formulation of the physical solution. Plate 3 graphically portrays the annual precipitation from 1934-35 through 2018-19.

Watermaster Determinations

Each year the Watermaster uses its long-established procedures to analyze the basic hydrologic and water quality data in order to determine, at Riverside Narrows and at Prado, the Base Flow, the Adjusted Base Flow, the Cumulative Credits or Debits to Upper Area parties, and the Minimum Required Base Flow for the following water year. The procedures include determining, for both locations, the amounts of Nontributary Flow or other non-storm flow to be excluded from Base Flow.

During Water Year 2018-19 there were no sources of Nontributary Flow in the River at Riverside Narrows or Prado Dam.

There was one source of non-storm flow in the River at Prado that the Watermaster has not included in Base Flow. Eastern Municipal Water District (EMWD) reported that it discharged 6,116 acre-feet of treated wastewater to Temescal Creek, with a flow-weighted average TDS of 729 mg/L, that originated in the San Jacinto River Watershed. Discharges from the San Jacinto Watershed were not taken into account in the settlement discussions and calculations that led to the flow obligations in the Judgment. In the past the Watermaster decided that fifty percent of any portion of such discharges that reach Prado Reservoir and that are subsequently captured by OCWD should be added to the Cumulative Credit at Prado (after the usual water quality adjustment). IEUA Groundwater Recharge Coordinator/Hydrogeologist Andy Campbell estimated that 4,317 acre-feet of the EMWD treated wastewater, with an average TDS concentration of 736 mg/L, reached Prado Reservoir, that 2,299 acre-feet of it was captured by OCWD, and recommended that the Cumulative Credit at Prado be increased accordingly using the previously established fifty percent rule. The Watermaster accepted the estimate and the recommendation.

The determinations of the Watermaster for Water Year 2018-19 are explained in detail for Prado in Chapter II and for Riverside Narrows in Chapter III. A summary of the annual determinations by the Watermaster is presented in Table 1 for both locations for the period of 1970-71 through 2018-19. Note that the Base Flow obligations set forth in the Judgment at both Prado and Riverside Narrows have been met for the water year and cumulative credits have accrued to the upper respective Districts.

TABLE 1

SUMMARY OF FINDINGS AT PRADO

Water Year	Rainfall (in)[1]	USGS Measured Flow (ac-ft)	Total Flow (ac-ft)[2]	Base Flow (ac-ft)[3]	Weighted TDS (mg/L)[4]	Adjusted Base Flow (ac-ft)	Cumulative Credit (ac-ft)[5]
1971-72	9.62	51,743	51,743	40,416	707	40,416	-5,182
1972-73	18.46	76,848	77,484	48,999	638	51,531	4,349
1973-74	12.72	128,436	62,511	43,106	633	45,513	7,862
1974-75	13.49	93,397	61,855	50,176	694	51,263	17,125
1975-76	15.86	120,590	59,209	45,627	635	48,098	23,223
1976-77	11.95	72,278	62,953	48,387	660	50,000	31,223
1977-78	30.47	255,043	252,850	58,501	383	73,955	63,178
1978-79	17.51	145,198	134,506	71,863	580	79,049	100,227
1979-80	30.93	536,174	527,760	82,509	351	106,505	164,732
1980-81	10.45	118,300	117,888	74,875	728	74,875	205,652
1981-82	18.34	143,702	143,367	81,548	584	89,431	253,083
1982-83	32.36	426,273	426,750	111,692	411	138,591	353,036
1983-84	10.81	178,730	177,606	109,231	627	115,876	431,514
1984-85	12.86	163,247	162,912	125,023	617	133,670	523,184
1985-86	17.86	196,900	197,373	127,215	567	141,315	622,499
1986-87	8.08	140,872	143,191	119,848	622	127,638	708,137
1987-88	13.78	176,292	166,818	124,104	582	136,308	802,445
1988-89	12.64	159,659	152,743	119,572	583	131,230	891,675
1989-90	8.53	144,817	143,463	119,149	611	127,986	977,661
1990-91	15.48	195,186	186,426	111,151	514	128,379	1,064,040
1991-92	16.54	198,280	189,677	106,948	499	124,862	1,146,902
1992-93	30.92	571,138	566,630	128,067	368	163,499	1,268,401
1993-94	11.62	159,560	152,808	111,186	611	119,432	1,345,833
1994-95	25.14	429,270	422,816	123,468	415	152,792	1,458,387
1995-96	11.92	217,160	190,553	131,861	514	152,299	1,568,686
1996-97	18.64	249,685	198,459	136,676	514	157,861	1,684,547
1997-98[6]	33.41	462,646	456,316	155,711	392	195,677	1,838,224
1998-99	8.02	184,998	182,310	158,637	581	174,369	1,970,593
1999-00	11.09	207,850	188,538	148,269	527	169,644	2,098,237
2000-01	16.13	222,559	208,535	153,914	525	176,360	2,232,597
2001-02	5.08	174,968	156,596	145,981	587	159,728	2,350,325
2002-03	16.22	256,157	245,947	146,113	463	174,970	2,484,182
2003-04[7]	10.80	214,102	201,967	143,510	502	167,190	2,609,619
2004-05	29.89	638,513	637,568	154,307	348	199,570	2,769,555
2005-06	13.23	247,593	246,101	147,736	517	170,266	2,901,383
2006-07	4.61	156,147	153,823	129,830	604	140,216	3,005,130
2007-08	13.70	199,690	194,309	116,483	495	136,382	3,103,677
2008-09	10.14	162,698	161,026	102,711	527	117,519	3,181,385
2009-10	17.79	243,776	243,690	103,099	443	125,179	3,266,053
2010-11[7]	23.50	324,892	313,018	102,031	522	117,166	3,342,412
2011-12	9.01	121,123	121,123	93,068	597	101,056	3,401,833
2012-13	9.53	100,003	99,735	81,452	621	86,814	3,446,890
2013-14	12.42	86,486	86,486	63,536	582	69,784	3,474,674
2014-15	11.09	107,600	107,600	64,048	522	73,548	3,506,222
2015-16	8.84	115,023	102,610	71,225	560	79,535	3,543,757
2016-17	21.57	191,539	191,539	70,010	408	87,046	3,588,803
2017-18	6.81	82,554	82,554	65,438	625	69,528	3,616,331
2018-19	19.85	251,974	251,974	97,993	395	122,900	3,698,381

TABLE 1 (Continued)

SUMMARY OF FINDINGS AT RIVERSIDE NARROWS

Water Year	Rainfall (in)[1]	USGS Measured Flow (ac-ft)	Total Flow (ac-ft)[2]	Base Flow (ac-ft)[3]	Weighted TDS (mg/L)[4]	Adjusted Base Flow (ac-ft)	Cumulative Credit (ac-ft)[5]
1971-72	9.62	41,257	22,253	16,157	712	16,017	2,529
1972-73	18.46	33,048	32,571	17,105	700	17,105	4,384
1973-74	12.72	25,494	24,494	16,203	700	16,203	5,337
1974-75	13.49	20,970	19,644	15,445	731	15,100	5,187
1975-76	15.86	27,627	26,540	17,263	723	16,977	6,914
1976-77	11.95	24,871	23,978	18,581	722	18,286	9,950
1977-78	30.47	182,500	181,760	22,360	726	21,941	16,641
1978-79	17.51	47,916	47,298	26,590	707	26,456	27,847
1979-80	30.93	254,333	253,817	25,549	676	25,549	38,146
1980-81	10.45	34,698	34,278	19,764	715	19,550	42,446
1981-82	18.34	83,050	82,708	32,778	678	32,778	59,974
1982-83	32.36	279,987	279,645	57,128	610	57,128	101,852
1983-84	10.81	83,087	82,745	56,948	647	56,948	143,550
1984-85	12.86	79,113	78,771	69,772	633	69,772	198,072
1985-86	17.86	99,600	99,258	68,220	624	68,220	251,042
1986-87	8.08	78,093	77,752	59,808	649	59,808	295,600
1987-88	13.78	80,047	79,706	55,324	620	55,324	335,674
1988-89	12.64	62,717	62,376	52,259	607	52,259	372,683
1989-90	8.53	58,500	58,159	53,199	590	53,583	411,016
1990-91	15.48	74,525	73,790	45,041	616	45,041	440,807
1991-92	16.54	71,768	71,427	40,306	620	40,306	465,863
1992-93	30.92	267,384	267,043	41,434	634	41,434	492,047
1993-94	11.62	45,477	45,006	31,278	677	31,278	508,075
1994-95	25.14	245,617	243,411	45,562	646	45,562	538,387
1995-96	11.92	83,256	81,786	54,548	625	54,548	577,685
1996-97	18.64	107,280	104,518	62,618	624	62,618	625,053
1997-98	33.41	214,375	213,033	65,013	601	65,013	674,816
1998-99	8.02	76,294	76,294	73,094	603	73,094	732,660
1999-00	11.09	75,572	75,572	63,499	602	63,499	780,909
2000-01	16.13	78,091	75,331	61,872	603	61,872	827,531
2001-02	5.08	68,844	59,434	58,705	606	58,705	870,986
2002-03	16.22	92,166	88,502	57,747	617	57,747	913,483
2003-04	10.80	77,336	75,799	54,788	634	54,788	953,021
2004-05	29.89	355,503	355,503	65,760	616	65,760	1,003,531
2005-06	13.23	111,840	111,113	67,161	608	67,161	1,055,442
2006-07	4.61	57,868	56,022	56,123	635	56,123	1,096,315
2007-08[8]	13.70	78,619	74,554	46,776	674	46,776	1,127,841
2008-09	10.14	69,027	67,567	43,902	663	43,902	1,156,493
2009-10	17.79	112,631	112,631	45,887	643	45,887	1,187,130
2010-11	23.50	174,075	174,075	49,753	654	49,753	1,221,633
2011-12	9.01	45,049	45,049	42,641	664	42,641	1,249,024
2012-13	9.53	41,337	41,337	36,407	662	36,407	1,270,181
2013-14	12.42	42,766	42,766	32,313	646	32,313	1,287,244
2014-15	11.09	41,958	41,958	28,302	630	28,302	1,300,296
2015-16	8.84	41,007	41,007	30,877	635	30,877	1,315,923
2016-17	21.57	83,601	83,601	36,090	650	36,090	1,336,763
2017-18	6.81	34,792	34,792	28,378	662	28,378	1,349,891
2018-19	19.85	97,063	97,063	36,604	652	36,604	1,371,245

TABLE 1 (Continued)

(1) Measured at San Bernardino County Department of Public Works (SBCDPW) Station 2146 (former San Bernardino County Hospital) until Water Year 2000-01. Estimated for that location for Water Years 2000-01 through 2003-04. Measured at SBCDPW Station 2146-A for Water Year 2004-05. Measured at USGS Gilbert Street Precipitation Gage at San Bernardino for Water Year 2005-06. For 2006-07, measured at SBCDPW 2146 from Oct. 1 to Dec. 21 and at USGS Gilbert Street Precipitation Gage for the remainder of the year. Measured at USGS Gilbert Street Precipitation Gage at San Bernardino since Water Year 2007-08.

(2) As determined by the Watermaster, Total Flow based on Computed Inflow at Prado or measured flow at Riverside Narrows in any year may be exclusive of any Nontributary Flow, Exchange Water or other "water management" flows and, at Prado, may include discharges from Lake Elsinore or the San Jacinto Watershed that reach the Santa Ana River.

(3) As determined by the Watermaster: (a) Base Flow at Prado in any year is exclusive of Storm Flow and may be exclusive of any Nontributary Flow, Exchange Water or other "water management" flows as well as any discharges from Lake Elsinore or the San Jacinto Watershed that reach the Santa Ana River; (b) Base Flow at Riverside Narrows in any year is exclusive of Storm Flow and may be exclusive of any Nontributary Flow, Exchange Water or other "water management" flows and, beginning in 1979-80, includes wastewater from Rubidoux CSD that is treated at the Riverside Regional WWTP.

(4) For Base and Storm Flow at Prado and Base Flow only at Riverside Narrows.

(5) As determined by the Watermaster, Cumulative Credit at Prado in any year may include credit for a portion of any water discharged from Lake Elsinore or the San Jacinto Watershed that reach the Santa Ana River.

(6) The Base Flow and Adjusted Base flow for Water Year 1997-98 were returned to their originally published values to correct an error in the adjustment to account for San Jacinto Watershed flows arriving at Prado. This correction is also reflected in the Cumulative Credit for this and subsequent years.

(7) A correction was made for Water Years 2003-04 and 2010-11 in the calculation of Weighted TDS based on an adjustment to account for OC-59 water that arrived at Prado. This correction is reflected in the Weighted TDS and Adjusted Base Flow for these years. This correction is also reflected in the Cumulative Credit for these and subsequent years.

(8) The Base Flow amount for Water Year 2007-08 at Riverside Narrows was published as 47,760 acre-feet in the Thirty-Eighth Annual Report. The correct amount is 46,776 acre-feet.

Notable Watershed Programs and Activities

Each year when the Watermaster is compiling and analyzing the information it needs to prepare its report to the court, it also takes notice of programs and activities in the Watershed that, while they do not directly enter into the determinations of the Watermaster, do have significant potential to affect River flow or quality. The following are brief descriptions of such items.

Upper Area Treated Wastewater Discharges

Data on treated wastewater discharged in the Upper Area are compiled annually because wastewater is a major contributor to Base Flow in the River. The historical data on treated wastewater discharged are summarized in Table 2. The locations of wastewater treatment plants are shown on Plate 2.

Salt Exports from the Upper Area

High salinity water, mostly from groundwater desalters, is exported from the Upper Area to the ocean through Santa Ana Watershed Project Authority's Santa Ana Regional Interceptor (SARI) in Orange County and Inland Empire Brine Line (IEBL) in San Bernardino and Riverside Counties and IEUA's Non-Reclaimable Wastewater System (NRWS). This salt export helps to protect River water quality and, therefore, helps the Upper Area parties comply with the Judgment. The available historical data on salt export are summarized in Table 3. The SARI/IEBL first went into service in Water Year 1985-86. The NRWS went into service prior to 1970, but records of NRWS flow data are only available beginning with Water Year 1981-82. The locations of the SARI/IEBL and NRWS pipelines are shown on Plate 2.

Arundo donax Eradication

Arundo donax is a non-native species of reed that has invaded many waterways in California. It displaces native vegetation, resulting in undesirable habitat for animals. *Arundo* also consumes water at the rate of about 5.6 acre-feet per acre per year compared to only about 1.9 for native plants, a net water loss of about 3.7 acre-feet per year per acre of *Arundo*. By the early 1990s there were about 10,000 acres of *Arundo* in the Santa Ana River Watershed. In 1997 a consortium of local, state and federal agencies launched a long-term eradication program in the watershed for reasons of both habitat restoration and water savings. *Arundo* spreads quickly downstream as roots and rhizomes break off during high stream flows. Therefore, the eradication program began at the farthest upstream locations and is working toward the River mouth. Each location requires multiyear retreatment. To date the consortium has eradicated 8,000 acres of *Arundo* in the watershed.

TABLE 2

TREATED WASTEWATER EFFLUENT DISCHARGED ABOVE PRADO

(acre-feet)

Water Year	Wastewater discharges upstream from Colton that generally do not flow continuously to Santa Ana River above E Street				Wastewater discharges to Santa Ana River and its tributaries that have hydraulic continuity to the Santa Ana River above Riverside Narrows					Wastewater discharges to the Santa Ana River between Riverside Narrows and Prado Dam								Wastewater discharges to Temescal Creek or its tributaries which have hydraulic continuity to the Santa Ana River					Total Discharge to surface flow of the Santa Ana River	Total Waste Water Discharged in the Watershed
																			Est. EMWD Temescal Elsinore						
	Redlands	Beaumont	Yucaipa	Subtotal (A)	San Bernardino[7]	Colton	Rialto	RIX[1]	Subtotal (B)	Riverside	Corona[2]	IEUA RP 1[3]	IEUA RP 2	IEUA RP 5	IEUA CCWRF[4]	WRCRW[5]	Subtotal (C)	EMWD Discharge (1)	Arriving at Prado (2)	Valley[6] WRP (3)	Valley MWD (4)	Subtotal (D) (2+3+4)	(B+C+D)	(A+B+C+D+1-2)
1970-71	2,650	no record	-	2,650	17,860	2,520	2,270	-	22,650	18,620	3,190	-	-	-	-	-	21,810	-	-	-	-	-	44,460	47,110
1971-72	2,830	no record	-	2,830	16,020	2,230	2,400	-	20,650	19,010	3,230	6,740	-	-	-	-	28,980	-	-	-	-	-	49,630	52,460
1972-73	2,810	450	-	3,260	18,670	2,530	2,260	-	23,460	19,060	3,340	10,380	-	-	-	-	32,780	-	-	-	-	-	56,240	59,500
1973-74	2,770	600	-	3,370	17,680	2,530	2,320	-	22,530	19,560	3,510	11,440	2,320	-	-	-	36,830	-	-	-	-	-	59,360	62,730
1974-75	2,540	570	-	3,110	16,750	1,980	2,320	-	21,050	19,340	4,020	14,960	2,280	-	-	-	40,600	-	-	-	-	-	61,650	64,760
1975-76	2,450	620	-	3,070	17,250	2,540	2,240	-	22,030	19,580	4,700	15,450	2,950	-	-	-	42,680	-	-	-	-	-	64,710	67,780
1976-77	3,170	580	-	3,750	17,650	3,260	2,330	-	23,240	18,770	5,010	14,640	3,380	-	-	-	41,800	-	-	-	-	-	65,040	68,790
1977-78	3,280	620	-	3,900	18,590	3,810	2,380	-	24,780	20,310	5,200	14,650	4,060	-	-	-	44,220	-	-	-	-	-	69,000	72,900
1978-79	3,740	670	-	4,410	19,040	3,850	3,050	-	25,940	21,070	5,390	15,040	5,070	-	-	-	46,570	-	-	-	-	-	72,510	76,920
1979-80	4,190	690	-	4,880	20,360	4,190	2,990	-	27,540	22,910	5,360	14,410	5,520	-	-	-	48,200	-	-	-	-	-	75,740	80,620
1980-81	4,410	690	-	5,100	20,550	3,930	3,370	-	27,850	24,180	5,590	17,270	5,260	-	-	-	52,300	-	-	-	-	-	80,150	85,250
1981-82	4,420	700	-	5,120	23,340	3,780	3,470	-	30,590	25,640	5,410	19,580	5,360	-	-	-	55,990	-	-	-	-	-	86,580	91,700
1982-83	4,530	710	-	5,240	24,160	3,600	3,620	-	31,380	25,020	5,860	20,790	4,290	-	-	-	55,960	-	-	-	-	-	87,340	92,580
1983-84	5,150	800	-	5,950	22,080	3,700	3,830	-	29,610	26,090	6,200	20,950	3,950	-	-	-	57,190	-	-	-	-	-	86,800	92,750
1984-85	4,990	840	-	5,830	23,270	3,830	4,070	-	31,170	27,750	6,250	25,160	4,280	-	-	-	63,440	-	-	-	-	-	94,610	100,440
1985-86	5,200	820	-	6,020	24,720	4,010	4,720	-	33,450	28,820	5,900	28,240	2,660	-	-	-	65,620	-	-	-	-	-	99,070	105,090
1986-87	5,780	880	800	7,460	26,810	4,170	5,350	-	36,330	30,340	6,170	27,160	5,000	-	-	-	68,670	-	-	-	-	-	105,000	112,460
1987-88	6,060	940	1,850	8,850	27,880	5,240	6,040	-	39,160	34,660	6,050	31,290	5,500	-	-	-	77,500	-	-	-	-	-	116,660	125,510
1988-89	5,250	1,030	2,260	8,540	27,640	5,550	6,280	-	39,470	35,490	8,080	35,510	6,180	-	-	-	85,260	-	-	-	-	-	124,730	133,270
1989-90	6,360	1,100	2,370	9,830	28,350	5,810	6,260	-	40,420	33,210	9,140	34,760	5,730	-	-	-	82,840	-	-	-	-	-	123,260	133,090
1990-91	6,690	1,120	2,490	10,300	27,570	5,670	6,290	-	39,530	32,180	9,110	36,840	6,100	-	-	-	84,230	-	-	-	-	-	123,760	134,060
1991-92	6,230	1,150	2,580	9,960	25,060	5,660	6,360	-	37,080	32,660	9,010	40,360	5,780	-	1,550	-	89,360	-	-	-	-	-	126,440	136,400
1992-93	6,880	1,180	2,580	10,640	25,550	6,210	6,460	-	38,220	34,100	9,600	41,510	5,640	-	4,720	-	95,570	-	-	-	-	-	133,790	144,430
1993-94	6,440	1,150	2,710	10,300	23,800	5,830	6,540	-	36,170	32,640	7,790	37,310	5,430	-	7,010	-	90,180	-	-	-	-	-	126,350	136,650
1994-95	6,720	1,180	2,560	10,460	26,330	5,500	6,820	-	38,650	33,950	7,340	39,680	5,360	-	8,690	-	95,020	-	-	-	-	-	133,670	144,130
1995-96	6,550	1,260	2,640	10,450	13,240	2,770	6,890	20,760	43,660	33,960	7,850	39,590	4,810	-	9,060	-	95,270	-	-	-	-	-	138,930	149,380
1996-97	6,510	1,280	2,780	10,570	-	-	7,160	42,800	49,960	34,240	5,040	39,940	4,790	-	9,750	-	93,760	-	-	-	-	-	143,720	154,290
1997-98	7,022	1,356	3,116	11,494	-	-	7,063	49,683	56,746	35,422	8,718	44,940	4,969	-	9,264	1,461	104,774	1,779	1690	-	-	1,690	163,210	174,793
1998-99	7,379	1,367	3,128	11,874	-	-	6,524	47,587	54,111	34,844	11,629	43,354	5,345	-	9,534	4,594	109,300	-	-	-	3,049	3,049	166,460	178,334
1999-00	7,670	1,373	3,284	12,327	-	-	7,392	45,012	52,404	35,399	13,152	42,967	4,378	-	9,954	2,371	108,221	-	-	-	4,159	4,159	164,784	177,111
2000-01	7,379	1,377	3,345	12,101	-	-	8,346	49,407	57,753	35,663	13,100	43,863	4,401	-	11,615	2,210	110,852	-	-	-	4,245	4,245	172,850	184,951
2001-02	7,395	1,434	3,285	12,114	-	-	7,952	44,513	52,465	35,586	12,378	40,377	4,056	-	10,677	2,380	105,454	-	-	352	4,477	4,829	162,748	174,862
2002-03	7,499	1,593	3,480	12,572	217	4	8,042	45,570	53,833	36,298	12,027	45,838	4,343	-	10,837	2,409	111,752	2,312	2,024	444	5,012	7,480	173,065	185,925
2003-04	6,625	1,793	3,898	12,316	124	0	8,158	44,526	52,808	36,664	11,394	39,734	2,307	4,821	9,113	2,818	106,851	4,345	1,140	549	5,037	6,726	166,386	181,907
2004-05	7,632	2,051	3,899	13,583	4,406	183	7,815	42,025	54,428	38,123	12,558	40,644	-	8,777	8,637	3,521	112,260	15,195	13,746	653	7,025	21,424	188,112	203,144
2005-06	5,789	2,246	3,945	11,981	1,184	101	7,883	45,259	54,427	37,358	13,021	35,486	-	9,036	8,389	3,311	106,601	14,669	12,631	701	6,259	19,591	180,618	194,637
2006-07	4,991	2,555	4,056	11,601	10	-	7,654	44,011	51,676	36,355	11,727	31,829	-	12,534	6,851	4,376	103,672	13,105	11,092	691	4,792	16,575	171,922	185,537
2007-08	3,665	2,856	4,055	10,576	518	0	7,258	42,476	50,252	35,703	9,408	26,001	-	12,200	8,029	5,952	97,293	10,808	8,930	811	1,553	11,294	158,839	171,293
2008-09	2,386	2,894	3,993	9,273	263	0	6,724	40,311	47,299	33,636	9,062	23,854	-	9,711	8,920	6,374	91,557	6,669	4,653	948	518	6,119	144,975	156,264
2009-10	2,876	2,956	4,105	9,937	298	-	6,658	40,672	47,628	33,731	8,808	21,983	-	8,046	7,258	6,153	85,978	4,961	4,814	934	876	6,624	140,231	150,315
2010-11	3,271	3,050	4,196	10,516	1,292	-	6,710	39,333	47,335	33,487	9,275	18,177	-	7,279	5,987	6,486	80,690	5,680	5,418	622	4,464	10,504	138,529	149,308
2011-12	3,503	3,054	4,112	10,669	76	-	6,703	37,966	44,745	31,622	9,249	14,563	-	7,184	5,137	6,409	74,164	1,225	735	507	786	2,027	120,936	132,096
2012-13	3,652	3,139	4,191	10,982	13	-	6,611	35,390	42,014	31,996	9,406	10,647	-	5,388	5,015	6,994	69,446	2,727	502	502	650	1,654	113,113	126,321
2013-14	3,549	3,345	4,133	11,028	175	-	6,527	33,271	39,973	30,302	8,662	9,898	-	3,188	3,606	6,402	62,058	-	-	533	623	1,156	103,187	114,215
2014-15	3,149	3,428	2,920	9,497	-	-	6,285	31,668	37,954	29,673	9,611	11,589	-	3,957	4,124	6,690	65,644	-	-	605	626	1,231	104,828	114,325
2015-16	3,274	3,372	3,765	10,411	15	-	6,420	32,343	38,778	29,074	10,425	12,531	-	2,910	3,368	7,097	65,405	-	-	174	644	818	105,001	115,411
2016-17	3,084	3,645	3,976	10,705	327	-	6,755	35,306	42,387	30,030	8,445	12,390	-	3,324	3,813	6,882	64,884	-	-	894	589	1,482	108,754	119,458
2017-18	1,891	3,749	3,706	9,346	0	-	6,210	32,493	38,703	28,922	8,574	12,564	-	3,854	1,627	7,610	63,151	-	-	1,154	626	1,780	103,634	112,980
2018-19	3,909	4,043	4,233	12,185	0	-	6,892	32,925	39,817	24,962	8,851	19,093	-	6,831	2,944	7,845	70,526	6,116	4,317	1,070	520	5,907	116,250	130,234

1. RIX = Rapid Infiltration and Extraction Facility for San Bernardino and Colton, including over-extraction of groundwater
2. A portion of the Corona discharge goes to ponds, which are considered tributary to the Santa Ana River.
3. Beginning in 1997-98, includes IEUA Plant #4 flows. In 2016-17 RP1 effluent includes flows into Prado Regional Park Lake.
4. CCWRF = Carbon Canyon Water Reclamation Facility
5. WRCRW = Western Riverside County Regional Wastewater Treatment Plant
6. Lee Lake WTP name changed to Temescal Valley WRP in WY 2014-15
7. Discharge numbers were updated during the 2016-17 reporting cycle.

TABLE 3

HIGH SALINITY WATER EXPORTED
FROM THE SANTA ANA RIVER WATERSHED

Water Year	Inland Empire Utility Agency Non-Reclaimable Wastewater	Santa Ana Watershed Project Authority Santa Ana Regional Interceptor (SARI)[1]		
	North System (acre-feet)	SARI Flow[2] (acre-feet)	Average TDS (mg/L)	Total Flow (acre-feet)
1970-71	NA	---	---	---
1971-72	NA	---	---	---
1972-73	NA	---	---	---
1973-74	NA	---	---	---
1974-75	NA	---	---	---
1975-76	NA	---	---	---
1976-77	NA	---	---	---
1977-78	NA	---	---	---
1978-79	NA	---	---	---
1979-80	NA	---	---	---
1980-81	NA	---	---	---
1981-82	4,236	---	---	4,236
1982-83	4,651	---	---	4,651
1983-84	4,142	---	---	4,142
1984-85	2,346	---	---	2,346
1985-86	2,995	2,791 [3]	NA	5,786 [3]
1986-87	4,943	2,869 [3]	NA	7,813 [3]
1987-88	5,177	2,948 [3]	NA	8,125 [3]
1988-89	5,949	3,622 [3]	NA	9,572 [3]
1989-90	5,240	7,393	1,649	12,633
1990-91	2,847	7,340	1,906	10,187
1991-92	3,421	6,457	2,346	9,878
1992-93	3,774	5,277	2,516	9,051
1993-94	3,764	7,860	2,302	11,624
1994-95	4,131	8,656	1,903	12,787
1995-96	3,863	9,597	2,175	13,460
1996-97	4,191	10,225	2,292	14,417
1997-98	4,575	8,210	2,456	12,785
1998-99	3,666	4,305	2,611	7,971
1999-00	4,272	7,711	2,154	11,983
2000-01	5,075	8,205	2,504	13,280
2001-02	4,297	8,385	3,289	12,682
2002-03	3,926	9,331	3,482	13,257
2003-04	3,950	10,505	3,798	14,455
2004-05	4,220	10,971	3,460	15,191
2005-06	5,085	12,847	4,118	17,932
2006-07	4,609	13,168	4,120	17,777
2007-08	4,658	12,123	4,986	16,781
2008-09	4,284	12,993	5,037	17,277
2009-10	3,865	13,325	5,003	17,190
2010-11	3,443	13,282	5,066	16,725
2011-12	3,668	13,471	5,884	17,139
2012-13	3,862	12,061	5,626	15,923
2013-14	4,190	12,185	5,350	16,375
2014-15	4,063	12,056	5,460	16,119
2015-16	4,110	11,396	5,364	15,506
2016-17	4,324	11,957	5,361	16,281
2017-18	4,410	11,520	5,626	15,930
2018-19	4,193	11,336	5,953	15,529

1. Santa Ana Regional Interceptor began operation in 1985-86.
2. IEUA Non-Reclaimable Wastewater from the South System goes into the SARI and is included in SARI Flow.
3. SARI flow and Total Flow for 1985-86 through 1988-89 is partial flow.

NA = Data Not Available

Chino Groundwater Basin Hydraulic Control

During most of the twentieth century much of the land overlying the Chino Basin was devoted to irrigated agriculture that obtained its water supply directly from the basin. In more recent times the agriculture is being replaced by urban development, but the agricultural water use left behind a legacy of high concentrations of nitrates and other salts in the groundwater, making it unsuitable for urban use unless treated. As agricultural pumping of groundwater in the lower part of the Basin was cut back, the California Regional Water Quality Control Board, Santa Ana Region ("RWQCB"), and OCWD both became concerned about the outlook for increased amounts of poor quality water rising in the Santa Ana River above Prado Dam.

Under historic anti-degradation water quality standards, the recharge of recycled water in the Chino Basin was impossible because the Basin lacked assimilative capacity. In order to allow for the use and recharge of recycled water, the RWQCB amended the Basin Plan for the Santa Ana Watershed to allow for the use of special "maximum benefit" standards. As a condition of approval of the use of the maximum benefit standards, the RWQCB's Water Quality Control Plan requires that the Chino Basin entities develop and implement a Hydraulic Control Program with the dual objectives of minimizing the loss of groundwater to the River and protecting the River against the salts by increasing pumping from wells low in the Basin. Much of the pumped groundwater is treated in desalination facilities, with the product water being served to municipalities and the brine stream being exported to the ocean via the SARI/IEBL.

The Chino Basin Watermaster files an annual report with RWQCB on the program, water chemistry, hydrologic balance, piezometric groundwater surface elevations, and groundwater modeling. In February 2016, Chino Basin Watermaster announced that hydraulic control had been achieved.

Watermaster Service Expenses

In accordance with Paragraph 7(d) of the Judgment, the fees and expenses of each of the members of the Watermaster are borne by the parties by whom they were nominated. All other Watermaster service expenses are shared by the parties with OCWD paying 40% of the cost and WMWD, SBVMWD, and IEUA each paying 20% of the cost.

The Watermaster annually adopts a budget for the costs of services other than those provided by the USGS. Table 4 shows the budget and actual expenses incurred for such services during the 2018-19 fiscal year as well as the budget adopted for the 2019-2020 fiscal year. A financial review was performed by OCWD and is reported in Appendix C.

TABLE 4

WATERMASTER SERVICE BUDGET AND EXPENSES

Budget Item	July 1, 2018 to June 30, 2019 Budget	July 1, 2018 to June 30, 2019 Expenses	July 1, 2019 to June 30, 2020 Budget
Support Services	$9,000.00	$8,000.00	$9,000.00
Reproduction of Annual Report	1,000.00	743.00	1,000.00
TOTAL	$10,000.00	$8,743.00	$10,000.00

Stream flow measurements and water quality data required by the Watermaster are, for the most part, furnished by the USGS through a cooperative monitoring program which also includes some precipitation data to supplement data provided by the USGS and other agencies. The costs of the cooperative monitoring program for Water Year 2018-19, and each party's share of the costs, are set forth in Table 5.

TABLE 5

COSTS TO THE PARTIES AND USGS FOR MEASUREMENTS WHICH PROVIDE DATA USED BY THE SANTA ANA RIVER WATERMASTER

October 1, 2018 to September 30, 2019

	Total Cost	USGS Share	Parties' Share
USGS PRECIPITATION GAGING STATIONS			
Gilbert Street Precipitation Gage at San Bernardino	$9,100	$0	$9,100
Middle Fork Lytle Creek Precipitation	$5,450	$5,450	$0
USGS FLOW AND WATER QUALITY GAGING			
Santa Ana River at MWD Crossing (Riverside Narrows)			
Surface Water Gage	$33,000	$11,050	$21,950
Water Quality Monitoring TDS Sampling	$13,700	$4,600	$9,100
Santa Ana River below Prado Dam			
Surface Water Gage	$26,050	$26,050	$0
Extra Measurements in WY19	$16,332	$0	$16,332
Water Quality Monitoring	$18,850	$6,300	$12,550
Water Quality Monitoring TDS Sampling	$12,550	$4,200	$8,350
Water Quality Conductance Program	$2,950	$0	$2,950
Temescal Creek above Main St., near Corona	$23,500	$7,850	$15,650
Chino Creek at Schaefer Avenue	$23,500	$7,850	$15,650
Cucamonga Creek near Mira Loma	$23,500	$7,850	$15,650
Temescal Creek at Corona Lake near Corona	$17,500	$0	$17,500
TOTAL COST AND SHARES	$225,982	$81,200	$144,782
COST DISTRIBUTION AMONG PARTIES			
Inland Empire Utilities Agency	20%		$28,956
Orange County Water District	40%		$57,913
San Bernardino Valley Municipal Water District	20%		$28,956
Western Municipal Water district	20%		$28,956

CHAPTER II

BASE FLOW AT PRADO

This chapter deals with determinations of 1) the components of flow at Prado, which include Nontributary Flow, water discharged from San Jacinto Watershed, Storm Flow, and Base Flow and 2) the Adjusted Base Flow at Prado credited to IEUA and WMWD.

Flow at Prado

During Water Year 2018-19, the flow of the River as measured at the USGS gaging station below Prado Dam amounted to 251,974 acre-feet. There was 1 acre-foot of water in storage at the beginning of the Water Year, and 2 acre-feet of water remained in storage at the end of the Water Year. Inflow to the reservoir included 97,993 acre-feet of Base Flow and 149,666 acre-feet of Storm Flow. There were no Nontributary Flows to Prado. Water discharged from the San Jacinto Watershed was excluded from Base Flow but was partially credited to the Cumulative Credit at Prado. Discharge from the San Jacinto Watershed calculated to have reached Prado Reservoir was 4,317 acre-feet. The monthly components of flow of the River at Prado Dam for Water Year 2018-19 are listed in Table 6 and are shown graphically on Plate 4. Historical Base and Storm Flows of the River below Prado during Water Years 1934-35 through 2018-19 are presented on Plate 5.

Nontributary Flow

Nontributary Flow includes water that originated outside the watershed and other water that the Watermaster has determined should be excluded from Base Flow. During Water Year 2018-19, there were no Nontributary Flows that were determined to have reached Prado. Some flows from the San Jacinto Watershed were determined to have reached Prado Reservoir. In the past, Nontributary Flows have included, and may include in the future, other water discharged to the River pursuant to water exchange or other such programs.

Releases to San Antonio Creek

Since May 1973, OCWD has from time to time purchased State Water Project water for the replenishment of the groundwater basin in Orange County. The water has been released at two locations: Santa Ana River above Riverside Narrows (1972-72 only) and San Antonio Creek near the City of Upland. The general procedure used by the Watermaster to account for Nontributary Flows released to San Antonio Creek via OC-59 is fully described in the Twelfth (1981-82) Annual Report. During Water Year 2018-19, there was no water discharged to San Antonio Creek for OCWD via OC-59.

TABLE 6

COMPONENTS OF FLOW AT PRADO DAM
WATER YEAR 2018-19
(acre-feet)

	USGS Measured Outflow	Storage Change (1)	Computed Inflow	San Jacinto Watershed Flow at Prado (2)	San Antonio Creek (3)	Storm Flow	Base Flow
2018							
October	6,999	2	7,001	0	0	1,284	5,717
November	6,666	2,273	8,939	0	0	2,838	6,101
December	22,998	(2,271)	20,727	0	0	11,347	9,380
2019							
January	28,748	12,099	40,847	0	0	28,848	12,000
February	87,281	6,421	93,702	1,771	0	80,544	11,386
March	30,672	(1,783)	28,889	1,971	0	15,420	11,497
April	23,048	(11,746)	11,302	575	0	591	10,136
May	22,090	(4,931)	17,159	0	0	8,391	8,768
June	7,581	(62)	7,519	0	0	403	7,116
July	5,806	0	5,806	0	0	0	5,806
August	4,926	0	4,926	0	0	0	4,926
September	5,159	1	5,160	0	0	0	5,160
Total	251,974	3	251,977	4,317	0	149,666	97,993

(1) The monthly change in storage is included in the monthly components of flow.

(2) Discharge due to overflow of Lake Elsinore and/or discharge of wastewater by EMWD from the San Jacinto Watershed.

(3) State Water Project water released into San Antonio Creek from turnout OC-59 for OCWD and calculated to have reached Prado this Water Year.

San Jacinto Watershed Discharge

Prior to Water Year 1997-98, discharges from the San Jacinto Watershed reaching Prado Reservoir were due to discharges from Lake Elsinore, and had been accounted for as "Lake Elsinore Discharge." In 1998, Eastern Municipal Water District (EMWD) completed its Reach 4 discharge pipeline to Wasson Canyon, which is tributary to Temescal Wash. The pipeline discharges tertiary-treated wastewater to Temescal Wash above Lee Lake when flows exceed EMWD's storage facility capacity. The collective discharges from Lake Elsinore and EMWD to Temescal Wash are referred to herein as San Jacinto Watershed discharges.

During water Year 2018-19, EMWD discharged 6,116 acre-feet of treated wastewater to Temescal Wash, and 4,317 acre-feet of that discharge was estimated to have reached Prado Reservoir. OCWD captured 2,299 acre-feet of the San Jacinto Watershed discharge and 2,018 acre-feet flowed past OCWD groundwater recharge facilities and was considered as lost to the ocean. Because discharges from the San Jacinto Watershed were not envisioned in the formulation of the Judgment, the Watermaster previously determined that to the extent such discharges occur and are captured by OCWD, fifty percent of such captured water will be added as Cumulative Credit at Prado. Thus, for Water Year 2018-19, the Cumulative Credit at Prado includes 1,150 acre-feet of San Jacinto Watershed outflow. Summaries of the EMWD Discharges, San Jacinto Watershed Discharge Calculations, and San Jacinto Watershed Discharges are contained in Appendix E. Page E-16 of Appendix E includes hydrographs of Discharge of Temescal Creek at Main Street in Corona, Lee Lake Discharge, EMWD Discharge, and Elsinore Precipitation. These hydrographs illustrate the known and estimated components of flow of Temescal Creek.

Storm Flow

Portions of storm flows are retained behind Prado Dam for flow regulation and for water conservation purposes. The United States Army Corps of Engineers (USACE) owns and operates the Dam according to a flow release schedule which allows for water to be captured and subsequently released at rates which can be captured and recharged by OCWD. The Dam has a spillway elevation of 543 feet above mean sea level. On April 12, 1995, the USACE, the United States Fish and Wildlife Service (USFWS), and OCWD reached an agreement to increase the seasonal water conservation pool from elevation 494 to elevation 505 feet after March 1 of each year in exchange for a $1 million contribution by OCWD to the USFWS to be used to develop least Bell's vireo habitat by the removal of a non-native plant, *Arundo donax*. In 2006 the USACE and OCWD signed an agreement to increase the winter conservation pool elevation from elevation 494 to 498 in exchange for a $930,000 contribution from OCWD to habitat restoration in the watershed. Monthly and annual quantities of Storm Flow are shown in Table 6.

During Water Year 2018-19, the maximum volume of water stored in Prado Reservoir reached 39,230 acre-feet on February 15, 2019. The maximum daily mean flow released from Prado Dam to the River during the Water Year was 5,380 cfs on February 15, 2019.

Base Flow

The Base Flow is that portion of the total flow remaining after subtracting Storm Flow, Nontributary Flow and certain other flows determined by the Watermaster. Flows affecting the determination of Base Flow in Water Year 2018-19 did not include discharges from the San Jacinto Watershed. The general procedure used by the Watermaster to separate the Water Year 2018-19 flow components was the same as used for previous years and is fully described in the Fifth (1974-75) Annual Report. Table 6 shows the monthly and annual quantities of Base Flow.

Water Quality Adjustments

The flow-weighted average TDS for the total flow passing Prado Dam was found to be 395 mg/L. This determination was based on records from a continuous monitoring device operated by the USGS for EC of the River flow below Prado Dam. This record was supplemented by thirty-nine (39) grab samples for EC collected by the USGS and analyzed for TDS. One other grab sample was analyzed for EC and not TDS.

For Water Year 2018-19 a correlation between TDS and EC yields the following best fit equation:

$$TDS = EC \times 0.5978$$

(where the units of TDS and EC are mg/L and μs/cm, respectively)

Using the daily EC data, flow-weighted average daily concentrations for TDS were calculated using the above equation. The plot of TDS on Plate 6 shows the average daily TDS concentration of the River flow passing Prado Dam. A summary of daily TDS and EC of the River below Prado Dam is contained in Appendix F. At Prado Dam, the flow-weighted average annual TDS concentration of 395 mg/L represents the quality of the total flow including releases to San Antonio Creek and discharges from San Jacinto Watershed, if any. The Judgment requires that Base Flow shall be subject to adjustment based on the TDS of Base Flow and Storm Flow only. Hence, a determination of the TDS of Base Flow plus Storm Flow only is detailed in the following paragraphs.

Adjustment for State Water Project Flow to San Antonio Creek

No State Water Project flows discharged to San Antonio Creek reached Prado Dam.

Adjustment for San Jacinto Watershed Discharge

Discharge from the San Jacinto Watershed during Water Year 2018-19 reaching Prado Reservoir was estimated to be 4,317 acre-feet. Using EMWD discharge data, the TDS data for the discharge, and monthly volume of the discharge estimated to have reached Prado Reservoir, a flow-weighted average TDS of 736 mg/L was calculated. A summary of these calculations is contained in Appendix E.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow X Average TDS
1. Measured Outflow	251,974	401	101,041,574
2. Less Nontributary Flow San Antonio Creek	0	---	---
3. Less San Jacinto Watershed Discharge	4,317	736	3,177,312
4. Measured Outflow less lines 2 and 3	247,657		97,864,262
Average TDS in Total Base and Storm Flow	97,864,262 ÷ 247,657 = 395 mg/L		

As shown above, the flow-weighted average annual TDS of Storm Flow and Base Flow for Water Year 2018-19 is 395 mg/L.

Adjusted Base Flow at Prado

The Judgment provides that the amount of Base Flow at Prado received during any year shall be subject to adjustment based on flow-weighted average annual TDS of the Base Flow and Storm Flow at Prado as follows:

If the Weighted Average TDS in Base Flow and Storm Flow at Prado is:	Then the Adjusted Base Flow shall be determined by the formula:
Greater than 800 mg/L	$Q - \frac{35}{42{,}000} Q(TDS-800)$
700 mg/L to 800 mg/L	Q
Less than 700 mg/L	$Q + \frac{35}{42{,}000} Q(700-TDS)$

where Q = Base Flow actually received.

The flow-weighted average annual TDS of 395 mg/L is less than 700 mg/L. Therefore, the Base Flow of 97,993 acre-feet must be adjusted by the above equation for TDS less than 700 mg/L. Thus, the Adjusted Base Flow is as follows:

$$(97{,}993 \text{ acre-feet}) + \frac{35}{42{,}000} \times (97{,}993 \text{ acre-feet}) \times (700 - 395) = 122{,}900 \text{ acre-feet}$$

Entitlement and Credit or Debit

Paragraph 5(c) of the Judgment states that "CBMWD (now IEUA) and WMWD shall be responsible for an average annual Adjusted Base Flow of 42,000 acre-feet at Prado. CBMWD (IEUA) and WMWD each year shall be responsible for not less than 37,000 acre-feet of Base Flow at Prado, plus one-third of any cumulative debit; provided, however, that for any year commencing on or after October 1, 1986, when there is no cumulative debit, or for any year prior to 1986 whenever the cumulative credit exceeds 30,000 acre-feet, said minimum shall be 34,000 acre-feet."

The Watermaster agreed that San Jacinto Watershed outflows were not envisioned during the formulation of the Judgment and because of the periodic occurrence of San Jacinto Watershed flows at Prado, the Watermaster decided, as in previous years, to credit one-half of any such outflows recharging the groundwater basin in Orange County to IEUA and WMWD.

The findings of the Watermaster concerning flow at Prado for Water Year 2018-19 required under the Judgment are as follows:

1.	Measured Outflow at Prado	251,974 acre-feet
2.	Base Flow at Prado	97,993 acre-feet
3.	Annual Weighted TDS of Base and Storm Flow	395 mg/L
4.	Annual Adjusted Base Flow	122,900 acre-feet
5.	Cumulative Adjusted Base Flow	5,715,223 acre-feet
6.	Other Credits (Debits) [1]	1,150 acre-feet
7.	Cumulative Entitlement of OCWD	2,058,000 acre-feet
8.	Cumulative Credit [2]	3,698,381 acre-feet
9.	One-Third of Cumulative Debit	0 acre-feet
10.	Minimum Required Base Flow in 2018-19	34,000 acre-feet

1. Other Credits (Debits) are comprised of San Jacinto Watershed outflow.
2. Cumulative Credit includes 41,158 acre-feet of San Jacinto Watershed cumulative outflow.

TABLE 7
HISTORICAL WATERMASTER FINDINGS AT PRADO DAM
(acre-feet)

Water Year	Base Flow	Annual Adjusted Base Flow	Cumulative Adjusted Base Flow	Other Credits (Debits)[1]	Cumulative Entitlement of OCWD	Cumulative Credit[2]
1970-71	38,402	38,402	38,402	0	42,000	-3,598
1971-72	40,416	40,416	78,818	0	84,000	-5,182
1972-73	48,999	51,531	130,349	0	126,000	4,349
1973-74	43,106	45,513	175,862	0	168,000	7,862
1974-75	50,176	51,263	227,125	0	210,000	17,125
1975-76	45,627	48,098	275,223	0	252,000	23,223
1976-77	48,387	50,000	325,223	0	294,000	31,223
1977-78	58,501	73,955	399,178	0	336,000	63,178
1978-79	71,863	79,049	478,227	0	378,000	100,227
1979-80	82,509	106,505	584,732	0	420,000	164,732
1980-81	74,875	74,875	659,607	8,045	462,000	205,652
1981-82	81,548	89,431	749,038	0	504,000	253,083
1982-83	111,692	138,591	887,629	3,362	546,000	353,036
1983-84	109,231	115,876	1,003,505	4,602	588,000	431,514
1984-85	125,023	133,670	1,137,175	0	630,000	523,184
1985-86	127,215	141,315	1,278,490	0	672,000	622,499
1986-87	119,848	127,638	1,406,128	0	714,000	708,137
1987-88	124,104	136,308	1,542,436	0	756,000	802,445
1988-89	119,572	131,230	1,673,666	0	798,000	891,675
1989-90	119,149	127,986	1,801,652	0	840,000	977,661
1990-91	111,515	128,379	1,930,031	0	882,000	1,064,040
1991-92	106,948	124,862	2,054,893	0	924,000	1,146,902
1992-93	128,067	163,499	2,218,392	0	966,000	1,268,401
1993-94	111,186	119,432	2,337,824	0	1,008,000	1,345,833
1994-95	123,468	152,792	2,490,616	1,762	1,050,000	1,458,387
1995-96	131,861	152,299	2,642,915	0	1,092,000	1,568,686
1996-97	136,676	157,861	2,800,776	0	1,134,000	1,684,547
1997-98[3]	155,711	195,677	2,996,453	0	1,176,000	1,838,224
1998-99	158,637	174,369	3,170,822	0	1,218,000	1,970,593
1999-00	148,269	169,644	3,340,466	0	1,260,000	2,098,237
2000-01	153,914	176,360	3,516,826	0	1,302,000	2,232,597
2001-02	145,981	159,728	3,676,554	0	1,344,000	2,350,325
2002-03	146,113	174,970	3,851,524	887	1,386,000	2,484,182
2003-04[4]	143,510	167,190	4,018,714	247	1,428,000	2,609,619
2004-05	154,307	199,570	4,218,284	2,366	1,470,000	2,769,555
2005-06	147,736	170,266	4,388,550	3,562	1,512,000	2,901,383
2006-07	129,830	140,216	4,528,766	5,531	1,554,000	3,005,130
2007-08	116,483	136,382	4,665,148	4,165	1,596,000	3,103,677
2008-09	102,711	117,519	4,782,667	2,189	1,638,000	3,181,385
2009-10	103,099	125,179	4,907,846	1,489	1,680,000	3,266,053
2010-11[4]	102,031	117,166	5,025,012	1,193	1,722,000	3,342,412
2011-12	93,068	101,056	5,126,068	365	1,764,000	3,401,833
2012-13	81,452	86,814	5,212,882	243	1,806,000	3,446,890

TABLE 7 (Continued)
HISTORICAL WATERMASTER FINDINGS AT PRADO DAM
(acre-feet)

Water Year	Base Flow	Annual Adjusted Base Flow	Cumulative Adjusted Base Flow	Other Credits (Debits)[1]	Cumulative Entitlement of OCWD	Cumulative Credit[2]
2013-14	63,536	69,784	5,282,666	0	1,848,000	3,474,674
2014-15	64,048	73,548	5,356,214	0	1,890,000	3,506,222
2015-16	71,225	79,535	5,435,749	0	1,932,000	3,543,757
2016-17	70,010	87,046	5,522,795	0	1,974,000	3,588,803
2017-18	65,438	69,528	5,592,323	0	2,016,000	3,616,331
2018-19	97,993	122,900	5,715,223	1,150	2,058,000	3,698,381

(1) Other Credits (Debits) are comprised of San Jacinto Watershed outflow which is the sum of discharge from Lake Elsinore and wastewater discharged by EMWD.

(2) Cumulative Credit includes 41,158 acre-feet of San Jacinto Watershed cumulative outflow.

(3) The Base Flow and Adjusted Base Flow for Water Year 1997-98 were returned to their originally published values to correct an error in the adjustment to account for San Jacinto Watershed flow arriving at Prado. This correction is also reflected in the Cumulative Credit for this and subsequent years.

(4) A correction was made for Water Years 2003-04 and 2010-11 in the calculation of Weighted TDS based on an adjustment to account for OC-59 water that arrived at Prado. This correction is reflected in the Weighted TDS and Adjusted Base Flow for these years. This correction is also reflected in the Cumulative Credit for these and subsequent years.

CHAPTER III

BASE FLOW AT RIVERSIDE NARROWS

This chapter deals with determinations of 1) the components of flow at Riverside Narrows, which include Storm Flow and Base Flow and 2) the Adjusted Base Flow at Riverside Narrows credited to SBVMWD.

Flow at Riverside Narrows

The flow of the River at Riverside Narrows was to 97,063 acre-feet, measured at the USGS gaging station near the MWD Crossing. Separated into its components, Base Flow was 36,604 acre-feet and Storm Flow was 62,611 acre-feet. Included in Base Flow is 2,152 acre-feet of treated wastewater from Rubidoux Community Services District (Rubidoux CSD) that now bypasses the USGS gaging station. The Storm and Base Flow components of the flow of the River at Riverside Narrows for each month in the Water Year 2018-19 are listed in Table 8 and shown graphically on Plate 7. The components of flow of the River at Riverside Narrows during the period 1934-35 through 2018-19 are presented on Plate 8.

Nontributary Flow

Nontributary Flow includes water that originated outside the watershed, as well as other water that the Watermaster has determined should be excluded from Base Flow. During Water Year 2018-19, no Nontributary Flow was delivered to the River upstream of Riverside Narrows and Prado Dam. In the past, Nontributary Flows have included, and may include in the future, other water discharged to the River pursuant to water exchange or other such programs.

Base Flow

Based on the hydrograph shown on Plate 7 a separation was made between Storm Flow and the sum of Base Flow and Nontributary Flow utilizing in general the procedures reflected in the Work Papers of the engineers (as referenced in Paragraph 2 of the Engineering Appendix of the Judgment).

In April 1980, Rubidoux CSD made the first delivery of treated wastewater to the regional treatment plant at Riverside. Prior to that time, Rubidoux CSD had discharged to the River upstream of the Riverside Narrows gaging station. Treated wastewater from Rubidoux CSD during Water Year 2018-19, in the amount of 2,152 acre-feet, has been added to the Base Flow as measured at the gaging station. A summary of Rubidoux CSD discharges is contained in Appendix G.

TABLE 8

COMPONENTS OF FLOW AT RIVERSIDE NARROWS
WATER YEAR 2018-19
(acre-feet)

	Month	USGS Measured Flow	Storm Flow	Rubidoux Waste-water	Base Flow [1]
2018	October	3,225	827	185	2,583
	November	4,283	1,914	179	2,548
	December	6,911	4,046	184	3,049
2019	January	18,366	14,706	189	3,849
	February	35,919	31,961	176	4,134
	March	7,283	3,349	185	4,119
	April	3,185	7	175	3,353
	May	7,983	5,109	177	3,051
	June	3,277	686	172	2,763
	July	2,364	0	178	2,542
	August	2,303	0	181	2,484
	September	1,964	6	171	2,129
Total		97,063	62,611	2,152	36,604

(1) Base Flow equals USGS measured flow, minus storm flow, minus transferred water (when applicable), plus Rubidoux Wastewater.

Water Quality Adjustments

The determination of water quality at the Riverside Narrows Gaging Station was made using periodic grab samples taken and analyzed for TDS by the USGS and the City of Riverside. A summary of TDS and EC data of the River at Riverside Narrows is contained in Appendix H.

In October 2013, the City of Riverside changed the TDS and EC location for sampling. The new sampling location was further upstream and was not representative of stream flow at the Riverside Narrows. Beginning October 2016, the City of Riverside changed its sampling location and its TDS and EC data are again representative of stream flow at the Riverside Narrows. The City data are thus used in the water quality adjustments for Water Year 2018-19.

Adjustment for Nontributary Flow

During Water Year 2018-19, there was no Nontributary Flow. Therefore, no water quality adjustment was required.

Adjustment for Treated Wastewater Discharges from the Rubidoux Community Services District

The flow-weighted quality of treated wastewater from Rubidoux CSD was 918 mg/L. A monthly summary of discharges and quality is contained in Appendix G.

The Base Flow quality adjustments resulting from exclusion of the Nontributary Flow and inclusion of the Rubidoux CSD treated wastewater are shown in the following table, and resulted in a Base Flow TDS of 652 mg/L.

Flow Component	Annual Flow (acre-feet)	Average TDS (mg/L)	Annual Flow x Average TDS
1. Base Flow plus Nontributary Flow	34,452	635	21,877,020
2. Less Nontributary Flow	0	---	---
3. Plus Rubidoux CSD Treated Wastewater	2,152	918	1,975,536
4. Base Flow (line 1 less line 2 plus line 3)	36,604		23,852,556
Average TDS of Base Flow		23,852,556 ÷ 36,604 = 652 mg/L	

Adjusted Base Flow at Riverside Narrows

The Judgment provides that the amount of Base Flow at Riverside Narrows credited during any year shall be subject to adjustment based on weighted average annual TDS in the Base Flow as follows:

If the Weighted Average TDS in Base Flow at Riverside Narrows is:	Then the Adjusted Base Flow shall be determined by the formula:
Greater than 700 mg/L	$Q - \frac{11}{15,250}Q(TDS-700)$
600 mg/L to 700 mg/L	Q
Less than 600 mg/L	$Q + \frac{11}{15,250}Q(600-TDS)$

where Q = Base Flow actually received.

From the previous subsection, the weighted average annual TDS in the Base Flow at Riverside Narrows for Water Year 2018-19 was 652 mg/L. Therefore, no adjustment is necessary, and the Adjusted Base Flow for Water Year 2018-19 is 36,604 acre-feet.

Entitlement and Credit or Debit

Paragraph 5(b) of the Judgment states that "SBVMWD shall be responsible for an average annual Adjusted Base Flow of 15,250 acre-feet at Riverside Narrows. SBVMWD each year shall be responsible for not less than 13,420 acre-feet of Base Flow plus one-third of any cumulative debit, provided, however, that for any year commencing on or after October 1, 1986, when there is no cumulative debit, or for any year prior to 1986 whenever the cumulative credit exceeds 10,000 acre-feet, said minimum shall be 12,420 acre-feet."

Findings of the Watermaster concerning flow at Riverside Narrows for Water Year 2018-19 required under the Judgment are as follows:

1.	Base Flow at Riverside Narrows	36,604 acre-feet
2.	Annual Weighted TDS of Base Flow	652 mg/L
3.	Annual Adjusted Base Flow	36,604 acre-feet
4.	Cumulative Adjusted Base Flow	2,118,495 acre-feet
5.	Cumulative Entitlement of IEUA and WMWD	747,250 acre-feet
6.	Cumulative Credit	1,371,245 acre-feet
7.	One-Third of Cumulative Debit	0 acre-feet
8.	Minimum Required Base Flow in 2018-19	12,420 acre-feet

CHAPTER IV

HISTORY AND SUMMARY OF THE JUDGMENT in the case of Orange County Water District v. City of Chino, et al. (Case No. 117628-County of Orange)

History of Litigation

The complaint in the case was filed by Orange County Water District on October 18, 1963, seeking an adjudication of water rights against substantially all water users in the area tributary to Prado Dam within the Santa Ana River Watershed, but excluding the area tributary to Lake Elsinore. Thirteen cross-complaints were filed in 1968, extending the adjudication to include substantially all water users in the area downstream from Prado Dam. With some 4,000 parties involved in the case (2,500 from the Upper Area and 1,500 from the Lower Area), it became obvious that every effort should be made to arrive at a settlement and physical solution in order to avoid enormous and unwieldy litigation.

Efforts to arrive at a settlement and physical solution were pursued by public officials, individuals, attorneys, and engineers. Attorneys for the parties organized in order to facilitate settlement discussions and, among other things, provided guidance for the formation and activities of an engineering committee to provide information on the physical facts.

An initial meeting of the engineers representing the parties was held on January 10, 1964. Agreement was reached that it would be beneficial to undertake jointly the compilation of basic data. Liaison was established with the Department of Water Resources, State of California, to expedite the acquisition of data. Engineers representing the parties were divided into subcommittees which were given the responsibility of investigating such things as the boundary of the Santa Ana River Watershed and its subareas, standardization of the terminology, the location and description of wells and diversion facilities, waste disposal and transfer of water between subareas.

In response to a request from the attorneys' committee at a meeting held April 17, 1964, on April 30, 1964, the joint engineering committee prepared a list of preliminary engineering studies directed toward settlement of the Santa Ana River water rights litigation. Special assignments were made to individual engineers on selected items requested by the attorneys' committee.

The attorneys and engineers for the defendants then commenced a series of meetings separate from the representatives of the plaintiffs in order to consolidate their positions and to determine a course of action. On October 7, 1964, engineers for the defendants presented the results of the studies made by the joint engineering committee. The defendants' attorneys requested that additional information be provided on the methods of measuring flow at Prado Dam, the historical supply and disposal of water passing Prado Dam, segregation of flow into components, and determination of the amount of supply which was usable by the downstream area. On December 11, 1964, the supplemental information was presented to the defendants' attorneys.

During 1965, engineers and attorneys for the defendants held numerous conferences and conducted additional studies in an attempt to determine their respective positions in the case. Early in 1966, the plaintiff and defendants exchanged drafts of possible principles for settlement. Commencing March 22 and ending April 13, 1966, four meetings were held by the engineers to discuss the draft of principles for settlement.

On February 25, 1968, the defendants submitted a request to the Court that the Order of Reference be issued requesting the California Department of Water Resources to determine the physical facts. On May 9, 1968, the plaintiffs' attorney submitted motions opposing the Order of Reference and requested that a preliminary injunction be issued. In the meantime, every effort was being made to come to an agreement on the Judgment. Commencing on February 28, 1968 and extending until May 14, 1968, six meetings were held to determine the scope of physical facts on which agreement could be reached so that if an Order of Reference were to be approved by the Court, the work under the proposed reference would not repeat the extensive basic data collection and compilation which had already been completed and on which engineers for both plaintiffs and defendants had reached substantial agreement. Such basic data were compiled and published in two volumes under date of May 14, 1968, entitled "Appendix A, Basic Data."

On May 21, 1968, an outline of a proposal for settlement of the case was prepared and a committee of attorneys and engineers for the parties commenced preparation of the settlement documents. On June 16, 1968, the Court held a hearing on the motions it had received requesting a preliminary injunction and an Order of Reference. The parties requested that the Court delay the preliminary hearings on these motions in view of the efforts toward settlement that were underway. The plaintiff, however, was concerned regarding the necessity of bringing the case to trial within the statutory limitation and, accordingly, on July 15, 1968, submitted a motion to set the complaint in the case for trial. On October 15, 1968, the trial was commenced and was adjourned after one-half day of testimony on behalf of the plaintiff. Thereafter, the parties filed with the Court the necessary Settlement Documents including a Stipulation for Judgment. The Court entered the Judgment on April 17, 1969, along with Stipulations and Orders dismissing all defendants and cross-defendants except for the four major public water districts overlying, in aggregate, substantially all of the major areas of water use in the watershed. The districts, the locations of which are shown on Plate 1, "Santa Ana River Watershed", are as follows:

(1) Orange County Water District (OCWD), representing all lower basin entities located within Orange County downstream of Prado Dam.

(2) Western Municipal Water District (WMWD), representing middle basin entities located within Riverside County on both sides of the Santa Ana River primarily upstream from Prado Dam.

(3) Inland Empire Utilities Agency (IEUA), formerly Chino Basin Municipal Water District (CBMWD), located in the San Bernardino County Chino Basin area, representing middle basin entities within its boundaries and located primarily upstream from Prado Dam.

(4) San Bernardino Valley Municipal Water District (SBVMWD), representing all entities within its boundaries, and embraced within the upper portion of the Riverside Basin area, the Colton Basin area (being an upstream portion of the middle basin) and the San Bernardino Basin area, being essentially the upper basin.

Summary of Judgment

Declaration of Rights

The Judgment sets forth a declaration of rights. Briefly stated, the Judgment provides that the water users in the Lower Area have rights, as against the water users in the Upper Area, to receive certain average and minimum annual amounts of non-storm flow ("Base Flow") at Prado Dam, together with the right to all storm flow reaching Prado Dam. The amount of the Lower Area entitlement is variable based on the quality of the water received by the Lower Area. Water users in the Upper Area have the right as against the water users in the Lower Area to divert, pump, extract, conserve, store and use all surface and groundwater supplies originating within the Upper Area, so long as the Lower Area receives the water to which it is entitled under the Judgment and there is compliance with all of its provisions.

Physical Solution

The Judgment also sets forth a comprehensive "physical solution" for satisfying the rights of the Lower Area. To understand the physical solution, it is necessary to understand the following terms that are used in the Judgment:

Storm Flow – That portion of the total flow which originates from precipitation and runoff and which passes a point of measurement (either Riverside Narrows or Prado Dam) without having first percolated to groundwater storage in the zone of saturation, calculated in accordance with procedures referred to in the Judgment.

Base Flow - That portion of the total surface flow passing a point of measurement (either Riverside Narrows or Prado Dam) which remains after deduction of storm flow, nontributary flows, exchange water purchased by OCWD, and certain other flows as determined by the Watermaster.

Adjusted Base Flow - Actual Base Flow in each year adjusted for water quality pursuant to formulas specified in the Judgment. The adjustment of Base Flow for water quality is intended to provide an incentive to the Upper Area to maintain a better quality of water in the River. When the TDS is lower than a specified value at one of the measuring points, the water quantity obligation is lower. When the TDS is higher than a specified value, the water quantity obligation is higher. This is the first comprehensive adjudication in Southern California in which the quality of water is taken into consideration in the quantification of water rights.

Credits and Debits - Under the accounting procedures provided for in the Judgment, credits accrue to SBVMWD in any year when the Adjusted Base Flow exceeds

15,250 acre-feet at Riverside Narrows and jointly to IEUA and WMWD when the Adjusted Base Flow exceeds 42,000 acre-feet at Prado Dam. Debits accrue in any year when the Adjusted Base Flows falls below those levels. Credits or debits accumulate year to year.

Obligation at Riverside Narrows

SBVMWD has an obligation to assure an average annual Adjusted Base Flow of 15,250 acre-feet at Riverside Narrows, subject to the following:

(1) A minimum Base Flow of 13,420 acre-feet plus one-third of any cumulative debit.

(2) After October 1, 1986, if no cumulative debit exists, the minimum Base Flow shall be 12,420 acre-feet.

(3) Prior to 1986, if the cumulative credits exceed 10,000 acre-feet, the minimum Base Flow shall be 12,420 acre-feet.

(4) All cumulative debits shall be removed by the discharge of a sufficient Base Flow at Riverside Narrows at least once in any ten consecutive years following October 1, 1976. Any cumulative credits shall remain on the books of account until used to offset any subsequent debits or until otherwise disposed of by SBVMWD.

(5) The Base Flow at Riverside Narrows shall be adjusted using weighted average annual TDS in such Base Flow in accordance with the formula set forth in the Judgment.

Obligation at Prado Dam

IEUA and WMWD have a joint obligation to assure an average annual Adjusted Base Flow of 42,000 acre-feet at Prado Dam, subject to the following:

(1) Minimum Base Flow at Prado shall not be less than 37,000 acre-feet plus one-third of any cumulative debit.

(2) After October 1, 1986, if no cumulative debit exists, the minimum Base Flow quantity shall be 34,000 acre-feet.

(3) Prior to 1986, if the cumulative credit exceeds 30,000 acre-feet, the minimum Base Flow shall be 34,000 acre-feet.

(4) Sufficient quantities of Base Flow shall be provided at Prado to discharge completely any cumulative debits at least once in any ten consecutive years following October 1, 1976. Any cumulative credits shall remain on the books of account until used to offset any debits, or until otherwise disposed of by IEUA and WMWD.

(5) The Base Flow at Prado during any year shall be adjusted using the weighted average annual TDS in the total flow at Prado (Base Flow plus Storm Flow) in accordance with the formula set forth in the Judgment.

Other Provisions

SBVMWD, IEUA and WMWD are enjoined from exporting water from the Lower Area to the Upper Area, directly or indirectly. OCWD is enjoined from exporting or "directly or indirectly causing water to flow" from the Upper Area to the Lower Area. Any inter-basin acquisition of water rights will have no effect on Lower Area entitlements. OCWD is prohibited from enforcing two prior judgments so long as the Upper Area Districts are in compliance with the physical solution. The composition of the Watermaster and the nomination and appointment process for members are described along with a definition of the Watermaster's duties and a formula for sharing its costs. The court retains continuing jurisdiction over the case. There are provisions for appointment of successor parties and rules for dealing with future actions that might conflict with the physical solution.

History of the Watermaster Committee Membership

The Santa Ana River Watermaster is a committee composed of five members nominated by the parties and appointed by the court. SBVMWD, IEUA (formerly CBMWD), and WMWD nominate one member each and OCWD nominates two. The Watermaster members annually elect a Chairman, Secretary, and Treasurer.

The original five members were appointed at the time of entry of the Judgment. They prepared a *pro forma* annual report for the 1969-70 Water Year. The first annual report required by the Judgment was prepared for the 1970-71 Water Year, and reports have been prepared annually since then.

The membership of the Watermaster has changed over the years. The historical listing of members and officers shown in Table 9 reflects the signatories to each annual report.

TABLE 9
HISTORY OF THE WATERMASTER COMMITTEE MEMBERSHIP

Water Year	SBVMWD	IEUA	WMWD	OCWD	OCWD
1969-70	Clinton O. Henning	William J. Carroll	Albert A. Webb, Secretary	Max Bookman, Chairman	John M. Toups
1970-71 through 1973-74	James C. Hanson	William J. Carroll	Albert A. Webb, Secretary	Max Bookman, Chairman	John M. Toups
1974-75 through 1977-78	James C. Hanson	William J. Carroll	Donald L. Harriger	Max Bookman, Chairman	John M. Toups, Secretary
1978-79 through 1981-82	James C. Hanson	William J. Carroll	Donald L. Harriger	Max Bookman, Chairman	William R. Mills, Jr., Secretary
1982-83 through 1983-84	James C. Hanson	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr., Secretary
1984-85 through 1988-89	Robert L. Reiter	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr., Secretary
1989-90 through 1994-95	Robert L. Reiter, Secretary/Treasurer	William J. Carroll	Donald L. Harriger	Harvey O. Banks, Chairman	William R. Mills, Jr.
1995-96	Robert L. Reiter, Secretary/Treasurer	William J. Carroll, Chairman	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr.
1996-97	Robert L. Reiter, Secretary/Treasurer	William J. Carroll	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman
1997-98	Robert L. Reiter, Secretary/Treasurer	Robb D. Quincey	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman
1998-99 through 2000-01	Robert L. Reiter, Secretary/Treasurer	Richard W. Atwater	Donald L. Harriger	Bill B. Dendy	William R. Mills, Jr., Chairman
2001-02 through 2002-03	Robert L. Reiter, Secretary/Treasurer	Richard W. Atwater	Donald L. Harriger, Chairman	Bill B. Dendy	Virginia L. Grebbien
2003-04 through 2005-06	Robert L. Reiter, Chairman/Treasurer	Richard W. Atwater	John V. Rossi	Bill B. Dendy, Secretary	Virginia L. Grebbien
2006-07 through 2007-08	Samuel H. Fuller, Secretary/Treasurer	Richard W. Atwater	John V. Rossi	Bill B. Dendy, Chairman	Craig D. Miller
2008-09	Samuel H. Fuller, Secretary/Treasurer	Richard W. Atwater	John V. Rossi	Robert C. Wagner	Craig D. Miller, Chairman
2009-10	Samuel H. Fuller, Secretary/Treasurer	Thomas A. Love	John V. Rossi, Chairman	Michael R. Markus	Roy L. Herndon
2010-11	Samuel H. Fuller, Secretary/Treasurer	Thomas A. Love, Chairman	John V. Rossi	Michael R. Markus	Roy L. Herndon

TABLE 9 (Continued)
HISTORY OF THE WATERMASTER COMMITTEE MEMBERSHIP

Water Year	SBVMWD	IEUA	WMWD	OCWD	OCWD
2011-12	Samuel H. Fuller, Secretary/Treasurer	Thomas A. Love	John V. Rossi	Michael R. Markus	Roy L. Herndon, Chairman
2012-13 through 2015-16	Douglas D. Headrick, Secretary/Treasurer	P. Joseph Grindstaff	John V. Rossi	Michael R. Markus	Roy L. Herndon, Chairman
2016-17 through 2017-18	Douglas D. Headrick, Secretary/Treasurer	Halla Razak	Craig D. Miller	Michael R. Markus	Roy L. Herndon, Chairman
2018-19	Wen B. Huang Secretary/Treasurer	Shivaji Deshmukh	Craig D. Miller	Michael R. Markus	Roy L. Herndon, Chairman

Santa Ana River Watershed

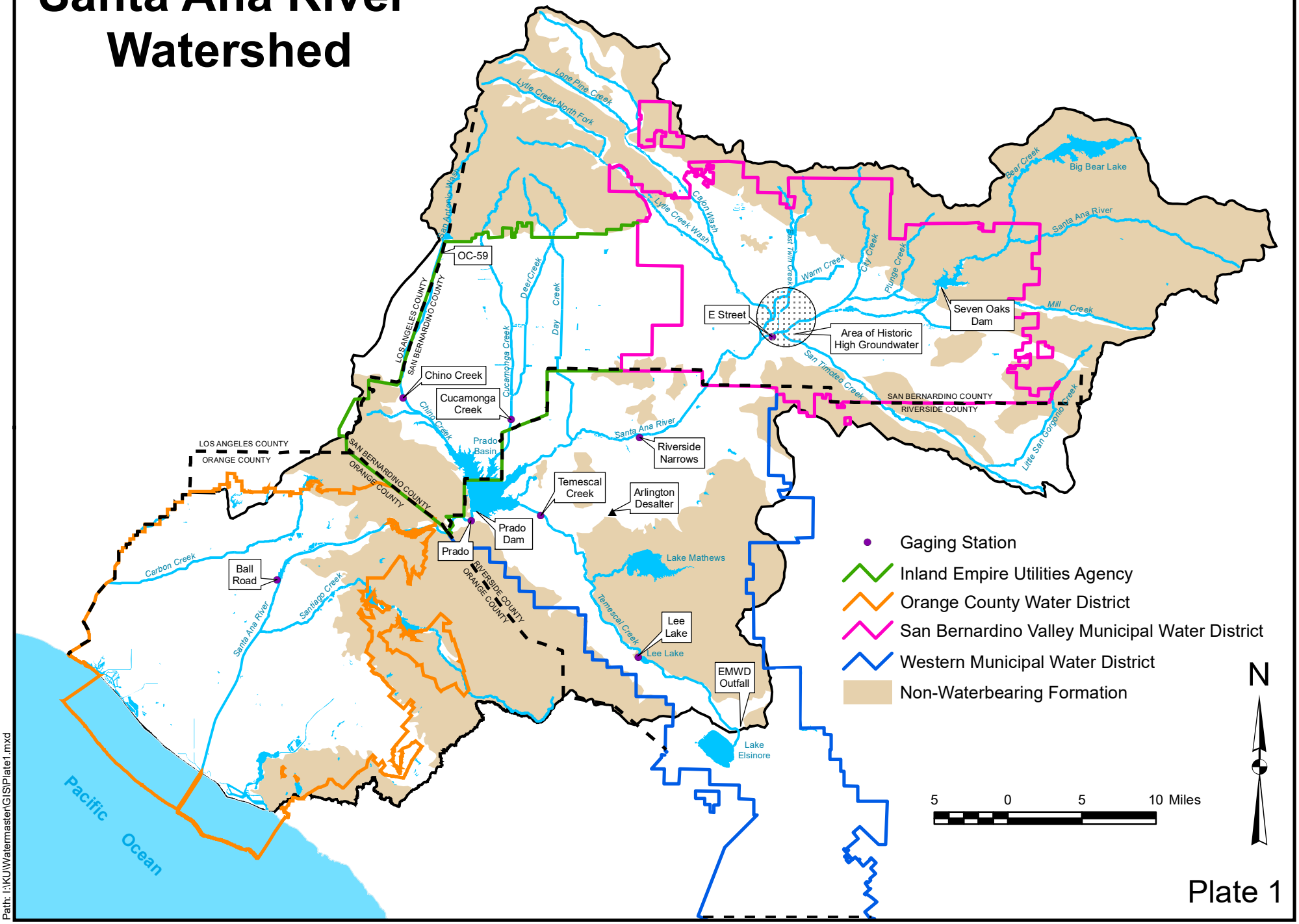

Plate 1

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Santa Ana River Watershed Wastewater Treatment Plants and Salt Export Pipelines

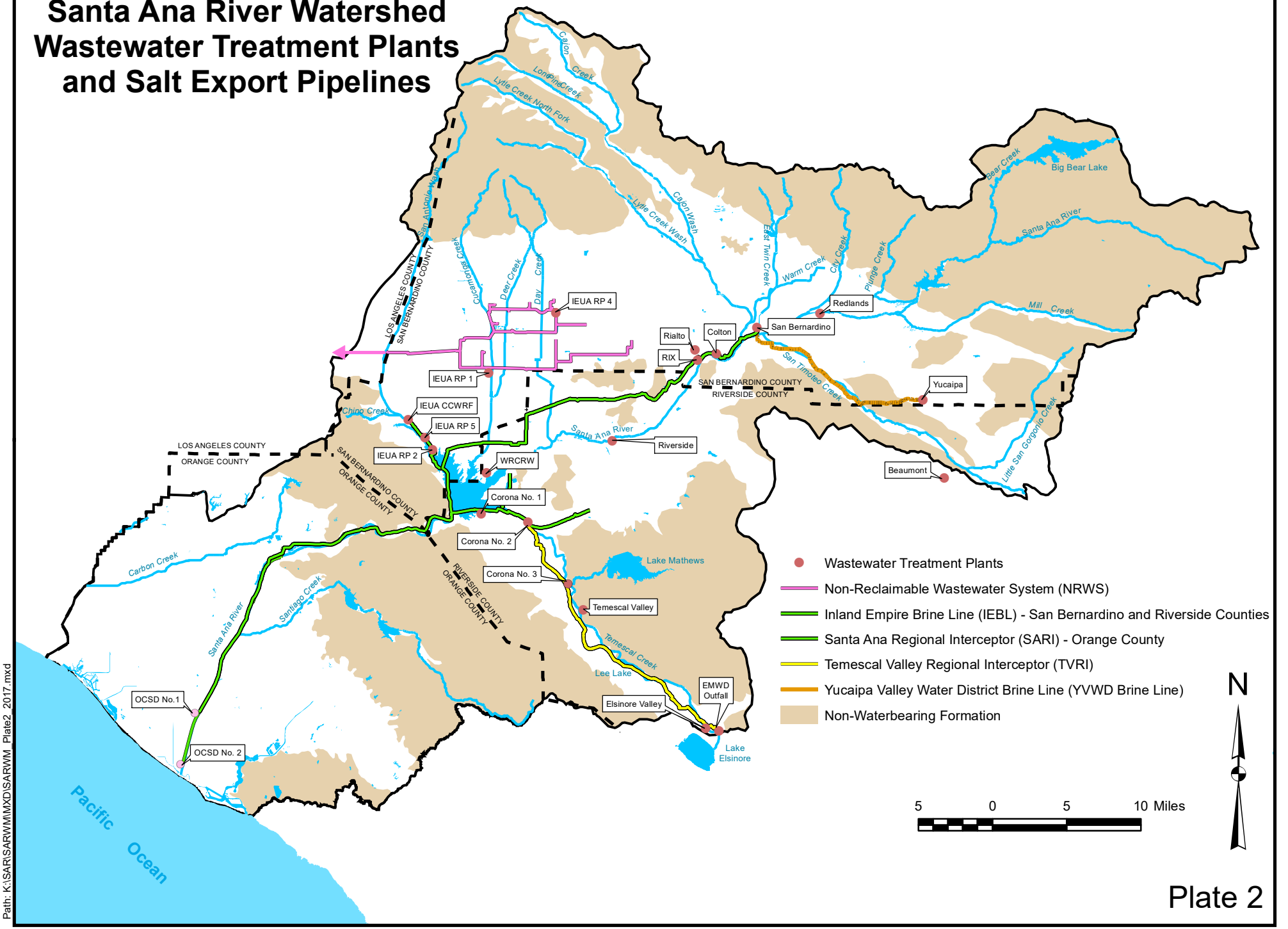

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Plate 2

PRECIPITATION AT SAN BERNARDINO STARTING IN 1934-35

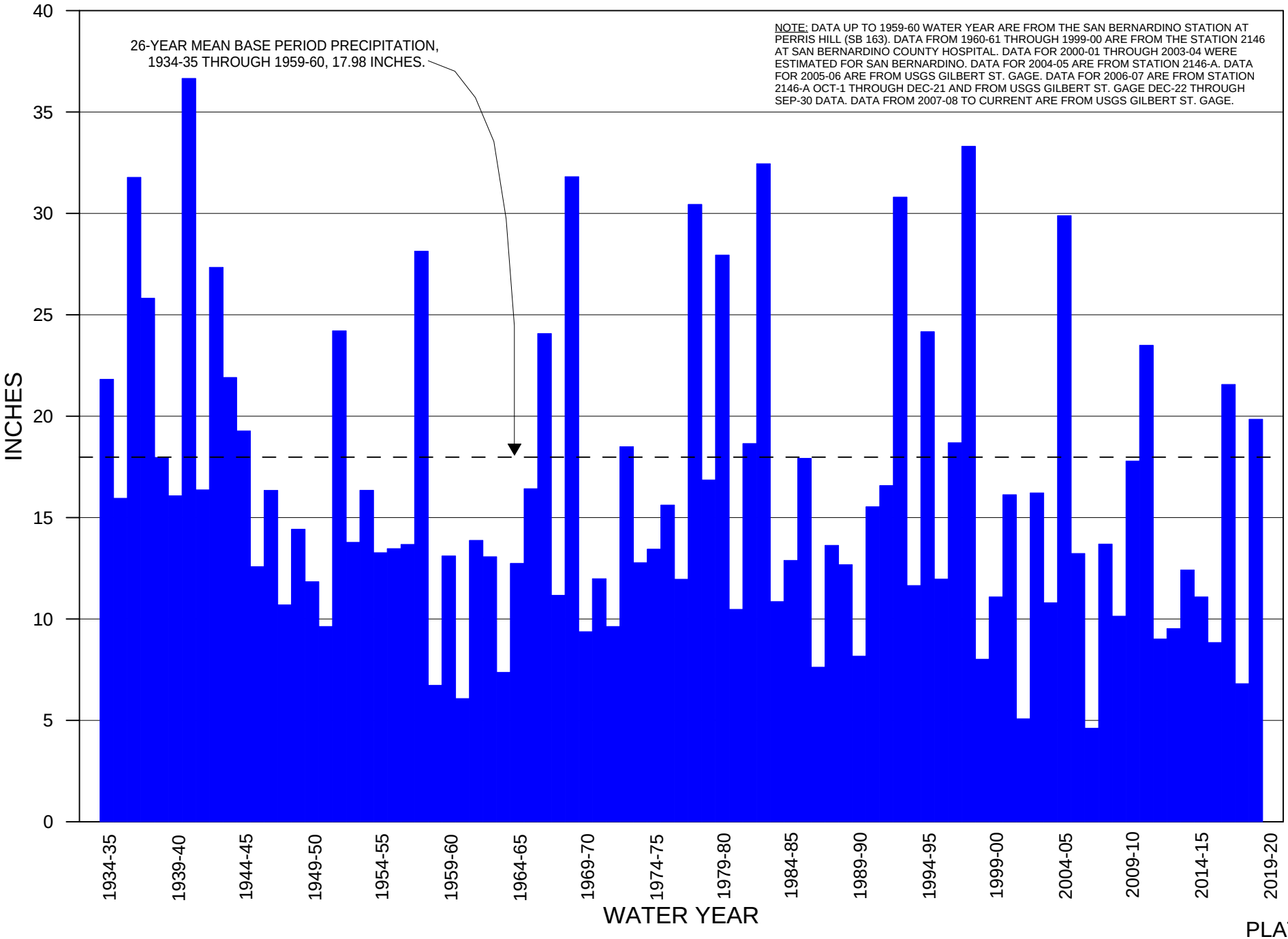
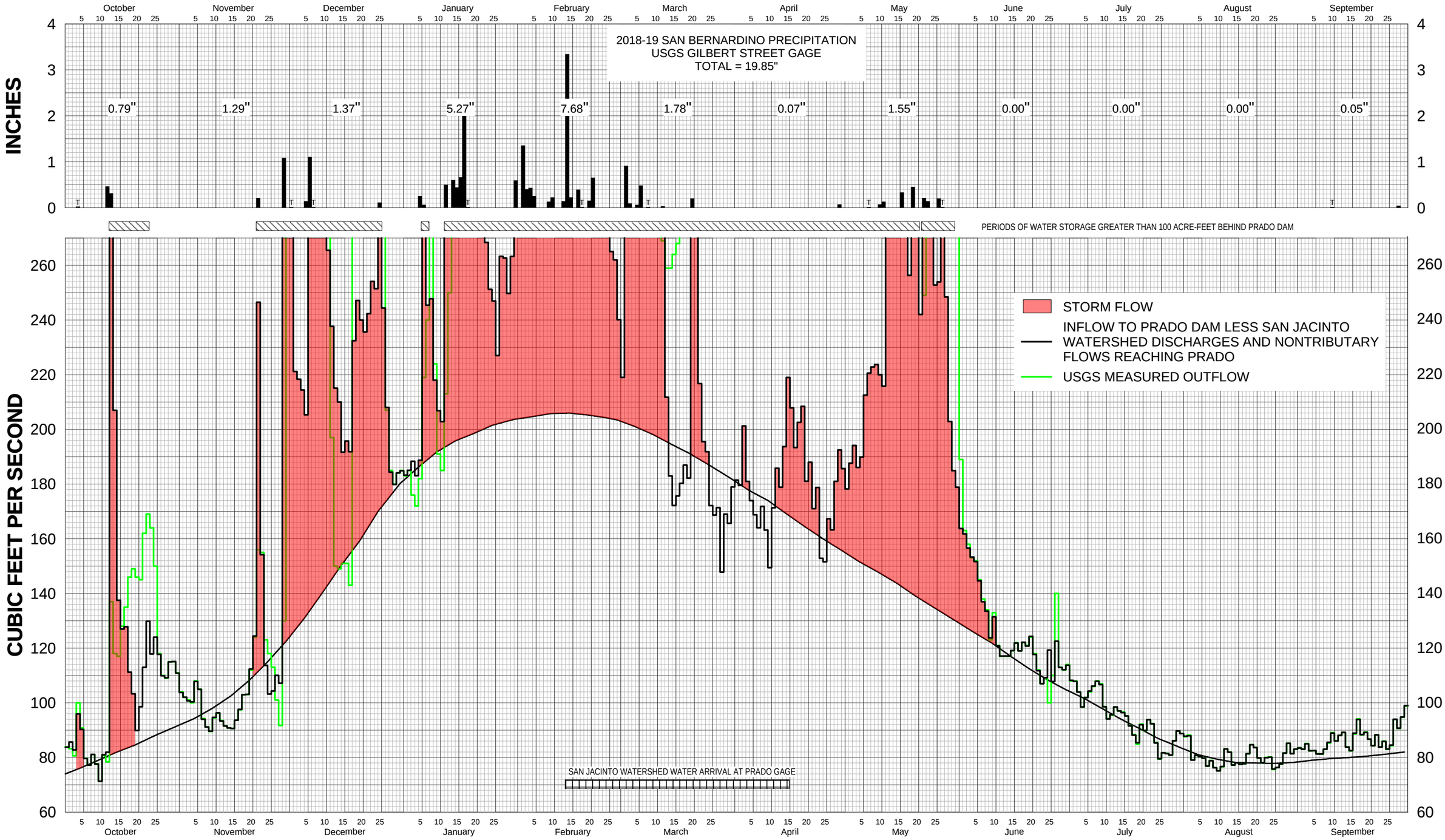


PLATE 3



DISCHARGE OF THE SANTA ANA RIVER AT PRADO DAM & SAN BERNARDINO PRECIPITATION
WATER YEAR 2018-19

Plate 4

DISCHARGE OF SANTA ANA RIVER AT PRADO STARTING WITH 1934-35

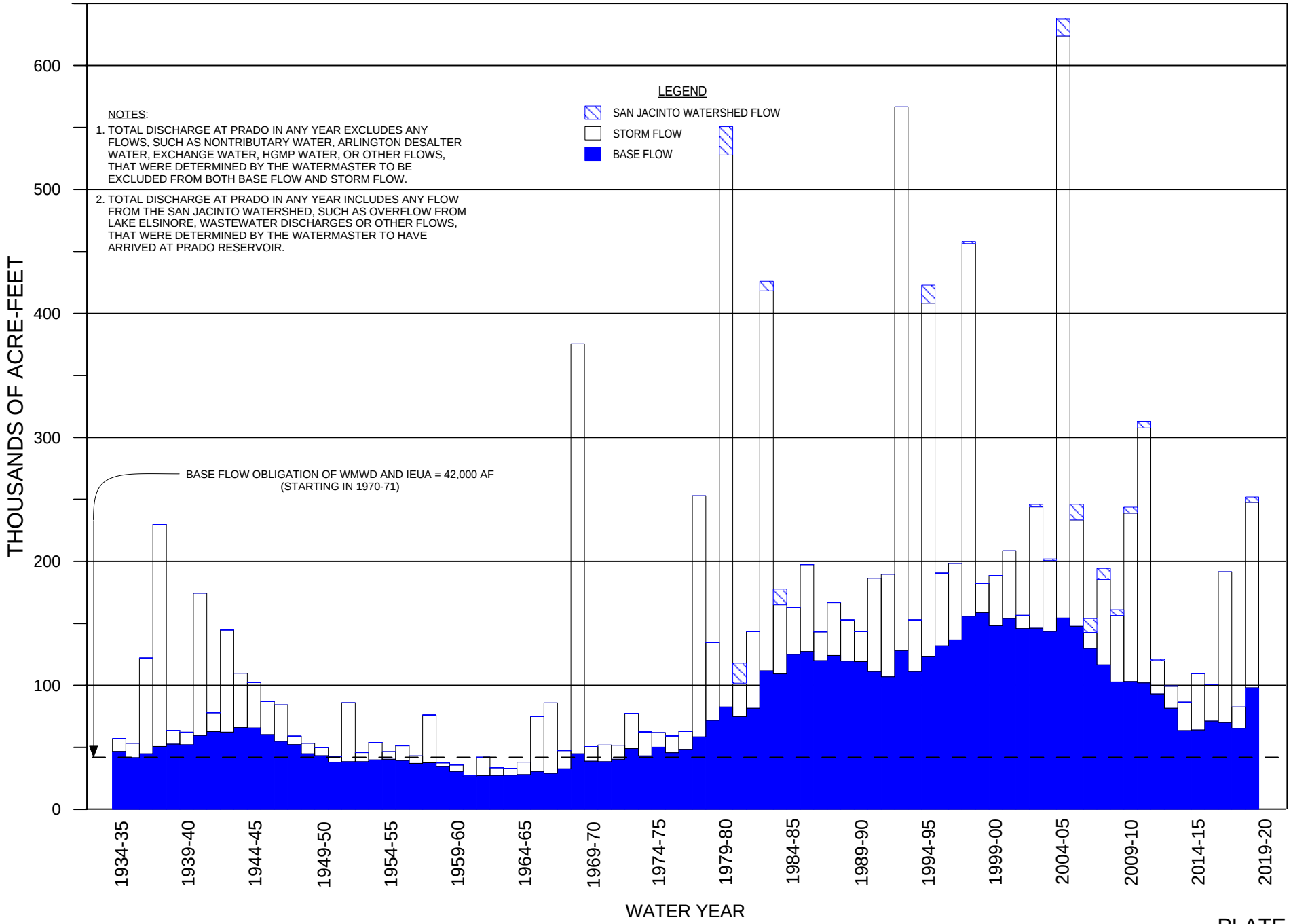
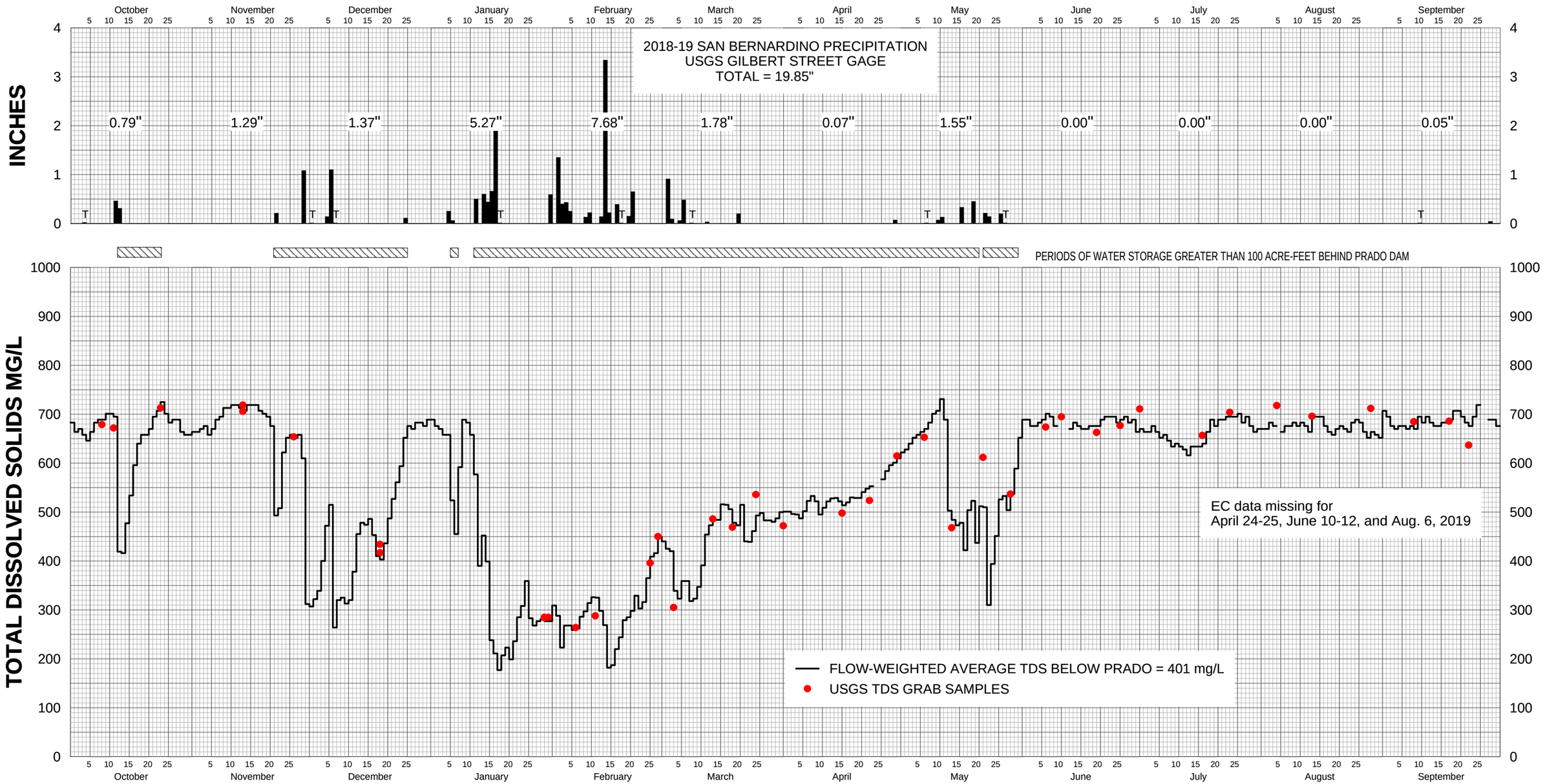


PLATE 5



DISSOLVED SOLIDS IN SANTA ANA RIVER BELOW PRADO DAM
WATER YEAR 2018-19

Plate 6

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS & SAN BERNARDINO PRECIPITATION
WATER YEAR 2018-19

Plate 7

DISCHARGE OF SANTA ANA RIVER AT RIVERSIDE NARROWS STARTING WITH 1934-35

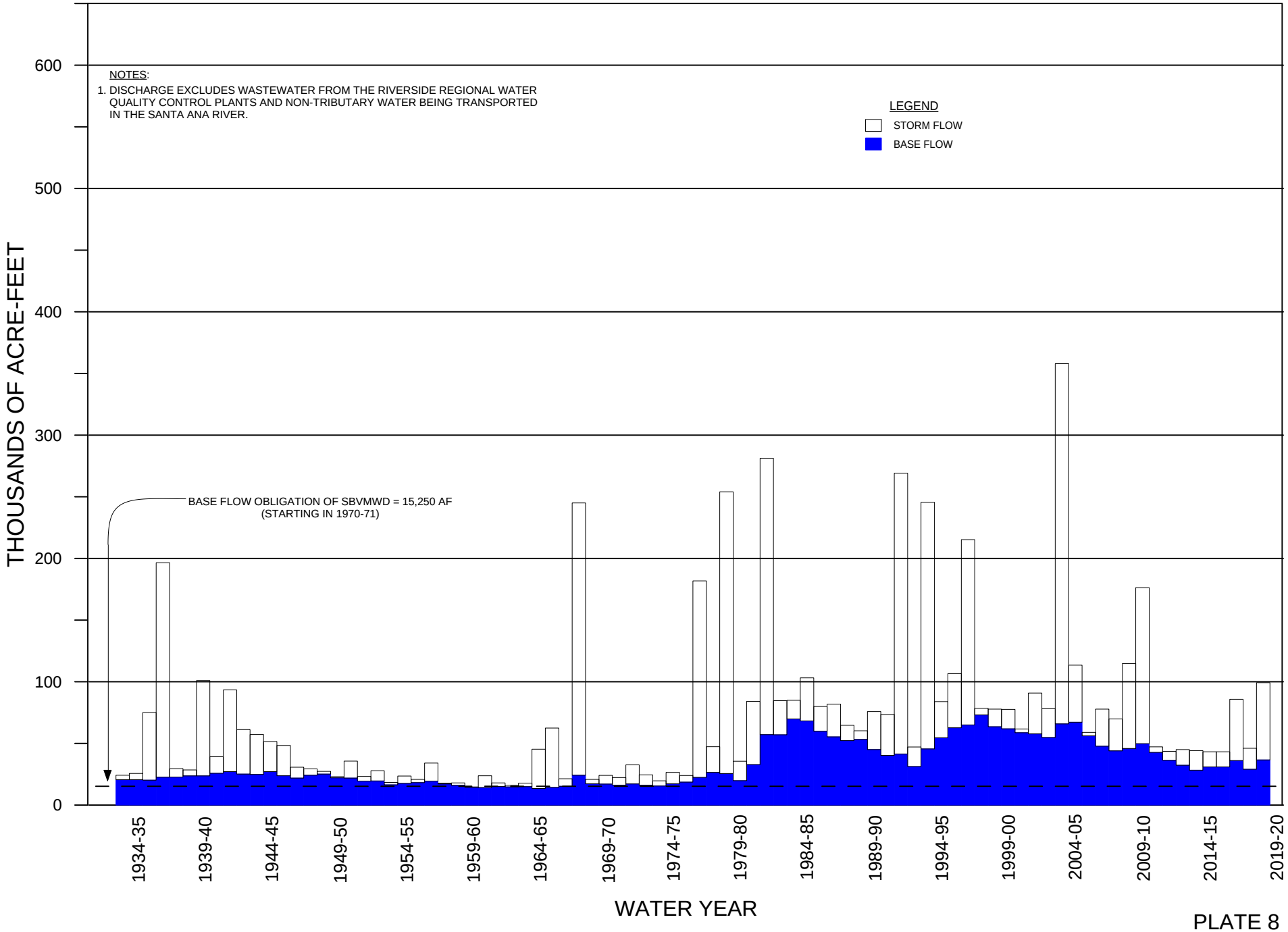


PLATE 8

SANTA ANA RIVER WATERMASTER

FOR

ORANGE COUNTY WATER DISTRICT

v. CITY OF CHINO et al.

CASE NO. 117628 - COUNTY OF ORANGE

BASIC DATA

FOR THE

FORTY- NINTH ANNUAL REPORT

OF THE

SANTA ANA RIVER WATERMASTER

FOR WATER YEAR

OCTOBER 1, 2018 - SEPTEMBER 30, 2019

April 30, 2020

TABLE OF CONTENTS

APPENDICES

The following appendices are bound separately and available for review at the office of the Secretary of the Santa Ana River Watermaster.

APPENDIX A

USGS FLOW MEASUREMENTS OF THE SANTA ANA RIVER FLOWS BELOW PRADO, AT MWD CROSSING, AND WATER QUALITY RECORDS FOR THE SANTA ANA RIVER AT PRADO DAM AND AT MWD CROSSING; USGS FLOW MEASUREMENTS AT E STREET, OF TEMESCAL CREEK ABOVE MAIN STREET (AT CORONA), TEMESCAL CREEK AT CORONA LAKE “LEE LAKE” (NEAR CORONA), CUCAMONGA CREEK (NEAR MIRA LOMA), CHINO CREEK AT SCHAEFER AVENUE (NEAR CHINO),LYTLE CREEK, WARM CREEK, AND SAN TIMOTEO CREEK NEAR LOMA LINDA

WATER YEAR 2018-19

USGS Water-Year Summary 2019

11074000 Santa Ana River below Prado Dam, CA

LOCATION - Lat 33°53'00", long 117°38'40" referenced to North American Datum of 1927, Riverside County, CA, Hydrologic Unit 18070203, in La Sierra Grant, on left bank of outlet channel, 2,500 ft downstream from axis of Prado Dam, and 4.5 mi west of Corona.

DRAINAGE AREA - 2,258 mi² of which 768 mi² probably is noncontributing. above Lake Elsinore.

REVISIONS HISTORY - 12/06/2016: Unit and daily value water temperature and specific conductance from April 8, 2016 through Sept. 8, 2016 have been revised superseding those published at http://waterdata.usgs.gov site 11074000.

SURFACE-WATER RECORDS

PERIOD OF RECORD - May 1930 to November 1939 (irrigation seasons only), March 1940 to current year. Published as "at Santa Fe Railroad Bridge, near Prado" May 1930 to November 1931, as "at Atchison, Topeka, and Santa Fe Railroad Bridge, near Prado" May 1932 to November 1939, and as "below Prado Dam, near Prado" March 1940 to September 1950.

GAGE - Water-stage recorder and concrete control August 1944 through Apr. 25, 2005, and since Nov. 14, 2005. Datum of gage is approximately 449 ft above NGVD of 1929 (levels by U.S. Army Corps of Engineers). Prior to Mar. 18, 1940, at about same site at various datums. From Apr. 26, 2005, to Nov. 13, 2005, gage was located on right bank of a temporary bypass (diversion) channel, in use during the construction of an improved outlet channel from Prado Dam. Temporary gage was at a different datum. From Nov. 14, 2005 to Oct. 7, 2008, gage was located on right bank of reconstructed outlet channel. Since Oct. 7, 2008, gage is located on left bank of channel.

REMARKS - Flow regulated since 1940 by Prado Flood-Control Reservoir, capacity, 196,200 acre-ft. Natural streamflow affected by extensive ground-water withdrawals, diversion for irrigation, discharges of treated effluent, and return flow from irrigated areas. Releases of imported water are made to the basin by the California Water Project at times in some years, via San Antonio Creek from Rialto Pipeline below San Antonio Dam. During the current year, 12,780 acre-ft was released. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES OUTSIDE PERIOD OF RECORD - Flood of Mar. 2, 1938, reached a discharge of 100,000 ft³/s, on basis of slope-area measurement of peak flow at site 2.5 mi downstream.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 13,200 ft³/s, Jan. 15, 2005, gage height, 8.73 ft, site and datum then in use, from rating curve extended above 11,600 ft³/s; minimum daily, 2.4 ft³/s, July 29 to Aug. 3, Sept. 20, 1978 (result of gate closure).

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8183&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11074000&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	83.9	104	300	183	993	343	379	390	189	108	87.6	83.5
2	83.2	102	297	185	1,760	345	351	406	163	108	88.2	83.1
3	80.6	101	393	176	2,480	350	351	412	158	104	79.1	85.1
4	100	100	379	172	1,900	798	351	406	153	98.4	80.8	82.4
5	90.8	108	283	182	1,310	1,110	348	400	152	102	e80.3	82.5
6	79.7	105	290	219	912	1,120	347	429	145	104	e79.8	81.4
7	77.2	94.2	482	240	380	1,140	345	451	e138	106	76.8	81.2
8	81.1	91.2	635	412	379	1,140	381	448	e134	108	78.9	83.0
9	77.7	89.5	619	224	380	1,140	398	419	e123	107	76.3	85.3
10	71.3	94.5	602	191	380	1,130	399	399	e133	98.6	75.1	89.1
11	80.7	96.3	473	185	379	631	401	382	121	94.2	76.6	86.1
12	78.4	93.5	197	213	1,250	269	405	361	117	95.4	83.1	88.1
13	137	91.6	150	250	1,790	259	408	404	117	98.4	82.0	89.1
14	118	90.8	149	312	3,240	259	410	412	117	97.0	77.2	83.9
15	117	90.6	151	446	5,380	264	411	374	119	96.6	78.0	82.4
16	128	93.6	151	394	5,320	268	411	339	122	95.2	77.6	88.6
17	135	97.4	143	1,180	5,330	272	409	354	119	91.7	77.7	94.1
18	146	103	501	1,680	3,850	276	425	337	122	88.4	81.3	88.3
19	149	103	654	512	1,860	280	425	317	121	84.9	84.7	89.3
20	146	112	649	511	847	286	415	389	124	92.2	83.7	86.7
21	145	124	622	507	768	289	407	298	118	89.8	79.8	84.3
22	162	156	597	521	628	291	401	249	112	93.8	78.1	88.3
23	169	155	569	527	623	292	394	345	107	92.4	80.0	83.8
24	164	123	532	440	615	293	398	313	109	85.5	80.2	86.0
25	150	118	483	329	402	333	384	307	100	79.4	75.6	83.0
26	118	113	353	627	273	355	367	300	110	81.7	76.4	84.3
27	110	101	207	623	272	357	370	297	140	81.5	77.6	93.9
28	109	91.7	185	630	303	375	372	292	113	80.8	81.6	90.6
29	115	130	180	637		395	372	311	112	86.1	85.2	94.7
30	115	288	184	786		399	385	315	114	89.6	81.4	98.8
31	111		185	1,000		405		281		88.8	83.0	
Total	3,529	3,361	11,590	14,490	44,000	15,459	11,620	11,140	3,822	2,927	2,484	2,601
Mean	114	112	374	468	1,572	499	387	359	127	94.4	80.1	86.7
Max	169	288	654	1680	5380	1140	425	451	189	108	88.2	98.8
Min	71.3	89.5	143	172	272	259	345	249	100	79.4	75.1	81.2
Ac-ft	6,999	6,666	23,000	28,749	87,280	30,669	23,050	22,090	7,581	5,806	4,926	5,159

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1941 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	128	149	238	395	442	389	258	187	151	124	106	101
Max	910	322	1,300	3,543	2,733	2,556	1,101	915	736	446	403	372
(WY)	(2005)	(1997)	(2011)	(1993)	(1998)	(1980)	(1980)	(1998)	(1983)	(1998)	(2005)	(1997)
Min	22.4	33.5	39.5	49.2	49.8	54.3	43.3	35.2	29.0	17.7	14.8	16.2
(WY)	(1962)	(1963)	(1963)	(1963)	(1961)	(1961)	(1961)	(1961)	(1961)	(1960)	(1960)	(1960)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1941 - 2019	
Annual total	127,000			
Annual mean	348.0		221.3	
Highest annual mean			882.0	2005
Lowest annual mean			36.4	1961
Highest daily mean	5,380	Feb 15	11,400	Jan 14, 2005
Lowest daily mean	71.3	Oct 10	2.40	Jul 29, 1978
Annual 7-day minimum	77.7	Aug 05	3.00	Sep 24, 1973
Maximum peak flow	5,710[a]	Feb 17	13,200[a]	Jan 15, 2005
Maximum peak stage	7.73	Feb 17	8.73	Jan 15, 2005
Annual runoff (cfsm)	0.154		0.098	
Annual runoff (inches)	2.09		1.33	
10 percent exceeds	623.0		384.5	
50 percent exceeds	162.0		136.0	
90 percent exceeds	81.7		43.0	

[a] Discharge affected by Regulation or Diversion

USGS Water-data graph for site USGS 11074000

USGS Water-Year Summary 2019

11074000 Santa Ana River below Prado Dam, CA

LOCATION - Lat 33°53'00", long 117°38'40" referenced to North American Datum of 1927, Riverside County, CA, Hydrologic Unit 18070203, in La Sierra Grant, on left bank of outlet channel, 2,500 ft downstream from axis of Prado Dam, and 4.5 mi west of Corona.

DRAINAGE AREA - 2,258 mi² of which 768 mi² probably is noncontributing. above Lake Elsinore.

REVISIONS HISTORY - 12/06/2016: Unit and daily value water temperature and specific conductance from April 8, 2016 through Sept. 8, 2016 have been revised superseding those published at http://waterdata.usgs.gov site 11074000.

WATER-QUALITY RECORDS

PERIOD OF RECORD - Water years 1967 to current year. CHEMICAL DATA: Water years 1967 to current year. BIOLOGICAL DATA: Water years 1975-81. SEDIMENT DATA: Water years 1974-94, 1999 to current year.

PERIOD OF DAILY RECORD - SPECIFIC CONDUCTANCE: February 1968 to current year. WATER TEMPERATURE: October 1969 to current year. CHLORIDE: October 1970 to September 1971. SUSPENDED-SEDIMENT DISCHARGE: October 1973 to June 1982.

INSTRUMENTATION - Water-quality monitor recording specific conductance and water temperature since October 1969. On October 26th 2016 (QM 3915) Continuous water quality equipment setup (YSI 600R)moved to ~30 ft down stream of the gage house.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8184_8185_8186_8187&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11074000&agency_cd=USGS

SPECIFIC CONDUCTANCE, WATER, UNFILTERED, MICROSIEMENS PER CENTIMETER AT 25 DEGREES CELSIUS
YEAR 2018-10-01 to 2019-09-30
DAILY VALUES

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
	October			November			December			January			February			March		
1	1,150	1,090	1,130	1,110	1,080	1,100	528	494	509	1,170	1,130	1,140	543	475	511	770	687	728
2	1,120	1,080	1,100	1,110	1,090	1,100	559	508	533	1,130	1,110	1,120	614	416	476	772	649	704
3	1,130	1,050	1,110	1,130	1,080	1,110	608	519	562	1,130	1,100	1,110	465	308	369	752	632	696
4	1,120	1,040	1,090	1,130	1,110	1,120	712	607	662	1,100	1,080	1,090	479	422	444	632	514	561
5	1,090	1,030	1,070	1,120	1,080	1,090	844	707	782	1,100	1,020	1,090	476	423	444	561	513	535
6	1,130	1,070	1,100	1,130	1,090	1,110	886	619	852	1,080	725	867	448	419	429	704	541	595
7	1,170	1,090	1,130	1,160	1,120	1,140	619	403	437	843	716	754	463	53	434	705	523	594
8	1,160	1,110	1,140	1,170	1,130	1,150	550	480	530	1,110	843	980	487	462	473	541	513	527
9	1,160	1,120	1,140	1,190	1,160	1,180	583	513	538	1,160	1,110	1,140	507	474	492	561	525	535
10	1,190	1,110	1,160	1,200	1,140	1,180	550	474	519	1,150	1,110	1,130	534	507	520	611	534	575
11	1,180	1,140	1,160	1,210	1,150	1,190	600	488	530	1,110	1,080	1,090	573	528	540	727	579	647
12	1,180	764	1,150	1,220	1,150	1,190	742	517	626	1,090	687	956	577	502	538	783	725	752
13	1,130	425	694	1,200	1,150	1,180	835	699	753	688	614	645	502	488	493	798	766	783
14	726	680	689	1,190	1,150	1,170	835	767	792	867	671	749	622	310	445	836	780	802
15	849	726	789	1,200	1,150	1,190	812	757	785	884	510	660	349	257	302	822	775	802
16	932	848	884	1,200	1,170	1,190	830	713	804	522	339	394	341	284	309	890	810	855
17	1,040	932	986	1,200	1,170	1,190	775	713	750	390	297	350	423	307	364	877	838	853
18	1,080	1,040	1,060	1,180	1,150	1,170	792	571	678	328	260	293	464	283	404	862	822	838
19	1,090	1,080	1,090	1,180	1,140	1,160	725	606	667	351	328	342	491	438	462	826	757	792
20	1,100	1,090	1,090	1,170	1,120	1,150	768	693	722	397	347	370	481	465	472	802	763	783
21	1,130	1,100	1,110	1,150	1,070	1,120	851	768	807	374	312	330	559	455	494	905	797	852
22	1,170	1,120	1,150	1,070	562	817	895	850	873	442	314	391	570	517	545	797	698	728
23	1,180	1,160	1,170	972	726	841	962	894	928	493	442	472	530	479	501	752	710	727
24	1,220	1,180	1,200	1,050	972	1,030	1,030	962	983	587	468	510	551	509	523	793	742	764
25	1,220	1,120	1,160	1,090	1,050	1,080	1,110	1,010	1,080	636	502	595	684	548	605	865	771	816
26	1,150	1,110	1,130	1,100	1,090	1,090	1,160	1,070	1,120	507	423	468	702	646	677	847	796	824
27	1,160	1,110	1,140	1,100	1,070	1,080	1,140	1,080	1,110	465	432	444	728	656	689	821	771	800
28	1,160	1,110	1,140	1,110	1,070	1,090	1,150	1,100	1,130	467	454	459	811	704	744	838	769	799
29	1,110	1,080	1,100	1,100	650	1,010	1,160	1,110	1,130	480	459	466				815	777	795
30	1,100	1,080	1,090	650	482	516	1,160	1,100	1,120	483	421	459				826	794	806
31	1,100	1,070	1,090				1,180	1,110	1,140	486	436	459				849	815	828
Max	1220	1180	1200	1220	1170	1190	1180	1110	1140	1170	1130	1140	811	704	744	905	838	855
Min	726	425	689	650	482	516	528	403	437	328	260	293	341	53	302	541	513	527

Day	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean
	April			May			June			July			August		
1	843	817	829	1,060	1,010	1,030	1,160	1,120	1,140	1,120	1,080	1,110	1,150	1,070	1,110
2	851	798	829	1,080	1,010	1,040	1,160	1,120	1,140	1,120	1,050	1,100	1,130	1,060	1,110
3	845	799	822	1,070	1,050	1,060	1,140	1,110	1,120	1,120	1,060	1,100	1,160	1,060	1,130
4	843	782	820	1,100	1,060	1,080	1,150	1,100	1,120	1,140	1,080	1,120	1,170	1,030	1,120
5	837	777	806	1,110	1,070	1,090	1,150	1,120	1,130	1,150	1,040	1,100	1,130	1,060	---
6	865	804	831	1,110	1,080	1,100	1,170	1,110	1,140	1,110	1,040	1,080	1,130	1,020	1,100
7	896	848	866	1,120	1,110	1,110	1,190	1,140	1,160	1,110	1,070	1,090	1,130	1,080	1,120
8	891	873	882	1,150	1,120	1,130	1,180	1,120	1,150	1,100	1,050	1,070	1,130	1,110	1,120
9	878	836	864	1,160	1,150	1,160	1,140	1,100	1,120	1,070	1,040	1,050	1,140	1,120	1,130
10	839	805	820	1,190	1,160	1,170	---	---	---	1,070	1,040	1,060	1,140	1,110	1,120
11	866	822	843	1,220	1,190	1,210	---	---	---	1,070	964	1,050	1,150	1,110	1,130
12	887	845	865	1,260	846	1,140	---	---	---	1,070	996	1,040	1,140	1,090	1,120
13	884	867	874	868	800	833	1,150	1,090	1,110	1,050	939	1,020	1,170	1,070	1,100
14	885	868	875	833	771	802	1,140	1,090	1,130	1,060	1,020	1,050	1,170	1,090	1,150
15	872	853	864	806	730	783	1,140	1,090	1,120	1,070	1,040	1,050	1,170	1,140	1,150
16	856	846	851	860	675	791	1,130	1,090	1,110	1,070	1,040	1,050	1,180	1,100	1,150
17	880	848	861	783	655	699	1,130	1,080	1,110	1,120	1,040	1,060	1,150	1,080	1,120
18	889	863	878	885	782	834	1,140	1,090	1,120	1,130	1,080	1,100	1,130	1,060	1,100
19	881	868	876	911	685	866	1,140	1,080	1,120	1,150	1,110	1,140	1,130	1,070	1,090
20	885	866	875	768	655	724	1,150	1,080	1,120	1,150	1,100	1,120	1,130	1,070	1,110
21	925	873	895	892	756	847	1,170	1,110	1,140	1,160	1,130	1,140	1,150	1,080	1,120
22	918	900	908	928	536	844	1,170	1,140	1,150	1,160	1,120	1,140	1,160	1,060	1,110
23	927	910	916	579	482	514	1,170	1,140	1,150	1,160	1,140	1,150	1,150	1,050	1,100
24	---	927	---	721	579	653	1,170	1,130	1,150	1,170	1,130	1,150	1,150	1,110	1,130
25	---	---	---	827	693	747	1,160	1,100	1,130	1,180	1,090	1,150	1,170	1,070	1,140
26	961	900	939	906	827	871	1,180	1,120	1,140	1,180	1,090	1,160	1,150	1,090	1,130
27	987	932	967	903	835	883	1,180	1,120	1,150	1,150	1,100	1,130	1,140	1,060	1,100
28	1,010	960	986	858	821	835	1,150	1,110	1,130	1,170	1,090	1,150	1,130	987	1,080
29	1,040	960	995	927	854	889	1,150	1,120	1,140	1,170	1,100	1,120	1,140	1,000	1,100
30	1,030	989	1,010	1,030	927	975	1,130	1,090	1,100	1,140	1,060	1,100	1,120	1,030	1,090
--				1,140	1,030	1,080				1,150	1,080	1,110	1,130	1,030	1,080
Max				1260	1190	1210				1180	1140	1160	1180	1140	
Min				579	482	514				1050	939	1020	1120	987	

Day	Max	Min	Mean
	September		
1	1,200	1,120	1,170
2	1,190	1,110	1,150
3	1,160	1,080	1,120
4	1,140	1,080	1,110
5	1,140	1,090	1,120
6	1,160	1,110	1,120
7	1,140	1,100	1,110
8	1,170	1,020	1,120
9	1,170	1,060	1,110
10	1,170	1,140	1,150
11	1,150	1,100	1,130
12	1,160	1,140	1,150
13	1,140	1,110	1,130
14	1,140	1,110	1,120
15	1,160	1,100	1,120
16	1,170	1,110	1,130
17	1,160	1,120	1,130
18	1,150	1,120	1,140
19	1,190	1,140	1,170
20	1,190	1,150	1,170
21	1,170	1,140	1,150
22	1,150	1,110	1,130
23	1,140	1,100	1,120
24	1,190	1,120	1,150
25	1,220	1,130	1,190
26	1,220	1,170	1,190
27	1,180	1,140	1,150
28	1,170	1,110	1,140
29	1,160	1,120	1,140
30	1,140	1,100	1,120
--			
Max	1220	1170	1190
Min	1140	1020	1110


USGS 11074000 SANTA ANA R BL PRADO DAM CA
DAILY Specific conductance, water, unfiltered, microsiemens per centimeter at 25 degrees Celsius
1400
1200
1000
800
600
400
200
0
Oct 2018
Nov 2018
Dec 2018
Jan 2019
Feb 2019
Mar 2019
Apr 2019
May 2019
Jun 2019
Jul 2019
Aug 2019
Sep 2019
Daily maximum specific conductance
Daily mean specific conductance
Daily minimum specific conductance
Period of approved data
Graph courtesy of the U.S. Geological Survey

USGS Water-Year Summary 2019

11066460 Santa Ana River at Metropolitan Water District Crossing, near Arlington, CA

LOCATION - Lat 33°58'07", long 117°26'51" referenced to North American Datum of 1927, in NE 1/4 SW 1/4 sec.30, T.2 S., R.5 W., Riverside County, CA, Hydrologic Unit 18070203, near center of Metropolitan Water District pipeline crossing, 0.8 mi downstream from Union Pacific Railroad Bridge, 1.1 mi upstream from bridge on Van Buren Boulevard, and 3.3 mi north of Arlington.

DRAINAGE AREA - 852 mi².

REVISIONS HISTORY - WDR CA-83-1: Drainage area.

SURFACE-WATER RECORDS

PERIOD OF RECORD - March 1970 to current year.

GAGE - Water-stage recorder and crest-stage gage. Elevation of gage is 685 ft above NGVD of 1929, from topographic map. Prior to Apr. 15, 1985, water-stage recorder at site 300 ft upstream on left bank at different datum. From Apr. 15 to Sept. 30, 1985, water-stage recorder near right bank (atop pier 9 of Metropolitan Water District pipeline crossing), at same site and datum. From Oct. 1, 1985, to June 16, 1993, water-stage recorder and crest-stage gage on right bank at same site and datum. From June 17, 1993, to Sept. 30, 2003, water-stage recorder and crest-stage gage on left bank at same site and datum. From Oct. 1, 2003 to Oct. 17, 2005, water-stage recorder in reach-in shelter on pipeline catwalk, near pier #13 at same site and datum. Since Oct. 18, 2005, water-stage recorder is situated in reach-in shelter on upper deck platform, near pier #13 at same site and datum.

REMARKS - Flow partly regulated by Big Bear Lake (station 11049000) and, since November 1999, by Seven Oaks Flood-Control Reservoir, capacity, 145,600 acre-ft. Natural streamflow affected by ground-water withdrawals, diversions for irrigation, return flows from irrigated areas, and discharges of treated effluent. The records at this station are equivalent to those collected at "Santa Ana River at Riverside Narrows, near Arlington" minus the flow at "Riverside Water-Quality Control Plant at Riverside Narrows, near Arlington". See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES OUTSIDE PERIOD OF RECORD - Maximum discharge since at least 1927, 100,000 ft³/s, Mar. 2, 1938, on basis of slope-area measurement, at site 1.1 mi downstream. Flood of Jan. 22, 1862, 320,000 ft³/s, on basis of slope-conveyance study, at site 8.2 mi upstream. Stage at that site was 5 ft higher than that of Mar. 2, 1938.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 49,100 ft³/s, Dec. 21, 2010, gage height, 16.83 ft, from rating curve extended above 21,900 ft³/s on basis of area-velocity studies; maximum gage height, 20.23 ft, site and datum then in use, Mar. 4, 1978; minimum daily, 15 ft³/s, Sept. 7, 8, 1980.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8098&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11066460&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	25.5	41.9	57.4	50.1	148	76.4	56.0	49.0	92.0	40.6	34.6	34.0
2	25.2	40.5	40.7	49.4	1,200	354	54.9	47.8	91.0	41.1	36.2	32.6
3	26.0	39.0	40.7	50.4	1,210	400	58.5	45.9	88.0	38.8	39.6	31.0
4	44.8	39.3	44.8	52.0	957	118	55.5	45.6	89.4	43.4	40.0	32.9
5	35.1	41.7	62.2	53.4	1,210	82.0	55.4	46.6	84.1	39.2	40.6	33.4
6	35.1	42.3	1,350	100	565	410	57.0	48.5	78.0	38.9	39.1	34.8
7	37.2	43.0	567	57.3	364	257	56.2	46.3	61.4	40.4	39.8	35.8
8	37.7	42.3	141	57.2	315	153	54.2	48.2	64.1	44.0	41.0	35.4
9	38.2	40.0	80.0	56.0	320	116	56.1	47.7	57.8	42.5	41.7	37.2
10	40.0	40.1	60.5	57.7	316	99.0	57.8	50.1	55.1	41.0	40.4	38.5
11	38.6	37.6	53.4	57.9	322	89.8	56.1	73.3	52.0	37.3	39.5	37.4
12	39.8	37.9	50.2	157	277	89.2	55.7	353	53.1	38.4	41.4	36.7
13	353	39.2	47.8	91.6	262	81.9	53.6	378	50.0	38.3	39.5	35.0
14	79.2	36.7	46.4	234	7,590	72.5	52.2	391	47.9	37.9	40.1	33.2
15	62.8	38.9	45.4	306	1,210	70.7	56.4	289	46.4	39.5	40.0	32.9
16	54.9	37.5	45.5	1,050	346	68.2	54.7	188	44.7	37.5	37.6	32.5
17	51.7	37.7	47.7	4,510	190	67.8	56.5	98.3	44.7	34.2	39.4	32.1
18	47.9	39.1	49.6	1,020	212	63.9	51.3	103	43.5	36.8	39.5	31.1
19	45.9	39.1	51.1	208	114	64.8	51.8	187	40.2	39.7	37.7	29.9
20	42.6	39.0	49.4	119	97.5	124	53.6	169	42.2	38.3	35.8	31.7
21	42.9	39.9	48.1	101	258	117	54.2	94.2	42.3	36.4	35.2	31.0
22	43.5	46.8	46.7	86.2	117	81.2	55.2	141	41.3	37.3	36.5	28.9
23	43.5	44.3	47.5	80.3	93.9	75.4	50.0	185	41.3	39.1	38.0	27.7
24	42.2	44.8	47.6	70.8	89.4	75.1	48.8	121	42.0	32.2	33.5	28.8
25	42.7	39.3	65.5	68.8	82.6	75.3	49.4	102	43.5	35.4	32.9	30.6
26	41.5	42.4	51.5	62.4	82.3	72.0	49.6	105	42.6	38.0	34.1	32.1
27	39.9	39.0	50.0	59.4	81.7	69.8	47.5	186	44.7	37.3	33.9	33.9
28	40.9	41.1	49.1	62.3	78.6	66.9	46.8	108	43.9	35.2	33.2	33.1
29	43.2	592	49.0	61.5		63.7	50.0	92.7	42.4	39.2	32.9	33.3
30	42.5	437	48.4	57.8		60.0	50.7	90.1	42.5	37.1	33.0	32.7
31	41.9		50.1	212		57.2		94.4		36.6	34.3	
Total	1,626	2,159	3,484	9,259	18,110	3,672	1,606	4,025	1,652	1,192	1,161	990
Mean	52.4	72.0	112	299	647	118	53.5	130	55.1	38.4	37.5	33.0
Max	353	592	1350	4510	7590	410	58.5	391	92.0	44.0	41.7	38.5
Min	25.2	36.7	40.7	49.4	78.6	57.2	46.8	45.6	40.2	32.2	32.9	27.7
Ac-ft	3,225	4,283	6,911	18,370	35,920	7,282	3,185	7,983	3,277	2,364	2,303	1,964

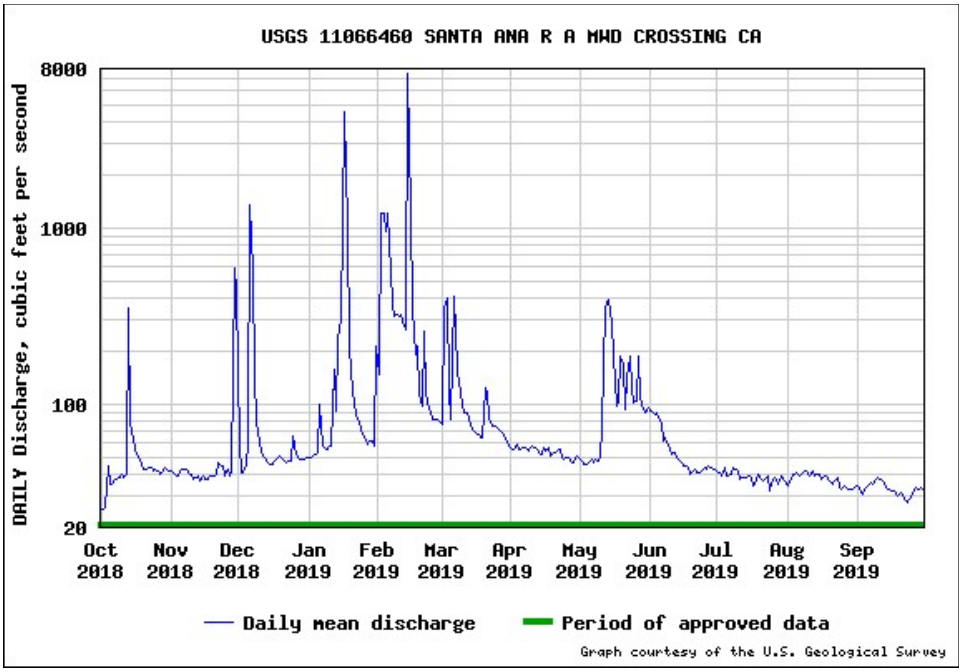
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2000 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	87.3	84.0	212	293	220	134	122	85.3	64.4	57.1	60.9	58.5
Max	498	141	1,729	2,350	756	498	501	314	192	137	201	97.6
(WY)	(2005)	(2003)	(2011)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2015)
Min	30.1	36.4	37.7	36.9	46.7	32.1	38.1	38.4	30.5	25.7	27.3	29.7
(WY)	(2018)	(2018)	(2018)	(2014)	(2018)	(2015)	(2015)	(2018)	(2017)	(2016)	(2016)	(2016)

SUMMARY STATISTICS

	Water Year 2019		Water Years 2000 - 2019	
Annual total	48,940			
Annual mean	134.1		122.8	
Highest annual mean			491.0	2005
Lowest annual mean			48.1	2018
Highest daily mean	7,590	Feb 14	22,000	Jan 11, 2005
Lowest daily mean	25.2	Oct 02	17.1	Dec 21, 2015
Annual 7-day minimum	29.8	Sep 19	23.3	Aug 22, 2013
Maximum peak flow	16,500[a,b]	Feb 14	49,100[a,b]	Dec 21, 2010
Maximum peak stage	16.45	Feb 14	16.83	Dec 21, 2010
Annual runoff (cfsm)	0.157		0.144	
Annual runoff (inches)	2.14		1.96	
10 percent exceeds	209.6		120.0	
50 percent exceeds	48.1		68.6	
90 percent exceeds	34.7		34.8	

[a] Discharge affected to unknown degree by Regulation or Diversion
[b] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



SAR@MWDXing Water Quality

Date	EC (um/cm)	TDS (mg/L)	Source	TDS/EC Ratio
10/12/2018	1010	618	USGS	0.61
10/24/2018	1010	611	USGS	0.60
11/14/2018	1030	606	USGS	0.59
11/27/2018	1010	625	USGS	0.62
12/10/2018	1020	613	USGS	0.60
12/19/2018	1020	616	USGS	0.60
1/30/2019	1000	613	USGS	0.61
2/2/2019	127	95	USGS	0.75
2/26/2019	952	597	USGS	0.63
3/4/2019	735	452	USGS	0.61
3/19/2019	1000	611	USGS	0.61
4/1/2019	1010	617	USGS	0.61
4/23/2019	1030	524	USGS	0.51
5/7/2019	1030	627	USGS	0.61
5/22/2019	643	404	USGS	0.63
6/7/2019	981	587	USGS	0.60
6/20/2019	1000	620	USGS	0.62
7/1/2019	1020	619	USGS	0.61
7/24/2019	1050	628	USGS	0.60
8/5/2019	1020	638	USGS	0.63
8/29/2019	1010	623	USGS	0.62
9/9/2019	1030	623	USGS	0.60
9/23/2019	1030	626	USGS	0.61
Average	946	574		0.61

USGS Water-Year Summary 2019

11059300 Santa Ana River at E Street, near San Bernardino, CA

LOCATION - Lat 34°03'54", long 117°17'58" referenced to North American Datum of 1927, San Bernardino County, CA, Hydrologic Unit 18070203, in San Bernardino Grant, on left bank, 0.4 mi downstream from E Street Bridge, 0.4 mi upstream from Warm Creek, 1.2 mi downstream from San Timoteo Creek, 2.8 mi south of San Bernardino, and 26 mi downstream from Big Bear Lake.

DRAINAGE AREA - 541 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD - March 1939 to September 1954, October 1966 to current year.

GAGE - Water-stage recorder and crest-stage gage. Elevation of gage is 940 ft above NGVD of 1929, from topographic map. Prior to Nov. 10, 1950, on right bank 0.4 mi upstream at datum 24.50 ft higher. Nov. 11, 1950, to September 1954, on both banks 0.4 mi upstream at datum 24.50 ft higher. October 1966 to September 1976, on right bank 0.4 mi upstream at datum 14.50 ft higher. October 1976 to September 1977, gage was removed for channel construction. October 1977 to Jan. 28, 1981, on right bank, 0.5 mi upstream at elevation 10 ft higher.

REMARKS - San Bernardino County Flood Control District (SBCFCD) declared growth in channel 'semi-permanent' citing environmental regulation in 2016. Flow partly regulated by Big Bear Lake (station 11049000) and, since November 1999, by Seven Oaks Flood-Control Reservoir, capacity, 145,600 acre-ft. Natural flow of stream affected by ground-water withdrawals and diversion for domestic use and irrigation upstream from station. Effluent from sewage reclamation plant 1.0 mi upstream caused sustained flow past gage from 1967 to Mar. 21, 1996. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 35,700 ft³/s, Jan. 11, 2005, gage height, 9.04 ft, current site and datum, from rating curve extended above 5,930 ft³/s on basis of critical-depth computations; maximum gage height, 11.9 ft, Feb. 25, 1969, site and datum then in use; no flow for many days many years prior to 1967 and since Mar. 21, 1996.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web
(USGS Water Data for the Nation), accessed [February 20, 2020],
https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8056&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11059300&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	0.00	0.16	43.1	24.8	18.9	4.43	7.71	e18.6	e66.5	0.00	0.00	0.00
2	0.00	0.05	15.8	26.7	211	144	6.80	e17.5	e61.5	0.00	0.00	0.00
3	0.00	0.03	13.4	27.0	139	184	8.03	e18.1	e60.1	0.00	0.00	0.00
4	1.93	0.02	9.94	26.3	194	59.9	7.51	e18.0	e60.6	0.00	0.00	0.00
5	0.01	0.56	14.0	25.4	362	31.0	5.72	e16.2	e57.5	0.00	0.00	0.00
6	0.01	0.50	501	70.5	162	309	5.37	e18.2	e54.0	0.00	0.00	0.00
7	0.01	0.78	149	40.3	74.6	79.3	4.47	e16.8	e47.4	0.00	0.00	0.00
8	0.05	0.15	55.6	28.7	45.9	46.3	5.52	e17.0	e46.4	0.00	0.00	0.00
9	0.03	0.75	31.8	25.6	32.4	13.3	5.45	e14.7	e44.6	0.00	0.00	0.00
10	0.01	0.82	24.6	25.3	36.4	4.66	5.04	12.7	e36.5	0.00	0.00	0.00
11	0.23	0.81	23.4	25.9	41.3	e3.73	6.11	e218	e16.1	0.00	0.00	0.00
12	0.26	1.63	22.5	68.9	18.6	31.6	6.31	e591	0.00	0.00	0.00	0.00
13	163	0.26	22.2	8.98	6.08	12.1	e7.67	e452	0.00	0.00	0.00	0.00
14	5.25	0.92	20.3	27.8	1,470	3.22	e7.35	e458	0.00	0.00	0.00	0.00
15	1.42	0.72	21.1	42.0	338	3.17	6.27	308	0.00	0.00	0.00	0.00
16	0.99	0.97	21.2	101	153	2.33	6.95	196	0.00	0.00	0.00	0.00
17	0.80	0.46	21.4	e750	106	2.02	7.01	81.0	0.00	0.00	0.00	0.00
18	0.75	0.90	20.6	122	79.8	0.56	3.92	85.5	0.00	0.00	0.00	0.00
19	0.79	1.44	20.4	28.6	e53.2	2.55	2.96	148	0.00	0.00	0.00	0.00
20	1.90	1.11	20.6	15.8	46.5	85.6	4.38	e143	0.00	0.00	0.00	0.00
21	1.84	1.49	20.9	9.42	115	21.3	4.52	e58.5	0.00	0.00	0.00	0.00
22	2.46	4.69	21.7	6.12	33.0	e15.4	8.35	e93.3	0.00	0.00	0.00	0.00
23	2.65	1.41	20.5	5.93	17.4	11.4	e11.1	e104	0.00	0.00	0.00	0.00
24	1.52	1.40	21.4	5.68	11.0	8.61	e13.7	e66.6	0.00	0.00	0.00	0.00
25	0.81	1.16	60.8	4.74	8.92	7.40	e17.3	e65.8	0.00	0.00	0.00	0.00
26	0.01	1.63	26.9	3.85	8.37	4.35	e15.8	e125	0.00	0.00	0.00	0.00
27	0.01	1.42	25.8	4.92	8.89	3.48	e3.39	e129	0.00	0.00	0.00	0.00
28	0.01	1.11	23.5	5.81	5.90	3.93	e12.9	e69.2	0.00	0.00	0.00	0.00
29	0.02	432	23.4	5.61		3.64	8.55	e73.7	0.00	0.00	0.00	e0.48
30	0.12	125	24.6	5.49		6.87	e13.2	e72.9	0.00	0.00	0.00	e1.39
31	0.10		25.1	52.6		6.27		e72.6		0.00	0.00	
Total	187	584	1,366	1,622	3,797	1,115	229	3,779	551	.000	.000	1.87
Mean	6.03	19.5	44.1	52.3	136	36.0	7.65	122	18.4	.000	.000	.062
Max	163	432	501	750	1470	309	17.3	591	66.5	0.00	0.00	1.39
Min	0.00	0.02	9.94	3.85	5.90	0.56	2.96	12.7	0.00	0.00	0.00	0.00
Ac-ft	371	1,159	2,710	3,217	7,532	2,212	455	7,495	1,093	.000	.000	3.71

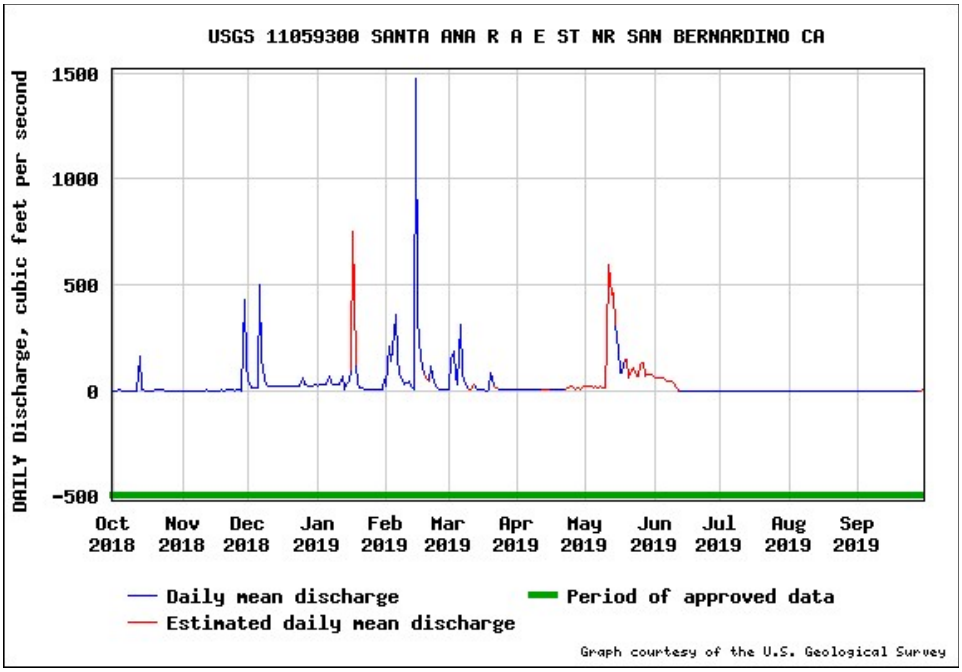
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2000 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	14.2	13.0	72.0	111	78.2	52.4	46.6	26.5	6.82	5.18	6.75	3.89
Max	200	47.1	764	1,185	376	398	351	247	112	52.9	102	40.6
(WY)	(2005)	(2014)	(2011)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)	(2005)
Min	.000	.67	.98	.000	.82	4.11	.041	.000	.000	.000	.000	.000
(WY)	(2003)	(2001)	(2018)	(2003)	(2002)	(2008)	(2002)	(2002)	(2002)	(2002)	(2002)	(2002)

SUMMARY STATISTICS

	Water Year 2019		Water Years 2000 - 2019	
Annual total	13,230			
Annual mean	36.3		36.3	
Highest annual mean			264.8	2005
Lowest annual mean			1.70	2002
Highest daily mean	1,470	Feb 14	12,500	Jan 11, 2005
Lowest daily mean	0.0	Oct 01	0.0	May 14, 2000
Annual 7-day minimum	0.0	Jun 12	0.0	Sep 11, 2000
Maximum peak flow	6,250[a,b]	Feb 14	35,700[a,b]	Jan 11, 2005
Maximum peak stage	6.96	Feb 14	9.04	Jan 11, 2005
Annual runoff (cfsm)	0.067		0.067	
Annual runoff (inches)	0.910		0.911	
10 percent exceeds	80.3		40.0	
50 percent exceeds	4.38		0.940	
90 percent exceeds	0.0		0.0	

[a] Discharge affected by Regulation or Diversion
[b] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11072100 Temescal Creek above Main Street, at Corona, CA

LOCATION - Lat 33°53'21", long 117°33'43" referenced to North American Datum of 1927, Riverside County, CA, Hydrologic Unit 18070203, in La Sierra Grant, on right bank, 500 ft upstream from Main Street Bridge in Corona, and 1.5 mi upstream from topographic boundary of Prado Flood-Control Basin.

DRAINAGE AREA - 224 mi². excludes 768 mi² above Lake Elsinore.

REVISIONS HISTORY -

On January 23, 2015, discharge records were revised for the period of September 10, 2013 to October 5, 2014.

Period October 4, 2018 to October 1, 2019 was accidentally approved in Aquarius Time-Series with no Analysis record.

SURFACE-WATER RECORDS

PERIOD OF RECORD - October 1980 to July 1983, February 1984 to current year.

GAGE - Water-stage recorder and concrete-lined flood-control channel. Elevation of gage is 600 ft above NGVD of 1929, from topographic map. December 1967 to September 1974, water-stage recorder at site 1.2 mi downstream at different datum (published as station 11072200, "Temescal Creek at Corona"). October 1980 to July 1983 at site 500 ft downstream at different datum.

REMARKS - Flow regulated by several small storage reservoirs. Many diversions upstream from station for irrigation. Water discharged to channel from Arlington Desalter at times since September 1990; records for water years 1981 to 1990 and 1991 to current year are not equivalent. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES OUTSIDE PERIOD OF RECORD - Maximum discharge, 8,850 ft³/s, Feb. 25, 1969, gage height, 8.17 ft, from floodmark, at old site (station 11072200) 1.2 mi downstream on basis of slope-area measurement of peak flow.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 6,140 ft³/s, Feb. 14, 2019, gage height, 7.22 ft, from rating curve on basis of step-backwater 2018 analysis; minimum daily, 0.77 ft³/s, on Dec. 13, 2018.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8161&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11072100&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019
1	1.05	1.64	1.62	1.16	3.05	34.6	48.2	25.6	2.96	2.94	4.83	2.90
2	1.16	1.81	1.28	1.36	231	163	52.7	26.6	3.78	3.47	3.07	2.96
3	3.69	2.02	1.38	1.51	22.5	44.7	57.8	25.4	3.39	3.43	1.89	3.32
4	30.8	2.29	1.35	1.81	73.6	36.2	56.1	24.9	2.20	3.38	2.28	3.89
5	2.13	2.72	23.3	8.62	53.3	37.7	54.8	25.9	1.56	3.59	2.49	4.23
6	2.02	2.86	259	25.1	2.98	185	46.6	29.0	1.92	4.62	1.79	e3.78
7	1.71	3.55	10.5	2.75	2.32	53.0	42.8	27.0	1.88	3.92	2.57	e2.72
8	1.54	2.67	1.77	1.57	2.32	58.6	42.1	28.2	1.04	4.24	2.64	e2.41
9	2.51	2.01	1.52	1.71	15.3	45.2	41.1	30.7	1.09	4.31	2.05	e2.64
10	3.66	3.06	1.34	2.01	7.71	54.6	40.5	35.3	2.31	5.59	2.46	e2.36
11	1.74	1.83	1.05	1.97	2.82	62.1	39.0	22.8	0.94	4.51	3.05	e2.28
12	56.7	1.86	1.14	67.2	2.08	84.1	34.3	21.9	1.10	4.40	3.19	e2.18
13	52.0	2.03	0.77	1.56	8.18	49.1	25.8	19.4	1.58	3.15	2.32	e1.66
14	2.21	2.47	0.98	63.4	2,570	51.0	22.3	17.8	1.46	2.58	2.22	1.48
15	1.74	2.63	0.97	159	656	44.7	21.9	15.0	1.34	2.55	2.08	1.70
16	0.82	3.25	0.97	174	225	54.2	19.1	29.5	1.55	2.59	2.78	2.60
17	1.45	3.72	1.27	116	139	46.8	21.0	6.16	1.72	2.70	2.09	1.42
18	1.47	4.32	1.34	3.44	109	49.2	23.3	3.51	1.74	4.37	2.23	2.41
19	1.54	4.63	1.64	1.57	89.6	53.0	21.2	15.6	2.03	2.78	2.87	2.12
20	1.93	4.29	1.34	1.48	87.9	213	15.4	9.81	2.06	2.79	2.53	1.62
21	1.69	5.39	1.76	1.52	151	76.0	11.5	3.91	1.89	2.83	3.27	1.84
22	1.95	22.4	2.07	1.13	99.2	45.1	13.1	91.6	2.37	3.24	3.20	1.97
23	2.03	3.57	1.61	1.31	81.1	37.6	12.7	7.49	4.70	3.45	4.16	2.60
24	2.23	3.97	2.03	1.00	73.2	36.3	19.1	3.38	3.88	4.17	4.16	1.99
25	2.25	3.67	3.78	1.43	73.1	35.5	20.5	2.33	2.32	3.99	2.89	2.06
26	2.20	3.53	1.91	1.15	71.3	34.9	22.4	1.90	2.28	3.42	2.99	2.04
27	1.88	3.30	1.84	1.41	55.9	33.8	23.5	3.08	3.04	3.58	3.15	2.10
28	2.28	4.04	1.59	1.26	42.3	37.1	23.9	1.84	2.85	3.48	3.27	3.73
29	2.23	179	2.10	2.00		23.1	26.1	1.57	2.83	4.59	3.44	4.44
30	2.19	14.8	2.07	2.31		35.3	25.7	1.41	3.74	4.02	3.11	3.95
31	1.47		1.86	76.0		41.8		1.18		5.03	2.71	
Total	194	299	337	728	4,951	1,855	925	560	67.6	114	87.8	77.4
Mean	6.27	9.98	10.9	23.5	177	59.9	30.8	18.1	2.25	3.67	2.83	2.58
Max	56.7	179	259	174	2570	213	57.8	91.6	4.70	5.59	4.83	4.44
Min	0.82	1.64	0.77	1.00	2.08	23.1	11.5	1.18	0.94	2.55	1.79	1.42
Ac-ft	385	594	669	1,443	9,820	3,682	1,834	1,110	134	226	174	154

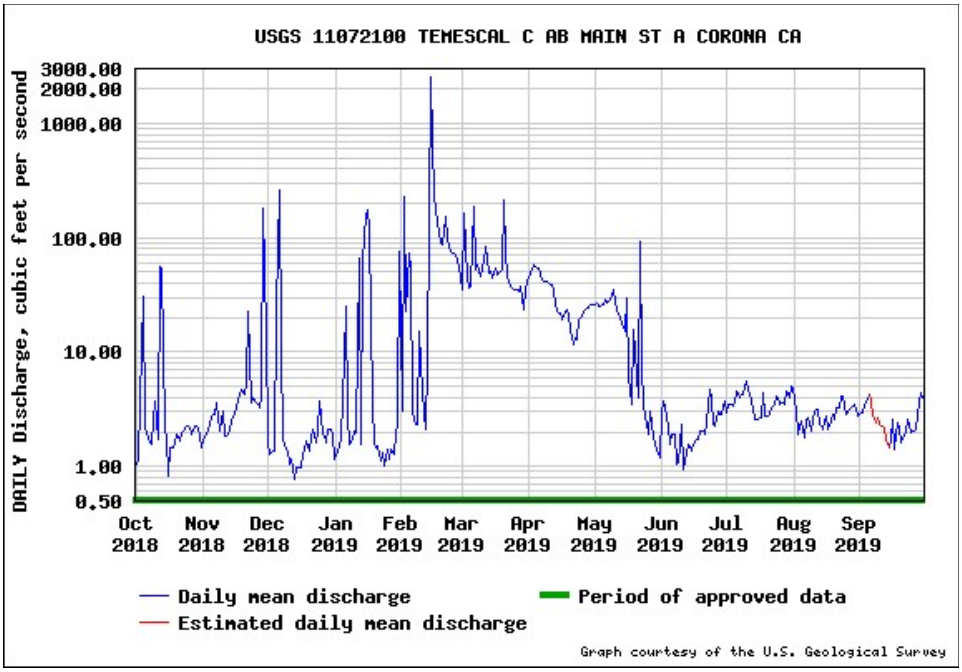
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1991 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	11.8	14.5	25.7	50.5	78.6	50.7	29.3	16.2	9.61	8.73	8.09	8.83
Max	52.6	58.3	222	335	400	349	190	100	34.3	24.9	20.7	30.4
(WY)	(2005)	(2006)	(2011)	(2005)	(2005)	(1995)	(1995)	(1995)	(1995)	(1993)	(2005)	(2005)
Min	1.95	1.76	1.59	2.51	3.24	1.75	1.15	.79	1.38	1.70	1.58	1.25
(WY)	(2015)	(2016)	(2018)	(2014)	(2016)	(2015)	(2018)	(2016)	(2016)	(2016)	(2015)	(2018)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1991 - 2019	
Annual total	10,200			
Annual mean	27.9		25.8	
Highest annual mean			104.4	2005
Lowest annual mean			4.09	2018
Highest daily mean	2,570	Feb 14	2,870	Dec 22, 2010
Lowest daily mean	0.770	Dec 13	0.340	Jul 03, 1992
Annual 7-day minimum	1.02	Dec 11	0.513	May 08, 2013
Maximum peak flow	6,140[a,b]	Feb 14	6,140[a,b]	Feb 14, 2019
Maximum peak stage	7.22	Feb 14	7.27	Dec 22, 2010
Annual runoff (cfsm)	0.125		0.115	
Annual runoff (inches)	1.69		1.56	
10 percent exceeds	54.7		52.7	
50 percent exceeds	3.19		9.71	
90 percent exceeds	1.47		1.68	

[a] Discharge affected by Regulation or Diversion
[b] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11071900 Temescal Creek at Corona Lake, near Corona, CA

LOCATION - Lat 33°45'01", long 117°26'45" referenced to North American Datum of 1983, in SE 1/4 NW 1/4 sec.07, T.5 S., R.5 W., Riverside County, CA, Hydrologic Unit 18070203, on left bank, 10 ft upstream from Corona Lake Weir Control into Temescal Creek, 9.3 mi downstream of Lake Elsinore, and 12.3 mi south of Corona.

DRAINAGE AREA - 57.9 mi^2.

SURFACE-WATER RECORDS

PERIOD OF RECORD - November 5, 2012 to current year.

GAGE - Water-stage recorder and concrete spillway control. Elevation of gage is 1,190 ft above NGVD of 1929, from a topographic map.

REMARKS - Gage established for the purpose of monitoring discharges from concrete weir on spill way of Corona Lake flowing into Temescal Creek.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 1090 ft^3/s, Feb. 19, 2019, gage height, 39.93 ft; minimum discharge, 0.00 ft^3/s, on many days, gage height, <17.34 ft., many days in 2015, while stage was below orifice.

U.S. Department of the Interior
U.S. Geological Survey

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES

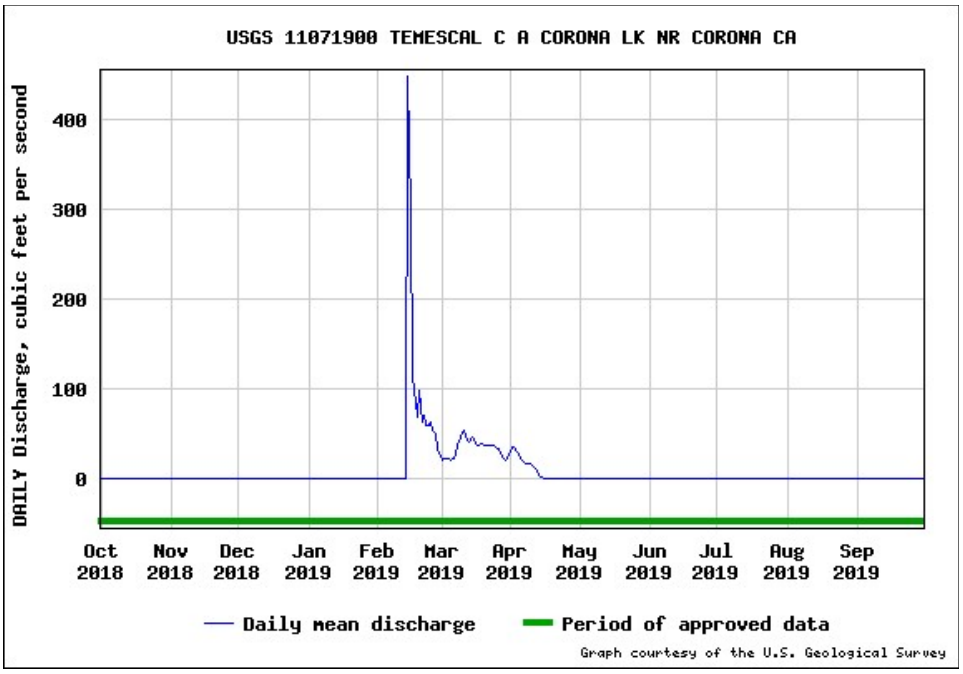
Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	0.00	0.00	0.00	0.00	0.00	19.7	34.8	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	20.8	35.1	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	21.7	29.4	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	0.00	22.2	27.9	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	20.4	22.4	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	22.2	18.1	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	26.3	15.7	0.00	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	35.8	15.9	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.00	44.9	16.0	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	49.8	14.3	0.00	0.00	0.00	0.00	0.00
11	0.00	0.00	0.00	0.00	0.00	52.5	10.6	0.00	0.00	0.00	0.00	0.00
12	0.00	0.00	0.00	0.00	0.00	42.0	6.57	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	0.00	40.7	3.12	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	449	44.9	0.38	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	296	41.7	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	114	37.7	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	83.4	36.4	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	67.5	37.8	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	97.0	37.7	0.00	0.00	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	62.3	37.4	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	69.5	36.7	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.00	0.00	0.00	58.9	36.2	0.00	0.00	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	59.2	36.3	0.00	0.00	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	63.4	35.7	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.00	0.00	54.0	34.1	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	48.6	33.4	0.00	0.00	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	33.0	26.5	0.00	0.00	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	24.1	21.6	0.00	0.00	0.00	0.00	0.00	0.00
29	0.00	0.00	0.00	0.00		20.4	0.00	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		21.3	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.00		29.1		0.00		0.00	0.00	
Total	.000	.000	.000	.000	1,580	1,024	250	.000	.000	.000	.000	.000
Mean	.000	.000	.000	.000	56.4	33.0	8.34	.000	.000	.000	.000	.000
Max	0.00	0.00	0.00	0.00	449	52.5	35.1	0.00	0.00	0.00	0.00	0.00
Min	0.00	0.00	0.00	0.00	0.00	19.7	0.00	0.00	0.00	0.00	0.00	0.00
Ac-ft	.000	.000	.000	.000	3,134	2,031	496	.000	.000	.000	.000	.000

STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 2013 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	.000	.000	.000	1.36	13.4	6.47	1.19	.000	.000	.000	.000	.000
Max	.000	.000	.000	7.61	56.4	33.0	8.34	.000	.000	.000	.000	.000
(WY)	(2014)	(2014)	(2013)	(2017)	(2019)	(2019)	(2019)	(2013)	(2013)	(2013)	(2013)	(2013)
Min	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	(2014)	(2014)	(2013)	(2014)	(2014)	(2014)	(2013)	(2013)	(2013)	(2013)	(2013)	(2013)

SUMMARY STATISTICS

	Water Year 2019		Water Years 2013 - 2019	
Annual total	2,854			
Annual mean	7.82		1.87	
Highest annual mean			7.82	2019
Lowest annual mean			0.0	2014
Highest daily mean	449.0	Feb 14	449.0	Feb 14, 2019
Lowest daily mean	0.0	Oct 01	-0.010	Feb 02, 2017
Annual 7-day minimum	0.0	Oct 01	-0.001	Jan 30, 2017
Maximum peak flow	1,090	Feb 19	1,090	Feb 19, 2019
Maximum peak stage	39.93	Feb 19	39.93	Feb 19, 2019
Annual runoff (cfsm)	0.135		0.031	
Annual runoff (inches)	1.83		0.427	
10 percent exceeds	29.2		0.0	
50 percent exceeds	0.0		0.0	
90 percent exceeds	0.0		0.0	



USGS Water-Year Summary 2019

11073360 Chino Creek at Schaefer Avenue, near Chino, CA

LOCATION - Lat 34°00'14", long 117°43'34" referenced to North American Datum of 1927, San Bernardino County, CA, Hydrologic Unit 18070203, in Santa Ana del Chino Grant, on right bank, 300 ft downstream from old Schaefer Avenue Bridge, 0.8 mi downstream from San Antonio Creek, and 1.5 mi southwest of Chino.

DRAINAGE AREA - 48.9 mi².

REVISIONS HISTORY - WDR CA-84-1: 1983 (instantaneous maximum discharge). WDR CA-95-1: 1992, 1993.

SURFACE-WATER RECORDS

PERIOD OF RECORD - October 1969 to current year. CHEMICAL DATA: Water year 1998. SEDIMENT DATA: Water year 1998.

GAGE - Water-stage recorder and concrete-lined flood-control channel. Concrete dikes formed low-water control from October 1975 to Apr. 16, 1991. Elevation of gage is 685 ft above NGVD of 1929, from topographic map.

REMARKS - Since 1997, due to construction in area of gage, Schaefer Avenue no longer extends to the Chino Creek crossing. The Schaefer Avenue Bridge, however, remains. Flow mostly regulated by San Antonio Flood-Control Reservoir, capacity, 7,700 acre-ft. Natural streamflow affected by extensive ground-water withdrawals, diversions for power, domestic use, irrigation, and return flow from irrigated areas. Releases of imported water are made to the basin by the California Water Project at times in some years, via San Antonio Creek from Rialto Pipeline below San Antonio Dam, at a site approximately 11 mi upstream. During the current water year, the California Water Project reported no releases were made into the basin. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES OUTSIDE PERIOD OF RECORD - Flood of Jan. 25, 1969, reached a stage of 9.23 ft, present datum, discharge, 9,200 ft³/s, on basis of contracted-opening measurement at site 6.1 mi downstream.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 12,700 ft³/s, Feb. 27, 1983, gage height, 10.32 ft, from rating curve extended above 560 ft³/s, on basis of slope-conveyance study; no flow May 21, June 30, July 1, Oct. 30, Nov. 3, 1977.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8167&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11073360&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	0.57	0.42	0.89	0.19	0.66	0.69	0.58	0.56	0.63	0.28	0.30	0.88
2	0.55	0.45	1.55	0.20	382	230	0.64	0.51	0.60	0.67	0.29	2.64
3	e5.75	0.40	0.90	0.23	69.1	4.71	0.65	0.58	0.63	1.16	0.23	3.20
4	5.90	0.41	0.75	0.18	139	1.62	0.97	0.52	0.56	0.24	0.22	3.42
5	0.76	0.42	18.3	51.5	31.4	2.39	0.73	0.46	0.58	0.25	0.26	1.59
6	0.85	0.56	555	17.9	1.28	340	0.88	0.64	0.61	0.22	0.41	1.26
7	1.93	0.57	7.78	2.65	0.95	47.7	1.15	0.61	0.60	0.20	0.28	1.16
8	0.87	0.53	1.35	0.32	1.29	2.15	0.50	0.59	0.51	0.27	0.30	2.04
9	0.63	0.48	0.83	0.28	30.2	1.36	0.45	0.60	0.50	0.24	0.30	2.97
10	0.65	0.39	0.73	0.28	27.6	1.16	0.40	0.61	0.56	0.26	0.23	4.61
11	0.59	0.40	0.56	0.48	2.13	1.31	0.43	0.48	0.59	0.27	0.34	5.74
12	94.5	0.44	0.47	69.1	1.24	1.79	0.41	0.44	0.58	0.30	0.26	7.11
13	67.9	0.57	0.44	1.34	3.37	1.21	0.40	0.51	0.55	0.23	0.27	3.21
14	1.36	0.54	0.51	107	953	0.93	0.50	0.50	0.52	0.20	0.41	2.25
15	0.77	0.67	0.37	135	26.9	0.82	0.38	0.53	0.45	0.26	0.74	3.32
16	0.69	0.72	0.36	251	3.54	0.77	0.42	37.3	0.41	0.37	0.54	1.12
17	0.49	0.65	0.36	464	7.43	0.86	0.46	0.78	0.56	0.28	0.55	1.62
18	0.45	0.63	0.42	3.19	1.97	0.79	0.45	0.58	0.75	0.35	0.45	4.36
19	0.46	0.74	0.42	2.27	1.08	1.16	0.42	7.34	0.77	0.29	0.55	5.18
20	0.53	1.63	0.39	1.70	11.8	31.4	0.45	1.33	0.76	0.21	0.48	5.24
21	0.50	0.56	0.44	1.48	7.98	0.92	0.44	0.65	0.72	0.21	0.41	5.79
22	0.54	67.1	0.39	1.05	1.03	0.77	0.43	222	0.48	0.26	0.47	6.06
23	0.50	1.07	0.35	0.36	0.78	0.78	0.47	2.06	0.40	0.30	0.36	3.22
24	1.00	0.70	0.34	0.28	0.74	0.75	0.53	2.07	0.56	0.44	0.32	0.38
25	0.48	0.57	4.04	0.69	0.76	0.74	0.53	2.11	0.38	0.23	0.28	1.38
26	0.52	0.54	0.34	0.30	0.87	0.68	0.55	18.5	0.43	0.29	0.36	0.30
27	0.44	0.82	0.32	0.31	0.70	0.67	0.56	1.16	0.36	0.18	0.40	0.33
28	0.70	0.53	0.22	0.30	0.79	0.66	0.58	0.95	0.37	0.21	0.39	0.31
29	0.45	290	0.12	0.50		0.66	1.35	0.55	0.27	0.31	0.53	0.27
30	0.42	4.16	0.14	0.30		0.64	0.53	0.62	0.26	0.37	1.85	0.27
31	0.69		0.16	108		0.58		0.58		0.35	0.47	
Total	192	378	599	1,222	1,710	681	17.2	307	15.9	9.70	13.3	81.2
Mean	6.21	12.6	19.3	39.4	61.1	22.0	.57	9.89	.53	.31	.43	2.71
Max	94.5	290	555	464	953	340	1.35	222	0.77	1.16	1.85	7.11
Min	0.42	0.39	0.12	0.18	0.66	0.58	0.38	0.44	0.26	0.18	0.22	0.27
Ac-ft	382	749	1,189	2,425	3,391	1,350	34.2	608	31.6	19.2	26.3	161

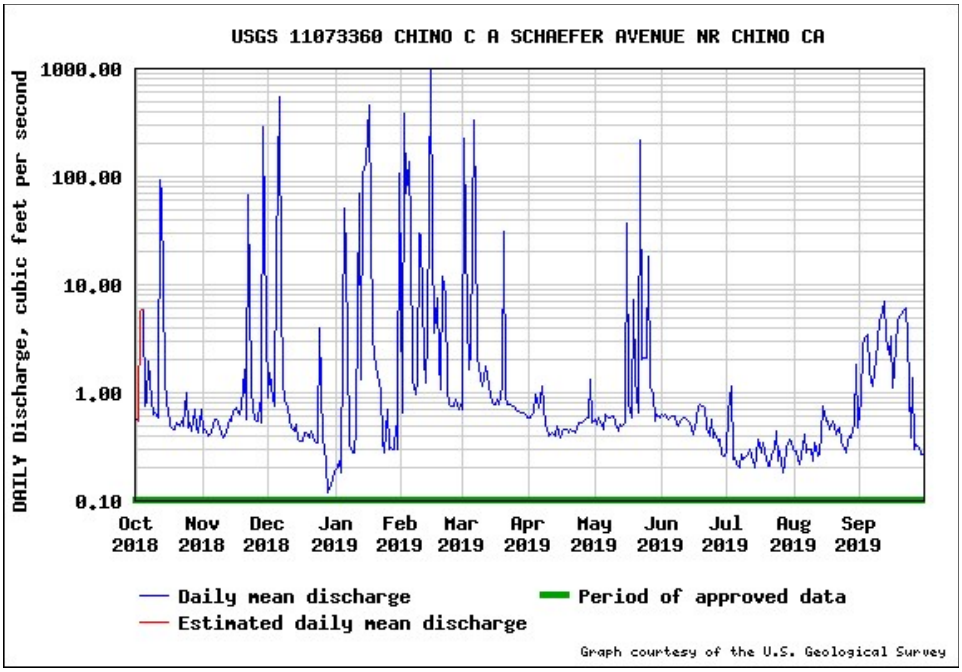
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1970 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	14.2	13.7	23.5	32.3	34.4	22.6	8.13	10.1	14.5	16.4	14.3	11.5
Max	126	113	189	221	193	257	68.6	104	184	176	191	198
(WY)	(1979)	(1976)	(1976)	(2005)	(1980)	(1978)	(1974)	(1997)	(1976)	(1974)	(1974)	(1997)
Min	.061	.20	.29	.48	.33	.30	.14	.22	.062	.069	.12	.13
(WY)	(1978)	(2018)	(2018)	(2014)	(1972)	(1972)	(1977)	(1973)	(1977)	(1977)	(2015)	(1977)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1970 - 2019	
Annual total	5,226			
Annual mean	14.3		17.9	
Highest annual mean			92.4	1974
Lowest annual mean			2.09	2018
Highest daily mean	953.0	Feb 14	2,060	Mar 01, 1978
Lowest daily mean	0.120	Dec 29	0.0	May 21, 1977
Annual 7-day minimum	0.174	Dec 29	0.024	Oct 28, 1977
Maximum peak flow	4,440[a,b]	May 22	13,100[a,b]	Feb 27, 1983
Maximum peak stage	7.44	May 22	10.32	Feb 27, 1983
Annual runoff (cfsm)	0.293		0.366	
Annual runoff (inches)	3.97		4.98	
10 percent exceeds	5.96		56.0	
50 percent exceeds	0.580		1.19	
90 percent exceeds	0.280		0.300	

[a] Discharge affected by Regulation or Diversion
[b] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11073495 Cucamonga Creek near Mira Loma, CA

LOCATION - Lat 33°58'58", long 117°35'55" referenced to North American Datum of 1927, in SW 1/4 NE 1/4 sec.22, T.2 S., R.7 W., San Bernardino County, CA, Hydrologic Unit 18070203, on right bank, 300 ft upstream from Merrill Avenue Bridge, and 4.6 mi west of Mira Loma.

DRAINAGE AREA - 75.8 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD - January 1968 to July 1977, December 1978 to current year. CHEMICAL DATA: Water years 1999-2000. SPECIFIC CONDUCTANCE: Water years 1999-2000. WATER TEMPERATURE: Water years 1999-2000. SEDIMENT DATA: Water years 1999-2000.

GAGE - Water-stage recorder, crest-stage gage, and concrete-lined flood-control channel. Elevation of gage is 660 ft above NGVD of 1929, from topographic map. Prior to July 1977 at site 100 ft downstream at different datum.

REMARKS - Channel is a trapezoidal concrete floodway; records for low and medium flows prior to July 31, 1977, are not equivalent (channel concrete lined since July 31, 1977). Inland Empire Utilities Agency Tertiary Plant No. 1 began discharging effluent 3.3 mi upstream from station on May 8, 1985. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 17,300 ft³/s, Oct. 20, 2004, gage height, 6.58 ft, from rating curve extended above 617 ft³/s on basis of step-backwater computations; maximum gage height, 7.85 ft, Feb. 27, 1983. Prior to operation of Plant No. 1, no flow for most of some years. Minimum daily since 1985, 0.04 ft³/s, October 1, 2017.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8174&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11073495&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	58.4	18.0	27.6	49.8	62.7	89.6	58.7	11.1	13.1	46.2	5.82	2.75
2	64.8	26.1	24.1	48.3	725	438	49.3	5.70	7.38	34.4	4.84	29.0
3	93.2	10.1	30.2	56.5	239	107	51.1	5.82	7.95	24.9	6.48	36.9
4	87.6	29.6	32.9	63.2	390	86.0	50.4	9.30	8.53	32.1	7.07	6.41
5	41.7	22.7	51.8	70.0	208	92.8	42.8	16.2	8.68	30.1	4.81	27.5
6	38.6	18.8	666	97.3	86.3	444	44.2	15.0	9.03	40.7	3.88	38.9
7	43.4	18.4	77.0	73.8	69.2	209	44.0	11.0	4.33	39.6	3.02	3.04
8	45.1	15.1	50.5	64.9	59.1	71.8	46.5	9.83	6.41	37.1	2.69	1.66
9	47.3	36.5	47.6	58.1	110	71.1	28.7	12.5	11.1	34.3	2.15	2.72
10	35.5	23.7	47.1	63.4	164	111	20.4	12.2	2.91	28.8	4.24	5.35
11	36.8	37.0	45.2	73.6	71.7	125	29.4	6.13	1.63	28.9	7.05	6.07
12	78.9	31.2	46.5	126	67.7	136	31.5	4.69	6.48	19.4	6.41	3.82
13	142	21.2	48.0	77.5	69.1	134	43.2	6.89	6.90	31.1	2.26	1.91
14	25.7	5.62	47.5	221	1,930	81.8	45.6	5.84	3.97	28.8	2.03	2.20
15	63.6	12.9	43.7	247	224	54.5	55.5	13.9	2.00	24.1	1.88	5.95
16	58.4	12.4	45.7	535	109	69.9	44.7	90.3	2.81	25.9	1.89	2.88
17	42.6	16.6	47.1	1,540	87.6	70.1	33.2	35.2	1.56	20.7	2.63	4.12
18	26.2	18.4	49.6	103	71.7	77.0	26.0	30.2	0.23	19.5	4.32	2.96
19	14.2	24.3	48.8	75.1	81.8	73.4	31.6	31.1	0.28	36.1	2.92	32.9
20	14.6	41.3	49.8	69.3	90.5	133	41.9	18.9	0.17	23.6	3.84	41.0
21	25.6	54.5	49.8	58.5	74.5	110	41.3	7.23	0.00	28.2	2.21	51.0
22	30.1	87.2	54.6	55.4	61.8	64.2	23.0	94.1	0.01	17.3	2.84	47.5
23	32.9	6.75	61.3	40.2	48.8	63.4	14.4	49.2	0.04	10.5	3.29	40.3
24	27.0	5.33	61.1	41.9	60.8	65.6	7.62	54.1	0.24	6.14	3.11	33.3
25	39.4	6.15	66.1	38.1	61.3	67.5	16.2	44.6	0.10	7.13	4.15	31.2
26	34.1	16.3	48.5	49.3	67.2	52.5	11.8	68.2	109	4.23	2.37	36.3
27	28.5	30.4	41.2	53.9	70.9	56.3	10.2	53.9	37.5	5.27	2.14	10.8
28	33.8	30.9	28.5	60.5	83.2	51.0	14.8	48.5	44.2	15.3	2.15	18.2
29	36.5	350	30.5	61.7		50.9	23.3	36.8	51.4	10.4	1.86	14.5
30	33.1	43.9	32.1	69.8		53.3	15.6	22.0	35.9	10.0	2.47	10.2
31	23.6		37.1	166		53.6		9.03		7.51	1.60	
Total	1,403	1,071	2,037	4,408	5,445	3,363	997	839	384	728	108	551
Mean	45.3	35.7	65.7	142	194	108	33.2	27.1	12.8	23.5	3.50	18.4
Max	142	350	666	1540	1930	444	58.7	94.1	109	46.2	7.07	51.0
Min	14.2	5.33	24.1	38.1	48.8	50.9	7.62	4.69	0.00	4.23	1.60	1.66
Ac-ft	2,783	2,125	4,041	8,743	10,800	6,671	1,976	1,665	761	1,445	215	1,094

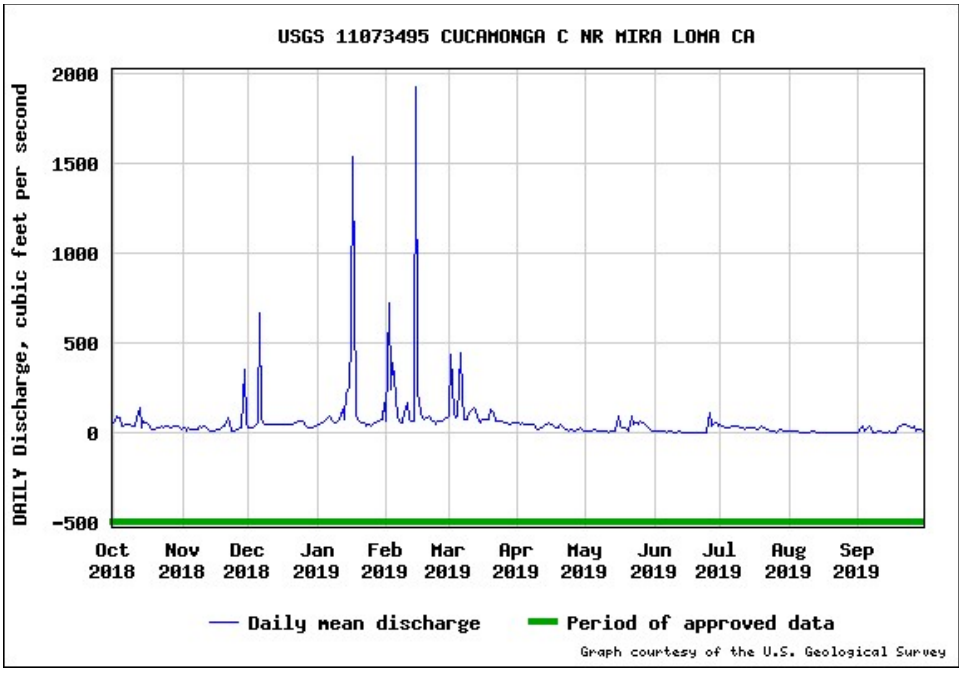
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1986 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	40.3	40.0	63.2	88.7	99.6	62.0	41.4	32.8	28.2	26.9	26.0	30.4
Max	223	102	328	442	350	198	114	69.4	57.1	53.4	51.8	52.0
(WY)	(2005)	(2003)	(2011)	(2005)	(2005)	(1995)	(2006)	(2003)	(1992)	(2004)	(1992)	(1986)
Min	10.5	12.5	16.7	15.6	14.5	12.1	6.27	6.60	2.54	1.86	2.67	3.86
(WY)	(2018)	(2013)	(2014)	(2014)	(2016)	(2017)	(2013)	(2014)	(2017)	(2018)	(2015)	(2016)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1986 - 2019	
Annual total	21,340			
Annual mean	58.5		48.0	
Highest annual mean			137.4	2005
Lowest annual mean			15.8	2013
Highest daily mean	1,930	Feb 14	5,200	Jan 09, 2005
Lowest daily mean	0.0	Jun 21	0.0	Jun 21, 2019
Annual 7-day minimum	0.120	Jun 19	0.120	Jun 19, 2019
Maximum peak flow	8,220[a]	Jan 17	17,300[a]	Oct 20, 2004
Maximum peak stage	5.57	Jan 17	6.58	Oct 20, 2004
Annual runoff (cfsm)	0.771		0.634	
Annual runoff (inches)	10.5		8.61	
10 percent exceeds	89.9		60.7	
50 percent exceeds	34.1		33.0	
90 percent exceeds	3.00		8.98	

[a] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11060400 Warm Creek near San Bernardino, CA

LOCATION - Lat 34°04'42", long 117°17'58" referenced to North American Datum of 1927, San Bernardino County, CA, Hydrologic Unit 18070203, in San Bernardino Grant, on left bank, 0.2 mi downstream from Interstate Highway 215 Bridge, and 2.0 mi southwest of San Bernardino.

DRAINAGE AREA - 11 mi².

REVISIONS HISTORY - WDR CA-83-1: Drainage area. WDR CA-92-1: 1978 (instantaneous maximum discharge), 1980-81 (instantaneous maximum discharge), 1983-86 (instantaneous maximum discharge).

SURFACE-WATER RECORDS

PERIOD OF RECORD - February 1964 to September 1972, October 1974 to current year. CHEMICAL DATA: Water years 1999-2004. SPECIFIC CONDUCTANCE: Water years 1999-2001. WATER TEMPERATURE: Water years 1999-2001. SEDIMENT DATA: Water years 1999-2004.

GAGE - Water-stage recorder and concrete-lined flood-control channel. Elevation of gage is 960 ft above NGVD of 1929, from topographic map. Prior to Oct. 1, 1974, at site 0.1 mi upstream at different datum.

REMARKS - Natural channel prior to October 1972; concrete-lined channel since October 1974. Possible diversion during high flows into Warm Creek from Lytle Creek flood detention basin 3.4 mi upstream. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 8,500 ft³/s, Mar. 4, 1978, gage height, 4.88 ft, from rating curve extended above 420 ft³/s, on basis of step-backwater analysis, maximum gage height, 6.33 ft, Nov. 22, 1965, site and datum then in use; no flow at times in some years.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8060&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11060400&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	0.00	0.09	0.17	0.37	1.26	2.94	2.36	0.35	1.32	0.16	0.19	0.33
2	0.00	0.09	0.16	0.40	98.7	82.0	2.36	0.25	1.22	0.18	0.15	0.32
3	0.00	0.11	0.19	0.38	32.2	12.1	2.36	0.24	2.60	0.18	0.19	0.31
4	0.10	0.60	0.42	0.37	30.8	4.62	2.24	0.24	3.10	0.18	0.26	0.34
5	0.04	0.60	2.13	1.57	21.9	4.81	1.75	0.24	5.34	0.18	0.29	4.38
6	0.04	0.10	115	10.0	0.60	48.2	1.49	0.23	0.63	0.18	0.24	5.82
7	0.03	0.08	1.04	0.64	0.65	5.36	1.48	0.23	0.29	0.19	0.26	2.77
8	0.04	0.06	0.30	0.50	0.51	4.58	1.21	0.25	0.20	0.17	0.23	0.24
9	0.06	0.07	0.27	0.50	5.18	3.65	1.15	0.26	0.16	0.18	0.25	0.29
10	0.36	0.08	0.27	0.50	6.80	3.62	1.01	0.31	0.16	0.19	0.25	0.66
11	0.57	0.08	0.35	0.50	0.55	3.71	1.13	1.31	0.21	0.22	0.26	0.28
12	7.75	0.11	0.68	6.80	0.38	4.04	1.44	0.70	0.16	0.21	0.23	0.29
13	30.5	0.11	0.69	0.75	0.81	3.77	1.39	0.55	0.19	0.19	0.29	0.31
14	0.17	0.17	0.67	40.7	408	3.62	1.37	0.51	0.24	0.16	0.30	0.90
15	0.49	0.28	0.67	24.7	15.2	3.62	1.35	0.50	0.20	0.36	0.35	0.28
16	0.93	0.28	0.64	66.0	3.73	3.62	1.33	11.8	0.20	1.13	0.25	0.30
17	1.13	0.14	0.50	246	20.5	3.62	1.31	1.08	0.27	1.01	0.23	0.48
18	1.12	0.14	0.50	1.21	3.83	3.62	1.30	1.06	0.20	0.23	0.26	0.30
19	1.01	0.38	0.50	0.50	2.59	4.13	1.28	6.89	0.18	0.22	0.30	0.28
20	1.01	0.21	0.52	0.46	3.77	13.5	1.25	3.71	0.27	0.21	0.25	0.30
21	1.03	0.16	0.52	0.45	31.6	2.82	1.12	1.93	0.37	0.18	0.34	0.26
22	0.25	7.13	0.48	0.36	2.31	2.36	0.77	7.45	0.23	0.21	0.35	0.37
23	0.11	0.18	0.54	0.31	1.89	2.36	0.51	5.88	0.23	0.20	0.25	0.50
24	0.11	0.11	0.38	0.30	1.83	2.36	0.39	2.52	0.22	0.21	0.24	0.44
25	0.11	0.11	9.59	0.30	1.49	2.90	0.39	2.38	0.34	0.18	0.38	0.54
26	0.11	0.11	0.51	0.44	1.83	3.62	0.45	3.66	0.25	0.20	0.33	0.50
27	0.11	0.11	0.37	0.52	3.62	3.62	0.37	3.02	1.24	0.19	1.03	0.64
28	0.11	0.11	0.37	0.50	3.48	3.62	0.37	1.91	2.27	0.19	2.29	0.78
29	0.11	61.1	0.38	0.49		2.95	0.86	1.89	2.18	1.36	0.38	0.66
30	0.08	1.97	0.37	0.49		2.94	0.36	1.49	0.16	2.88	0.41	0.61
31	0.08		0.37	32.8		2.75		1.48		0.20	0.36	
Total	47.6	74.9	140	440	706	251	36.1	64.3	24.6	11.7	11.4	24.5
Mean	1.53	2.50	4.50	14.2	25.2	8.11	1.20	2.07	.82	.38	.37	.82
Max	30.5	61.1	115	246	408	82.0	2.36	11.8	5.34	2.88	2.29	5.82
Min	0.00	0.06	0.16	0.30	0.38	2.36	0.36	0.23	0.16	0.16	0.15	0.24
Ac-ft	94.3	149	277	872	1,400	499	71.7	128	48.9	23.3	22.6	48.6

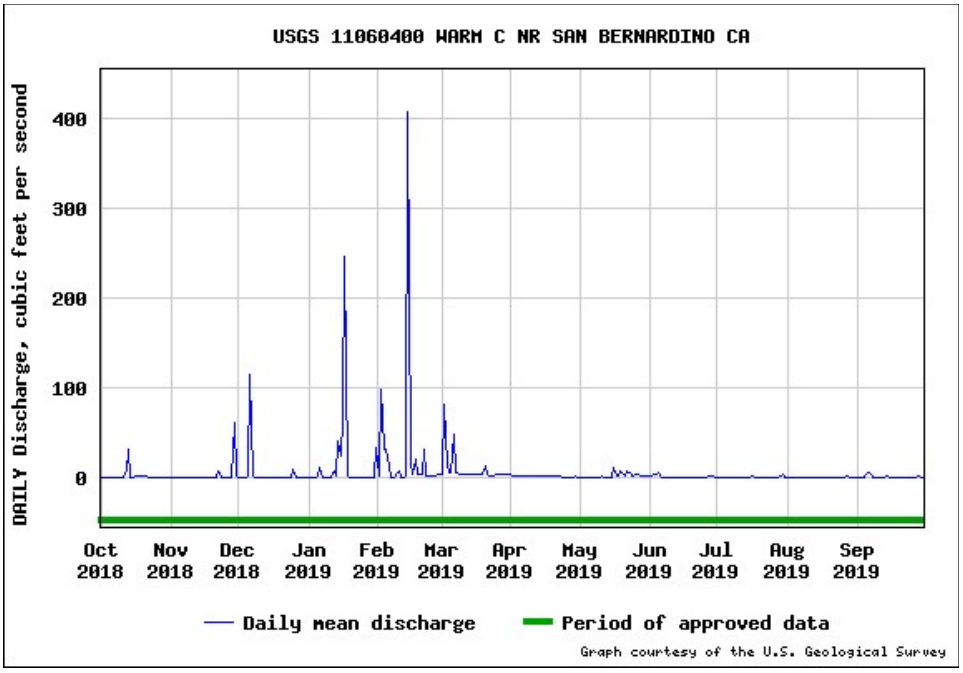
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1975 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	5.39	6.82	10.0	14.0	26.5	22.3	10.2	7.99	5.82	5.11	4.94	4.78
Max	32.4	33.1	48.3	41.2	418	376	44.2	86.7	43.6	34.5	50.6	30.3
(WY)	(1984)	(1986)	(2011)	(1993)	(1978)	(1978)	(1986)	(1980)	(1980)	(1980)	(1983)	(1983)
Min	.011	.087	.14	.066	.72	.12	.049	.076	.008	.011	.002	.022
(WY)	(2015)	(1996)	(2018)	(2003)	(2002)	(2015)	(2018)	(2016)	(2015)	(2016)	(2016)	(2016)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1975 - 2019	
Annual total	1,832			
Annual mean	5.02		10.2	
Highest annual mean			70.5	1978
Lowest annual mean			1.23	2002
Highest daily mean	408.0	Feb 14	3,400	Mar 01, 1978
Lowest daily mean	0.0	Oct 01	0.0	Nov 29, 1974
Annual 7-day minimum	0.030	Oct 01	0.0	Dec 07, 1974
Maximum peak flow	1,920[a]	Feb 14	8,500[a]	Mar 04, 1978
Maximum peak stage	2.88	Feb 14	4.88	Mar 04, 1978
Annual runoff (cfsm)	0.456		0.930	
Annual runoff (inches)	6.19		12.6	
10 percent exceeds	4.60		24.0	
50 percent exceeds	0.480		1.70	
90 percent exceeds	0.146		0.050	

[a] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11065000 Lytle Creek at Colton, CA

LOCATION - Lat 34°04'44", long 117°18'17" referenced to North American Datum of 1927, San Bernardino County, CA, Hydrologic Unit 18070203, in San Bernardino Grant, on right bank, 400 ft downstream from Colton Avenue, 1,930 ft upstream from outlet end of channel, and 1.3 mi northeast of Colton.

DRAINAGE AREA - 186 mi².

REVISIONS HISTORY - WDR CA-83-1: Drainage area.

SURFACE-WATER RECORDS

PERIOD OF RECORD - October 1957 to September 1983, October 1984 to current year.

GAGE - Water-stage recorder and concrete-lined flood-control channel. Datum of gage is 974.67 ft above NGVD of 1929 (levels by U.S. Army Corps of Engineers).

REMARKS - Flow partly regulated by Lytle Creek spreading grounds 3.2 mi upstream. Diversions upstream from station for irrigation, power development, domestic use, and ground-water replenishment. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 17,500 ft³/s, Mar. 4, 1978, gage height, 14.8 ft, from rating curve extended above 4,200 ft³/s, on basis of discharge for design flood at gage height 21.4 ft; no flow at times.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&80090&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11065000&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	2018	2018	2018	2019	2019	2019	2019	2019	2019	2019	2019	2019
1	0.00	1.98	1.50	e0.61	e0.57	0.42	0.34	0.20	0.08	0.00	0.21	0.08
2	0.00	1.58	1.79	e0.61	e301	50.2	0.31	0.16	0.10	0.00	0.21	0.10
3	0.04	1.33	2.31	e0.67	52.6	e4.74	0.37	0.13	0.04	0.00	0.20	0.21
4	0.15	1.27	2.36	e1.06	66.6	0.41	0.46	0.15	0.04	0.05	0.22	0.21
5	1.28	1.21	2.98	e5.27	e24.3	0.42	0.40	0.28	0.07	0.01	0.17	0.29
6	0.29	1.17	120	e10.3	0.10	59.1	0.35	0.32	0.05	0.00	0.12	0.25
7	0.30	1.11	e4.63	e0.87	0.07	e5.94	0.27	0.18	0.02	0.00	0.14	0.03
8	0.07	1.50	1.90	e0.61	0.07	0.52	0.28	0.11	0.03	0.00	0.12	0.05
9	0.10	1.85	1.67	e0.54	1.53	0.47	0.29	0.15	0.04	0.00	0.16	0.04
10	0.15	1.17	1.79	e0.54	1.21	0.55	0.46	0.15	0.05	0.00	0.12	0.09
11	0.10	2.49	1.96	e0.54	0.10	0.64	0.50	0.13	0.05	0.00	0.23	0.02
12	5.16	3.74	2.15	e8.61	0.07	1.17	0.40	0.17	0.03	0.00	0.12	0.02
13	9.42	2.94	1.92	e2.83	0.15	0.58	0.55	0.34	0.04	0.00	0.15	0.02
14	0.83	3.35	2.33	e46.5	978	0.49	0.46	0.34	0.04	0.00	0.17	0.02
15	1.28	1.23	2.25	e22.6	e84.2	0.64	0.38	0.28	0.07	1.82	0.12	0.01
16	1.00	1.98	1.90	e77.6	4.00	0.63	0.73	6.24	0.02	1.92	0.16	0.09
17	0.66	2.17	1.86	701	e8.89	0.46	0.61	0.15	0.02	1.09	0.05	0.05
18	0.71	1.87	2.08	e9.93	0.92	0.46	0.58	0.12	0.01	0.19	0.08	0.03
19	0.99	1.77	2.05	1.06	0.53	0.56	0.56	e3.12	0.01	0.07	0.05	0.05
20	0.77	2.09	2.05	0.75	1.78	3.60	0.47	0.68	0.01	0.03	0.09	0.03
21	0.99	1.88	2.28	0.91	16.8	0.48	0.28	0.13	0.01	0.02	0.07	0.03
22	1.06	e5.18	2.41	0.78	0.18	0.70	0.18	5.39	0.03	0.04	0.05	0.02
23	1.06	1.51	2.11	0.89	0.26	0.41	0.12	0.61	0.02	0.20	0.04	0.01
24	0.77	1.40	1.60	0.92	0.24	0.40	0.16	0.08	0.01	0.64	0.35	0.02
25	0.71	1.61	e9.33	0.87	0.35	0.51	0.21	0.09	0.01	0.42	0.11	0.04
26	0.62	1.48	e1.41	0.98	0.38	0.60	0.16	0.85	0.01	0.23	0.08	0.05
27	1.06	1.64	e0.60	0.94	0.31	0.41	0.29	1.00	0.01	0.24	0.09	0.15
28	1.01	1.47	e0.55	0.98	0.35	0.41	0.25	0.10	0.01	0.14	0.16	0.08
29	1.05	e48.6	e0.56	1.04		0.26	0.31	0.11	0.03	0.08	0.11	0.06
30	1.33	e3.43	e0.57	0.96		0.24	0.22	0.10	0.03	0.10	0.15	0.04
31	2.11		e0.59	e15.9		0.34		0.11		0.13	0.02	
Total	35.1	106	183	918	1,545	137	11.0	22.0	.99	7.42	4.12	2.19
Mean	1.13	3.53	5.92	29.6	55.2	4.41	.37	.71	.033	.24	.13	.073
Max	9.42	48.6	120	701	978	59.1	0.73	6.24	0.10	1.92	0.35	0.29
Min	0.00	1.11	0.55	0.54	0.07	0.24	0.12	0.08	0.01	0.00	0.02	0.01
Ac-ft	69.6	210	364	1,820	3,066	271	21.7	43.6	1.96	14.7	8.17	4.34

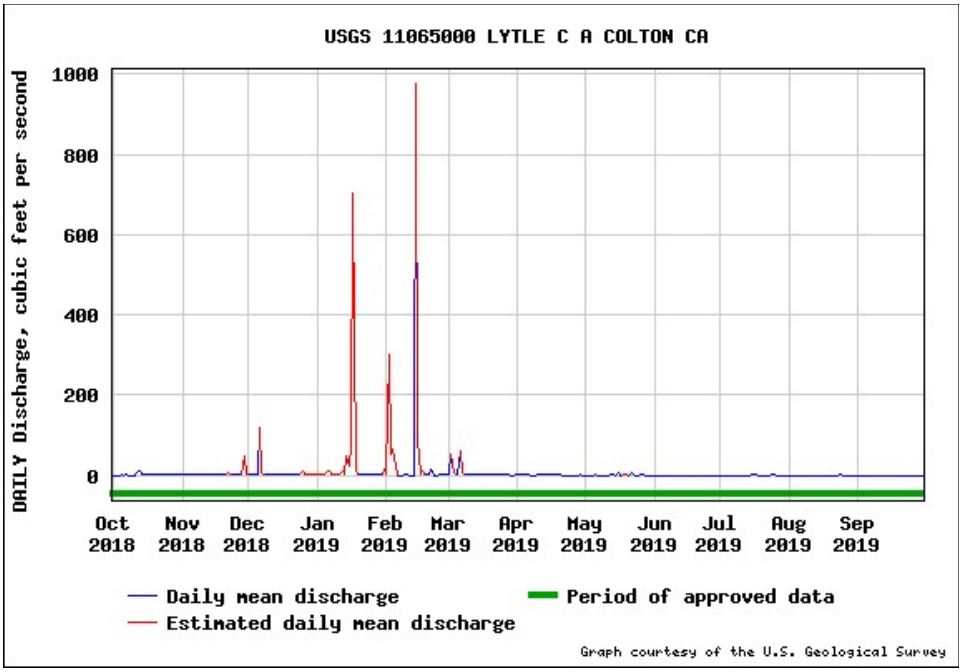
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1958 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	2.03	3.58	9.43	19.0	26.7	14.6	3.77	3.26	1.85	1.17	.79	.63
Max	83.2	79.1	142	318	363	326	57.3	87.6	61.3	35.4	17.1	9.58
(WY)	(2005)	(1966)	(2011)	(1969)	(1980)	(1978)	(1969)	(1969)	(1978)	(1978)	(1969)	(1980)
Min	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
(WY)	(1958)	(1958)	(1959)	(1963)	(1961)	(1959)	(1961)	(1959)	(1958)	(1958)	(1958)	(1958)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1958 - 2019	
Annual total	2,972			
Annual mean	8.14		7.16	
Highest annual mean			65.4	1969
Lowest annual mean			0.008	1977
Highest daily mean	978.0	Feb 14	5,040	Jan 25, 1969
Lowest daily mean	0.0	Oct 01	0.0	Oct 01, 1957
Annual 7-day minimum	0.0	Jul 06	0.0	Oct 01, 1957
Maximum peak flow			17,500[a,b]	Mar 04, 1978
Maximum peak stage			14.80	Mar 04, 1978
Annual runoff (cfsm)	0.044		0.038	
Annual runoff (inches)	0.594		0.521	
10 percent exceeds	3.04		2.83	
50 percent exceeds	0.370		0.0	
90 percent exceeds	0.020		0.0	

[a] Discharge affected to unknown degree by Regulation or Diversion
[b] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other



USGS Water-Year Summary 2019

11057500 San Timoteo Creek near Loma Linda, CA

LOCATION - Lat 34°03'41", long 117°16'00" referenced to North American Datum of 1927, in NW 1/4 NE 1/4 sec.26, T.1 S., R.4 W., San Bernardino County, CA, Hydrologic Unit 18070203, on left bank, 1,500 ft upstream from Redlands Boulevard Bridge, and 0.6 mi northwest of Loma Linda.

DRAINAGE AREA - 125 mi².

SURFACE-WATER RECORDS

PERIOD OF RECORD - October 1954 to September 1965, February 1968 to September 1975, April 1979 to current year. Discharge measurements only, October 1997 to September 1998. WATER TEMPERATURE: Water years 1979-82, 1992-94. SEDIMENT DATA: Water years 1979-82, 1992-94.

GAGE - Water-stage recorder and concrete-lined flood-control channel. Elevation of gage is 1,040 ft above NGVD of 1929, from topographic map. Prior to April 1979, water-stage recorder at site 0.45 mi downstream at different datum. April 1979 to Dec. 7, 1997, at site 0.25 mi downstream at different datum.

REMARKS - Since Dec. 7, 1997, channel is a trapezoidal concrete floodway. No regulation upstream from station. Natural flow affected by pumping and return flow from irrigated areas. See schematic diagram of Santa Ana River Basin available from the California Water Science Center.

EXTREMES FOR PERIOD OF RECORD - Maximum discharge, 15,000 ft³/s, Feb. 25, 1969, gage height, 8.2 ft, from floodmark, from rating curve extended above 2,100 ft³/s, on basis of slope-conveyance study of peak flow, at site and datum then in use; no flow for many days most years.

U.S. Department of the Interior
U.S. Geological Survey

Suggested citation: U.S. Geological Survey, 2020, National Water Information System data available on the World Wide Web (USGS Water Data for the Nation), accessed [February 20, 2020], https://nwis.waterdata.usgs.gov/nwis/wys_rpt?dv_ts_ids=&8045&adr_begin_date=2018-10-01&adr_end_date=2019-09-30&site_no=11057500&agency_cd=USGS

DISCHARGE, CUBIC FEET PER SECOND
YEAR 2018-10-01 to 2019-09-30
DAILY MEAN VALUES
[e, Value has been estimated.]

Day	Oct 2018	Nov 2018	Dec 2018	Jan 2019	Feb 2019	Mar 2019	Apr 2019	May 2019	Jun 2019	Jul 2019	Aug 2019	Sep 2019
1	1.79	0.61	29.6	17.6	47.1	18.4	7.60	13.1	5.91	0.93	2.38	1.08
2	2.89	0.63	9.34	17.4	92.4	34.7	7.20	10.1	6.60	1.07	0.90	1.77
3	0.28	0.45	8.07	17.2	107	33.1	7.87	14.5	8.69	0.65	0.32	1.17
4	3.96	0.52	6.11	14.7	51.2	26.3	8.23	5.83	10.3	0.65	0.34	1.61
5	1.02	0.85	9.38	14.2	80.6	30.9	8.64	14.9	9.49	0.88	0.44	1.53
6	1.87	0.83	40.9	51.0	49.0	35.0	8.97	26.8	6.92	1.36	0.70	1.33
7	2.04	0.94	112	61.4	30.1	29.0	8.70	22.9	4.54	0.57	0.99	2.74
8	1.90	0.63	33.6	21.7	15.7	28.1	8.44	15.8	5.16	0.48	1.81	0.71
9	2.75	1.66	18.2	19.0	20.8	13.4	6.97	23.5	6.77	0.66	1.43	1.36
10	3.26	2.81	12.1	19.8	20.7	13.5	5.75	39.6	2.41	0.71	1.61	1.30
11	3.19	2.11	10.7	18.8	33.6	12.9	7.86	31.0	2.62	0.78	0.87	5.06
12	9.77	1.37	9.99	36.6	26.9	14.1	8.98	23.6	2.94	1.00	1.42	1.29
13	24.0	1.55	9.03	30.4	18.2	10.4	8.01	39.6	0.96	1.11	e4.37	1.90
14	5.43	1.96	e7.53	32.8	666	9.83	9.95	21.8	1.96	0.61	0.44	1.83
15	2.00	1.81	8.73	65.0	104	9.21	10.1	7.14	1.93	0.48	0.55	3.20
16	1.92	2.34	8.66	106	43.4	8.80	8.87	12.9	e1.35	0.21	1.15	0.87
17	1.60	1.16	8.61	224	32.3	9.57	7.99	23.7	e0.78	0.31	1.39	0.86
18	1.53	1.59	7.75	102	36.1	10.2	6.43	10.1	e0.76	0.31	0.78	1.76
19	1.78	1.69	7.28	32.7	30.4	10.9	7.70	20.7	e0.91	0.46	2.11	1.38
20	3.03	2.27	6.82	25.6	39.0	30.3	9.68	18.0	e0.97	0.56	4.25	5.47
21	2.13	1.54	6.76	15.4	36.4	26.7	7.73	12.7	e2.52	0.74	3.39	3.37
22	1.59	3.31	6.95	12.8	33.1	20.6	9.33	49.7	e5.67	0.65	2.85	1.01
23	1.54	2.12	6.26	10.5	30.3	10.0	22.1	120	2.00	0.96	1.62	0.86
24	1.09	1.49	6.70	10.0	22.0	9.61	3.56	39.2	1.45	1.17	2.46	1.30
25	0.66	1.36	21.6	8.82	24.0	9.81	3.27	18.6	3.00	0.35	1.49	2.59
26	0.24	2.25	10.2	7.54	20.8	9.40	2.32	17.7	2.77	0.37	1.56	2.18
27	0.26	1.69	12.9	8.89	17.1	9.14	4.23	27.7	16.7	0.62	1.49	3.16
28	0.48	2.82	11.8	10.8	20.2	9.74	5.90	15.7	2.24	0.74	1.20	5.58
29	0.68	38.7	12.1	11.9		8.98	4.66	11.9	1.38	0.68	2.79	10.8
30	0.52	69.0	12.3	11.3		7.92	7.66	6.80	1.04	0.59	11.3	8.81
31	0.71		15.6	30.3		6.92		8.35		0.57	4.23	
Total	85.9	152	488	1,066	1,748	517	235	724	121	21.2	62.6	77.9
Mean	2.77	5.07	15.7	34.4	62.4	16.7	7.82	23.4	4.02	.68	2.02	2.60
Max	24.0	69.0	112	224	666	35.0	22.1	120	16.7	1.36	11.3	10.8
Min	0.24	0.45	6.11	7.54	15.7	6.92	2.32	5.83	0.76	0.21	0.32	0.71
Ac-ft	170	302	967	2,115	3,468	1,026	466	1,436	239	42.1	124	154

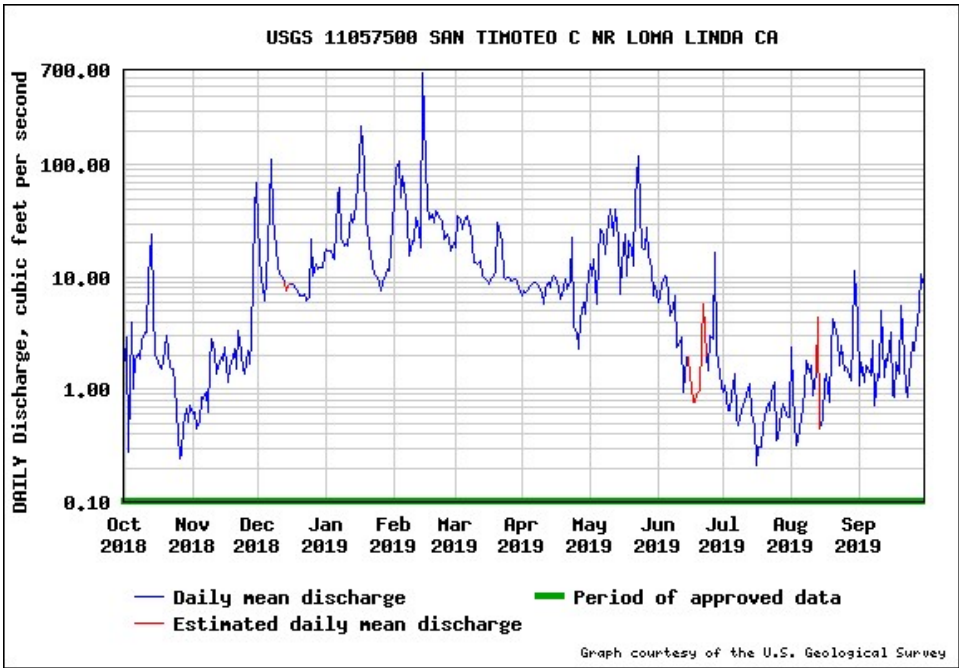
STATISTICS OF MONTHLY MEAN DATA FOR WATER YEARS 1955 - 2019, BY WATER YEAR (WY)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Mean	2.06	2.88	6.90	14.7	14.8	8.02	3.45	2.26	1.29	.85	.82	.98
Max	39.8	16.5	76.2	124	186	53.7	23.1	23.4	7.37	6.82	3.06	4.95
(WY)	(2005)	(2014)	(2011)	(2005)	(1969)	(1991)	(2006)	(2019)	(2013)	(2015)	(2014)	(2015)
Min	.000	.000	.16	.079	.17	.000	.000	.000	.000	.000	.000	.000
(WY)	(1996)	(1996)	(1996)	(1972)	(1968)	(1997)	(1979)	(1996)	(1996)	(1995)	(1995)	(1995)

SUMMARY STATISTICS

	Water Year 2019		Water Years 1955 - 2019	
Annual total	5,299			
Annual mean	14.5		5.04	
Highest annual mean			25.3	2005
Lowest annual mean			0.447	2002
Highest daily mean	666.0	Feb 14	3,500	Feb 25, 1969
Lowest daily mean	0.210	Jul 16	0.0	Feb 04, 1968
Annual 7-day minimum	0.420	Jul 14	0.0	Apr 15, 1969
Maximum peak flow	1,920[a]	Feb 14	15,000	Feb 25, 1969
Maximum peak stage	3.66	Feb 14	8.50[b]	Feb 16, 1980
Annual runoff (cfsm)	0.116		0.039	
Annual runoff (inches)	1.58		0.525	
10 percent exceeds	32.5		6.80	
50 percent exceeds	6.76		0.780	
90 percent exceeds	0.692		0.0	

[a] All or part of the record affected by Urbanization, Mining, Agricultural changes, Channelization, or other
[b] Gage datum changed during this year



APPENDIX B

DAILY PRECIPITATION DATA
FOR SAN BERNARDINO

WATER YEAR 2018-19

TABLE B-1

DAILY PRECIPITATION
USGS GILBERT STREET PRECIPITATION GAGE AT SAN BERNARDINO
NEAR FORMER COUNTY HOSPITAL SITE
(inches)

	2018			2019								
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	1.35	0.91	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.40	0.09	0.00	0.00	0.00	0.00	0.00	0.00
4	0.02	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.14	0.25	0.25	0.06	0.00	0.00	0.00	0.00	0.00	0.00
6	0.00	0.00	1.10	0.06	0.00	0.48	0.00	0.00	0.00	0.00	0.00	0.00
7	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
8	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
9	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.07	0.00	0.00	0.00	0.01
11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.00	0.00
12	0.46	0.00	0.00	0.50	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
13	0.31	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.60	3.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.44	0.22	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.33	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	2.16	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.15	0.20	0.00	0.00	0.00	0.00	0.00	0.00
21	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00
22	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.00	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	0.00	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00
27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
29	0.00	1.08	0.00	0.00		0.00	0.07	0.00	0.00	0.00	0.00	0.00
30	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00	0.00
31	0.00		0.00	0.59		0.00		0.00		0.00	0.00	
Total	0.79	1.29	1.37	5.27	7.68	1.78	0.07	1.55	0.00	0.00	0.00	0.05

Total Rainfall = 19.85 Inches

APPENDIX C

SANTA ANA RIVER WATERMASTER
FINANCIAL STATEMENTS WITH REPORT
ON EXAMINATION BY
ORANGE COUNTY WATER DISTRICT CONTROLLER

WATER YEAR 2018-19

SINCE 1933

ORANGE COUNTY WATER DISTRICT

ORANGE COUNTY'S GROUNDWATER AUTHORITY

March 10, 2020

Santa Ana River Watermaster
C/O SBVMWD
P.O. Box 5906
San Bernardino, CA 92412-5906

Subject: Review of Fiscal Year 2018-19 Financial Transactions

Gentlemen:

I have reviewed the transactions and prepared the attached Statement of Assets and Liabilities comprised of cash transactions for the Santa Ana River Watermaster, and the related Statement of Revenue, Expenses and Changes in Fund Balance for the year ended June 30, 2019. This review includes examining supporting documentation that supports the amounts and disclosures in the financial statements. We have reviewed minutes of meetings, annual budgets as well as Bank of America Checking Accounts' transactions and statements, and have concluded that all transactions were properly recorded.

Best Regards,

ORANGE COUNTY WATER DISTRICT

Vishav Sharma
Finance Manager

CC: R. Fick

PO Box 8300
Fountain Valley, CA 92728-8300

18700 Ward Street
Fountain Valley, CA 92708

(714) 378-3200
(714) 378-3373 fax

www.ocwd.com

SANTA ANA RIVER WATERMASTER

NOTES TO FINANCIAL STATEMENTS

JUNE 30, 2019

1. SIGNIFICANT ACCOUNTING POLICIES:

Basis of Accounting:

The Santa Ana River Watermaster's ("Watermaster") policy is to prepare its financial statements on the cash basis of accounting. Consequently, certain revenues are recognized when received rather than when earned, and certain expenses are recognized when cash is disbursed rather than when the obligation is incurred.

2. ORGANIZATION AND HISTORY:

The Santa Ana River Watermaster is composed of a committee of five representatives from four water districts. Two representatives serve from Orange County Water District and one representative each serves from the Inland Empire Utilities Agency, Western Municipal Water District and San Bernardino Valley Municipal Water District. The committee was established on April 23, 1969, by order of the Superior Court of California in Orange County as part of a judgment resulting from a lawsuit by the Orange County Water District as plaintiff vs. City of Chino, et al, as defendants.

Costs and expenses incurred by the individual representatives are reimbursed directly from the water districts. Collective Watermaster costs and expenses are budgeted and paid for by the Watermaster after receiving contributions from the water districts. Water districts contributions are made in the following ratios:

Orange County Water District	40%
Inland Empire Utilities Agency	20%
Western Municipal Water District	20%
San Bernardino Valley Municipal Water District	20%
Total	100%

For WY 2018-19, $10,000 were budgeted and collected as the contributions to cover the anticipated cost.

The Watermaster issues a report each year to satisfy its obligation to monitor and test water flows from the Upper Area to the Lower Area of the Santa Ana River.

3. CASH IN BANK:

The following disclosures are made in accordance with Statement No. 3 of the Governmental Accounting Standards Board (GASB 3):

Cash at June 30, 2019 consisted of the following:

Bank of America:	$4,500

All cash is fully insured by the FDIC.

SANTA ANA RIVER WATERMASTER

FINANCIAL STATEMENTS

JUNE 30, 2019

SANTA ANA RIVER WATERMASTER

STATEMENT OF ASSETS AND LIABILITIES ARISING FROM CASH TRANSACTIONS

JUNE 30, 2019

ASSETS

Cash in Bank Account	$ 4,500

LIABILITIES AND NET ASSETS

Total Net Assets	$ 4,500

SANTA ANA RIVER WATERMASTER

STATEMENT OF REVENUE AND EXPENSES ARISING FROM CASH TRANSACTIONS

FOR THE PERIOD JULY 1, 2018 - JUNE 30, 2019

	Actual	Budget	Variance - Favorable (Unfavorable)	
REVENUE COLLECTED:				
Water District Contributions				
Orange County Water District	$ 4,000	$ 4,000	-	
Inland Empire Utilities Agency	2,000	2,000	-	
Western Municipal Water District	2,000	2,000	-	
San Bernardino Valley Municipal Water District	2,000	2,000	-	
TOTAL REVENUE COLLECTED	$ 10,000	$ 10,000	$ -	(A)
EXPENSES PAID:				
Professional Engineering Services	$ 8,000	$ 8,000	0	(B)
Administrative Expenses:				
Auditing Services				
Reproduction of Annual Report	743	-	(743)	(C)
Bank service charges				
	$ 8,743	$ 8,000	$ (743)	
CHANGE IN NET ASSETS	$ 1,257			
NET ASSETS - BEGINNING OF THE YEAR	$ 3,242			
NET ASSETS - END OF THE YEAR	$ 4,500			

(A) $10,000 revenue was budgeted and collected for the fiscal year 2018-19

(B) The payment of $8,000 to IEUA was for the work done during the FY 2017-2018.

(C) For the administrative expense of the WY 2017-18, the payment was made in May 2019 to OCWD.

APPENDIX D

WATER QUALITY AND DISCHARGE OF WATER RELEASED BY MWDSC TO SAN ANTONIO CREEK NEAR UPLAND (CONNECTION OC-59)

WATER YEAR 2018-19

There was no discharge of OC-59 water to Santa Ana River during the 2018-2019 water year.

APPENDIX E

WATER QUALITY AND DISCHARGE FROM THE SAN JACINTO WATERSHED

WATER YEAR 2018-19

TABLE E-1

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
October 2018

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	1.1	1.1	0.0	0.0	0.0	0.0	0.0
2	1.2	1.2	0.0	0.0	0.0	0.0	0.0
3	3.7	1.2	2.5	0.0	0.0	0.0	0.0
4	30.8	1.2	29.6	0.0	0.0	0.0	0.0
5	2.1	2.1	0.0	0.0	0.0	0.0	0.0
6	2.0	2.0	0.0	0.0	0.0	0.0	0.0
7	1.7	1.7	0.0	0.0	0.0	0.0	0.0
8	1.6	1.6	0.0	0.0	0.0	0.0	0.0
9	2.3	2.3	0.0	0.0	0.0	0.0	0.0
10	3.4	3.4	0.0	0.0	0.0	0.0	0.0
11	1.8	1.8	0.0	0.0	0.0	0.0	0.0
12	57.8	1.8	56.0	0.0	0.0	0.0	0.0
13	52.6	1.8	50.8	0.0	0.0	0.0	0.0
14	2.1	2.1	0.0	0.0	0.0	0.0	0.0
15	1.8	1.8	0.0	0.0	0.0	0.0	0.0
16	1.1	1.1	0.0	0.0	0.0	0.0	0.0
17	1.5	1.5	0.0	0.0	0.0	0.0	0.0
18	1.5	1.5	0.0	0.0	0.0	0.0	0.0
19	1.6	1.6	0.0	0.0	0.0	0.0	0.0
20	1.9	1.9	0.0	0.0	0.0	0.0	0.0
21	1.7	1.7	0.0	0.0	0.0	0.0	0.0
22	1.9	1.9	0.0	0.0	0.0	0.0	0.0
23	2.0	2.0	0.0	0.0	0.0	0.0	0.0
24	2.1	2.1	0.0	0.0	0.0	0.0	0.0
25	2.1	2.1	0.0	0.0	0.0	0.0	0.0
26	2.1	2.1	0.0	0.0	0.0	0.0	0.0
27	1.9	1.9	0.0	0.0	0.0	0.0	0.0
28	2.2	2.2	0.0	0.0	0.0	0.0	0.0
29	2.1	2.1	0.0	0.0	0.0	0.0	0.0
30	2.1	2.1	0.0	0.0	0.0	0.0	0.0
31	1.5	1.5	0.0	0.0	0.0	0.0	0.0
Total (cfs)	195.1	56.2	138.9	0.0	0.0	0.0	0.0
(acre-feet)	387.0	112.0	275.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
November 2018

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	1.7	1.7	0.0	0.0	0.0	0.0	0.0
2	1.8	1.8	0.0	0.0	0.0	0.0	0.0
3	2.0	2.0	0.0	0.0	0.0	0.0	0.0
4	2.2	2.2	0.0	0.0	0.0	0.0	0.0
5	2.5	2.5	0.0	0.0	0.0	0.0	0.0
6	2.6	2.6	0.0	0.0	0.0	0.0	0.0
7	3.2	3.2	0.0	0.0	0.0	0.0	0.0
8	2.5	2.5	0.0	0.0	0.0	0.0	0.0
9	1.9	1.9	0.0	0.0	0.0	0.0	0.0
10	2.8	2.8	0.0	0.0	0.0	0.0	0.0
11	1.8	1.8	0.0	0.0	0.0	0.0	0.0
12	1.8	1.8	0.0	0.0	0.0	0.0	0.0
13	2.0	2.0	0.0	0.0	0.0	0.0	0.0
14	2.3	2.3	0.0	0.0	0.0	0.0	0.0
15	2.4	2.4	0.0	0.0	0.0	0.0	0.0
16	2.9	2.9	0.0	0.0	0.0	0.0	0.0
17	3.3	3.3	0.0	0.0	0.0	0.0	0.0
18	3.7	3.7	0.0	0.0	0.0	0.0	0.0
19	4.0	4.0	0.0	0.0	0.0	0.0	0.0
20	3.7	3.7	0.0	0.0	0.0	0.0	0.0
21	4.6	3.7	0.9	0.0	0.0	0.0	0.0
22	21.5	3.7	17.8	0.0	0.0	0.0	0.0
23	3.2	3.2	0.0	0.0	0.0	0.0	0.0
24	3.5	3.5	0.0	0.0	0.0	0.0	0.0
25	3.2	3.2	0.0	0.0	0.0	0.0	0.0
26	3.1	3.1	0.0	0.0	0.0	0.0	0.0
27	3.0	3.0	0.0	0.0	0.0	0.0	0.0
28	3.5	1.7	1.8	0.0	0.0	0.0	0.0
29	191.0	1.7	189.3	0.0	0.0	0.0	0.0
30	13.7	1.7	12.0	0.0	0.0	0.0	0.0
Total (cfs)	301.3	79.5	221.8	0.0	0.0	0.0	0.0
(acre-feet)	598.0	158.0	440.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
December 2018

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	1.7	1.7	0.0	0.0	0.0	0.0	0.0
2	1.4	1.4	0.0	0.0	0.0	0.0	0.0
3	1.5	1.5	0.0	0.0	0.0	0.0	0.0
4	1.5	1.5	0.0	0.0	0.0	0.0	0.0
5	22.5	1.5	21.0	0.0	0.0	0.0	0.0
6	242.0	1.5	240.5	0.0	0.0	0.0	0.0
7	8.8	1.5	7.3	0.0	0.0	0.0	0.0
8	1.7	1.7	0.0	0.0	0.0	0.0	0.0
9	1.5	1.5	0.0	0.0	0.0	0.0	0.0
10	1.4	1.4	0.0	0.0	0.0	0.0	0.0
11	1.2	1.2	0.0	0.0	0.0	0.0	0.0
12	1.2	1.2	0.0	0.0	0.0	0.0	0.0
13	1.0	1.0	0.0	0.0	0.0	0.0	0.0
14	1.1	1.1	0.0	0.0	0.0	0.0	0.0
15	1.1	1.1	0.0	0.0	0.0	0.0	0.0
16	1.1	1.1	0.0	0.0	0.0	0.0	0.0
17	1.3	1.3	0.0	0.0	0.0	0.0	0.0
18	1.4	1.4	0.0	0.0	0.0	0.0	0.0
19	1.6	1.6	0.0	0.0	0.0	0.0	0.0
20	1.4	1.4	0.0	0.0	0.0	0.0	0.0
21	1.7	1.7	0.0	0.0	0.0	0.0	0.0
22	2.0	2.0	0.0	0.0	0.0	0.0	0.0
23	1.6	1.6	0.0	0.0	0.0	0.0	0.0
24	2.0	2.0	0.0	0.0	0.0	0.0	0.0
25	3.4	1.9	1.5	0.0	0.0	0.0	0.0
26	1.9	1.9	0.0	0.0	0.0	0.0	0.0
27	1.8	1.8	0.0	0.0	0.0	0.0	0.0
28	1.6	1.6	0.0	0.0	0.0	0.0	0.0
29	2.1	2.1	0.0	0.0	0.0	0.0	0.0
30	2.0	2.0	0.0	0.0	0.0	0.0	0.0
31	1.9	1.9	0.0	0.0	0.0	0.0	0.0
Total (cfs)	318.2	47.9	270.3	0.0	0.0	0.0	0.0
(acre-feet)	631.0	95.0	536.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
January 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	1.4	1.4	0.0	0.0	0.0	0.0	0.0
2	1.5	1.5	0.0	0.0	0.0	0.0	0.0
3	1.6	1.6	0.0	0.0	0.0	0.0	0.0
4	1.9	1.9	0.0	0.0	0.0	0.0	0.0
5	9.4	1.7	7.7	0.0	0.0	0.0	0.0
6	25.9	1.7	24.2	0.0	0.0	0.0	0.0
7	2.7	1.7	1.0	0.0	0.0	0.0	0.0
8	1.7	1.7	0.0	0.0	0.0	0.0	0.0
9	1.8	1.8	1.7	0.0	0.0	0.0	0.0
10	2.1	2.1	0.0	0.0	0.0	0.0	0.0
11	2.1	2.1	0.0	0.0	0.0	0.0	0.0
12	72.5	1.7	70.8	0.0	0.0	0.0	0.0
13	1.7	1.7	0.0	0.0	0.0	0.0	0.0
14	69.6	1.7	67.9	0.0	0.0	0.0	0.0
15	165.0	1.7	163.3	0.0	0.0	0.0	0.0
16	194.0	1.7	192.3	0.0	0.0	0.0	0.0
17	127.0	1.7	125.3	0.0	0.0	741.0	0.0
18	3.3	1.7	1.6	0.0	0.0	1,271.0	0.0
19	1.8	1.8	0.0	0.0	0.0	0.0	0.0
20	1.7	1.7	0.0	0.0	0.0	0.0	0.0
21	1.8	1.8	0.0	0.0	0.0	0.0	0.0
22	1.5	1.5	0.0	0.0	0.0	0.0	0.0
23	1.6	1.6	0.0	0.0	0.0	0.0	0.0
24	1.4	1.4	0.0	0.0	0.0	0.0	0.0
25	1.7	1.7	0.0	0.0	0.0	0.0	0.0
26	1.5	1.5	0.0	0.0	0.0	0.0	0.0
27	1.7	1.7	0.0	0.0	0.0	0.0	0.0
28	1.6	1.6	0.0	0.0	0.0	0.0	0.0
29	2.3	2.3	0.0	0.0	0.0	0.0	0.0
30	2.5	2.5	0.0	0.0	0.0	0.0	0.0
31	82.7	2.4	80.3	0.0	0.0	0.0	0.0
Total (cfs)	788.9	54.5	736.1	0.0	0.0	2012.0	0.0
(acre-feet)	1565.0	108.0	1460.0	0.0	0.0	3991.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
February 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	3.2	2.4	0.8	0.0	0.0	600.0	0.0
2	220.0	2.4	217.6	0.0	0.0	1,288.0	0.0
3	21.5	2.4	19.1	0.0	0.0	1,888.0	0.0
4	76.8	2.4	74.4	0.0	0.0	1,322.0	0.0
5	54.5	2.4	52.1	23.1	0.0	747.0	0.0
6	2.9	2.9	0.0	64.5	0.0	324.0	0.0
7	2.4	2.4	0.0	66.1	0.0	0.0	0.0
8	2.4	2.4	0.0	72.8	0.0	0.0	0.0
9	15.2	2.4	12.8	67.4	0.0	46.0	0.0
10	7.0	2.4	4.6	62.2	0.0	0.0	0.0
11	2.8	2.8	0.0	67.0	0.0	3.0	0.0
12	2.2	2.2	0.0	86.9	0.0	956.0	0.0
13	6.8	2.5	4.3	71.0	0.0	1,559.0	0.0
14	2,180.0	2.5	2,106.5	70.8	35.5	3,106.0	0.0
15	650.0	2.5	576.7	16.3	70.9	5,292.0	0.0
16	239.0	2.5	220.2	66.0	43.6	5,237.0	0.0
17	137.0	2.5	68.5	73.6	41.1	5,248.0	0.0
18	104.0	2.5	27.9	75.7	69.8	3,727.0	0.0
19	83.5	2.5	5.3	73.5	74.6	1,621.0	0.0
20	82.1	2.5	6.1	74.9	74.6	394.0	0.0
21	152.0	2.5	74.6	76.5	74.2	329.0	0.0
22	94.6	2.5	15.6	71.1	75.7	275.0	0.0
23	75.6	2.5	2.0	68.0	73.8	359.0	0.0
24	67.4	2.5	1.5	69.3	67.2	356.0	0.0
25	67.5	2.5	11.0	65.3	58.7	144.0	0.0
26	65.8	2.5	14.7	23.7	51.3	21.0	30.3
27	49.7	2.5	6.4	23.4	44.7	8.0	36.7
28	36.1	2.5	0.6	19.0	36.9	0.0	36.9
Total (cfs)	4,501.9	69.5	3,523.3	1,447.9	892.7	34,850.0	103.9
(acre-feet)	8,929.0	138.0	6,988.0	2,872.0	1,771.0	69,124.0	206.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
March 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	28.7	2.5	2.1	18.6	28.6	0.0	28.6
2	168.0	2.5	145.8	19.7	21.9	0.0	21.9
3	39.0	2.5	15.7	21.1	20.3	0.0	20.3
4	30.7	2.5	6.5	19.7	21.3	463.0	0.0
5	32.4	2.5	7.7	19.2	22.0	836.0	0.0
6	181.0	2.5	158.1	27.0	21.3	881.0	0.0
7	48.3	2.5	23.6	46.2	21.3	800.0	0.0
8	54.6	2.5	25.8	58.3	24.3	691.0	0.0
9	40.5	2.5	2.2	57.6	31.1	675.0	0.0
10	50.4	2.5	3.0	61.8	40.4	612.0	0.0
11	58.7	2.5	6.4	41.1	47.4	261.0	0.0
12	83.1	2.5	28.1	40.3	51.2	0.0	51.2
13	45.2	2.5	0.7	56.7	47.3	0.0	47.3
14	47.3	2.5	4.1	49.4	41.4	0.0	41.4
15	41.4	2.5	0.0	44.5	39.8	0.0	39.8
16	51.1	2.5	6.9	41.9	40.3	0.0	40.3
17	43.5	2.5	3.3	45.2	39.7	0.0	39.7
18	46.2	2.5	7.3	44.1	37.1	0.0	37.1
19	50.4	2.5	10.1	37.0	37.1	0.0	37.1
20	214.0	2.5	173.8	40.7	37.8	0.0	37.8
21	76.3	2.5	36.4	37.4	37.6	0.0	37.6
22	42.5	2.5	3.3	38.9	37.1	0.0	37.1
23	34.9	2.5	0.0	39.2	34.6	0.0	34.6
24	33.6	2.5	0.0	34.9	31.8	0.0	31.8
25	33.0	2.5	0.0	38.7	30.8	0.0	30.8
26	32.5	2.5	0.0	21.7	30.3	0.0	30.3
27	31.5	2.5	0.0	22.3	29.5	0.0	29.5
28	35.1	2.5	0.0	22.2	27.8	0.0	27.8
29	22.0	2.5	0.0	23.2	23.0	0.0	23.0
30	33.6	2.5	0.0	36.1	20.0	0.0	20.0
31	40.5	2.5	0.0	46.7	20.9	0.0	20.9
Total (cfs)	1770.0	77.5	670.9	1151.5	994.0	5219.0	765.2
(acre-feet)	3511.0	154.0	1331.0	2284.0	1971.0	10352.0	1518.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
April 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	47.7	2.5	0.0	44.6	25.2	0.0	25.2
2	52.9	2.5	0.0	25.9	32.0	0.0	32.0
3	58.6	2.5	0.0	47.4	35.0	0.0	35.0
4	56.9	2.5	0.0	17.0	32.3	0.0	32.3
5	55.5	2.5	0.0	23.0	28.7	0.0	28.7
6	46.5	2.5	0.0	17.0	25.2	0.0	25.2
7	42.4	2.5	0.0	20.1	20.3	0.0	20.3
8	41.8	2.5	0.0	18.7	16.9	0.0	16.9
9	40.9	2.5	0.0	17.3	15.8	0.0	15.8
10	40.2	2.5	0.0	0.7	16.0	0.0	16.0
11	38.7	2.5	0.0	0.0	15.2	0.0	15.2
12	33.8	2.5	0.0	0.0	12.5	0.0	12.5
13	24.8	2.5	0.0	0.0	8.6	0.0	8.6
14	21.1	2.5	0.0	0.0	4.8	0.0	4.8
15	20.7	2.5	0.0	0.0	1.8	0.0	1.8
16	17.8	2.5	15.3	0.0	0.2	0.0	0.2
17	19.9	2.5	17.4	0.0	0.0	0.0	0.0
18	22.4	2.5	19.9	0.0	0.0	0.0	0.0
19	20.3	2.5	17.8	0.0	0.0	0.0	0.0
20	14.7	2.5	12.2	0.0	0.0	0.0	0.0
21	10.8	2.5	8.3	0.0	0.0	0.0	0.0
22	12.3	2.5	9.8	0.0	0.0	0.0	0.0
23	11.9	2.5	9.4	0.0	0.0	0.0	0.0
24	18.3	2.5	15.8	0.0	0.0	0.0	0.0
25	19.9	2.5	17.4	0.0	0.0	0.0	0.0
26	22.0	2.5	19.5	0.0	0.0	0.0	0.0
27	23.3	2.5	20.8	0.0	0.0	0.0	0.0
28	23.8	2.5	21.3	0.0	0.0	0.0	0.0
29	26.3	2.5	23.8	0.0	0.0	0.0	0.0
30	26.0	2.5	23.5	0.0	0.0	0.0	0.0
Total (cfs)	912.2	75.0	252.2	231.7	290.0	0.0	290.0
(acre-feet)	1809.0	149.0	500.0	460.0	575.0	0.0	575.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
May 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	25.9	2.5	23.4	0.0	0.0	0.0	0.0
2	27.1	2.5	24.6	0.0	0.0	0.0	0.0
3	25.9	2.5	23.4	0.0	0.0	0.0	0.0
4	25.4	2.5	22.9	0.0	0.0	0.0	0.0
5	26.6	2.5	24.1	0.0	0.0	0.0	0.0
6	30.0	2.5	27.5	0.0	0.0	0.0	0.0
7	28.0	2.5	25.5	0.0	0.0	0.0	0.0
8	29.3	2.5	26.8	0.0	0.0	0.0	0.0
9	32.1	2.5	29.6	0.0	0.0	0.0	0.0
10	37.5	2.5	35.0	0.0	0.0	0.0	0.0
11	23.6	2.5	21.1	0.0	0.0	0.0	0.0
12	22.6	2.5	20.1	0.0	0.0	0.0	0.0
13	19.9	2.5	17.4	0.0	0.0	0.0	0.0
14	18.3	2.5	15.8	0.0	0.0	0.0	0.0
15	15.3	2.5	12.8	0.0	0.0	0.0	0.0
16	32.5	2.5	30.0	0.0	0.0	0.0	0.0
17	7.0	2.5	4.5	0.0	0.0	0.0	0.0
18	4.6	2.5	2.1	0.0	0.0	0.0	0.0
19	16.8	2.5	14.3	0.0	0.0	0.0	0.0
20	10.7	2.5	8.2	0.0	0.0	0.0	0.0
21	5.0	2.5	2.5	0.0	0.0	0.0	0.0
22	95.5	2.5	93.0	0.0	0.0	0.0	0.0
23	8.3	2.5	5.8	0.0	0.0	0.0	0.0
24	4.5	2.5	2.0	0.0	0.0	0.0	0.0
25	3.4	2.5	0.9	28.4	0.0	0.0	0.0
26	2.9	2.5	0.4	14.3	0.0	0.0	0.0
27	4.0	2.5	1.5	15.6	0.0	0.0	0.0
28	2.8	2.5	0.3	19.1	0.0	0.0	0.0
29	2.4	2.4	0.0	20.5	0.0	0.0	0.0
30	2.2	2.2	0.0	14.6	0.0	0.0	0.0
31	2.0	2.0	0.0	21.6	0.0	0.0	0.0
Total (cfs)	591.9	76.6	515.4	134.1	0.0	0.0	0.0
(acre-feet)	1174.0	152.0	1022.0	266.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
June 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	3.7	3.7	0.0	14.2	0.0	0.0	0.0
2	4.4	4.4	0.0	14.7	0.0	0.0	0.0
3	4.0	4.0	0.0	15.3	0.0	0.0	0.0
4	2.8	2.8	0.0	18.6	0.0	0.0	0.0
5	2.2	2.2	0.0	17.5	0.0	0.0	0.0
6	2.5	2.5	0.0	11.7	0.0	0.0	0.0
7	2.4	2.4	0.0	26.3	0.0	0.0	0.0
8	1.6	1.6	0.0	0.0	0.0	0.0	0.0
9	1.6	1.6	0.0	0.0	0.0	0.0	0.0
10	2.7	2.7	0.0	0.0	0.0	0.0	0.0
11	1.5	1.5	0.0	0.0	0.0	0.0	0.0
12	1.6	1.6	0.0	0.0	0.0	0.0	0.0
13	2.0	2.0	0.0	0.0	0.0	0.0	0.0
14	1.9	1.9	0.0	0.0	0.0	0.0	0.0
15	1.8	1.8	0.0	0.0	0.0	0.0	0.0
16	1.9	1.9	0.0	0.0	0.0	0.0	0.0
17	2.1	2.1	0.0	0.0	0.0	0.0	0.0
18	2.1	2.1	0.0	0.0	0.0	0.0	0.0
19	2.3	2.3	0.0	0.0	0.0	0.0	0.0
20	2.3	2.3	0.0	0.0	0.0	0.0	0.0
21	2.1	2.1	0.0	0.0	0.0	0.0	0.0
22	2.5	2.5	0.0	0.0	0.0	0.0	0.0
23	4.4	4.4	0.0	0.0	0.0	0.0	0.0
24	3.7	3.7	0.0	0.0	0.0	0.0	0.0
25	2.4	2.4	0.0	0.0	0.0	0.0	0.0
26	2.4	2.4	0.0	0.0	0.0	0.0	0.0
27	3.7	3.7	0.0	0.0	0.0	0.0	0.0
28	3.9	3.9	0.0	0.0	0.0	0.0	0.0
29	3.9	3.9	0.0	0.0	0.0	0.0	0.0
30	4.7	4.7	0.0	0.0	0.0	0.0	0.0
Total (cfs)	81.1	81.1	0.0	118.3	0.0	0.0	0.0
(acre-feet)	161.0	161.0	0.0	235.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
July 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	3.9	3.9	0.0	0.0	0.0	0.0	0.0
2	4.4	4.4	0.0	0.0	0.0	0.0	0.0
3	4.3	4.3	0.0	0.0	0.0	0.0	0.0
4	4.3	4.3	0.0	0.0	0.0	0.0	0.0
5	4.4	4.4	0.0	0.0	0.0	0.0	0.0
6	5.3	4.3	1.0	0.0	0.0	0.0	0.0
7	4.7	4.7	0.0	0.0	0.0	0.0	0.0
8	4.9	4.9	0.0	0.0	0.0	0.0	0.0
9	5.0	5.0	0.0	0.0	0.0	0.0	0.0
10	6.0	6.0	0.0	0.0	0.0	0.0	0.0
11	5.1	5.1	0.0	0.0	0.0	0.0	0.0
12	4.9	4.9	0.0	0.0	0.0	0.0	0.0
13	3.7	3.7	0.0	0.0	0.0	0.0	0.0
14	3.2	3.2	0.0	0.0	0.0	0.0	0.0
15	3.2	3.2	0.0	0.0	0.0	0.0	0.0
16	3.1	3.1	0.0	0.0	0.0	0.0	0.0
17	3.2	3.2	0.0	0.0	0.0	0.0	0.0
18	4.7	3.3	1.4	0.0	0.0	0.0	0.0
19	3.3	3.3	0.0	0.0	0.0	0.0	0.0
20	3.3	3.3	0.0	0.0	0.0	0.0	0.0
21	3.2	3.2	0.0	0.0	0.0	0.0	0.0
22	3.6	3.6	0.0	0.0	0.0	0.0	0.0
23	3.8	3.8	0.0	0.0	0.0	0.0	0.0
24	4.3	3.6	0.7	0.0	0.0	0.0	0.0
25	4.2	3.6	0.5	0.0	0.0	0.0	0.0
26	3.6	3.6	0.0	0.0	0.0	0.0	0.0
27	3.7	3.7	0.0	0.0	0.0	0.0	0.0
28	3.6	3.6	0.0	0.0	0.0	0.0	0.0
29	4.5	4.5	0.0	0.0	0.0	0.0	0.0
30	4.0	4.0	0.0	0.0	0.0	0.0	0.0
31	4.8	4.8	0.0	0.0	0.0	0.0	0.0
Total (cfs)	128.3	124.6	3.7	0.0	0.0	0.0	0.0
(acre-feet)	254.0	247.0	7.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
August 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	4.7	4.7	0.0	0.0	0.0	0.0	0.0
2	3.1	3.1	0.0	0.0	0.0	0.0	0.0
3	2.1	2.1	0.0	0.0	0.0	0.0	0.0
4	2.5	2.5	0.0	0.0	0.0	0.0	0.0
5	2.6	2.6	0.0	0.0	0.0	0.0	0.0
6	2.0	2.0	0.0	0.0	0.0	0.0	0.0
7	2.7	2.7	0.0	0.0	0.0	0.0	0.0
8	2.7	2.7	0.0	0.0	0.0	0.0	0.0
9	2.3	2.3	0.0	0.0	0.0	0.0	0.0
10	2.6	2.6	0.0	0.0	0.0	0.0	0.0
11	3.1	3.1	0.0	0.0	0.0	0.0	0.0
12	3.2	3.2	0.0	0.0	0.0	0.0	0.0
13	2.4	2.4	0.0	0.0	0.0	0.0	0.0
14	2.4	2.4	0.0	0.0	0.0	0.0	0.0
15	2.2	2.2	0.0	0.0	0.0	0.0	0.0
16	2.8	2.8	0.0	0.0	0.0	0.0	0.0
17	2.2	2.2	0.0	0.0	0.0	0.0	0.0
18	2.4	2.4	0.0	0.0	0.0	0.0	0.0
19	2.9	2.9	0.0	0.0	0.0	0.0	0.0
20	2.6	2.6	0.0	0.0	0.0	0.0	0.0
21	3.2	3.2	0.0	0.0	0.0	0.0	0.0
22	3.1	3.1	0.0	0.0	0.0	0.0	0.0
23	3.9	3.9	0.0	0.0	0.0	0.0	0.0
24	3.9	3.9	0.0	0.0	0.0	0.0	0.0
25	2.8	2.8	0.0	0.0	0.0	0.0	0.0
26	2.9	2.9	0.0	0.0	0.0	0.0	0.0
27	3.1	3.1	0.0	0.0	0.0	0.0	0.0
28	3.1	3.1	0.0	0.0	0.0	0.0	0.0
29	3.3	3.3	0.0	0.0	0.0	0.0	0.0
30	3.0	3.0	0.0	0.0	0.0	0.0	0.0
31	2.7	2.7	0.0	0.0	0.0	0.0	0.0
Total (cfs)	88.4	88.4	0.0	0.0	0.0	0.0	0.0
(acre-feet)	175.0	175.0	0.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19
September 2019

Day	[1] Temescal Creek Flow	[2] Temescal Creek Base Flow	[3] Scalped Storm Flow	[4] EMWD Discharge to Temescal Creek	[5] San Jacinto Watershed Outflow At Prado	[6] Santa Ana River Flow Lost to the Ocean	[7] San Jacinto Outflow Recharged by OCWD
1	2.8	2.8	0.0	0.0	0.0	0.0	0.0
2	2.9	2.9	0.0	0.0	0.0	0.0	0.0
3	3.2	3.2	0.0	0.0	0.0	0.0	0.0
4	3.6	3.6	0.0	0.0	0.0	0.0	0.0
5	4.0	4.0	0.0	0.0	0.0	0.0	0.0
6	3.5	3.5	0.0	0.0	0.0	0.0	0.0
7	2.7	2.7	0.0	0.0	0.0	0.0	0.0
8	2.4	2.4	0.0	0.0	0.0	0.0	0.0
9	2.6	2.6	0.0	0.0	0.0	0.0	0.0
10	2.4	2.4	0.0	0.0	0.0	0.0	0.0
11	2.3	2.3	0.0	0.0	0.0	0.0	0.0
12	2.2	2.2	0.0	0.0	0.0	0.0	0.0
13	1.8	1.8	0.0	0.0	0.0	0.0	0.0
14	2.2	2.2	0.0	0.0	0.0	0.0	0.0
15	3.3	3.3	0.0	0.0	0.0	0.0	0.0
16	5.5	5.5	0.0	0.0	0.0	0.0	0.0
17	5.0	5.0	0.0	0.0	0.0	0.0	0.0
18	3.1	3.1	0.0	0.0	0.0	0.0	0.0
19	2.1	2.1	0.0	0.0	0.0	0.0	0.0
20	1.7	1.7	0.0	0.0	0.0	0.0	0.0
21	1.9	1.9	0.0	0.0	0.0	0.0	0.0
22	2.0	2.0	0.0	0.0	0.0	0.0	0.0
23	2.5	2.5	0.0	0.0	0.0	0.0	0.0
24	2.0	2.0	0.0	0.0	0.0	0.0	0.0
25	2.1	2.1	0.0	0.0	0.0	0.0	0.0
26	2.1	2.1	0.0	0.0	0.0	0.0	0.0
27	2.1	2.1	0.0	0.0	0.0	0.0	0.0
28	3.4	3.4	0.0	0.0	0.0	0.0	0.0
29	3.9	3.9	0.0	0.0	0.0	0.0	0.0
30	3.6	3.6	0.0	0.0	0.0	0.0	0.0
Total (cfs)	84.9	84.9	0.0	0.0	0.0	0.0	0.0
(acre-feet)	168.0	168.0	0.0	0.0	0.0	0.0	0.0

TABLE E-1 (continued)

SAN JACINTO WATERSHED DISCHARGE CALCULATIONS
WATER YEAR 2018-19

FOOTNOTES

1. USGS measured flow of Temescal Creek above Main St. at Corona, which can be found in Appendix A.

2. Temescal base flow was assumed to be the flow present when there are no sources of non-tributary flow and there has been no precipitation to cause storm flow.

3. Temescal Creek flow attributed to storm events.

4. Eastern Municipal Water District wastewater discharge to Temescal Creek at Wasson Canyon.

5. Flow in Temescal Creek at Corona attributed to EMWD discharge of wastewater to Temescal Creek.

6. Due to apparent inaccuracies and inconsistencies in the 5th Street stream gage readings, OCWD determined beginning in WY2018/19 to calculate Santa Ana River flow lost to the ocean as follows: 1) when Prado outflow is less than 1,000 cfs, the Prado and Imperial gages are typically within 5% of each other, and the loss to the ocean of Prado outflow is presumed to be zero, with OCWD capturing all such Prado outflow and 2) when Prado outflow is greater than or equal to 1,000 cfs, the Prado and Imperial gages typically differ by more than 5%, and losses to the ocean are calculated as Prado discharge minus OCWD's measured capture.

7. When the Santa Ana River flow lost to the ocean is greater than the San Jacinto watershed outflow reaching Prado Dam, it is assumed that no San Jacinto watershed outflow could be recharged by OCWD. When San Jacinto watershed outflow reaching Prado Dam was greater than the Santa Ana River flow lost to the ocean, San Jacinto watershed outflow recharged by OCWD was calculated as the difference between the two.

TABLE E-2

SUMMARY OF SAN JACINTO WATERSHED DISCHARGE
WATER YEAR 2018-19

MONTHLY TOTALS
(ACRE-FEET)

Month	EMWD Discharge to Temescal Creek	San Jacinto Watershed Outflow At Prado	Santa Ana River Flow Lost to the Ocean	San Jacinto Outflow Recharged By OCWD
2018				
October	0	0	0	0
November	0	0	0	0
December	0	0	0	0
2019				
January	0	0	3,991	0
February	2,872	1,771	69,124	206
March	2,284	1,971	10,352	1,518
April	460	575	0	575
May	266	0	0	0
June	235	0	0	0
July	0	0	0	0
August	0	0	0	0
September	0	0	0	0
Total	6,117	4,317	83,467	2,299

TABLE E-3

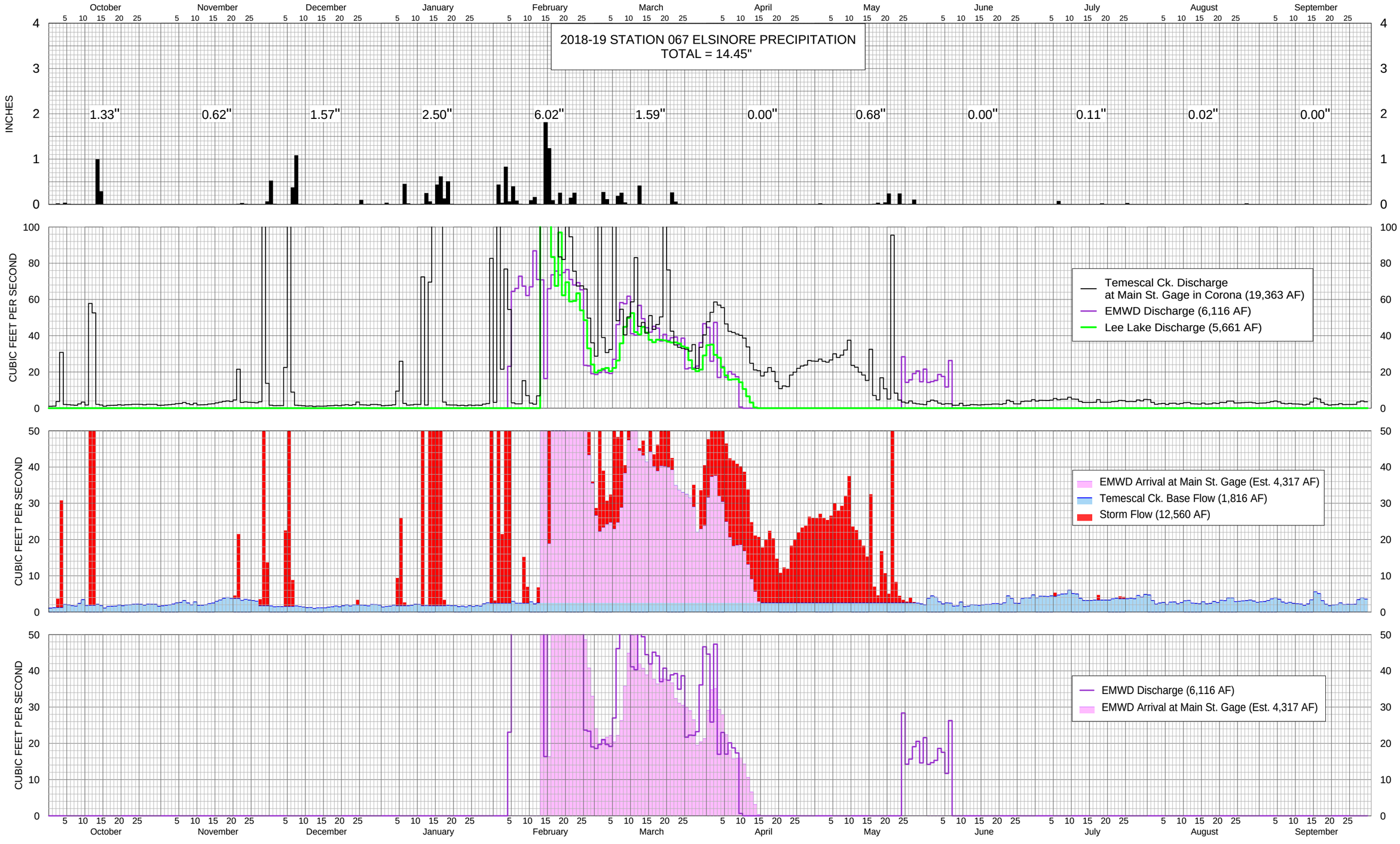
SUMMARY OF FLOW-WEIGHTED AVERAGE TDS
OF SAN JACINTO WATERSHED DISCHARGE
CALCULATED TO REACH PRADO RESERVOIR
WATER YEAR 2018-19

Month	EMWD Discharge to Temescal Creek (acre-feet) [1]	EMWD Discharge TDS (mg/L) [2]	EMWD Discharge x TDS [3]	San Jacinto Watershed Outflow At Prado (acre-feet)	EMWD Flow at Prado Reservoir x TDS [4]
2018					
October	0	---	---	0	0
November	0	---	---	0	0
December	0	---	---	0	0
2019					
January	0	---	---	0	0
February	2,872	678	1,947,216	1,771	1,200,738
March	2,284	805	1,838,620	1,971	1,586,655
April	460	680	312,800	575	391,000
May	266	710	188,860	0	0
June	235	720	169,200	0	0
July	0	---	---	0	0
August	0	---	---	0	0
September	0	---	---	0	0
Total	6,117		4,456,696	4,317	3,178,393

Flow-weighted TDS of EMWD Discharge [3] = 729 mg/L

Flow-weighted TDS of San Jacinto Watershed Outflow At Prado [4] = 736 mg/L

(1) Actual EMWD discharge to Temescal Creek at Wasson Canyon.
(2) Monthly Average TDS of EMWD Surface Water Discharge to Wasson Canyon.
(3) Water quality for EMWD discharge at Wasson Canyon =
(Sum of Monthly Discharge Volume X Discharge TDS)/Total Discharge Volume.
(4) Water quality for EMWD discharge arriving at Prado reservoir =
(Sum of Volume Arriving at Prado X Discharge TDS)/Sum of Monthly Volume Arriving at Prado



WATER YEAR 2018-19 PROVISIONAL DISCHARGE OF TEMESCAL CREEK AT MAIN STREET IN CORONA, LEE LAKE DISCHARGE, EMWD DISCHARGE, AND ELSINORE PRECIPITATION

APPENDIX F

WATER QUALITY AND DISCHARGE OF THE SANTA ANA RIVER BELOW PRADO DAM

WATER YEAR 2018-19

TABLE F-1

WATER QUALITY SAMPLES BELOW PRADO DAM
WATER YEAR 2018-19

Date	TDS (mg/L)	EC (um/cm)	TDS/EC Ratio	Source
10/9/2018	679	1120	0.6063	USGS
10/12/2018	672	1130	0.5947	USGS
10/24/2018	713	1180	0.6042	USGS
11/14/2018	706	1190	0.5933	USGS
11/14/2018	719	1180	0.6093	USGS
11/27/2018	654	1120	0.5839	USGS
12/7/2018		423	0.0000	USGS
12/19/2018	434	742	0.5849	USGS
12/19/2018	417	703	0.5932	USGS
1/30/2019	285	478	0.5962	USGS
1/30/2019	284	480	0.5917	USGS
1/31/2019	285	488	0.5840	USGS
2/7/2019	264	454	0.5815	USGS
2/12/2019	288	490	0.5878	USGS
2/26/2019	396	655	0.6046	USGS
2/28/2019	450	745	0.6040	USGS
3/4/2019	305	530	0.5755	USGS
3/14/2019	486	807	0.6022	USGS
3/19/2019	469	812	0.5776	USGS
3/25/2019	536	895	0.5989	USGS
4/1/2019	472	809	0.5834	USGS
4/16/2019	498	838	0.5943	USGS
4/23/2019	524	996	0.5261	USGS
4/30/2019	615	1010	0.6089	USGS
5/7/2019	653	1100	0.5936	USGS
5/14/2019	468	788	0.5939	USGS
5/22/2019	612	1010	0.6059	USGS
5/29/2019	537	897	0.5987	USGS
6/7/2019	674	1080	0.6241	USGS
6/11/2019	695	1160	0.5991	USGS
6/20/2019	663	1100	0.6027	USGS
6/26/2019	677	1140	0.5939	USGS
7/1/2019	711	1160	0.6129	USGS
7/17/2019	657	1130	0.5814	USGS
7/24/2019	704	1160	0.6069	USGS
8/5/2019	718	1180	0.6085	USGS
8/14/2019	696	1140	0.6105	USGS
8/29/2019	712	1180	0.6034	USGS
9/9/2019	685	1140	0.6009	USGS
9/18/2019	686	1120	0.6125	USGS
9/23/2019	637	1090	0.5844	USGS

TABLE F-2

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

October 2018

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	84	1,130	676	56,716
2	83	1,100	658	54,746
3	81	1,110	664	53,518
4	100	1,090	652	65,200
5	91	1,070	640	58,112
6	80	1,100	658	52,443
7	77	1,130	676	52,187
8	81	1,140	681	55,229
9	78	1,140	681	52,914
10	71	1,160	693	49,411
11	81	1,160	693	55,925
12	78	1,150	687	53,861
13	137	694	415	56,855
14	118	689	412	48,616
15	117	789	472	55,224
16	128	884	528	67,584
17	135	986	589	79,515
18	146	1,060	634	92,564
19	149	1,090	652	97,148
20	146	1,090	652	95,192
21	145	1,110	664	96,280
22	162	1,150	687	111,294
23	169	1,170	699	118,131
24	164	1,200	717	117,588
25	150	1,160	693	103,950
26	118	1,130	676	79,768
27	110	1,140	681	74,910
28	109	1,140	681	74,229
29	115	1,100	658	75,670
30	115	1,090	652	74,980
31	111	1,090	652	72,372
Total	3,529			2,252,132
		Monthly Flow-weighted TDS =	638	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

November 2018

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	104	1,100	658	68,432
2	102	1,100	658	67,116
3	101	1,110	664	67,064
4	100	1,120	670	67,000
5	108	1,090	652	70,416
6	105	1,110	664	69,720
7	94	1,140	681	64,150
8	91	1,150	687	62,654
9	90	1,180	705	63,098
10	95	1,180	705	66,623
11	96	1,190	711	68,469
12	94	1,190	711	66,479
13	92	1,180	705	64,578
14	91	1,170	699	63,469
15	91	1,190	711	64,417
16	94	1,190	711	66,550
17	97	1,190	711	69,251
18	103	1,170	699	71,997
19	103	1,160	693	71,379
20	112	1,150	687	76,944
21	124	1,120	670	83,080
22	156	817	488	76,128
23	155	841	503	77,965
24	123	1,030	616	75,768
25	118	1,080	646	76,228
26	113	1,090	652	73,676
27	101	1,080	646	65,246
28	92	1,090	652	59,788
29	130	1,010	604	78,520
30	288	516	308	88,704
Total	3,361			2,104,909
		Monthly Flow-weighted TDS =	626	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

December 2018

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	300	509	304	91,200
2	297	533	319	94,743
3	393	562	336	132,048
4	379	662	396	150,084
5	283	782	467	132,161
6	290	852	509	147,610
7	482	437	261	125,802
8	635	530	317	201,295
9	619	538	322	199,318
10	602	519	310	186,620
11	473	530	317	149,941
12	197	626	374	73,678
13	150	753	450	67,500
14	149	792	473	70,477
15	151	785	469	70,819
16	151	804	481	72,631
17	143	750	448	64,064
18	501	678	405	202,905
19	654	667	399	260,946
20	649	722	432	280,368
21	622	807	482	299,804
22	597	873	522	311,634
23	569	928	555	315,795
24	532	983	588	312,816
25	483	1,080	646	312,018
26	353	1,120	670	236,510
27	207	1,110	664	137,448
28	185	1,130	676	125,060
29	180	1,130	676	121,680
30	184	1,120	670	123,280
31	185	1,140	681	125,985
Total	11,595			5,196,240
		Monthly Flow-weighted TDS =	448	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

January 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	183	1,140	681	124,623
2	185	1,120	670	123,950
3	176	1,110	664	116,864
4	172	1,090	652	112,144
5	182	1,090	652	118,664
6	219	867	518	113,442
7	240	754	451	108,240
8	412	980	586	241,432
9	224	1,140	681	152,544
10	191	1,130	676	129,116
11	185	1,090	652	120,620
12	213	956	571	121,623
13	250	645	386	96,500
14	312	749	448	139,776
15	446	660	395	176,170
16	394	394	236	92,984
17	1,180	350	209	246,620
18	1,680	293	175	294,000
19	512	342	204	104,448
20	511	370	221	112,931
21	507	330	197	99,879
22	521	391	234	121,914
23	527	472	282	148,614
24	440	510	305	134,200
25	329	595	356	117,124
26	627	468	280	175,560
27	623	444	265	165,095
28	630	459	274	172,620
29	637	466	279	177,723
30	786	459	274	215,364
31	1,000	459	274	274,000
Total	14,494			4,648,784
		Monthly Flow-weighted TDS =	321	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

February 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	993	511	305	302,865
2	1,760	476	285	501,600
3	2,480	369	221	548,080
4	1,900	444	265	503,500
5	1,310	444	265	347,150
6	912	429	256	233,472
7	380	434	259	98,420
8	379	473	283	107,257
9	380	492	294	111,720
10	380	520	311	118,180
11	379	540	323	122,417
12	1,250	538	322	402,500
13	1,790	493	295	528,050
14	3,240	445	266	861,840
15	5,380	302	181	973,780
16	5,320	309	185	984,200
17	5,330	364	218	1,161,940
18	3,850	404	242	931,700
19	1,860	462	276	513,360
20	847	472	282	238,854
21	768	494	295	226,560
22	628	545	326	204,728
23	623	501	299	186,277
24	615	523	313	192,495
25	402	605	362	145,524
26	273	677	405	110,565
27	272	689	412	112,064
28	303	744	445	134,835
Total	44,004			10,903,933
		Monthly Flow-weighted TDS =	248	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

March 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	343	728	435	149,205
2	345	704	421	145,245
3	350	696	416	145,600
4	798	561	335	267,330
5	1,110	535	320	355,200
6	1,120	595	356	398,720
7	1,140	594	355	404,700
8	1,140	527	315	359,100
9	1,140	535	320	364,800
10	1,130	575	344	388,720
11	631	647	387	244,197
12	269	752	450	121,050
13	259	783	468	121,212
14	259	802	479	124,061
15	264	802	479	126,456
16	268	855	511	136,948
17	272	853	510	138,720
18	276	838	501	138,276
19	280	792	473	132,440
20	286	783	468	133,848
21	289	852	509	147,101
22	291	728	435	126,585
23	292	727	435	127,020
24	293	764	457	133,901
25	333	816	488	162,504
26	355	824	493	175,015
27	357	800	478	170,646
28	375	799	478	179,250
29	395	795	475	187,625
30	399	806	482	192,318
31	405	828	495	200,475
Total	15,464			6,198,268
		Monthly Flow-weighted TDS =	401	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

April 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	379	829	496	187,984
2	351	829	496	174,096
3	351	822	491	172,341
4	351	820	490	171,990
5	348	806	482	167,736
6	347	831	497	172,459
7	345	866	518	178,710
8	381	882	527	200,787
9	398	864	516	205,368
10	399	820	490	195,510
11	401	843	504	202,104
12	405	865	517	209,385
13	408	874	522	212,976
14	410	875	523	214,430
15	411	864	516	212,076
16	411	851	509	209,199
17	409	861	515	210,635
18	425	878	525	223,125
19	425	876	524	222,700
20	415	875	523	217,045
21	407	895	535	217,745
22	401	908	543	217,743
23	394	916	548	215,912
24	398	--- [2]		
25	384	--- [2]		
26	367	939	561	205,887
27	370	967	578	213,860
28	372	986	589	219,108
29	372	995	595	221,340
30	385	1,010	604	232,540
Total	11,620			5,704,791
		Monthly Flow-weighted TDS =	526 mg/L	
Total	10,838 [3]			

(1) TDS = EC x 0.5978

(2) Equipment malfunction thus EC data are missing for 04/24/2019 and 04/25/2019. Flow data period of missing EC are excluded in the monthly flow-weighted TDS calculation.

(3) Total outflow less days where data is missing.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

May 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	390	1,030	616	240,240
2	406	1,040	622	252,532
3	412	1,060	634	261,208
4	406	1,080	646	262,276
5	400	1,090	652	260,800
6	429	1,100	658	282,282
7	451	1,110	664	299,464
8	448	1,130	676	302,848
9	419	1,160	693	290,367
10	399	1,170	699	278,901
11	382	1,210	723	276,186
12	361	1,140	681	245,841
13	404	833	498	201,192
14	412	802	479	197,348
15	374	783	468	175,032
16	339	791	473	160,347
17	354	699	418	147,972
18	337	834	499	168,163
19	317	866	518	164,206
20	389	724	433	168,437
21	298	847	506	150,788
22	249	844	505	125,745
23	345	514	307	105,915
24	313	653	390	122,070
25	307	747	447	137,229
26	300	871	521	156,300
27	297	883	528	156,816
28	292	835	499	145,708
29	311	889	531	165,141
30	315	975	583	183,645
31	281	1,080	646	181,526
Total	11,137			6,266,525
		Monthly Flow-weighted TDS=	563	mg/L

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

June 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	189	1,140	681	128,709
2	163	1,140	681	111,003
3	158	1,120	670	105,860
4	153	1,120	670	102,510
5	152	1,130	676	102,752
6	145	1,140	681	98,745
7	138	1,160	693	95,634
8	134	1,150	687	92,058
9	123	1,120	670	82,410
10	133	--- [2]		
11	121	--- [2]		
12	117	--- [2]		
13	117	1,110	664	77,688
14	117	1,130	676	79,092
15	119	1,120	670	79,730
16	122	1,110	664	81,008
17	119	1,110	664	79,016
18	122	1,120	670	81,740
19	121	1,120	670	81,070
20	124	1,120	670	83,080
21	118	1,140	681	80,358
22	112	1,150	687	76,944
23	107	1,150	687	73,509
24	109	1,150	687	74,883
25	100	1,130	676	67,600
26	110	1,140	681	74,910
27	140	1,150	687	96,180
28	113	1,130	676	76,388
29	112	1,140	681	76,272
30	114	1,100	658	75,012
Total	3,822			2,334,161
		Monthly Flow-weighted TDS =	676	mg/L
Total	3,451 [3]			

(1) TDS = EC x 0.5978

(2) Equipment malfunction thus EC data are missing for 06/10/2019, 06/11/2019 and 06/12/2019. Flow data period of missing EC are excluded in the monthly flow-weighted TDS calculation.

(3) Total outflow less days where data is missing.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

July 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	108	1,110	664	71,712
2	108	1,100	658	71,064
3	104	1,100	658	68,432
4	98	1,120	670	65,928
5	102	1,100	658	67,116
6	104	1,080	646	67,184
7	106	1,090	652	69,112
8	108	1,070	640	69,120
9	107	1,050	628	67,196
10	99	1,060	634	62,512
11	94	1,050	628	59,158
12	95	1,040	622	59,339
13	98	1,020	610	60,024
14	97	1,050	628	60,916
15	97	1,050	628	60,665
16	95	1,050	628	59,786
17	92	1,060	634	58,138
18	88	1,100	658	58,167
19	85	1,140	681	57,817
20	92	1,120	670	61,774
21	90	1,140	681	61,154
22	94	1,140	681	63,878
23	92	1,150	687	63,479
24	86	1,150	687	58,739
25	79	1,150	687	54,548
26	82	1,160	693	56,618
27	82	1,130	676	55,094
28	81	1,150	687	55,510
29	86	1,120	670	57,687
30	90	1,100	658	58,957
31	89	1,110	664	58,963
Total	2,927			1,919,785
		Monthly Flow-weighted TDS =	656 mg/L	

(1) TDS = EC x 0.5978

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

August 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	88	1,110	664	58,166
2	88	1,110	664	58,565
3	79	1,130	676	53,472
4	81	1,120	670	54,136
5	80	--- [2]		
6	80	1,100	658	52,508
7	77	1,120	670	51,456
8	79	1,120	670	52,863
9	76	1,130	676	51,579
10	75	1,120	670	50,317
11	77	1,130	676	51,782
12	83	1,120	670	55,677
13	82	1,100	658	53,956
14	77	1,150	687	53,036
15	78	1,150	687	53,586
16	78	1,150	687	53,311
17	78	1,120	670	52,059
18	81	1,100	658	53,495
19	85	1,090	652	55,224
20	84	1,110	664	55,577
21	80	1,120	670	53,466
22	78	1,110	664	51,858
23	80	1,100	658	52,640
24	80	1,130	676	54,215
25	76	1,140	681	51,484
26	76	1,130	676	51,646
27	78	1,100	658	51,061
28	82	1,080	646	52,714
29	85	1,100	658	56,062
30	81	1,090	652	53,073
31	83	1,080	646	53,618
Total	2,401			1,548,984
		Monthly Flow-weighted TDS =	644 mg/L	
Total	2,403 [3]			

(1) TDS = EC x 0.5978

(2) Equipment malfunction thus EC data are missing for 08/05/2019. Flow data period of missing EC are excluded in the monthly flow-weighted TDS calculation.

(3) Total outflow less days where data is missing.

TABLE F-2 (continued)

SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM
WATER YEAR 2018-19

September 2019

Day	Prado Outflow (cfs)	Daily Mean EC (microsiemens/cm)	Computed TDS [1]	Outflow X TDS
1	84	1,170	699	58,367
2	83	1,150	687	57,090
3	85	1,120	670	57,017
4	82	1,110	664	54,714
5	83	1,120	670	55,275
6	81	1,120	670	54,538
7	81	1,110	664	53,917
8	83	1,120	670	55,610
9	85	1,110	664	56,639
10	89	1,150	687	61,212
11	86	1,130	676	58,204
12	88	1,150	687	60,525
13	89	1,130	676	60,232
14	84	1,120	670	56,213
15	82	1,120	670	55,208
16	89	1,130	676	59,894
17	94	1,130	676	63,612
18	88	1,140	681	60,132
19	89	1,170	699	62,421
20	87	1,170	699	60,603
21	84	1,150	687	57,914
22	88	1,130	676	59,691
23	84	1,120	670	56,146
24	86	1,150	687	59,082
25	83	1,190	711	59,013
26	84	1,190	711	59,937
27	94	1,150	687	64,509
28	91	1,140	681	61,699
29	95	1,140	681	64,491
30	99	1,120	670	66,196
Total	2,601			1,770,098
		Monthly Flow-weighted TDS =	681 mg/L	

(1) TDS = EC x 0.5978

TABLE F-3

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS BELOW PRADO DAM

WATER YEAR 2018-19

Month	Monthly Flow [1] (cfs-days)	Monthly Flow-weighted TDS[1] (mg/L)	Monthly Flow x TDS
2018			
October	3,529	638	2,252,132
November	3,361	626	2,104,909
December	11,595	448	5,196,240
2019			
January	14,494	321	4,648,784
February	44,004	248	10,912,992
March	15,464	401	6,198,268
April	11,620	526	5,704,791
May	11,137	563	6,266,525
June	3,822	676	2,334,161
July	2,927	656	1,919,785
August	2,401	644	1,548,984
September	2,601	681	1,770,098
Total	126,955 [1]		50,857,668
	Yearly Flow-weighted TDS[1] =	401	

(1) Prado Outflow and Flow Weighted TDS values exclude days when EC data are missing

APPENDIX G

WATER QUALITY AND FLOW OF WASTEWATER FROM RUBIDOUX COMMUNITY SERVICES DISTRICT DISCHARGED BELOW THE RIVERSIDE NARROWS GAGING STATION

WATER YEAR 2018-19

TABLE G-1

QUANTITY AND QUALITY OF WASTEWATER FROM RUBIDOUX
DISCHARGED BELOW THE
RIVERSIDE NARROWS GAGING STATION

WATER YEAR 2018-19

MONTH	Discharge (acre -feet)	TDS (mg/L)	Discharge xTDS
2018			
October	185	908	168,336
November	179	895	160,213
December	184	950	174,665
2019			
January	189	846	159,646
February	176	916	161,583
March	185	872	161,153
April	175	949	166,064
May	177	938	166,212
June	172	944	161,915
July	178	915	163,175
August	181	955	172,448
September	171	931	159,571
Total	2,152		1,974,981

Flow-weighted TDS = $\frac{1,974,981}{2,152}$ = 918 mg/L

APPENDIX H

WATER QUALITY AND DISCHARGE OF THE SANTA ANA RIVER AT RIVERSIDE NARROWS

WATER YEAR 2018-19

TABLE H-1

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2018-19

	Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data	Ratio	Monthly Average TDS
2018	10/02/2018	1024	630	C of R	0.62	
	10/07/2018	1014	625	C of R	0.62	
	10/09/2018	1026	622	C of R	0.61	
	10/12/2018	1010	618	USGS	0.61	
	10/14/2018	996	613	C of R	0.62	
	10/16/2018	1009	612	C of R	0.61	
	10/21/2018	1008	626	C of R	0.62	
	10/23/2018	1015	633	C of R	0.62	
	10/24/2018	1010	611	USGS	0.60	
	10/24/2018	1012	611	C of R	0.60	
	10/28/2018	993	619	C of R	0.62	
	10/30/2018	1004	611	C of R	0.61	***619***
	11/04/2018	1000	620	C of R	0.62	
	11/06/2018	1009	621	C of R	0.62	
	11/11/2018	1022	613	C of R	0.60	
	11/13/2018	1000	621	C of R	0.62	
	11/14/2018	1030	606	USGS	0.59	
	11/18/2018	998	609	C of R	0.61	
	11/20/2018	1008	614	C of R	0.61	
	11/25/2018	985	601	C of R	0.61	
	11/27/2018	1010	625	USGS	0.62	
	11/27/2018	994	617	C of R	0.62	***615***
	12/02/2018	1000	604	C of R	0.60	
	12/04/2018	1006	611	C of R	0.61	
	12/09/2018	994	608	C of R	0.61	
	12/10/2018	1020	613	USGS	0.60	
	12/11/2018	1022	630	C of R	0.62	
	12/18/2018	1032	628	C of R	0.61	
	12/19/2018	1020	616	USGS	0.60	
	12/23/2018	1006	613	C of R	0.61	
	12/25/2018	1000	613	C of R	0.61	***615***

TABLE H-1 (continued)

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2018-19

	Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data		Ratio	Monthly Average TDS
2019	01/01/2019	1016	623	C of R		0.61	
	01/06/2019	1008	597	C of R		0.59	
	01/08/2019	1016	619	C of R		0.61	
	01/13/2019	978	596	C of R		0.61	
	01/15/2019	986	597	C of R		0.61	
	01/20/2019	1001	625	C of R		0.62	
	01/22/2019	1017	635	C of R		0.62	
	01/27/2019	1033	629	C of R		0.61	
	01/29/2019	1053	628	C of R		0.60	
	01/30/2019	1000	613	USGS		0.61	***616***
	02/02/2019	127	95	USGS	*	0.75	
	02/03/2019	964	596	C of R		0.62	
	02/05/2019	997	618	C of R		0.62	
	02/10/2019	1050	650	C of R		0.62	
	02/12/2019	1043	683	C of R		0.65	
	02/17/2019	1068	661	C of R		0.62	
	02/19/2019	1070	658	C of R		0.61	
	02/24/2019	1054	643	C of R		0.61	
	02/26/2019	952	597	USGS		0.63	
	02/26/2019	1073	666	C of R		0.62	***641***
	03/03/2019	1014	639	C of R		0.63	
	03/04/2019	735	452	USGS	*	0.61	
	03/05/2019	1050	635	C of R		0.60	
	03/10/2019	1027	645	C of R		0.63	
	03/12/2019	1061	660	C of R		0.62	
	03/17/2019	1049	642	C of R		0.61	
	03/19/2019	1000	611	USGS		0.61	
	03/19/2019	1072	670	C of R		0.63	
	03/24/2019	1038	631	C of R		0.61	
	03/26/2019	1044	636	C of R		0.61	
	03/31/2019	1034	637	C of R		0.62	***641***

TABLE H-1 (continued)

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2018-19

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data		Ratio	Monthly Average TDS
04/01/2019	1010	617	USGS		0.61	
04/02/2019	1051	645	C of R		0.61	
04/07/2019	1011	597	C of R		0.59	
04/09/2019	1030	678	C of R		0.66	
04/14/2019	1005	629	C of R		0.63	
04/16/2019	1037	642	C of R		0.62	
04/21/2019	1027	643	C of R		0.63	
04/23/2019	1030	524	USGS		0.51	
04/23/2019	1028	624	C of R		0.61	
04/28/2019	1033	630	C of R		0.61	
04/30/2019	1051	653	C of R		0.62	***626***
05/05/2019	1021	627	C of R		0.61	
05/07/2019	1030	627	USGS		0.61	
05/07/2019	1035	644	C of R		0.62	
05/12/2019	1018	711	C of R		0.70	
05/14/2019	1026	692	C of R		0.67	
05/19/2019	1000	622	C of R		0.62	
05/21/2019	1018	708	C of R		0.70	
05/22/2019	643	404	USGS	*	0.63	
05/26/2019	1013	640	C of R		0.63	
05/28/2019	1020	640	C of R		0.63	***657***
06/02/2019	1038	662	C of R		0.64	
06/04/2019	1050	660	C of R		0.63	
06/07/2019	981	587	USGS		0.60	
06/09/2019	1020	646	C of R		0.63	
06/11/2019	1037	638	C of R		0.62	
06/16/2019	1024	638	C of R		0.62	
06/18/2019	1029	650	C of R		0.63	
06/20/2019	1000	620	USGS		0.62	
06/23/2019	1012	630	C of R		0.62	
06/25/2019	1048	646	C of R		0.62	
06/30/2019	1034	629	C of R		0.61	***637***

TABLE H-1 (continued)

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2018-19

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data	Ratio	Monthly Average TDS
07/01/2019	1020	619	USGS	0.61	
07/02/2019	1035	638	C of R	0.62	
07/09/2019	1069	652	C of R	0.61	
07/14/2019	1024	624	C of R	0.61	
07/16/2019	1050	639	C of R	0.61	
07/23/2019	1055	641	C of R	0.61	
07/24/2019	1050	628	USGS	0.60	
07/28/2019	1029	644	C of R	0.63	
07/30/2019	1048	655	C of R	0.63	***638***
08/04/2019	1046	648	C of R	0.62	
08/05/2019	1020	638	USGS	0.63	
08/06/2019	1032	647	C of R	0.63	
08/11/2019	1043	640	C of R	0.61	
08/13/2019	1040	643	C of R	0.62	
08/18/2019	1021	639	C of R	0.63	
08/20/2019	1042	710	C of R	0.68	
08/25/2019	1030	712	C of R	0.69	
08/28/2019	1057	685	C of R	0.65	
08/29/2019	1010	623	USGS	0.62	***659***

TABLE H-1 (continued)

WATER QUALITY SAMPLES AT RIVERSIDE NARROWS
WATER YEAR 2018-19

Date Sampled	EC (microsiemens/cm)	TDS (mg/L)	Source of Data	Ratio	Monthly Average TDS
09/01/2019	1034	672	C of R	0.65	
09/03/2019	1040	660	C of R	0.63	
09/05/2019	1059	685	C of R	0.65	
09/08/2019	1043	649	C of R	0.62	
09/09/2019	1030	623	USGS	0.60	
09/11/2019	1083	671	C of R	0.62	
09/15/2019	1043	658	C of R	0.63	
09/17/2019	1055	668	C of R	0.63	
09/18/2019	1067	719	C of R	0.67	
09/22/2019	1041	652	C of R	0.63	
09/23/2019	1030	626	USGS	0.61	
09/24/2019	1055	693	C of R	0.66	
09/29/2019	1038	670	C of R	0.65	***665***
Max	1083	719		0.75	***665***
Min	127	95		0.51	***615***

*	TDS data not used in determining monthly averages
C of R	City of Riverside
USGS	U.S. Geological Survey

TABLE H-2

ANNUAL SUMMARY OF FLOW-WEIGHTED TDS AT RIVERSIDE NARROWS
WATER YEAR 2018-19

	Month	Stream Flow [1] (acre-feet)	Monthly Average TDS [2] (mg/L)	Monthly Flow x TDS
2018	October	2,398	619	1,484,362
	November	2,369	615	1,456,935
	December	2,865	615	1,761,975
2019	January	3,660	616	2,254,560
	February	3,958	641	2,537,078
	March	3,934	641	2,521,694
	April	3,178	626	1,989,428
	May	2,874	657	1,888,218
	June	2,591	637	1,650,467
	July	2,364	638	1,508,232
	August	2,303	659	1,517,677
	September	1,958	665	1,302,070
	Total Stream Flow	34,452		21,872,696

$$\text{Flow-weighted TDS} = \frac{21{,}872{,}696}{34{,}452} = 635 \text{ mg/L}$$

(1) USGS measured flow minus storm flow.

(2) TDS based on water quality data from Table H-1.